
The Great Lakes

Pollutants and their Regulatory Framework

Daniella Burke, MSU MPP Program, dburke@senate.michigan.gov

The Great Lakes make up over 80% of the entire country's freshwater resource.^[15] Due to this, the entire country benefits from keeping them clean and protected. Many things currently effect the water quality of the Great Lakes, and great work has been done regarding their restoration, but it is clear more work is needed. Certain contaminants, like PFAS, microplastics, and algae blooms, are still plaguing our Great Lakes and each time an issue arises we create a policy and regulatory structure that tackles each issue individually, which breeds inefficiency. Policy structures should be pliable and malleable to all current and future water quality issues. A flexible structure is needed to tackle the quality of the Great Lakes more thoroughly and effectively from here on out.

THE GREAT LAKES SIGNIFICANCE

The Great Lakes Basin is a system of lakes that spans over 11,000 shoreline miles along Canada and the United States.^[13] This massive body of water has been used throughout history for various recreational and commercial activities, such as fishing, boating, swimming, and transporting goods. Besides their impact on human life, they are vital for wildlife and the various ecosystems that live within them.

WHO DOES THIS EFFECT?

Everyone. If the Great Lakes were its own country, it would form a \$4.7 trillion economy, which would be the fourth largest economy in the entire world.^[11] Many people have a vested interest in the Great Lakes. Which includes, first and foremost, anyone who drinks water, along with many commercial industries. Which includes real estate, tourism, fisheries, municipalities, and even local residents. Quality concerns among the Great Lakes can even raise costs of living due to increase costs of obtaining and the cleaning of infected waters.^[21]

PFAS:

These are man-made chemicals that are used in large amounts of consumer products, household products, industrial applications, firefighting foam, and many other common items. Their main point of entry into the environment is through industrial discharge, air emissions, landfills, and wastewater treatment plants.^[1]

MICROPLASTICS:

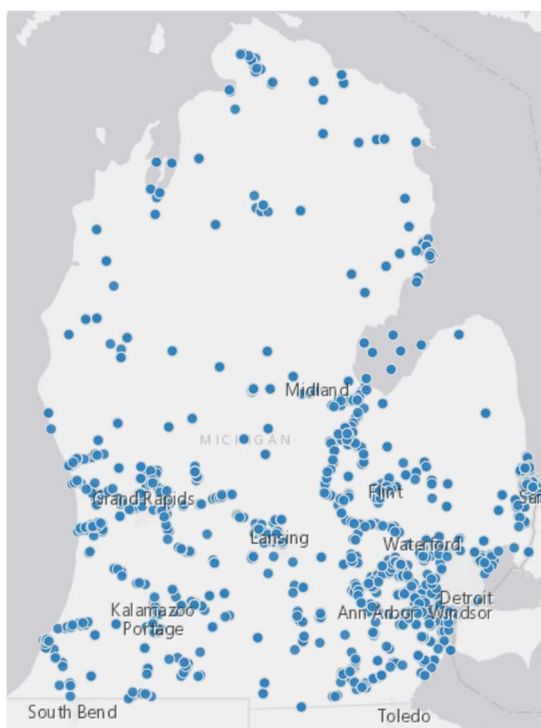
These are any piece of plastics that is 5 millimeters or smaller; or the size of a grain of rice. For example, the most common problematic source being microbeads used in exfoliating products. Though, any piece of plastic that degrades to 5mm or smaller is classified as a microplastic.^[4]

ALGAL BLOOMS:

These aquatic plants produce toxins and are created when large amounts of phosphorus and nitrogen enter the water. These blooms create "dead zones," killing all aquatic life and plants in the surrounding area.^[6]

PFAS ARE ALREADY IN OUR BLOOD

Per- and poly-fluoroalkyl substances, or PFAS, are one of the contaminants plaguing the Great Lakes. Commonly referred to as “forever chemicals”^[1], PFAS began entering our waterways in the 1940s and can take thousands of years to completely break down.^[12] Even though PFAS are used all the time and are in many different household items, we now know that these chemicals are dangerous to human and animal health when ingested by either drinking contaminated water or breathing them in.^[1]



Pictured above is the location of each waste site within Michigan. Each of these waste sites is considered a point of entry for PFAS to seep into the soil and enter the waterways.
Source: EGLE MPART: PFAS Geographic Information System

CURRENT RESEARCH

Even though research is limited on the effects of PFAS on the human body, there is a consensus among scientists that low levels of exposure to PFAS are of concern. Initial research on the health issues that can stem from PFAS state that they seem to cause anything from rashes to liver damage and even reproductive issues. What we are sure of regarding PFAS are:

- They have a very long half-life, so they can take years to degrade fully and leave our system or the environment,
- A study done in 2004, found that 98% of Americans had PFAS already in their blood, and
- PFAS are prone to buildup.^[1]

This means, that since they take forever to break down, and can easily collect within whatever system they are in - be it the human body, wildlife, or the environment - that system can degrade exponentially as more and more PFAS are pumped through the soil and into the water systems.^[2]

RESPONSES

- Sampling and treating the water,
- Removing PFAS from common household items,
- Banning PFAS in firefighting foam,
- Changing how we make or use items that contain PFAS.^[23]

CHALLENGES

- Current water treatment technologies are not advanced enough and not strong enough to remove PFAS from drinking water.^[1]
- The boiling of water, or burning of PFAS, causes them to be released into the air and breathed in by nearby populations.^[22]

MICROPLASTICS REDUCE THE NUTRITIONAL VALUE OF FISH

Another concern for the health and integrity of the Great Lakes is the amount of microplastics in the water. These tiny pieces of plastic are sometimes referred to as sponges, because they can soak up and carry pollutants already in the water or release whatever chemicals were used to create them. They can be eaten by fish and birds, then carried to other places or cause damage to the animals that ingested the plastic. Microplastics can even find their way into tap and bottled water, as well as other food or beverages the average person consumes.^[7]

CURRENT RESEARCH

More than 22 million pounds of plastic pollution ends up in the Great Lakes every single year and the Council of the Great Lakes Region estimates it will cost about \$400 million annually to fix this.^[7] Samples of the Great Lakes were collected, where they tested the amount of microplastics within each sample, and found that 90% of samples contained a level of microplastics that is unsafe for aquatic wildlife.^[3] Also, 98% of samples collected surpassed the threshold of food dilution toxicity; food dilution is defined as adding cheaper ingredients to otherwise high-quality food without mentioning the cheaper ingredient.^[14]

“90% of samples contained a severe amount of microplastics”

RESPONSES

- The United Nations Environment Assembly is discussing a ban on plastic pollution, which states a goal of coming up with a decision on the matter in 2024.^[17]
- Canada has done work in banning the manufacture of single-use plastics, with the intent of banning exporting single-use plastics as well.^[10]
- California has developed the Statewide Microplastic Strategy that proposes educating the people in the state about microplastic sources, impacts, and solutions. Their other strategies consist of removing plastic waste at the source, eliminating certain products or materials that contribute the most to microplastics, and intervening amongst certain water pathways that move the most microplastics into California waters.^[5]



CHALLENGES

Plastics is a huge industry, who have power and money to influence decisions made by policymakers and other relevant industries. Also, unless surrounding states are also increasing their regulatory efforts of microplastics, it will be difficult to see any real positive change.

ALGAL BLOOMS LEAD TO INCREASED COST OF LIVING

Algal blooms are the aquatic plants that are known to create dead zones in the water, due to the toxins they produce. This issue is most associated with farm water runoff because of the amount of phosphorus in fertilizers and animal waste, but phosphorus is also in household items like detergents. Points of entry are stormwater from urban environments, wastewater from sewer and septic systems, and fossil fuels.^[6]

CURRENT RESEARCH

The EPA has listed three categories to classify the type of effects harmful algal blooms have on society.

- Human Health Effects: anything from a rash to respiratory problems and neurological effects.
- Environmental Effects: acid rain, air pollution, and dead zones in the water.
- Economic Effects: increase water and fishing costs, negatively affect tourism and real estate, decrease property values, and increase cost of living via increase in water costs.^[21]

ALGAL BLOOMS & LAKE ERIE

Lake Erie is the most negatively affected by algal blooms and needs the biggest change. This is because it is the shallowest and warms up the quickest after winter. These warm waters contribute to rapid algae bloom growth.^[16] As well as approximately 80% of its inflow of water comes from the Detroit River, which means it is the only lake that is heavily influenced by urbanization, industrialization, and agriculture.^[13]



NOAA Great Lakes CoastWatch took the satellite image, pictured above, of Lake Erie and the harmful algae blooms within it in 2011. Algal bloom conditions vary every year but remain a constant issue.

RESPONSES

- Ohio, Michigan, and Minnesota are all moving forward with legislation that will provide farmers with grants to incentivize the adoption of practices known to reduce phosphorus levels.^{[9][18]}
- Georgia has seen a reduction in phosphorus in local waters due to state laws that reduced the amount of phosphorus coming from wastewater treatment facilities and restricting the use of phosphorus in detergents.^[24]

CHALLENGES

It is hard to change farmer's behaviors, even with incentivized best practices, as farmlands are still a relatively unregulated source of phosphorus pollution. Even though they are its largest contributors.^[19]

WHY SHOULD YOU CARE?

Unhealthy water conditions kill around two million people every single year, most of whom are children. The United Nations predicts at least intermittent water shortages that will affect two-thirds of the world by 2025.^[11] Typically, all pollutants and their solutions are looked at in isolation. However, the systems that address these pollutants, need to be looked at as one system to more efficiently and thoroughly tackle quality issues that continues to emerge within the Great Lakes Basin. My recommendations to do just that live within three categories:

Lake Erie alone provides drinking water for over 11 million people, 10 million of whom reside in the U.S.^[16]

GOVERNANCE

The Michigan Department Environment, Great Lakes, and Energy's (EGLE) division The Office of the Great Lakes (OGL) is already leading in water quality and conservation efforts through policy initiatives and the implementation of various programs and should have a more formal role in the rulemaking process. All government departments, including the other divisions within EGLE, that deal with water policy, in any capacity, should come together under OGL. This would be similarly structured to The Interagency Environmental Justice Response Team already under EGLE when dealing with Environmental Justice Efforts. This way, they can have one body discuss water policy and then promulgate rules under EGLE's already established rulemaking system.

REGULATION

Michigan struggles with sewer and stormwater overflow and could benefit from having a stormwater utility fee implemented or a goal that reduces overflows over time. Most water system utilities have an idea of how many gallons of stormwater they can handle and how often they have overflow. Creating mandatory reporting of the yearly average of overflow, would allow us to see how much more storage a facility might need. With another regulatory change being an addition to expanding what we are already testing for. A lot of municipalities, specifically schools, require lead testing and reporting, which could be expanded to more pollutants, including phosphorus levels, PFAS, and microplastics.

FUNDING

Besides general appropriations and grants EGLE already receives on a yearly basis, they can increase their money collection efforts by focusing on continuous revenue streams. Which can include an increase in fee for their water quality license plate from 35 to 50 dollars, where EGLE receives 40 dollars per plate and the remainder goes to the Secretary of State. As well as other state examples, like Minnesota who implemented an increase in sales and use tax rates by one-eighth a percent and 33% of that revenue goes to a Clean Water Fund.^[8]

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