

What Difference Does a Degree Make?

For seasonal residents, summers in Northern Michigan are an escape from sweltering heat downstate or in other parts of the country. After a robust winter, our year-round residents look forward to warm summer days and cool nights. Although summer can be hot, we normally average only five days annually above 90° Fahrenheit (F).

Most importantly, our summer nights cool down to pleasant ranges, with average July temperatures fluctuating from 75°-55° F in the hours from 8 pm to 4 am. This reflects our historic conditions, but climate change and warmer temperatures will bring different conditions that influence our environment, economy, and way of life. As temperatures warm, climate change will diminish our ability to cool down in the evening. Warmer evenings give people and wildlife less time to recuperate from peak heat.

Hotter weather will have varied impacts on our water resources, which are the foundation of our local economy. At the most basic level, higher air temperatures mean warmer water. This could lead to lower levels of dissolved oxygen in water, which means more stress on fish, insects, and other aquatic organisms. Coldwater ecosystems, such as our Blue-Ribbon Trout Streams, will be seriously threatened.

Another expected change in our region is more frequent and more intense precipitation. This will lead to increased runoff. Thus, we can expect more nonpoint source pollutants, including

sediment, nutrients, bacteria, and chlorides to be carried by stormwater into our waterways. This increased pollution load in lakes and streams could mean dramatic consequences, such as harmful or nuisance algal blooms.

Warmer temperatures may also enhance conditions for invasive species to take hold in the area. The Watershed Council received many reports of purple loosestrife and other aquatic invasive plant species growing heavily this past summer. While these invasives can inhibit recreation and lakefront views, more damaging are the ecological impacts. These include monoculture growth, resulting in decreased biodiversity and less forage for fish and wildlife. A dense infestation of invasive plants can even alter the hydrology of a stream or wetland.

There are warning signs on the horizon. Preliminary data from the National Oceanic and Atmospheric Administration (NOAA) shows that in August 2018, daily temperatures were generally above the normal high readings for Traverse City, Gaylord, Sault St. Marie, and Alpena. According to NOAA, 2018 is on pace to be the fourth hottest year ever recorded. Only three other years have been hotter: 2015, 2016, and 2017! Our past four years are the hottest on record, and the trend is foreboding.

It has been widely reported that the world has warmed more than 1° Celsius (C) since the Industrial Revolution. The Paris Agreement hoped to restrict warming to 2° C, but this could be difficult if we don't curb emissions immediately. While these numbers may seem like small differences, they can result in big changes that we are already witnessing from the warming trend: receding glaciers, rising sea levels, more frequent droughts inland, and more severe coastal storms.

As the world warms, we hope you will educate yourself about climate change. Green infrastructure and low impact development techniques protect water quality, protect coastlines, restore shorelines, and help with concerns related to increased temperatures and more severe storms. Additionally, please learn about choices you can make related to energy use and transportation. We must all become more familiar with how we can make the positive changes that are needed to make a difference – maybe even an entire degree of difference!





426 Bay Street, Petoskey, MI 49770
(231) 347-1181 • (231) 347-5928 fax
www.watershedcouncil.org

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Reflections From Our Executive Director

The Watershed Council has a full plate of monitoring, research, restoration, policy, and issue work that keeps us more than busy throughout the year. Then, wham! An emerging issue demands our attention and requires immediate action. In 2018, it was PFAS. As you will read on page 3, PFAS is an acronym standing for per- and poly-fluoroalkyl substances. PFAS are a group of industrially produced chemicals that have been detected in waters throughout the State of Michigan and across the nation. Obviously, this is not a good thing and one that the Watershed Council cannot ignore. So, we act.



Gail Gruenwald
Executive Director

Ten years ago, the emerging threat was contamination of surface waters from prescription and over-the-counter drugs. Since this issue came to our attention, we have worked in partnership to implement the POD (Prescription and Over-the-Counter Drug Drop-off) program. Through this partnership, literally tons of potential contaminants have been diverted from our waters and out of the hands of those that could misuse them.

Over the past nearly 40 years, new threats to our waters have come to our attention and the Watershed Council has responded. One invasive species after another is an example of an ever-changing landscape of new threats. Threats that require us to implement on-the-ground management strategies, as well as work on the policy front to prevent additional invasive aquatic species from entering and spreading in our waters. The Watershed Council's unique organizational structure allows us to address both the science and policy of ongoing and emerging threats.

The most significant threat ever, climate change, demands our attention and we are working to develop resiliency plans for our communities. We need to prepare communities for the changes and impacts that we are already seeing. Every watershed management action step we take is done through the lens of resiliency and the changes affecting our waters.

As we close out 2018, rest assured that the Watershed Council is not only implementing the programs that we have for decades, but also addressing those new issues that come to our attention. Thank you all so much for supporting the Watershed Council. As always, please contact us with questions, concerns, and to participate in this important work.

Save These Dates!

2019 Ice Breaker Speaker Series

January 2019 begins our 10th Annual Ice Breaker Speaker Series. These informational events are a great way to engage in warm conversations on some of today's hottest topics. **Events will be held on Thursdays, January 10 and 24, February 14 and 28, and March 14 and 28** from 12:00 Noon – 1:00 p.m. at the Watershed Council office in downtown Petoskey. Our speaker lineup will be posted in late December on our website at www.watershedcouncil.org/attend-an-event. All lectures are free and open to the public. Questions about the series can be directed to Kate Cwikiel or Kristy Beyer at (231) 347-1181.



The Forever Chemicals

PFAS Update

Recently, a group of industrially produced chemicals have been detected in waters throughout the State of Michigan and across the nation. These chemicals are collectively known as PFAS, an acronym standing for per- and poly-fluoroalkyl substances. In chemistry terms, this means the chemicals are made of chains of carbon atoms connected in various ways to fluorine and other elements. PFAS represent a group of human made chemicals that have been used in a variety of industries in the United States since the 1940s and 1950s. As such, PFAS can be found in everyday consumer products such as pizza boxes, nonstick cookware, and stain-and-water repellent clothing, including popular outdoor gear. The average person has been exposed to some level of PFAS during their lifetime. The exposure of concern is through drinking water and ingestion, while dermal contact is not deemed a significant risk at this time. Some evidence exists for adverse health effects, such as higher risk of various cancers, liver/kidney abnormalities, impacts on the immune system, and thyroid conditions. However, these are not completely understood and research continues to be conducted to understand how the timing, duration, and concentrations of exposure play a role on the effects of PFAS.

Rapidly becoming known as the “forever chemicals,” PFAS bioaccumulate and are incredibly persistent in the environment. This means the amount of PFAS that build up in the body and in ecosystems over time do not break down in the soil or water environment. Some PFAS can be both attracted to and repelled by water. Some of the foam observed along shorelines of lakes and rivers are indicative of PFAS. However much of this foam observed is a natural phenomenon from the breakdown of organic material. Natural foam is usually persistent, especially during the fall season as leaves and other organic material enter nearby waters. Foam from natural decomposition is white and not slimy to the touch, as opposed to potential PFAS related foam that has been described as whiter in coloration, frothy or effervescent in appearance, and slimy or sticky to the touch.

The State of Michigan is taking a proactive approach in identifying areas with PFAS contamination. Currently, the status of PFAS in the waters of our service area is relatively unknown. Communal drinking water systems are being tested across the state, with Emmet, Charlevoix, Antrim, and Cheboygan County systems tested this past August. Results for Antrim and Emmet County show no detectable levels of PFAS. The Walloon Lake Water System in Charlevoix County had non-detectable levels of PFOA and PFOS, but showed ranges between 2-19 parts per trillion (ppt) for other tested PFAS. The EPA has not set health advisory levels for the other PFAS compounds. We are still awaiting results for Cheboygan County. However, this is only for communal drinking water systems. Data for lakes, rivers, and individual wells are very limited.

The Watershed Council is working with local governments and State agencies to research and hopefully test for PFAS in lakes and rivers throughout our four-County service area during 2019. For more information on PFAS and to stay up-to-date with the State response to these emerging contaminants, please visit www.michigan.gov/pfasresponse.

PFAS FAQ

Is there a safe level of PFAS?

Currently, the Environmental Protection Agency's (EPA) recommended lifetime health advisory limit is set at 70 parts per trillion (ppt) for PFOA and PFOS (the two best studied PFAS compounds). However, this number may be too high. A recent draft study by the Centers for Disease Control and Prevention (CDC) found that, for certain PFAS, health issues began presenting themselves at significantly lower levels than the current EPA recommendation of 70 ppt. The Association of Drinking Water Administrators expects these study results will lower the recommended safe level to 7 ppt for PFOS and 11 ppt for PFOA, seven to ten times lower than the EPA's current recommendation.

How can I reduce potential exposure to PFAS in my drinking water?

There are some treatment options available for residents who are concerned about their drinking water. In-home water filtration systems are recommended by the Michigan Department of Health and Human Services to lower the levels of PFAS in drinking water. Both granular activated carbon (GAC) and reverse osmosis (RO) filters can reduce PFAS substances. An NSF P473 approved filter should be used. Filters must be selected, operated, and maintained to manufacturers specifications.

How do I know if my community water supply is at risk?

Contact your local water supplier and ask for information on PFOA and PFOS in their drinking water and request a copy of their Consumer Confidence Report.



UPDATE: Line 5

On October 3, 2018, the State of Michigan and Enbridge Energy announced a second Agreement between the State and Enbridge regarding Line 5 in Michigan. This Agreement calls for the State and Enbridge to initiate discussion on a multi-use utility tunnel beneath the Straits of Mackinac. The State is proposing that Enbridge would pay for all design, construction, operation, and maintenance of the tunnel for up to 99 years, subject to approvals by the Mackinac Bridge Authority. Tunnel construction is estimated to cost between \$350 million to \$500 million over a 7- to 10-year duration.

While the Agreement is being praised by the State as a solution that will protect the Great Lakes, in reality, it does not provide a final decision for the future of Line 5 and fails to protect the lifeblood of Michigan's economy and way of life.

The Agreement simply calls for initiation of discussions regarding a Straits tunnel. This does not mean the tunnel is agreed upon or even guaranteed to happen. In fact, Enbridge's official statement regarding the Agreement calls it merely "a commitment **to explore** the replacement of the Straits section of Line 5 with a tunnel under the lakebed that would contain a new pipeline." (emphasis added) Should Enbridge and the State fail to reach a further agreement about a tunnel, Enbridge still has the ability to operate Line 5 in the Straits of Mackinac in its current form, under the 1953 Easement. This is far from a solution. Rather, the Agreement leaves Line 5 operational for an unknown amount of time into the future without requiring sufficient safeguards to prevent an oil spill.

A solution to protect Michigan's waters and the Great Lakes would have been for the Agreement to call for the decommissioning of Line 5 within a designated timeframe. It is clear to all parties, even the State of Michigan, that Line 5 cannot remain in the Straits in its current form. Therefore, the only responsible course of action is for the State to initiate the process of decommissioning Line 5 while discussions continue regarding alternatives.

AQUAVIST NETWORK

If you regularly read the Aquavist column, you know that the Watershed Council convenes advisory committees around our service area to implement watershed management plans.

In October 2016, the Duncan-Grass Bays Watershed Management Plan was approved by the Michigan Department of Environmental Quality (MDEQ) and U.S. Environmental Protection Agency (EPA). This Watershed along Lake Huron near the City of Cheboygan is quite small, but is important for habitat and water protection. The Advisory Committee met three times this summer and heard Chris May from the Nature Conservancy discuss the Grass Bay Preserve. The Committee also heard from the U.S. Coast Guard about pollution response and interfacing with the local community when emergencies arise. Our last meeting included terrific presentations from the Great Lakes Tissue company and the Cheboygan Brewing Company.

The Burt Lake Watershed covers a very large area, including the Sturgeon, Crooked, and Maple Rivers. The Burt Lake Watershed Management Plan was recently approved by both the MDEQ and the EPA. The Burt Lake Watershed Advisory Committee met three times over the summer.

MANAGEMENT PLANS AT A GLANCE

Watershed Management Plan	Status
Duncan-Grass Bay Plan	EPA & MDEQ Approved
Burt Lake	EPA & MDEQ Approved
Little Traverse Bay (Existing plan update)	Approval Pending
Elk River Chain of Lakes	In Progress
Lake Charlevoix	EPA & MDEQ Approved

The Little Traverse Bay Advisory Committee met quarterly this year. We are currently waiting for approval of the Little Traverse Bay Watershed Protection Plan, an update of an existing plan approved in 2007. We anticipate its approval from both the MDEQ and EPA in 2019.

The next plan we will submit is for the Elk River Chain of Lakes (ERCOL). We have a first draft completed and will submit for approval over the winter to the MDEQ. The Elk River Chain of Lakes Watershed Plan Implementation Team (WPIT) meets every other month.

Finally, our Lake Charlevoix Watershed Management Plan was updated and approved in 2012. That Advisory Committee meets four times a year, and we are well underway with work to implement that Plan.

Advisory committees are open to local businesses and residents. If you have questions or would like to attend, please call Grenetta Thomassey at (231) 347-1181 ext. 1118.

DEICERS: A balance between winter safety and water quality

The vast majority of us need a little salt here and there. Whether you sprinkle it on your food or on your front steps, chloride-based products serve a purpose. When winter brings on piles of snow and sheets of ice, it is often too much to handle with just a shovel. For those who rely on deicers, the variety of options can be a bit daunting. Some have a limited range of temperature in which they will perform. Others are highly corrosive. All of them, however, have the potential to reach our lakes, streams, wetlands, and groundwater through runoff and infiltration. Based on the Watershed Council's 30 years of water quality data, chloride levels are increasing in our lakes. Chloride-based deicers are likely one source. While concentrations are currently below the toxic threshold, aquatic ecosystems can become stressed under elevated concentrations around 1,000 mg/L. However, the indirect effects of chloride often stress the environment first.

To minimize the effects of chloride, practice care when selecting and applying your deicer.

- Apply the amount recommended on the package. Over application of deicers will actually decrease performance, be more apt to pollute runoff, and is a waste of money.
- Apply the deicer at the temperature indicated on the packaging. Remember, some perform best within a certain temperature range.
- Add sand or other abrasives along with the deicer for more traction and to reduce the amount of deicer needed. Go sparingly on the sand though as it too can cause water quality problems when washed into nearby lakes and streams.
- Shovel as soon as snow begins accumulating and keep at it. Don't wait for a foot or more before you apply deicer. Deicers perform best when only a thin layer of snow or ice is on the ground. Anything more and the deicer won't work.

As for which deicer to use, several options are readily available and other products are either being developed or have a more limited market. The most common options include:

- **Calcium Magnesium Acetate (CMA)** is salt-free and biodegradable. It will not harm the environment if used in moderation and is less corrosive to concrete and less harmful to vegetation than salt. Although CMA is more expensive than rock salt, it's recommended for environmentally-sensitive areas. You can find CMA at most hardware stores.
- **Calcium chloride (CaCl)** is one of the best choices for super-cold climates. It's effective down to minus 25° F and is a better environmental choice than sodium chloride.
- **Sodium chloride (NaCl)**, aka rock salt, has the lowest price per pound, but is the hardest on the environment and not that effective at temps less than 15° F.

While safety should be everyone's first priority, we should also strive to find a balance that protects ourselves and our lakes, streams, wetlands, and groundwater.



New Grant Projects on the Horizon

Good news is always worth sharing. The Watershed Council was recently awarded a grant from the U.S. Fish and Wildlife Service (USFWS) through the National Fish Habitat Partnership program to implement *Promoting Bioengineering Options for Erosion Control on Michigan Inland Lakes*. Over the next two years, we will partner with other resource groups to develop two statewide publications that profile bioengineering erosion control design options for inland lakes. The first will highlight the continuum of bioengineering erosion control options for low-energy to high-energy sites, including options for sites with ice problems. The second will provide design criteria specifically for high-energy sites. In addition, a webinar on high-energy site design will be offered to shoreline contractors. We are excited to have support for this project and believe it will have a lasting impact on water resources throughout Michigan.

We received a second award from the USFWS to improve two road/stream crossings in the Burt Lake Watershed. The two priority sites were selected based on their current poor condition and the potential to improve the brook trout fishery, reduce localized flooding, and improve stream channel conditions. The larger of the two crossings is at Banwell Road over Berry Creek, a tributary to Pickerel Lake. The existing two culverts will be replaced with a channel-spanning timber bridge. The second site is at Snider Road and crosses over a tributary to the Crooked River. Because the USFWS funding will support only a portion of the total project costs, we will continue to fundraise to cover all costs before work begins.



Road/stream crossing construction in progress on Pickerel Lake Road in Emmet County.

Pickerel Lake Road/Stream Crossing project

In last winter's Current Reflections, we reported that Minnehaha Creek was flowing a bit more freely after construction of an improved road/stream crossing at Maxwell Road. We are happy to share more good news: this cold water stream is flowing even freer thanks to the second improvement project that is part of the Watershed Council's *Improving Aquatic Connectivity and Water Quality of Northern Michigan's Minnehaha Creek*.

The stream crossing at Pickerel Lake Road had a major upgrade this fall. Three undersized metal culverts previously posed as a barrier to fish passage and disrupted stream hydrology. The culverts were replaced with a stream channel-spanning timber bridge.

As part of the grant*, the Watershed Council is continuing to collect data at both crossings to assess changes in stream conditions at those locations. The anticipated long-term benefits include improved hydrology and stream channel form, as well as increased fish passage to upstream portions of the stream.

Improving road/stream crossings is just one of several management priorities that will help protect this high-quality, cold water trout stream. These two sites were identified as priority crossings as part of the comprehensive road/stream crossing inventory completed in 2014 by the Watershed Council. The results from the inventory revealed that of the 182 road/stream crossings within the Burt Lake Watershed, 52 crossings are considered complete fish passage barriers and 63 are rated as severe with regard to overall degree of erosion, hydrology, and fish passage.

* Funding and project assistance were provided by the National Fish and Wildlife Foundation's Sustain Our Great Lakes program, the U.S. Fish and Wildlife Service Fish Passage program, the Baiardi Foundation, Patagonia, and the Emmet County Road Commission.

Milton Township Greenbelt Project



The next time you're in Kewadin, be sure to check out the new greenbelt at the Milton Township Waterfront Park (formerly the Water's Edge Resort). The project is the result of a partnership between Milton Township, Elk-Skegemog Lake Association, Inhabitect LLC, and Tip of the Mitt Watershed Council. The Watershed Council provided 75% of the funding for the project through our current Elk River Watershed Protection grant, which includes incentivizing the installation of greenbelts throughout the Watershed. The grant is from the Michigan Department of Environmental Quality (MDEQ) Nonpoint Source Pollution Control Grants - Federal Clean Water Act Section 319.

Milton Township subsidized the project and demonstrated their commitment to shoreline protection strip requirements, which are part of their zoning ordinance. The landscape company, Inhabitect, LLC of Traverse City, worked with the Watershed Council and Township representatives to develop the greenbelt plan, which extends approximately 170' along the shoreline and is, on average, 11' wide. Plant species were selected based on their aesthetic traits, their tolerance for shoreline conditions, and low maintenance requirements. Nearly all of them are native to Michigan. We commend the Township for taking the initiative to install this community project.

More Partnerships, Less *Phragmites* in Northern Michigan

Imagine a plant at your favorite Lake Michigan beach that is 15 feet high and growing in a patch so dense that it blocks out the view of the water. This is the invasive reed called *Phragmites*. Since 2010, Tip of the Mitt Watershed Council has partnered with Emmet County to control *Phragmites* along the Lake Michigan coastline. Specifically known as *Phragmites australis*, it is an invasive reed that can push out native plants and make riparian areas unusable for humans and animals. Other parts of Michigan and other Great Lakes states are beleaguered by miles and miles of the reed, but the proactive work of area partners has ensured that Emmet County is not overrun by this aggressive plant.

Phragmites can spread unchecked along a shoreline using horizontal stems or rhizomes, and an ability to produce chemicals that make the soil unfit for other plants. An ordinance adopted in 2010 allows Emmet County to treat *Phragmites* if it becomes a public nuisance and spreads to other properties. Luckily, the County has never had to enforce the ordinance. One reason may be landowners voluntarily treating their *Phragmites*. The Watershed Council encourages voluntary treatment by securing an Aquatic Nuisance Control permit for treatment of all shoreline *Phragmites* in the entire County that everyone can work under. This permit, funded by the County, saves money and streamlines *Phragmites* treatment.

Since 2008, Watershed Council staff and interns walk the County's Lake Michigan shoreline every two years to document and measure stands of *Phragmites*. *Phragmites* found in a monitoring year are checked again in the off years. Property owners are notified if *Phragmites* is found on their shoreline and provided information about control and treatment. Treatment of identified stands began

in 2010 on 231 properties. Each subsequent survey has documented fewer stands of *Phragmites*.

This year, Watershed Council interns Sean Clark, Stephanie Facchine, Daniel Gonzalez, and Lizy Michaelson, performed most of the on-the-ground survey work. Wilderness State Park conducts their own surveys and treatment. The Little Traverse Bay Bands of Odawa Indians Youth Conservation Corps put in some survey miles, too. This year, only six shoreline properties with invasive *Phragmites* and two inland properties were identified. *Phragmites* monitoring is a shared effort in our County and we would be hard pressed to complete it without these valuable partnerships. Our work, along with high water levels which decrease the plant's habitat, have reduced shoreline *Phragmites* in Emmet County by 97%!

This year, we are also working with our local Cooperative Invasive Species Management Area (CISMA), which covers Charlevoix, Antrim, Kalkaska, and Emmet (CAKE) Counties. This year CAKE's cost-share treatment program has helped pay for 50% of treatment, with the landowner being responsible for the remainder. CAKE is doing parallel survey and treatment work in Charlevoix and Antrim Counties, making this an impactful year for *Phragmites* treatment in Northern Michigan.

Vigilant surveying, persistent local efforts, and working with partners have controlled the invasive *Phragmites* on our Lake Michigan shorelines. For more information, visit our website at www.watershedcouncil.org/phragmites.

Our work, along with high water levels which decrease the plant's habitat, have reduced shoreline *Phragmites* in Emmet County by 97%!

Summer intern, Stephanie Facchine, surveying the Lake Michigan shoreline for *Phragmites*.





Intern, Lizy Michaelson, diving for mussels during the one year follow up study on Round Lake.

Zequanox Project Update

As you may recall from the summer of 2017, a new biocontrol to manage nuisance invasive zebra and quagga mussels in a natural lake environment was put to the test in Emmet County's Round Lake. The research project was a scientific investigation led by the Watershed Council, in partnership with the U.S. Environmental Protection Agency (EPA), United States Geological Survey (USGS), Michigan Natural Features Inventory (MNFI), and the University of Michigan Biological Station. The project was funded through the Great Lakes Restoration Initiative.

Zequanox, a dead soil bacterium (*Pseudomonas fluorescens*), was applied in four 55 x 55m plots around the Lake. The white, powdery bacterium was mixed with Round Lake water and applied to the bottom 75cm of the water column, just above the lake bottom. Invasive mussels ingest the bacterium through normal filter feeding behavior. Once ingested, the bacterium destroys the digestive system of the nuisance mussel.

In 2017, scientists from all involved organizations collected data to investigate the direct and indirect effects of the *Zequanox* application. Researchers wanted to test the ability for *Zequanox* to directly manage invasive mussels and evaluate any potential impacts to other lake organisms. Researchers collected data from native mussels, invasive mussels, water chemistry, algal growth, and the emergence of aquatic insects, before and twice after (seven and 30 days) the application of *Zequanox*. Effectiveness on quagga mussels was not assessed at this time.

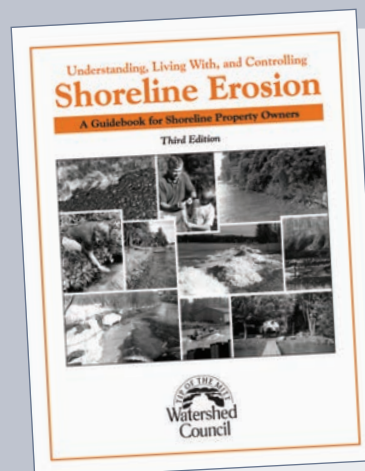
This past July, one year after the application of *Zequanox*, researchers returned to Round Lake to conduct the same data collection, and to evaluate the lasting effect of the molluscicide. Preliminary project data reveal little to no chemical and environmental change before and after *Zequanox* application. These data include dissolved oxygen, pH, and conductivity of the water. This is great preliminary news. We are still reviewing all the data that have been collected and will offer a broader, more conclusive answer on the effectiveness of using *Zequanox* as a management tool for natural environments. A comprehensive final report will be available next April. Stay tuned!

Bigger is Not Always Better

As lakefront property owners who have witnessed the incredible power of ice can attest, there is no stone big enough that ice can't move. Ice cover on our inland lakes is certainly something to be reckoned with. Ice can exert 10-12 tons per square feet of pressure on our shorelines! The challenge is to learn to live with ice and minimize its shoreline damage potential. One of the proven methods of mitigating ice damage, as well as wave energy, is by constructing a sloping, protective shoreline structure known as a revetment, which is designed to buffer wave energy and direct ice movement. Not to be confused with a seawall or bulkhead, which are typically solid, vertical structures constructed of metal, wood, or concrete, these revetments incorporate the principles of bioengineering and are composed of relatively small fieldstones. Technically speaking, any and all rock used to protect shorelines is considered riprap. Because riprap tends to be associated with larger, oversized rock, the Watershed Council generally does not use the term when discussing bioengineering practices.

The best approach to limit damage from ice push is to allow ice to move inland rather than try to prevent it from coming ashore. The following are some of the important factors to consider when designing and installing a protective shoreline revetment:

Slope: A properly designed and installed fieldstone revetment will have a gentle slope of 3H (Horizontal):1V (Vertical) or flatter. A steeper slope is more vulnerable to ice shove and may also be less stable. Think of the revetment as a wedge that assists ice up and over the shoreline rather than pushing directly into it. The top surface of the revetment, usually a layer of smaller fieldstones top-dressed over the larger fieldstone core, acts like ball bearings,



Suggested Resources

ONLINE PUBLICATION
FREE DOWNLOAD

Understanding, Living With, and Controlling Shoreline Erosion, A Guidebook for Shoreline Property Owners (Third Edition)

WEBSITES

Tip of the Mitt Watershed Council
www.watershedcouncil.org/watershed-protection-resources

Michigan Natural Shoreline Partnership
www.mishorelinepartnership.org

allowing the ice to move freely up the slope without major disruption of the revetment.

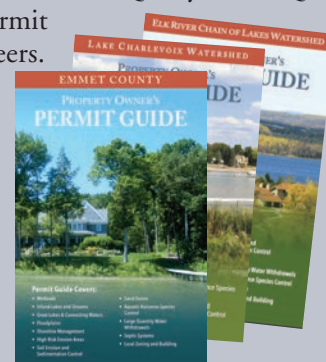
Fieldstone shape: Fieldstones should be mostly round in shape. Avoid using flat, plate-like rocks, which are more easily moved by the waves. In addition, rounded fieldstones, when gathered together, leave small interstitial spaces or voids between them that provide refuge for macroinvertebrates like mayflies and dragonflies.

Fieldstone sizing: Each site is different and has conditions unique to that location. When determining what size of stone should be used, several site factors, including fetch (the distance traveled by wind or waves across open water), nearshore water depth, and wave height must be considered. The fieldstone should vary in size with maximum, minimum, and median diameters. On most high-energy lakes in Northern Michigan, a 9-12" diameter fieldstone is typically the maximum size necessary to anchor the revetment in place, while a 4" diameter fieldstone is, generally speaking, the minimum size that is incorporated into the revetment. This does not factor in smaller drainstone and pea gravel used for the filter layer underneath the revetment.

Composition: The various sizes should be evenly distributed throughout the revetment. Hand placement of the fieldstone is encouraged. Careful installation can help insure the revetment is stable and voids between individual stones are minimized, which prevents wave energy from passing through the revetment and eroding the shoreline.

Plants: We would be remiss if we didn't mention the most important part of any shoreline: the plants. Deep-rooting native plants help knit together the soils behind the revetment further stabilizing the shoreline. In addition, they provide food, shelter, and structure for countless birds, insects, and other shoreline-dependent species.

Lastly, please remember that any shoreline work that occurs below the Ordinary High Water Mark will require a permit from the Michigan Department of Environmental Quality (MDEQ) and for some locations, a second permit from the Army Corps of Engineers. Refer to www.michigan.gov/deq and search for 'joint permit application.' Additionally, our *Property Owner's Permit Guide* can help you determine which permits are required. This easy-to-use booklet is available at our office and as a download from our website's resources page.



For more information about shoreline erosion, please refer to Tip of the Mitt Watershed Council's *Understanding, Living With, and Controlling Shoreline Erosion* publication at www.watershedcouncil.org under News and Resources. For more information about natural shorelines and their importance to lake health, visit www.mishorelinepartnership.org.

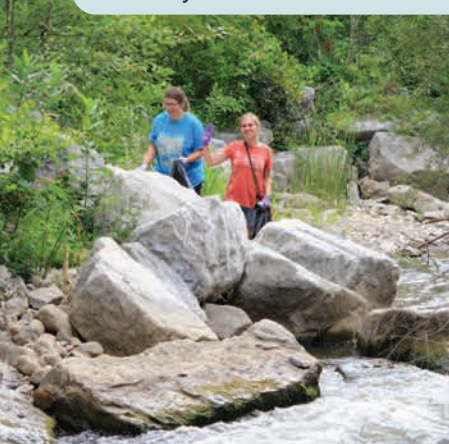
Ice can exert 10-12 tons per square feet of pressure on our shorelines!

EVENTS RECAP



Healing the Bear - Bear River Cleanup

On August 4th, over 150 enthusiastic volunteers gathered with Watershed Council staff under the Bear River Shelter in Petoskey to participate in the 14th Healing the Bear - Bear River Cleanup. Thankfully, the rain clouds cleared and created the perfect weather as the volunteers ventured into the River on foot and in canoes. After collecting three full truckloads and a trailer of trash and recyclables from the River, volunteers gathered again under the Bear River Shelter for a picnic lunch. Businesses that provided support to make this year's event possible include: Aldi of Petoskey, Bearcub Outfitters, Emmet County Recycling, Grain Train Natural Foods Market, Health Department of Northwest Michigan, Meijer of Petoskey, Odawa Casino, Olesons Farm Fresh Markets, Petoskey News-Review, Petoskey Plastics, and Plath's Meats. Thank you all for your sponsorship and support!

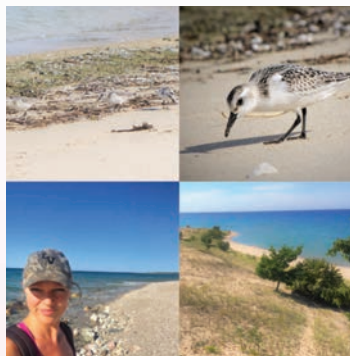


Waganakising Bay Day

The Watershed Council joined with environmental experts on wildlife, water quality, stewardship, and recreation to provide a free, family-friendly event during the Petoskey Festival on the Bay. Children enjoyed hands-on activities, crafts, demonstrations, and more!



The watershed model (above) and fish painting with stencils (right) were among the favorite activities of the day.



Photos: Mary Richardson

Volunteer Botulism Training

The Watershed Council hosted two trainings on avian botulism monitoring in August and September. Six monitors returned (Nancy Barnhart, Ron and Linda Moore, Sue Bissell, Tec Cummings, and Sue Stewart). Welcome to our four new monitors: Mary Richardson, Brian Bury, Sue Kurtz, and Jenna Sherman! As of press time, one recently deceased bird was found and sent to the Michigan Department of Natural Resources for testing.

Volunteer Stream Monitoring

Water-loving citizen scientists monitored local streams this fall. Information gathered by volunteers is used to determine the relative health of the stream and look at changes over time. Data is also used by MDEQ to identify sites that need further assessment and as supplemental data for statewide water resource management.



Minnehaha Stream Team



"Is the tide turning?"

The Watershed Council teamed up with the Michigan Environmental Council to host a gathering at Pond Hill Farm in Harbor Springs to discuss climate change, Line 5, water pollution, and the impact November elections may bring.



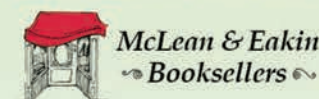
TV 9 & 10 Interview

The Watershed Action Volunteer Experience (WAVE) got some air time on 9 and 10 News' "The Four" program on October 9th with an interview with Water Resource Specialist, Caroline Keson.



Interview with Dan Egan

Our Water Resource Specialist, Caroline Keson, had the chance to interview author Dan Egan about his book *The Death and Life of the Great Lakes*. Over 150 people attended and many asked the author questions. Thanks to McLean and Eakin Booksellers in Petoskey for hosting.



MI Shoreland Stewards Ambassador Training



As part of the Michigan Natural Shoreline Partnership, the Watershed Council hosted the first MI Shoreland Stewards Ambassador training. The training is tailored for lake association volunteers or other groups who are interested helping in their neighbors protect their lake by utilizing the tools and resources of the MI Shoreland Stewards Program.

1st Place at the Flower Show

Our interns, Stephanie Facchine and Lizy Michaelson, won first prize for their educational display at the Charlevoix Area Garden Club's 20th Annual Flower Show! The functional display featured native plants and illustrated how rain gardens work.

Watershed Academy

Every stream tells a story. The stream begins life as a rivulet after flowing from the side of a hill or bubbling up from a wetland. As it picks up more groundwater and surface runoff, it swells to a creek that, after winding its way through the hills and valleys, becomes a rushing river. For many of us, those miles of meandering water are a mystery. But thanks to the Watershed Council's Watershed Academy, high school students from 13 schools in Northern Michigan are learning to tell their local stream's story.

The Watershed Academy is a stream monitoring program designed to put local high school students in touch with a stream in their community. Each year, 13 Northern Michigan streams are monitored by teams of high school students from every corner of the Watershed Council's service area. The teams collect valuable data on water chemistry, including crucial measurements like pH, dissolved oxygen, temperature, and nutrient levels. They also learn to identify the animals that call the stream home. Animals like mayflies, stoneflies, and caddisflies are used to determine the impacts that humans have on a waterbody.

However, this data only gives a chapter of the stream's story. Students learn the full story of their stream when they look at the watershed.

A watershed is a land area that drains to a specific body of water. As water flows across the land, it flows over and through the places that humans live. It picks up pollutants like oils, pesticides, sediment, and excess nutrients from fertilizers. These pollutants flow with the water to the waterbody where they can negatively impact the health of the waterbody. This fall, students assessed the land uses within their watersheds and identified ways they could protect and preserve the health of the waterbodies we cherish.

To see the Watershed Academy teams' stories and to learn more about the Watershed Academy, go to www.watershedcouncil.org. If you are interested in supporting water resources education in Northern Michigan or hearing more about the Watershed Council's education programs, contact Eli Baker at (231) 347-1181.



Macy Doster: AmeriCorps Volunteer

Not sure what AmeriCorps is? I wasn't either until about one month before I started my service here at Tip of the Mitt Watershed Council. AmeriCorps is a network of national volunteer service programs that work to improve lives and foster civic engagement. Specifically, I was a member of the Huron Pines AmeriCorps program which is a Michigan-wide AmeriCorps program that is focused on environmental and natural resources related service.

My time here at Tip of the Mitt Watershed Council has been full of different experiences. I helped with the Water Resources Education Program at three middle schools and Watershed

Academy at 13 high schools, reaching over 100 students. I coordinated a native planting event at the stormwater wetland on the North Central Michigan College campus, which really enhanced my planning and organizing skills. During my time here, I helped plan two of the Little Traverse Bay Watershed Green Infrastructure Workshops to educate local government officials on the benefits of

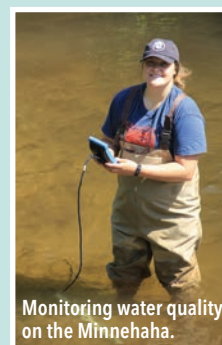
green infrastructure. I also helped develop the MI Shoreland Stewards Ambassador Program and coordinated two trainings for shoreline property owners.

After my term ends, I hope to work in a research-based position in the natural resources field. My experiences during my service at Tip of the Mitt Watershed Council have provided me with a lot of different opportunities. Through my exposure to many different areas of the natural resources field, I have discovered that I really enjoy monitoring stream habitats, electrofishing and fish surveying, and learning about implementing more natural shorelines. During my service, I have also realized that I would prefer educating people of all ages in a natural, less curriculum-based setting.

I am so thankful to have been a part of such an amazing group of people who strive to protect Michigan's waters through advocacy, education, science, and restoration actions. I am sad to leave such a wonderful organization, but I'm excited to see what the future brings.



Macy flew to Beaver Island for Watershed Academy.



Monitoring water quality on the Minnehaha.

WAVE Teams in Action

Our new volunteer program, Watershed Action Volunteer Experience (WAVE), provides technical and financial support for water resource projects to groups of volunteers. We currently have seven teams in Charlevoix and Emmet Counties. The program started in the spring with initial grants from the Charlevoix County Community Foundation and Petoskey-Harbor Springs Area Community Foundation. Since then, the program has received three additional grants. The Frey Foundation awarded \$5,000 to support the general program and the Dole Family Foundation awarded \$5,000 for team project costs in Antrim County. The Wireless Zone Foundation for Giving (the charitable arm of Verizon Wireless) gave \$1,000. If you have projects you'd like to work on, let us know! We are actively seeking funding and donations for future teams and to support this year's teams in future years.



Friends of the Boyne River

Master Gardener Nancy Cunningham, with the Friends of the Boyne River, will create educational signage at the Boyne River Nature Area to explain the importance of wetlands.



Boy Scout Troop #11



"Raydernators" Robotics Team

Led by Tip of the Mitt Watershed Council past board member Dave Clapp, Boy Scout Troop #11 and Charlevoix Elementary School "Raydernators" Robotics Team, will adhere "no dumping" stickers to East Jordan and Charlevoix stormwater drains and perform a beach cleanup in Charlevoix County.



Lake Charlevoix Association



Lake Charlevoix Association

Our first official WAVE team, the Lake Charlevoix Association led by Tom Darnton, will install educational signage for their shoreline demonstration garden in Sunset Park in Boyne City.



Soul Springs Permaculture

Located north of Harbor Springs, Soul Springs Permaculture is installing a rain garden. The project complements their desire for a sustainable and regenerative farm. Team leader Kammer Moss will eventually incorporate the project into a functional teaching garden.



Petoskey Noon Rotary

Jeff Wynder, Petoskey Noon Rotary Board Community Service chair, heads the first complete WAVE project installing pet waste stations in Curtis Park and the Petoskey Greenway. The City of Petoskey donated additional funds to make the entire project possible.



Staurt Ave. Neighborhood

Petoskey residents Kevin and Marcia Meyer noticed there was a stormwater problem in their neighborhood and decided to take action with WAVE. They are leading a team to construct a rain garden in part of Boyne Country Sports' parking lot.

NEW RESOURCE

FreshwaterCenter.org

FreshwaterCenter.org, the data repository for Northern Michigan's waters.



Tip of the Mitt Watershed Council has over 30 years of water quality monitoring data for surface waters across Emmet, Cheboygan, Charlevoix, and Antrim Counties. These data are collected through multiple programs and partnerships with lake associations and local organizations. We are excited to announce a new resource, available soon for viewing, querying, and interacting with data that have been collected. Although still under construction, the repository website www.freshwatercenter.org will be continuously updated this fall and into the future with data visualizations for highlighting water quality trends we have documented over the last three decades. The only thing for certain in some areas of Northern Michigan is change, and we want to continue highlighting any changes that occur in our picturesque waters of Northern Michigan.

Thank You...

Habitat Landscapes for maintaining the landscape at the Watershed Council office throughout the summer.

Simon Gelb for organizing and cleaning our lab area.

Irish Boat Shop for hosting our annual Whale of a Sale and storing our Boston Whaler, the H₂Observer, for the winter.

Jac Talcott for help during the *Zequanox* project.

University of Michigan Biological Station for logistical support during the *Zequanox* project.

Tom Darnton for logistical support during the Lake Charlevoix shoreline survey.

Kathy Germain for logistical support processing macroinvertebrate samples for our Volunteer Stream Monitoring program.

A special thank you to our dedicated **Volunteer Stream Monitors** and **Volunteer Lake Monitors** for another great season of data collection!

Our Wish List

Working in the 21st century requires 21st century equipment. Below is a wish list we have put together for pushing our work into overdrive! Any monetary donations toward the equipment listed below would be extremely helpful as we look to expand our efforts.

- **\$700 wading rod for water velocity:** Water quality monitoring in streams and rivers requires the measurement of water velocity and calculating discharge to help understand the amount of nutrients flowing downstream.
- **\$8,650 waterproof drone:** Yes, you read this correctly. Monitoring and conducting research with aerial technology has 'taken off' and is ideal for water-related research and monitoring. We would utilize this technology for monitoring sediment deposition, lake water levels and algal growth, stream habitats, invasive plant growth, and other watershed management projects.
- **\$200 technical backpack:** This backpack would be dedicated for transporting our field equipment to and from research sites.
- **\$500 quality and durable waders and wading boots** for field staff.
- **\$150 five cubic foot chest freezer:** Before delivering water samples to the lab for analysis, many of our samples need to be frozen.
- Full-size **energy efficient refrigerator.**
- New **reception area chairs and tables:** Our knowledge is in high demand, resulting in daily conversations with citizens.
- **\$1000 temperature and conductivity data loggers** for volunteer stream monitoring: These small gadgets anchored to the bottom of streams would collect hourly temperature and conductivity measurements in waters monitored by volunteers. The loggers can be deployed in May during spring sampling and retrieved during fall sampling in September.

To make our wishes come true, contact Gail Gruenwald or Lindy Buffington at (231) 347-1181 for details.

Thank you for your support!

6/12/2018- 10/12/18

New Members

Bradley and Dawn Ball
Ms. Lois Ballard
Mr. and Mrs. John Balser
Mr. Thomas Basso
Mrs. David L. Billings
Mr. and Mrs. Richard P. Binder Jr.
Jay and Linda Bingham
Ms. Winnie Boal
Mr. and Mrs. Marc Boeckl
Mr. and Mrs. Mark Borovich
Mr. and Mrs. Robert Briggs
Mr. and Mrs. Robert W. Buckner
Bonnie and John Buist
Ms. Patricia Burhans
William and Sandra Buyak
Bruce and Debra Byers
Robert and Ann Canfield
Martie and Chris Conner
Mr. and Mrs. William Craig
Mr. and Mrs. Carlo A. D'allolmo
Mr. and Mrs. Jim Demmer
Robert and Anna Maria Deyoung
Mr. and Mrs. Alton F. Doody III
Mr. Karl F. Dubois
Tom and Susan Eastman
Cheryl and Michael Eberhart
Ms. Margaret A. Edgar
Mr. Nick Ellena
Mrs. Lola Ermisch
Mr. and Mrs. Louis Fantini
Mr. Ross O. Felker
Rodney and Alice Gerard

James and Karen Gilleylen
Mr. and Mrs. George Googasian
Mr. and Mrs. Blair Headrick
Deborah and James Hogan
Ms. Sandra D. Hovermale
Paul and Tricia Howard
John and Lorraine Hughes
Mr. Kenneth Isham
Brad and Michelle Jarvis
Richard D. and Roxanne Jenkins
Mr. Scott C. Johnson
Dutch and Leslie Jones
Mrs. Sherren Jones
Dr. and Mrs. Howard Klausner
Mrs. Helen Kosier
Douglas and Ellen Law
Dorothy Lenz
Ms. Judith Lewandowski
Mrs. Pam Lewsley
Michael and Susan Loeffler
Ms. Carole Mack
Elizabeth L. Malone and Frank M. Malone
Mrs. Thomas B. Maus Sr.
Mark and Holli Mayer
Kevin Kavanagh and Renee McDuffee
Ms. Kay McKnight
Mr. and Mrs. Dale Meyer
Hans and Jutta Milobinski
Charles and Christine Nicholl
James and Janet Niedecken
Mr. James Nordlie
Erin O ' Donohue
Mrs. Caroline Ogburn
Chad and Sue Okuly
Mr. Frank Palermo

James J. and Kimberly A. Palmer
Thomas and Kathryn Papiernik
Ms. Dana Perlman
Mr. and Mrs. Donald Perrin
Dr. and Mrs. Charles Ping
Bruce and Jane Platte
Mr. and Mrs. John Rakolta Jr.
Mr. and Mrs. Robert R. Roll
Keith Ross
Ms. Laura Staich and Mr. Philip Ruedi
Mr. and Mrs. Lee Runk
Daniel and Julie Rush
Dr. Jennifer G. Rutledge
Chris and Jenny Schild
Julie and Dan Schmittiel
Mr. and Mrs. David G. Semrau
Rev. Al Shands
Dr. and Mrs. Robert Skoff
Mr. and Mrs. Kenneth W. Sparks
Sharon L. Spencer
Bruce and Judy Spiekhout
Mr. and Mrs. Paul Tomey
Maureen Trerice
David M. and Christine M. Underwood
William and Betty Wadland
Nancy Walther
Gretta Y. Walton
Mr. and Mrs. Lester Warner
Mr. Paul Warrick
Dr. and Mrs. Jay A. Werschky
Hugh N. Westwater
Gary and Judith Wolf
David and Laura Yell
Brian and Debra Zeeb
Mr. and Mrs. Robert F. Zurschmiede

Memorial Gifts

In memory of...

Dean Grundy
Birchwood Association of Mullett Lake
Joan Leonal
Birchwood Association of Mullett Lake
Robert McKenzie
Birchwood Association of Mullett Lake
Caroline Ragsdale Reuter
Birchwood Association of Mullett Lake
Kathy Walters Smith
Birchwood Association of Mullett Lake

John Spencer

Birchwood Association of Mullett Lake

David Svendsen

East Burt Lake Association

John Woodrow

Birchwood Association of Mullett Lake

Honorariums

In honor of...

G.P. Johnson Hightower
William Hightower
Lisa Loyd
Irish Boat Shop
Tom Mueller
Brent Popolizio
Dr. John and Mary Lou Tanton
Thomas and Deborah McMullen

Your Matching Gift Matters!

Thank you for your membership donations to the Watershed Council. To make your gift go even further, check to see if your employer or previous employer has a matching gift program. It's easy to do and we can help. Contact Gail Gruenwald or Debbie Esposito at (231) 347-1181.

Match your gift and double your impact toward protecting what you love!



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This newsletter contains information worth sharing.

When you're done reading it, don't throw it out.

Pass it on!

Getting an Early Start on Treating Spring Invasives

Every spring since the early 2000s, the Watershed Council has worked with lake associations, landowners, and conservancies of Michigan to combat the invasive purple loosestrife plant by releasing one of its natural predators, *Galerucella* beetles. Purple loosestrife (*Lythrum salicaria*) is a plant native to Europe and Asia where local insects and diseases have kept it in check. Introduced to North America as a garden plant, purple loosestrife has since invaded wild areas and degraded natural habitat for native plants and animals. The *Galerucella* beetles eat the invasive purple loosestrife plant, controlling its spread while remaining harmless to other native species in Michigan.

The Watershed Council makes the process of using beetles an easy one. We secure a permit from the U.S. Department of Agriculture that allows transport and distribution of beetles and coordinate ordering from a commercial supplier called Bio-Control of Weeds in Bozeman, Montana. Our original program, which started in 2005, collected beetles in our area and released them in new infestations. It established viable populations in our region. Now we work to bolster existing populations with beetles from Bio-Control of Weeds.

Last year, we distributed over 3,000 beetles to seven different organizations. This year we are encouraging loosestrife managers to locate plants this fall when flowers are still in bloom. Knowing the size of the stand that emerged during the prior year helps decide how many beetles are needed for treatment. Ordering will occur in late winter and treatment takes place in the spring. Beetles are the best option for stands greater than one acre in size or if loosestrife covers over 50% of an area. Approximately 300 beetles are required to establish a population to tackle an invasive loosestrife stand.

For more information or to participate in purple loosestrife control, please contact Caroline Keson at (231) 347-1181.



The *Galerucella* beetle feeds on the stem, leaf, and bud of loosestrife plants, preventing the plant from reproducing.



Purple loosestrife (*Lythrum salicaria*) in its flowering stage.

Purple loosestrife can be identified by its purple flowers that bloom from June to September. Purple loosestrife produces square stalks 4 to 7 feet high. Leaves are heart- or lance-shaped and flowers have 5 to 7 petals. Visit our website at watershedcouncil.org/purple-loosestrife for more information about identification.

There are three primary ways to control purple loosestrife: mechanical control, chemical control and biological control. Mechanical control is the physical removal of plants from the environment through cutting or pulling. Chemical control kills plants and inhibits regrowth by using herbicides. Biological control uses natural predators, such as plant diseases or insects, to help control the invasive plant.