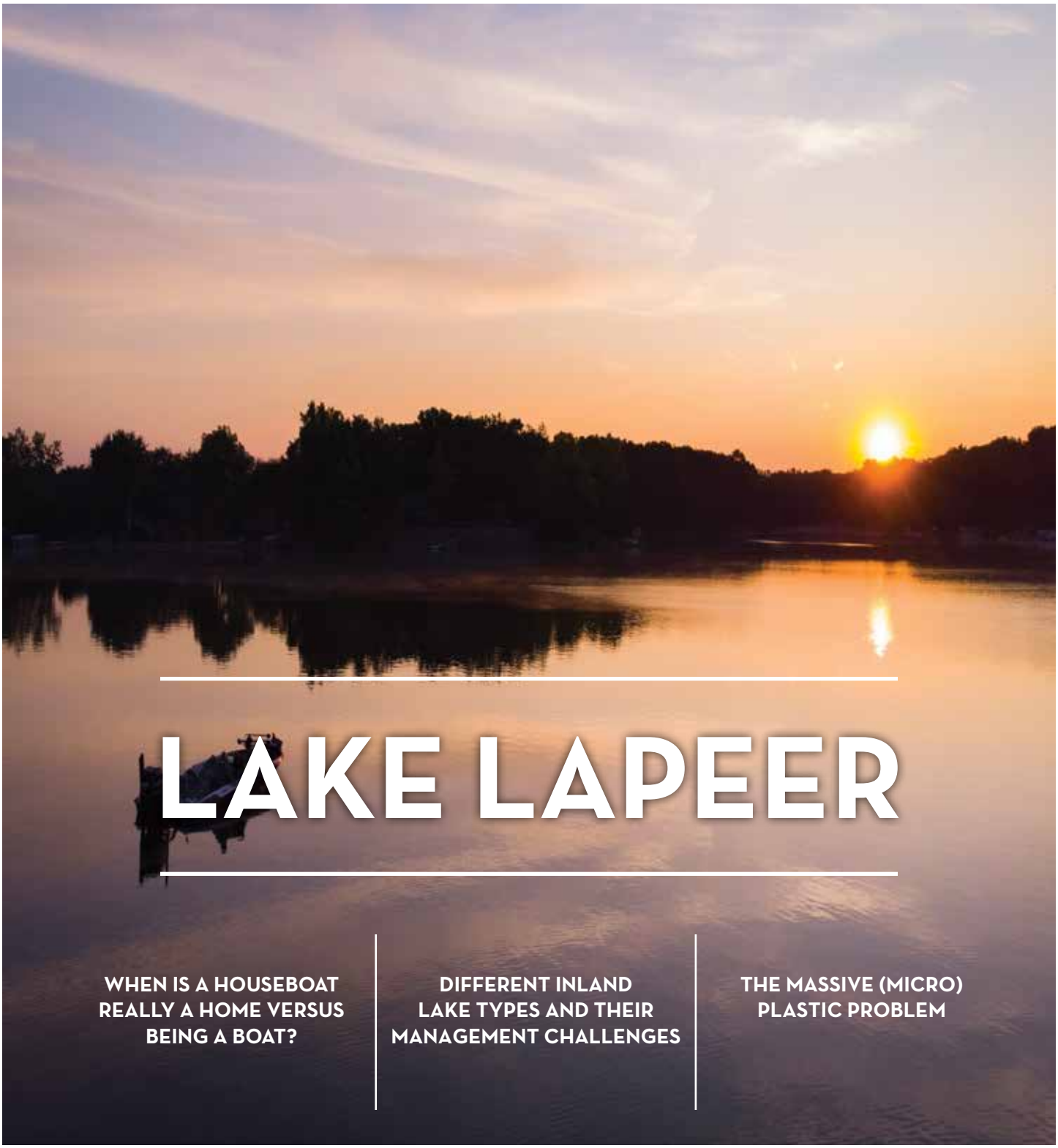
THE MICHIGAN
RIPARIAN
SUMMER 2021 | VOLUME 56 | NUMBER 3



LAKE LAPEER

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THE MICHIGAN RIPARIAN
mi-riparian.org

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DIRECTOR'S NOTES

We are interested in stewardship practices for shorelines to protect and preserve lakes and streams.

Our lake home, like most homes on our lake, had a lawn extending to the water's edge when we purchased the property. The desire for an unobstructed view of the water when our house was constructed likely resulted in removal of natural, native plants on the shore to achieve a beautiful, "suburban-like" lake yard. The problem with lawn grasses is shallow roots allowing fertilizers and chemicals to easily flow into the lake. The addition of nutrients to the lake produces increased blooms of algae and growth of aquatic plants. Over the years these practices resulted in oxygen depletion at the lower depths of our lake making it unsuitable for cold water-loving fish and encouraging the shift of the fishery to warm water species. Indeed, our lake once hosted a significant population of the desirable cisco, but ciscoes no longer exist in our lake due to the loss of an oxygen-rich cold water environment.

Native plants have deep roots that filter out nutrients flowing toward the lake or stream after rain events. We desired to offset the effects of a lakeshore lawn, and planted a 10-foot wide native plant zone on our lakefront in 2008. We enjoy the variety of native plants blooming and providing beauty on our lakeshore from spring to autumn. Geese do not enter our lake yard because they choose not to lose sight of the water. We observe geese grazing our neighbor's lawn, and then entering the lake to bypass our yard, only to reemerge on another neighbor's lawn to continue their feeding. We subsequently added extensive water gardens of native plants on each side of our lake yard; these plantings absorb the runoff from the roof of our home. And of course, we never apply fertilizer to the remaining areas of our lake lawn.

Lawn grass fails to prevent shoreline erosion. Deep-rooted, native plants on the shore effectively dissipate the energy from water waves; this is easily demonstrated by comparing erosion at undeveloped, native plant zones on your lake to that at lakefront residences. High water levels in lakes and flooding events have prompted riparians to harden their shorelines with seawalls or riprap placement to prevent erosion from wind driven waves, or the more robust waves generated by bladder boats. Waves rebounding from a hardened shore scour the bottom of the nearby littoral zone suspending nutrients to promote plant growth, and cover fish spawning areas. Hardened shorelines do not prevent nutrients from entering the lake or stream; native plants above the hardened structure will help protect your lake. We protected our shore from waves with coir logs placed in front of an old decaying submerged cement wall.

A recent practice of lakefront property owners is the creation of a sandy beach. Runoff from rain washes the sand into the lake covering fish spawning sites. Additionally, sandy beaches attract geese, resulting in the presence of E. coli and other bacteria in the beach sand.

A wealth of information for protecting your lake or stream through effective shoreline stewardship can be found through the links at **mymlsa.org**.

JOHN AND NANCY WILKS | JOHN WILKS SERVES AS VICE PRESIDENT OF MLSA. HE AND HIS WIFE NANCY RESIDE ON INDIAN LAKE IN VICKSBURG, MI.

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.

WHEN IS A HOUSEBOAT REALLY A HOME VERSUS BEING A BOAT?

CLIFFORD H. BLOOM, ESQ.
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Everyone knows that there are a variety of different boats and vessels that can be used for temporary overnight habitation or something akin to camping. Those vessels include larger cabin cruisers, power boats, yachts, houseboats, converted barges, and other watercraft. For decades, so-called "floating homes" and large houseboats have served as semi-permanent homes for many people in the warmer ocean coastal areas of the United States. Many do not consider floating homes to be true boats or water vessels. Those floating homes are not predominantly used for boating, recreational purposes, or water travel, but rather are primarily floating dwellings. That phenomenon has not been as common in seasonal Michigan, although the habitation of such vessels is increasing statewide. Some Michigan waterfront communities are becoming concerned about the potential proliferation of floating homes along their waterfront.

Why are floating homes potentially a problem for Michigan waterfront communities? There are a number of reasons. First, many floating homes are quite large, "clutter up" the waterfront, and block the upland views of the lake or river involved. Second, they take up scarce mooring or dock spaces along many waterfronts, thus decreasing the space available for boater tourism. Third, whereas most boats and vessels tend only to be in the water for a limited number of months during the summer season, floating homes often remain in the water year-round. Such year-round use can not only have potentially adverse or negative environmental impacts, but also require bubblers or other artificial means of keeping ice from forming, which can endanger people who are fishing, snowmobiling, or even walking on the ice. Fourth, the owners of floating homes do not pay real property taxes. Fifth, such floating homes are typically not subject to safeguards and energy efficiency requirements covered by typical building codes for houses on dry land. Sixth and finally, some find the semi-permanent placement of such large items along the shore to be aesthetically displeasing.

If a waterfront community in Michigan is concerned about the potential negative impacts of floating homes in the future, the local municipality should consider adopting a floating home ordinance. Such ordinances can either ban floating homes altogether or license and regulate such vessels. The most difficult aspect of drafting such an ordinance is to come up with a definition that legitimately and properly differentiates between objectionable and problematic floating homes versus true houseboats, cabin cruisers, yachts, and conventional ships or boats.

If a municipality decides to allow floating homes, a good floating home ordinance could include, at a minimum, the following regulations:

1. A good definition of a "floating home."
2. Licensing requirements for the floating homes and their mooring sites.
3. Height limitations.
4. Provisions governing potable water, sewage, garbage, and natural gas or propane facilities.
5. A designation of what areas within the municipality's waterfront can accommodate floating homes.
6. A prohibition on winter use.
7. Penalties for violation of the ordinance.

If a municipality is considering adopting an ordinance banning or regulating floating homes, it should consult with its municipal attorney first, including whether any aspects of a proposed ordinance may be preempted (i.e. precluded) by state or federal law. The municipal attorney should also consider whether such an ordinance should be an amendment to the existing zoning ordinance, a new separate regulatory ordinance, or both.

In some waterfront communities, critics might say that an ordinance is not needed if there are no floating homes currently being used in the community. However, one of the goals of proper municipal zoning and *planning* is to look to the future and to prevent problems before they arise.

MLSA GEAR

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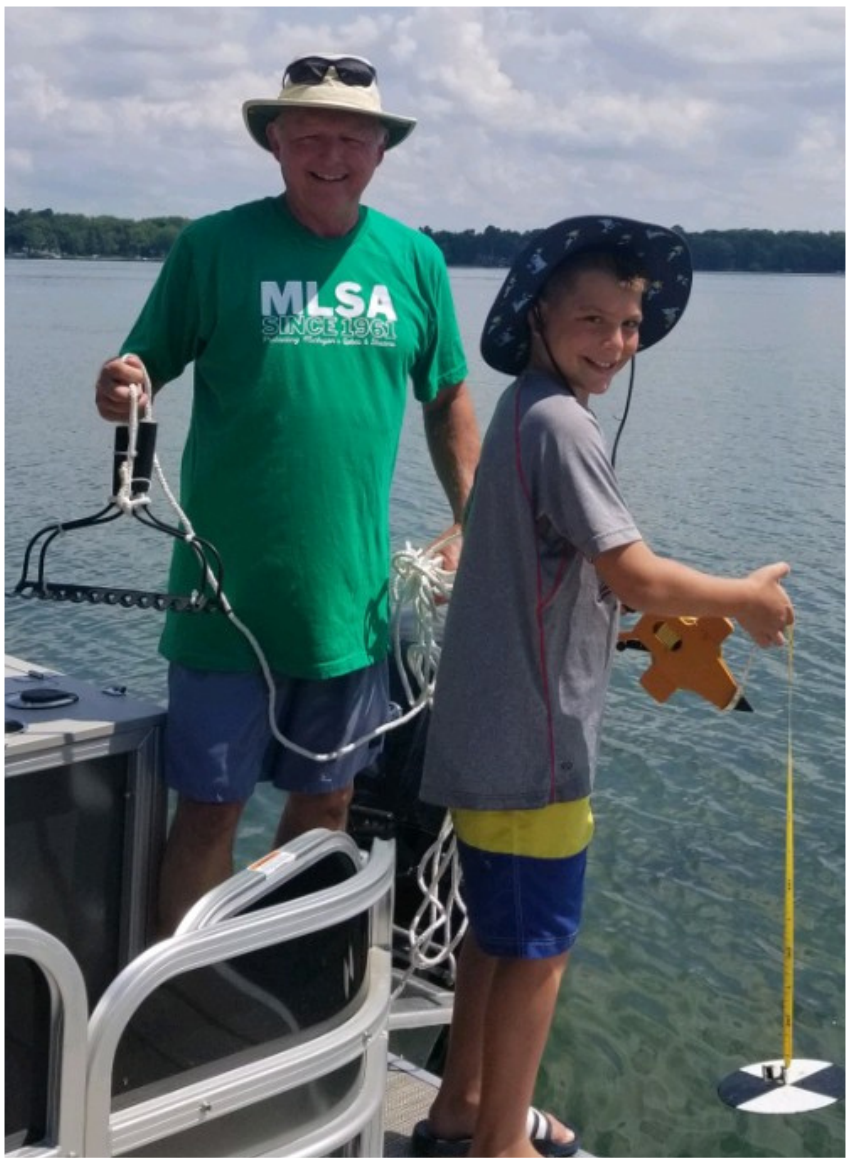
T-SHIRTS, HATS & MORE FOR LAKE & STREAM LOVERS



BOAT CLEANING EQUIPMENT AT LAUNCH SITES CAN STOP THE SPREAD OF AQUATIC INVASIVE SPECIES

AVAILABLE SYSTEMS VARY IN APPROACH, EFFECTIVENESS, AND COST

MARIA BLEITZ | MICHIGAN STATE UNIVERSITY
PAIGE FILICE | MICHIGAN STATE UNIVERSITY EXTENSION
KEVIN WALTERS | MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
JO LATIMORE | MICHIGAN STATE UNIVERSITY

Aquatic invasive species (AIS) can invade new waterways when they are carried in the bilge water of boats, tangled on watercraft propellers or trailers, or when they are attached to equipment like fishing lines. European frogbit and starry stonewort are two examples of AIS that pose a serious threat to Michigan waterbodies. They form dense mats of vegetation that block sunlight, outcompete native plants, and interfere with our ability to enjoy lakes and rivers. Once introduced, invasive species are very difficult and expensive to remove, and often treatments must be repeated. Therefore, AIS experts are encouraging communities to focus on prevention strategies such as installing boat cleaning systems to make it easy for boaters to remove AIS when they are entering or leaving a body of water. A boat cleaning system is any equipment (e.g., grabber tools, brushes, power washers) provided at a boat launch that helps remove or kill AIS on a watercraft. Available systems are diverse in size, cost, and cleaning method. Some systems are permanently installed in one location, while others are trailer-mounted and easily transported.

PERMANENT BOAT CLEANING SYSTEMS COME IN A VARIETY OF SHAPES AND SIZES DEPENDING ON THE BOAT LAUNCH AND COMMUNITY NEEDS. THIS IS A PERMANENT BOAT WASHING SYSTEM AT SOUTH HIGGINS STATE PARK. (PHOTO CREDIT: MARIA BLEITZ)

Communities with boat launches, like decontamination equipment, are diverse and one system does not fit all. Several factors should be considered when selecting a boat cleaning system to control AIS at boat launches. The first is the short and long-term cost of the equipment. Organizations should select a system supported by the financial resources available, considering operation, maintenance, transportation, and staffing costs. Second, each cleaning system has advantages and disadvantages related to its usage and decontamination effectiveness. The most effective boat cleaning system is one that is frequently used, even if its decontamination effectiveness is lower than other options. For example,

THE MSU MOBILE BOAT WASH IS A HOT WATER, HIGH PRESSURE WASHING UNIT ON A TRAILER.

hot water cleaning systems are typically the most effective at killing and removing AIS from watercraft; however, heated water requires trained operators, and permanent stations are not feasible at all boat launches. Unheated, high pressure water or waterless cleaning stations can be safely operated by first-time users, may be more practical at some boat launches due to size and cost, and still decrease the risk of AIS spread.

BOAT WASHING EQUIPMENT

HIGH PRESSURE, HOT WATER CLEANING SYSTEM

Hot water decontamination equipment includes a boiler tank and hose or spray gun that rinses the exterior and interior of the boat with very hot water, removing attached AIS and killing any that remain. Hot water is an environmentally benign method that effectively kills most AIS and is recommended by several government agencies in western states. In order to compensate for the cooling of the water between the spray hose and contact with AIS, water is heated to 60°C (140°F). However, due to the risk of damaging the boat, interior compartments require lower temperatures when sprayed for long durations. Organizations with these systems typically hire and train staff to protect themselves from liability claims. Hot water systems can be permanently installed or attached to a trailer and moved to various locations. Hot water systems may also offer a heat free, high pressure spray setting.

COST $$$

This is the most expensive boat cleaning system available when it is permanently installed at a boat launch. The high price is due to the cost of the equipment, operation, maintenance, installation (engineering, construction, power and water sources, wastewater disposal, and associated permits), and the need for trained staff to operate the boat wash. A mobile unit is less expensive, however, added costs include a tow vehicle, fuel, staffing, and maintenance.

HIGH PRESSURE CLEANING SYSTEM

Unheated, high pressure water decontamination equipment includes a spray gun that rinses the exterior of the boat. These systems can effectively remove aquatic plant fragments and small seeds, but do not kill AIS on contact. Unlike hot water cleaning, high pressure water spray is not often used to flush out the interior compartments of a boat (bilge, live well, engine, ballast tanks) due to the risk of damage. This could be an obstacle to decontamination because AIS in interior compartments could survive a multi-day journey to a new waterbody. High pressure decontamination systems exist as trailer-mounted units or can be permanently installed.

COST $$

This is a less expensive option, however a permanent station will have many of the same installation costs as a hot water system including equipment, operation, maintenance, and installation (engineering, construction, power and water sources, wastewater disposal, and associated permits). While trailer-mounted units are less expensive they still require a tow vehicle, fuel, staffing, and maintenance.

(CONTINUED ON PAGE 10)

BOAT CLEANING EQUIPMENT AT LAUNCH SITES CAN STOP THE SPREAD OF AQUATIC INVASIVE SPECIES

(CONTINUED FROM PAGE 9)

WATERLESS CLEANING SYSTEM

Waterless cleaning systems can be set up with a variety of tools, including a grabber tool for removing aquatic plants from hard-to-reach places, a plug wrench to extract the drain plug and drain the bilge, a vacuum to remove residual water, a brush to remove mud, and compressed air to dry the watercraft. Waterless systems can also be as simple as an aluminum sign with AIS removal tools and instructions. When dry, hitchhiking AIS do not survive. Five days of drying time are typically recommended before a watercraft is safe to launch in another waterbody, although using a waterless cleaning system to remove residual water may result in the boat becoming completely dry in less time.

COST $

This is the least expensive option and does not require advanced construction. However, there are recurring maintenance costs such as tool replacement.

EDUCATIONAL SIGNAGE AND EVENTS ARE VALUABLE FOR BOATERS

No matter the type of boat wash, signage should be placed at the cleaning station with clear and concise instructions. Research shows that word choice and tone of outreach materials may affect a boater's willingness to use boat washing equipment. Educational signage should be large, use imagery, and be placed where it will not be obscured by vegetation.

During educational events, staff or volunteers should be mindful of their tone, appearance, and timing when approaching boaters. Staff who connect with boaters and treat them as guests will be more successful in engaging those boaters in conversation than staff who approach with a serious expression and clipboard in hand. Boaters may also be reluctant to engage when they are busy trying to back up their trailer or attend to young family members. An example of a successful AIS boater education program is the Michigan State University Mobile Boat Wash. Staff of that program have incorporated these lessons into their boat washing events and emphasize their university affiliation by wearing university colors and displaying the MSU logo. University-related topics turn out to be good conversation starters.

Also, any education that makes it clear that boaters are socially expected to clean their boats will be successful at yielding boat-cleaning behavior. The belief that other boaters are judging one when ignoring an AIS cleaning station is a strong incentive to participate in cleaning actions. MSU Mobile Boat Wash staff have frequently observed boaters lining up to have their boats washed after they have witnessed someone else participating.

FOR MORE INFORMATION

To learn more about boating and aquatic invasive species visit the Michigan Clean Boats, Clean Waters website at micbcw.org. Since 2006, Clean Boats, Clean Waters has been

PHOTO CREDIT: CD3 SYSTEMS
WATERLESS CLEANING SYSTEMS CAN INCLUDE A VARIETY OF HAND TOOLS FOR BOATERS. HERE A BOATER IS USING A WET-DRY VACUUM AT A CD3 WATERCRAFT CLEANING STATION.

HIGH PRESSURE BOAT CLEANING SYSTEMS CAN INCLUDE HAND TOOLS FOR HARD-TO-REACH AREAS.

THE CLEAN BOATS, CLEAN WATERS PROGRAM RECENTLY PUBLISHED A WATERLESS BOAT CLEANING STATION SIGN DESIGNED TO BE PLACED AT BOAT LAUNCHES WITH DECONTAMINATION TOOLS ATTACHED TO THE BOTTOM RIGHT. THE GRAPHIC DESIGN FILE IS AVAILABLE FOR FREE TO INTERESTED GROUPS. LEARN MORE AT MICBCW.ORG.

engaging communities in the prevention of AIS through boater education. The program is a joint effort between Michigan State University Extension and the Michigan Department of Environment, Great Lakes, and Energy.

ASK THE EXPERTS

QUESTION: I see deadlines for grants that are available and information about grants that have been awarded. I have a project I would like to fund. How do I apply for a grant?

ANSWER: The grant process can be very intimidating if you are unfamiliar with it, but it's worthwhile if you are willing to put the time into it. Many grants require detailed proposals and lots of documentation. You are also often required to be a 501c3 nonprofit organization to apply. But that doesn't mean you shouldn't consider grant funding for your project. You just need to be prepared and do your research. You will need to ask yourself a few questions to get started.

Which organization would be best to partner with on the project? If you are part of an association, it is likely not a 501c3, which means that you need to find a nonprofit organization that will sponsor your project. Local lake and stream associations can partner with their conservation district, CISMA, or watershed council on the project. You will want to pick the organization that has the most interest in your project goals. For example, if you are hoping to start a campaign involving invasive species, the Cooperative Invasive Species Management Area (CISMA) is probably the place to start.

Which grant program is the best fit for your project? Maybe you are looking to do some extensive waterfront restoration or have a dam that needs to be removed. You will want to find a program with goals that are aligned with your project goals. You can find out if a program is right for you by reading through the description of the grant and communicating with the grant administrator to talk about their expectations and priorities. You will want to make sure that you have already read as much about the grant program as you possibly can before reaching out. Programs provide websites with extensive information so they don't have to explain the requirements to each prospective applicant individually. Try to keep your questions focused but don't be afraid to contact someone. Administrators want to help you when they can.

Is the timing and cost of your project in line with the program requirements? You will need to take into account the full timeline of the grant program from pre-proposal deadlines, to full proposal deadlines, to the date they announce the awards, and when the grant will pay out. This all has to work with the timing of your project. The amount the grant will award and the amount of match you are required to provide are also important considerations. You will need to account for all the money you are asking for and also indicate the match that may be required by the program. What is "match"? This could be the amount of money you need to provide from other sources and/or time promised by your organization or partners who are willing to help with the project. Each grant program will have their own requirements which is why it is so important to read through the materials provided and do your research.

Still not sure? Feel free to reach out. Remember, MLSA is here to support your organization.

MELISSA DESIMONE | MLSA EXECUTIVE DIRECTOR
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MLSA: 2021 CONFERENCE REPORT

2021 AWARDS PRESENTED BY MLSA PRESIDENT, DAVE MATUREN: RIPARIAN OF THE YEAR AWARD – CAROL KUESEL, SPIDER LAKE

This year our Riparian of the Year Award goes to an individual who has great enthusiasm and passion for improvement projects on Spider Lake in Grand Traverse county, Carol Kuesel. Carol started vacationing with her family on Spider Lake in the early 1990s and moved with her husband to live there full time in 2014. She was elected to the Spider Lake Property Owners Association in 2017 and now serves as vice president as well as co-chair of the water quality committee. Carol's lake activism truly started in her roles with Friends of Spider Lake, which then inspired the Protecting Our Lakes & Shorelands webinar series. She has championed many improvement initiatives on Spider Lake, such as drawing attention to algal blooms and the connection to septic systems; creating the Spider Lake Information Sheet (including a lake map and rules that can be shared with visitors to the lake); organizing the mobile boat wash; managing invasive species like purple loosestrife, invasive phragmites, and others; she initiated loon protection for the lake, writes educational articles for the association, monitors township and marine sheriff activities; reaches out to regional and statewide organizations for collaboration; and so much more.

MLSA MASTER'S JACKET – JOHN WILKS, MLSA VICE PRESIDENT

The MLSA Board of Directors is pleased to announce that it has unanimously voted to recognize John Wilks, of Indian Lake in Kalamazoo County, as having earned the privilege of wearing the MLSA Master's Jacket in 2021 and into the future.

John has been a Board Member of MLSA for nearly a decade, and has served as the Vice-President since 2018. He has provided a knowledgeable and steady hand for MLSA as it has worked through the transition to where we are today. John has also been a faithful participant at our conferences selling our books, and was almost the perennial winner of the "Bag of Peanuts" gift for being the first to register. John, and his wife, Nancy, have been active in MLSA Region 3 activities for over a decade. They also teamed up and led the Indian Lake Association of Vicksburg for many years. Additionally, John "walks the walk" and following the Shoreland Stewards guidelines, was the first person on Indian Lake to plant a natural shoreline.

MLSA'S 60TH ANNUAL CONFERENCE

Friday, April 30, 2021

ENGAGING SESSIONS

The day was packed from beginning to end with educational presentations on many topics. If you missed out, please visit mymlsa.org for recordings and slides.

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EXPERT PRESENTERS

These amazing people volunteered their time and talents to bring you each hour of our conference schedule. Check out the following pages for a summary of what they shared.

ENTHUSIASTIC PARTICIPANTS

A special THANK YOU to those who chose to make a donation to support us. Our mission is to support and educate. Thank you for helping us do just that!

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6

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Thank you for 60 years of working together to preserve and protect Michigan's lakes and streams.

Visit mymlsa.org

IF YOU MISSED A SESSION, WANT TO WATCH SOME SESSIONS AGAIN, OR WANT TO SHARE WITH YOUR NEIGHBORS AND ASSOCIATION, PLEASE FEEL FREE TO DO SO. ALL SESSION SLIDES AND VIDEOS ARE AVAILABLE ON OUR WEBSITE: HTTPS://MYMLSA.ORG/MLSA-EVENTS/MLSA60-VIRTUAL-CONFERENCE/

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY ON AQUATIC INVASIVE SPECIES

Speakers: Teresa Seidel, Director of Water Resources for Michigan EGLE

Sarah LaSage, Aquatic Invasive Species Coordinator for Michigan EGLE

Kevin Walters, Aquatic Biologist for Michigan EGLE

This session went into great detail about the work EGLE is currently doing to support inland water. There will be a follow-up meeting to help address the unanswered questions that came up during this presentation.

MORRISON LAKE, PHOSPHORUS MITIGATION WITH "PHOSLOCK"

Speakers: Jason Broekstra, VP of Michigan Operations for PLM Lake and Land Management

Scott Shuler, Western Regional Sales Manager for SePRO Corporation

Participants learned about a new phosphorus remediation tool that was used on Morrison Lake. Phoslock removes phosphorus from the water in an innovative way.

EDENVILLE DAM FAILURE – NO LOSS OF LIFE, MANY LESSONS LEARNED

Speaker: Jenifier Boyer, Midland County Emergency Management Coordinator

Prior to the failure of the two dams, the emergency teams in the area became concerned about the possible impact of a failure. This session discussed the planning and ultimate need for this important preparation work.

MICHIGAN ENVIRONMENTAL COUNCIL AS AN ADVOCATE FOR WATER

Speaker: Conan Smith, MEC President & CEO

We had a robust and personalized conversation with Conan about the work MLSA and MEC can do together to protect Michigan's natural resources.

VOLUNTEER MONITORING ON MICHIGAN INLAND LAKES AND STREAMS, THE SELF-HELP/CLMP/ MICORPS LEGACY

Speaker: Ralph Bednarz, DEQ – Retired

During his talk, Ralph outlined the long history of Michigan's volunteer monitoring program and how it evolved to the Michigan Clean Water Corps that we participate in today.

KEYNOTE SPEAKERS

Representative Gary Howell, *Chair of House Natural Resources and Outdoor Recreation Committee*

Senator Rick Outman, *Chair of Senate Environmental Quality Committee and Appropriations Subcommittee on Natural Resources*

The Representative and Senator spoke about their priorities for the current session and attendees were able to voice the issues unique to inland water.

SAD TALK, SPECIAL ASSESSMENT DISTRICTS IN WASHTENAW COUNTY

Speakers: Evan Pratt, Washtenaw County Water Resources Commissioner

Theo Eggermont, Washtenaw County Director of Public Works

Lauren Koloski, Washtenaw County Public Works Environmental Supervisor

Gabrielle Metzner-Gustafson, Project Scientist for Kieser & Associates

This session began with the basics of Special Assessment Districts (SAD) and went on to highlight the specifics of three SAD programs in the county.

INSURANCE AND LIABILITY FOR RIPARIAN ASSOCIATIONS AND HOMEOWNERS

Speaker: Mark Teicher, Attorney and MLSA Board Director

There is a great responsibility, and also liability, that comes with waterfront property ownership. Associations also carry liability. In this session we heard everything you need to consider to make sure you are protected as an individual and an association.

WORKING WITHIN THE WATERSHED

Speaker: Matt Meersman, Director of St. Joseph River Basin Commission

This session highlighted the importance of working beyond the shores of your waterbody and with the stakeholders all around that influence the health of your water.

WATER LAW AND CURRENT ISSUES

Speaker: Cliff Bloom, Attorney

Attorney Cliff Bloom gave his annual talk about Riparian rights, updating us with new information for 2021 and answering all questions shared by the participants.

LAKE LAPEER

DR. SUZANNE PALTE | LAKE LAPEER ASSOCIATION

> **"Someday There'll Be a Lake There... But Not Today"**

Lake Lapeer in Metamora, Michigan is a private lake community in Lapeer County. It encompasses 365 acres and the deepest part of the lake is about 15 feet. The community has seven different subdivisions around the lake and the Lake Lapeer Association is the official organization of the homeowners. Lake Lapeer is the perfect community for outdoor enthusiasts who are looking for a beautiful home close to nature. The lake is stocked with bass, northern pike, perch, bluegill, and walleye by the Lake Lapeer Association. Mal and Florence Johnson moved into their Lake Lapeer home in 1974. They raised three sons on the lake. Mal stated, "It's a great lake. We've enjoyed it." Their sons said, "Living on Lake Lapeer has been the best part of our lives." Lake Lapeer has been a lifesaver during this past year of the COVID-19 pandemic. Residents have thoroughly enjoyed the all-sports lake and getting to know their neighbors.

Lake Lapeer was originally conceived as an artificial lake project by James Cole, 1959 state water skiing champion, in 1961. Cole was a Detroit-area civil engineer who had a reputation for turning "worthless swamps into beautiful lakes and high-priced homesites" (Lapeer County Press, April 12, 1962). He had already developed eight artificial lakes, including Lake Sherwood near Milford, Lake Shannon near Fenton, and Lake James near Houghton Lake. His proposed Lake Lapeer development would cover between 950 and 1,350 acres. He planned to dam Farmers Creek on Merwin or Lippincott Road and create a lake with 21 miles of shoreline. The lake project would include 1,200 lakefront lots, and 2,000 lots not on the lake. A study from the Michigan State University publication, The Michigan Economic Record, March 1962, estimated that a $2,485,000 investment, in a hypothetical 600-acre artificial lake, would yield $22,800,000 in value.

Twenty-two landowners agreed to sell their land to James Cole for the lake development. But Mrs. Earnest Broecker and her parents, owners of 72 acres of the proposed lake development, refused to sell their family's farmland because Mrs. Broecker intended to live on the farmland.

The Lapeer County Press stated in an article about the development, "Never underestimate the power of a woman." When Mrs. Broecker stalled Cole's plans, he moved on to other developments in 1962.

365-ACRE LAKE PROJECT REVIVED

Hope for lake development was revived when Mrs. Broecker, whose refusal to sell her family farmland blocked the plans in 1962, changed her mind in 1965. Supervisors approved the development of a 365-acre lake in Hadley and Elba Townships in October 1965. It would be created by building a dam on Farmers Creek just south of Mitchell Road. The developers were Cory and Hartwig, a Hadley excavating and development firm, and White Sands Development of Ortonville. Corey and Hartwig had optioned some of the land already planned for the lake development. The Conservation Department, the County Road Commission, County Drain Commissioner, and the Circuit Court approved the lake development project. The land was cleared and excavation of the shallow areas and shaping of the shoreline came next. Much of the land was the bed of the old Wynn Mill Pond and was considered at the time to be of little value. Work on the actual Farmers Creek Dam began in August, 1967. Developers stated that the water would come from 31-square miles of watershed, and streams and springs in the area. They expected the lake to be formed by the spring of 1968. Platting was then prepared to present to Hadley and Elba Township Boards. The developers expected the new lake to be about 25 feet deep. Around the shoreline, there would be about 250 on-lake lots and about 250 off-lake lots.

(CONTINUED ON PAGE 18)

LAKE LAPEER

(CONTINUED FROM PAGE 17)

The first house was built on Lake Lapeer in 1969. The owners, Leonard and Lois Shaeffer, along with seven other owners helped incorporate the Lake Lapeer Association in November, 1973. The Lake Lapeer Association was organized under the provisions of Act 137, Public Acts for the year 1929. There were ten houses on the lake in 1974. Seventy houses were built by the late 1970s. Deeds of restrictions determined the size of the houses. People built small houses to use as fishing camps or rentals. Some lots were used as summer camps. About half of the houses belonged to permanent residents. In the 1980s, development took off with 150 houses built around the lake. The 1990s continued to see a boom in development on Lake Lapeer.

Currently there are 272 properties on the lake and 73 properties off of the lake. Of the 345 residences around Lake Lapeer, 251 households belong to the Lake Lapeer Association.

LAKE LAPEER DAM

The first dam was built of clay and partially gave way twice; once in the 1970s and again in the 1980s. A new dam that replaced the clay dam had a system of boards that could be added in the spring to raise the lake level and subtracted in the fall to lower the lake level. The lower lake level prevented damage to docks and erosion caused by ice and wind over the winter. Home owners were able to repair their shoreline and sea walls when the lake level was down by 36 inches. In 2002, the Lapeer County Drain Commissioner determined that the Lake Lapeer Dam needed to be rebuilt to avoid the dam breaking and subsequently flooding the homes downstream. Spillways were added on both sides of the dam to allow a sudden rise in water to spill over.

THE GREAT FLOOD OF 1975

In April of 1975, "the Flint River went on a rampage" (The Lapeer County Press, April 23, 1975). By midafternoon on April 20, the Flint River was expected to crest in Lapeer. Farmers Creek, which feeds into the Flint River, is the source of water for Lake Lapeer. If the Lake Lapeer Dam broke, the City of Lapeer would be inundated with water. On Saturday and Sunday, Elba Township firemen, National Guardsmen, and homeowners stacked sandbags at the Lake Lapeer dam. The water was about 3½ feet above the established level and 8 inches above the emergency spillway. Three homes that were threatened by the high water were saved because of the sandbagging.

LAKE LAPEER WON'T GET TO BE A VILLAGE

In 1989, a group of lake residents tried to create a new village of Lake Lapeer. A hearing at Hadley Fire Hall was held with more than 150 residents attending the meeting with the five-member state Boundary Commission. Mal Johnson, a lakeside resident and member of the village committee said, "The main reason for creating the village was to be able to enforce zoning ordinances – to control where septic systems go and to control sewage in the lake." The Lake Lapeer Association had zoning rules, but no authority to enforce them. Gary Howell, the Hadley and Elba Townships attorney, suggested, "The lake residents could work with the townships by establishing a special assessment district and levy a special tax to take care of the lake problems or form a special zoning district and create zoning ordinances specifically for the district." After several hearings with the State Boundary Commission and lake

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LAKE LAPEER

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residents, "the request was denied because there wasn't a need for the ability to fund a village", according to Arnold Whitney, one of two Lapeer County appointees on the board (The Lapeer County Press, March 15, 1989).

FOURTH OF JULY FIREWORKS AND LIBERTY ISLAND

In 1982, Lee Iacocca was chosen by then-President Ronald Reagan to lead the Statue of Liberty-Ellis Island Foundation, which oversaw the renovation of the Statue of Liberty and the reopening of Ellis Island as a museum of immigration. The statue renovation was completed in 1986. During that time, Lake Lapeer resident Nan Marvicsin worked as an executive secretary for Chrysler. After the campaign, Nan obtained the Statue of Liberty model that stood in the Chrysler Headquarters. She and her husband, Don, placed the statue on a small island in Lake Lapeer for the Fourth of July celebration. That was the beginning of Liberty Island and the Statue of Liberty that was lit up for the Lake Lapeer fireworks show. The annual professional fireworks show is funded by the residents of Lake Lapeer.

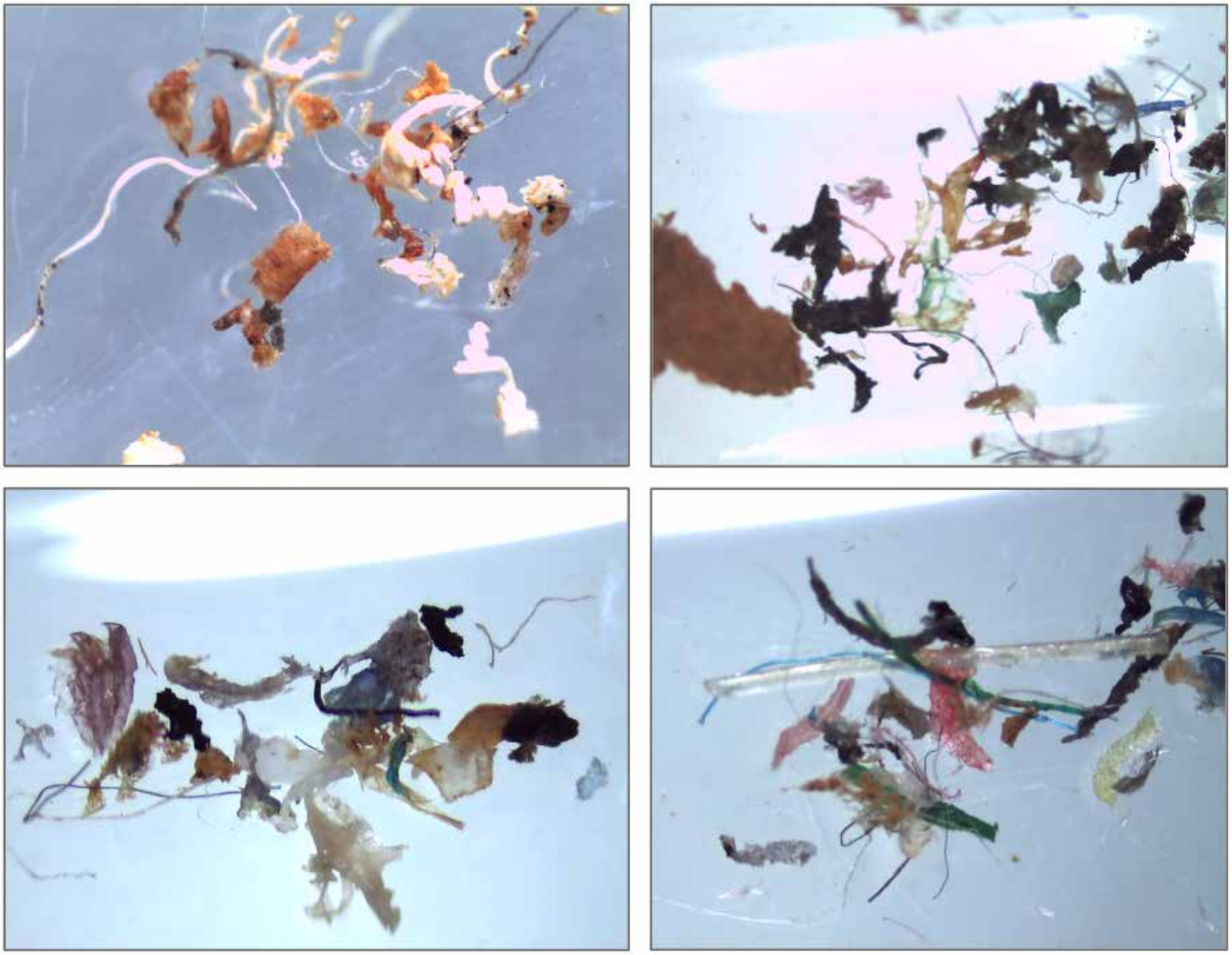
LAKE LAPEER LAKE BOARD

The Michigan legislature passed the Inland Lakes Improvement Act in 1966 "for the purpose of improving inland lakes." It included "the dredging and removal of undesirable materials from lakes, the acquisition of lands and other property by gift, grant, purchase, or condemnation, and the raising of money by taxation and special assessments for the purpose of this act" (The Michigan Riparian, February, 1980). In 2000, the water of Lake Lapeer became clogged with Eurasian milfoil. Previously, the Lake Lapeer Association hired a company to harvest the lake weeds with a mechanical harvester. Harvesting broke the Eurasian milfoil apart, causing it to spread. After discussions with a limnologist, the association determined that a different approach to weeding was needed. Chemicals would be used to control the Eurasian milfoil, along with other invasive weeds. The Lake Board was established through the Hadley and Elba Townships in 2001 to collect a special assessment to pay for the weed control. The Lake Board is still a functioning group and is currently looking at a process to dredge Lake Lapeer where silt has filled in the lake over the past 54 years.

LLA NEIGHBORHOOD WATCH

The Lake Lapeer Neighborhood Watch was organized in the spring of 2019 to encourage a welcoming and enjoyable lake atmosphere. The committee wanted to increase opportunities to meet, socialize, and strengthen a sense of community through planned activities. Knowing your neighbors also supports a safer environment. The committee organized a scavenger hunt on pontoon boats using the app Goose Chase. They also planned the July 3rd Lake Lapeer boat parade with boats decorated in patriotic colors. The Neighborhood Watch Committee organized Breakfast of the Bay with residents sharing breakfast in Turtle Bay. The August Euchre tournament, held on boats, was also a fun success. And in October, Trunk or Treat was held so the kids could go trick-or-treating safely.

For more information on Lake Lapeer, go to lakelapeer.net.



EXAMPLES OF MICROPLASTICS COLLECTED BY EMU'S MICROPLASTIC TEAM FROM THE LOWER ROUGE RIVER AND HURON RIVER IN THE SUMMER OF 2020.

THE MASSIVE (MICRO) PLASTIC PROBLEM

JENNIFER TROOST & MORGAN CHAUDRY | MASTERS STUDENTS IN BIOLOGY DEPARTMENT, EMU

THE BIG PLASTIC PROBLEM

The first synthetic plastics were invented in the early 1900s but it wasn't until after World War II that they started to become ubiquitous in modern society. Cheap and versatile, plastic began to be mass-produced to make necessary military resources during wartime. After the war, a strong marketing campaign by the plastic industry was launched to convince Americans that plastics were modern and wonderful, and that disposable products were convenient, not cheap and junky. Since then, we have entered the Age of Plastic, and plastics are used in nearly every product on the market. Globally, we are currently producing 380 million metric tons of plastic each year, much of which will stick around indefinitely and find its way to the ocean. Of course, not all plastic is bad. Plastic is used in computers and medical equipment, and is often necessary for sanitary reasons. But over 50% of the plastics produced are single-use, and only 9% of all plastics are recycled, resulting in the accumulation of plastic waste in landfills and plastics released into the environment as litter. It's estimated that there are 51 trillion pieces of plastic in the ocean (that's 500 times more than the number of stars in the sky), many of which are very small. These microplastics, plastics smaller than 5 mm, are an emergent environmental concern in aquatic ecosystems.

WHAT ARE MICROPLASTICS AND WHY ARE THEY BAD FOR LAKES AND STREAMS?

Microplastics can easily be transported long distances and into freshwater ecosystems due to their small size, light

density, and durability. Microplastics present a myriad of detrimental effects on aquatic ecosystems. For example, they leach harmful chemicals and bioaccumulate in food webs. Ingestion of microplastics can cause animals to have a false sense of satiation, which may result in malnutrition and potentially rupture internal organs. Additionally, plastics adsorb and transport harmful substances, such as perfluoroalkyl substances (PFAS), antibiotics, and other persistent organic pollutants, that have been linked to birth abnormalities and diseases in a wide range of species. Plastics may also be passed through food webs and eventually consumed by humans. In fact, one study conducted by the University of Newcastle in Australia showed that humans consume roughly a credit card worth of plastic per week.

Microplastics may also affect small organisms, such as bacteria, algae, fungi, and protists, that form the base of the food web and carry out many important ecosystem functions. For example, one study found that plastic debris increased the transport of microbes associated with harmful algal blooms. Another study found that microbial biofilms growing on microplastics were more likely to undergo gene exchange, leading to antibiotic resistance in freshwater pathogens which could have public health implications. However, to date, very little is known about how plastics may disrupt the important ecosystem functions that aquatic microorganisms carry out.

WHERE DO MICROPLASTICS COME FROM?

Microplastics are released into waterways from an array of sources such as the washing of synthetic clothing, industrial discharge, dust from cities, wear and tear of automobile tires, and the breakdown of larger plastics into smaller fragments. Microplastic fragments can be classified as either primary or secondary microplastics. Primary microplastics are produced as small fragments, smaller than 5 mm, for use in production of plastic products or self-care products such as facial cleansers and toothpastes. Secondary microplastics are created when larger macroplastics are degraded or fragmented into small particles.

One type of microplastic of particular concern are microfibers. These are small plastic fibers that shear off of synthetic clothing and have been found to make up a majority of microparticles found in some studies of natural waterways. Synthetic clothing made from materials such as polyester and nylon that is tossed around in a laundry machine can promote the spread of microfibers. Each load of laundry can shed anywhere from a few thousand to millions of microfibers. This wastewater flows through community sewers to a local wastewater treatment plant, and some studies show that wastewater treatment plants are an important source of microplastic pollution. Although wastewater treatment plants are not designed to remove microplastics, they remove approximately 95-99% of microplastics through the treatment process. However, the 1-5% can be significant point sources of microplastics, especially from large wastewater treatment facilities, discharging millions of microplastics per day into receiving streams.

Non-point sources of microplastic pollution that wash in from the watershed, are more difficult to pinpoint. Dust from urban areas has been shown to carry microplastics into the atmosphere and cycle it around the globe, similar to other major biogeochemical processes such as the water or carbon cycles. Tires can be worn down by heavy use and weathering, and can expel microplastics onto roadways. Rain or snowmelt can then transport these microplastics into local waterways. There are many other potential sources

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DIFFERENT INLAND LAKE TYPES AND THEIR MANAGEMENT CHALLENGES

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

INTRODUCTION

Our inland lakes were formed by different forces such as glaciers and human intervention. From a management perspective, it is clear that both man-made and natural lakes have challenges that must be acknowledged in order to allow for successful management outcomes. Not all natural lakes are void of problematic issues and not all man-made lakes require costly interventions. This article has been created to assist all lake communities with defining their lake type and connecting that definition to understanding the management challenges while offering improvement recommendations to assist with improvement prioritization.

All of the lake types described are associated with different lake issues, though some are similar across categories. For example, detailed aquatic vegetation surveys, invasive species threats, and water quality sampling apply to all lakes. This article is not a comprehensive list of issues by lake type but considers common problems that are observed in the specific lake ecosystems. Water quality issues may include but are not limited to unfavorable changes over time in specific water quality parameters such as nutrients, excessive aquatic vegetation or algae growth, shoreline erosion, reductions in water clarity, and sedimentation.

FIGURE 1. IMPOUNDMENT: FOREST LAKE (ARENAC COUNTY, MI)

CLASSIFICATION OF DIFFERENT LAKE TYPES

A. IMPOUNDMENTS

Impoundments are lake basins that are formed when a flowing watercourse is dammed to create a larger and deeper waterbody. These lakes generally have a lake level control structure that regulates the water levels with many lakes having a legal lake level established. By definition, a lake is an impoundment if one half or more of its maximum depth results from a water control structure. Impoundments offer the ability to recreate on a lake that would otherwise be too shallow or small for multiple properties to benefit. These lake systems are typically shallow with sediments that are fertile since flooded land or creek bed soils can be rich in nutrients that support sustained vegetation and tree growth. Impoundments usually have a high shoreline development factor (SDF), which is a ratio of the shoreline length to the circumference of a circle of area equal to that of the lake. As a result, impoundments can accommodate many homes. This can lead to overdevelopment and overuse of the lake, especially given a smaller surface area. Alternatively, this high level of development can accommodate more expenses for lake improvements. There are risks with impoundments such as dam and spillway failures, which can completely empty a lake basin upon catastrophic dam failures. Many of these lakes have at least one significant inlet or tributary and may also have other drains present and thus may also be classified as a drainage lake.

FIGURE 2. STORMWATER LAKE: AVON LAKE (OAKLAND COUNTY, MI)

IMPOUNDMENTS–MANAGEMENT CHALLENGES

Since the majority of impoundments are shallow, these systems are prone to excessive aquatic vegetation and algae growth. This is because more light reaches the seeds of the aquatic plants to promote germination. Coupled with this, is the fact that most impoundments contain nutrient-rich sediments that also promote rigorous aquatic vegetation growth. Incoming waters may also be nutrient-rich and contribute to nutrient-loading in the lake basin over time. This can result in excessive growth of rootless aquatic vegetation which desire high water column nutrients, and also rooted aquatic plants which derive most of their nutrients from lake sediments. In addition to nutrients, many impoundments are associated with increased sedimentation that may arise from incoming streams and also drains entering the lake. Drains in particular may empty large watershed areas into the lake, many of which are dominated by agricultural land uses that contribute nutrients and other pollutants. These lakes may also be referred to as drainage lakes that contain both an inlet and an outlet and receive the majority of the water from streams. They may also be referred to as "flow through" or riverine lakes. These lakes may have immediate watersheds of considerable size.

Erosion is prevalent as annual lake drawdowns are common in impoundments, and can create erosion in areas with substantial fluctuations in water levels, which are often exacerbated by weak shoreline protection. Many impoundments also have stumps and other large woody debris since the original land was cleared for the lake creation. These stumps can pose a hazard to lake survey boats and other recreational activities, and thus large

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DIFFERENT INLAND LAKE TYPES AND THEIR MANAGEMENT CHALLENGES

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stumps near the water should be marked for visibility. To best manage these unique aquatic ecosystems, the following recommendations are offered:

1. If there are tributaries or drains entering the impoundment, inventory all of them and sample them for nutrient and pollutant concentrations, and loading rates. In particular, water quality parameters such as dissolved oxygen, conductivity, total dissolved and total suspended solids, chlorides, phosphorus, ortho-phosphorus, total inorganic and Kjeldahl nitrogen, and E. coli bacteria should be evaluated multiple times per season to determine which of the drains and/or tributaries are problematic for the lake health. This information will also assist with future drain and immediate watershed mitigation efforts.

2. Conduct a whole-lake GPS survey of all stump locations and create a detailed map for safe navigation. During this survey, inventory all native and invasive aquatic vegetation to determine if the lake aquatic vegetation communities are balanced and if any remedial actions are needed to reduce invasive aquatic plant species. If treatments of aquatic vegetation are needed, consider all possible aquatic plant management options (i.e., herbicides, diver-assisted suction harvesting, harvesting, etc.) but choose ones that have the longest-lasting results for a sustainable outcome.

3. Conduct a shoreline-wide erosion survey of all properties. Catalog those properties with observed erosion issues in order to recommend future mitigation on a site basis. Erosion will contribute to lake turbidity, can impact fish spawning habitat through sedimentation, and reduces property values and should be addressed.

4. Evaluate the impacts of annual lake drawdowns on the lake ecosystem. This will allow for future decision-making relative to ideal drawdown depth that is meant to protect both the lake and the dock structures.

5. Conduct algal sampling of the lake basin. Many impoundments have elevated concentrations of blue-green algae which may need to be tested for toxin levels. In addition, algal analysis will reveal the relative abundance of algal genera and can be used for management decision making. Blue-green algae, for example, responds best to nutrient-reduction methods such as aeration and nutrient inactivation (i.e., alum, chelation) relative to the use of copper products that can bioaccumulate in lake sediments and exacerbate blue-green algae growth.

B. STORMWATER LAKES

Many urban developments have small inland waterways that vary in size from < 1 acre to nearly 50 acres. These lakes are often fed by stormwater inputs which drain the local development surfaces, but some may also have spring activity (i.e., gravel pits). These lakes are often shallow with maximum depths less than 20 feet and are often circular or square in shape. They are man-made systems but usually do not have water sources with major inflow except for the presence of drains entering the lake. During periods of heavy rainfall, the drains may contribute substantial quantities of water to the lake. Some lakes will allow for motorized boats whereas others allow motorless boats such as kayaks and paddle boats or canoes. Many of these lakes also have active homeowners associations that govern the use and management of the lake. They can also be classified as closed-basin lakes, but their location within the landscape allows for a new classification category as these lakes have unique management needs.

STORMWATER LAKES—MANAGEMENT CHALLENGES

Most stormwater lakes are small and some are considered ponds based on size. Due to their size limitations and the shallow depths commonly observed, these lakes may not be ideal for motorboats. Such boats may create waves that increase shoreline erosion as many of these lakes do not have natural shorelines or even shoreline structures. Stormwater lakes also usually contain numerous drains where pollutants can enter the lake and degrade water quality. The following management recommendations apply to this lake type:

1. Conduct a bathymetric survey to determine the mean and maximum depths and provide useful maps to the lake residents for safe recreation.

2. Conduct water quality sampling of both the lake basin and the drains to determine what impact the drains may be having on the basin water quality. Water quality parameters should be comprehensive and include dissolved

oxygen, pH, conductivity, total dissolved and total suspended solids, nutrients, chlorides, chlorophyll-a, and algal communities. Sediment samples that include benthic macroinvertebrates can also provide useful data that can indicate water quality issues as represented by key taxa.

3. If the drains prove to be significant sources of nutrients or chlorides, it may be useful to work with the local Road Commission and Water Resources Commission to make changes to problem drains. Some changes could include settlement ponds and filters but in some cases drain diversions may be needed.

4. If the lake is low in dissolved oxygen, aeration technology may be useful. Fountain aeration can be applied to small and shallow areas and bottom-diffused aeration can be applied to the entire lake basin to produce even and elevated dissolved oxygen concentrations throughout the water column. Aeration may also reduce algal blooms.

5. Whole-basin aquatic vegetation surveys should be conducted to inventory the communities and evaluate needs for invasive aquatic plant management. Since these systems usually have sand or gravel bottoms, vegetation is not likely to be as dense as in other lakes with highly fertile and organic sediments. Native aquatic vegetation should be preserved to the extent possible to prevent the lake from entering an algal-dominated state.

6. Consider the planting of native emergent vegetation around the entire lake basin. If this buffer is wide enough, it may be beneficial in reducing nutrients from lawn fertilizers and runoff. Since most of these lakes do not have significant relief around the lake, soft shorelines would be more advantageous than seawalls and also provide more areas for lake biota to thrive.

7. Consider fish stocking by private stocking companies if fishing is a desired activity and the water quality data is favorable. A fish survey may be needed first to determine survivability of certain fish species in each unique lake.

C. SEEPAGE OR CLOSED-BASIN LAKES

This lake type is commonly referred to as a kettle-hole lake as they may have a deep basin (though not all of them do) and also have no inlet or outlet. These lakes are dependent upon aquifers, springs, and precipitation to maintain their water levels and thus are susceptible to seasonal fluctuations. Seepage lakes generally do not have a diverse fishery because they are disconnected from nearby

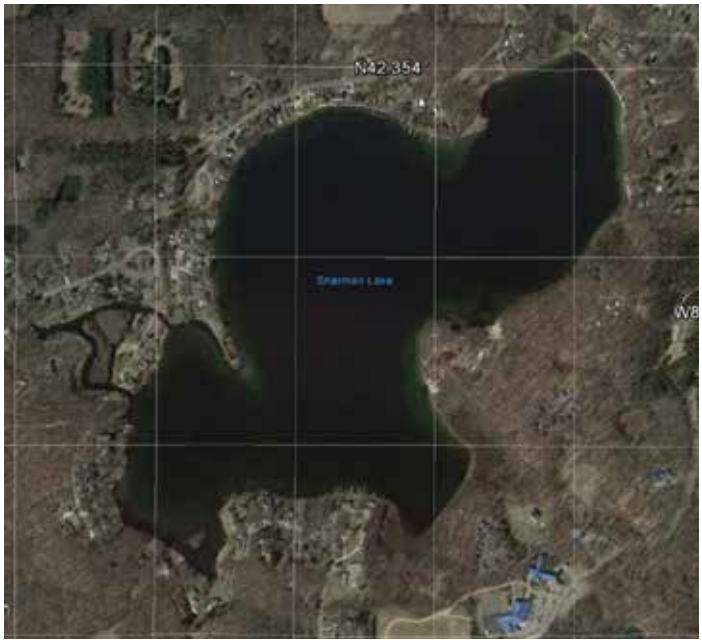

FIGURE 3. CLOSED-BASIN LAKE: SHERMAN LAKE (KALAMAZOO COUNTY, MI)

streams or other waterbodies. Closed-basin lakes are highly variable in size and are found throughout the world, but most have a small immediate watershed or drainage area.

CLOSED-BASIN LAKES—MANAGEMENT CHALLENGES

Since these lakes have a closed basin, they are most susceptible to pollution if impaired drains are present. The water could potentially stay in the lake for considerable time,

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DIFFERENT INLAND LAKE TYPES AND THEIR MANAGEMENT CHALLENGES

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especially if the lake is deep. In addition, they may also be susceptible to septic tank and drain field pollutants since most of the nutrients remain in the basin and may enter the lake sediment pore water. They then become available to rooted aquatic plants. As a result of these issues, the following management recommendations apply to these systems:

1. If drains are present, sample them for incoming nutrients, chlorides, and solids. If these levels are high, consider drain improvement to reduce loads to the lake.

2. If homes utilize septic systems, consider installation of a lake-wide sewer system. If cost-prohibitive, engage a trained canine to detect septic leachate and also conduct inspections of all tanks and drain fields. Septic leachate is highly mobile (especially nitrogen) in the groundwater and may reach the lake bed and feed aquatic plant and benthic algae growth.

3. Most closed-basin lakes may need fish stocking to maintain healthy fish populations as they are disconnected from streams that provide incoming fish. Consider regular fish surveys to determine fish population structure and what species would be most able to reproduce given the lake-specific conditions.

4. Introduce a lake-wide riparian educational program to reduce inputs of debris into the lake, such as solvents, leaves, grass clipping, plants, etc.

5. Many closed-basin lakes with public access sites are subject to transfer of invasive species such as invasive watermilfoil or zebra mussels. Consider installation of a voluntary boat wash station at the access site(s) to reduce the probability of invasive species transfer.

D. DRAINED LAKES

Drained lakes lack an inlet but have a continuously flowing outlet. The primary water sources to the lake are precipitation and runoff from the surrounding land. When the water flowing into these lakes is reduced, the outlets may become intermittent.

FIGURE 4. DRAINED LAKE: BAR LAKE (MANISTEE COUNTY, MI)

DRAINED LAKES—MANAGEMENT CHALLENGES

During periods of low precipitation, these lakes can present with recreational difficulties especially if the lake is very shallow. Proper land use is very important since these lakes rely on runoff as an additional water source. The following management considerations apply to this lake type:

1. During low water periods, avoid watering lawns with lake water as this may draw down shallow lake systems at a faster rate.

2. Assure that proper land use is being followed by lakefront owners since runoff can transport nutrients, solids, and other pollutants to the lake. Such land use Best Management Practices (BMPs) may include allowing for a vegetation buffer near the shoreline, reducing erosion from the land to the lake with proper shoreline protection, assuring all areas are vegetated—especially in areas with ponded soils, and avoiding lawn fertilization particularly during heavy rainfall periods.

E. SPRING LAKES

A spring lake has an outlet but lacks an inlet. Groundwater from the lakebed and from around the surrounding land is the primary source of water for this lake type. These lakes are often at the headwaters of many streams or river courses.

FIGURE 5. SPRING LAKE: BLUE LAKE (GLADWIN COUNTY, MI)

SPRING LAKES–MANAGEMENT CHALLENGES

Since these lakes receive most of their water source from groundwater springs, they usually have very good water quality, though some may have elevated nutrient concentrations if the land uses are not ideal. Groundwater may be high in nitrogen which can contribute elevated nitrates and ammonia to these lake systems. Consider the following management recommendations for these lakes:

1. To determine the concentration of nitrogen entering the lake from groundwater seepage, underwater seepage meters can be installed. These meters identify the types of nitrogen as well as concentrations. This data can be used to determine if nitrogen loading is occurring in the lake over time. Nitrogen can be used, along with phosphorus, by algae for sustained growth.

2. Discourage the use of lawn fertilizers around the lake. These can percolate through the surrounding soils and enter the groundwater, further amplifying the nitrogen pool entering the lake basin.

3. Many of these lakes have elevated and favorable dissolved oxygen concentrations and cooler water temperatures. If those conditions are sustained throughout the summer, consider planting the lake with trout fish species or other cold-water species. These fish thrive in higher dissolved oxygen concentrations and lower water temperatures.

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DIFFERENT INLAND LAKE TYPES AND THEIR MANAGEMENT CHALLENGES

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CONCLUSION

Michigan inland lakes continue to face challenges that are unique to specific lake categories, even though there are many similarities among all lakes. The management challenges described above are commonly observed within certain lake types and the management considerations offered can be used to assist riparian communities with numerous lake impairments. Lakes are very complicated entities with multiple functioning systems that are separate for the water itself, lake sediments, macro and micro biota, fishery, aquatic vegetation and algal communities, shorelines, and immediate watersheds. However, all of these systems are interconnected and dependent upon each other for optimum lake health. Furthermore, all of these components are indicators of changes within the lake ecosystem and should be protected. The management recommendations offered should allow for enhanced focus of unique lake problems so that they can be targeted, and resources can be allocated to those specific issues. In other words, classification of lake type and consideration of the recommended management methods should be used to prioritize lake improvements.

THE MASSIVE (MICRO) PLASTIC PROBLEM

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of microplastic pollution, but because monitoring of this type of pollution is sparse, the relative importance of various sources is not well understood.

HOW DO YOU MEASURE MICROPLASTICS IN WATERWAYS?

A large net, called a neuston net, with a mesh size of 0.33 mm, is used to sample for microplastics in flowing waters. What's collected in the net is then sieved to remove the particles larger than 5 mm. The net collects everything the water carries, so the plastic needs to be isolated from the other materials (leaves, sticks, algae, other organic debris, sand, and sediment, etc.). This is done by digesting the organic material using wet peroxide oxidation, followed by density separation to isolate the plastic from sand and sediments (plastics float in salt water). The remaining microplastics are then identified and counted with a stereomicroscope. The concentration and load of microplastics in the stream can be calculated by measuring the volume of water that flows through the net during the sampling period and the volume of water moving through the river. Using these methods, our lab group at Eastern Michigan University is measuring microplastics in local waterways to better understand the sources of microplastics and how plastics affect microbial communities and their function. Stay tuned! We will share some of our findings in the winter 2022 issue of *The Michigan Riparian*.

Jennifer Troost (jtroost3@emich.edu) and Morgan Chaudry (mchaudry@emich.edu) are M.S. students in the Biology Department at Eastern Michigan University working with Dr. Kristi Judd.

JENNIFER TROOST USES THE LARGE NEUSTON TO COLLECT MICROPLASTICS (AND OTHER MATERIAL) FROM THE ROUGE RIVER.

MORGAN CHAUDRY AND SADIE BAKER USE THE LARGE NEUSTON NET TO COLLECT MICROPLASTICS (AND OTHER MATERIAL) FROM THE HURON RIVER.

DR. KRISTI JUDD AND JENNIFER TROOST COLLECT MICROPLASTICS (AND OTHER MATERIAL) FROM THE HURON RIVER.

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