Restoring Pure Michigan

Tackling Industrial Livestock Pollution to Protect Clean Water

ENVIRONMENTAL LAW & POLICY CENTER

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Executive Summary

Michigan is known as the "Water Wonderland." From the Great Lakes on all sides to the many streams, lakes, and rivers within, water is the essence of "pure Michigan." Unfortunately, these waters are facing grave risks due to the rise of industrial-scale agricultural pollution.

Every single day, the animals confined on Michigan's 290 largest livestock operations — known as Concentrated Animal Feeding Operations or CAFOs — generate 62.7 million pounds of feces and other waste. That's 17 million *more* pounds per day than the state's entire human population of 10 million. This report describes how that animal waste is generated, how it ends up polluting the water and harming human health, and how the state's legal and regulatory system is failing to curb it.

Michigan is not alone in this battle. Harmful algal blooms and *E. coli* pollution are choking waters from coast to coast, from Lake Superior to the Gulf of Mexico. According to the U.S. EPA, nutrient water pollution, which drives harmful algal blooms, "is one of the most widespread and challenging environmental problems faced by our nation." But not every state has the same water legacy that Michigan has, nor the same opportunities to protect it. It is time to step up and seize these opportunities, for the health and economic future of all Michiganders.

"Best Management" Isn't the Best on its Own

Scientists, academics, environmentalists, and politicians all agree that nutrient runoff from agriculture is a key driver of harmful algal blooms, but they continue to debate the solution. Many years have been spent in pursuit of one approach: trying to get as many farmers as possible to voluntarily adopt a particular set of agricultural "best management practices," or BMPs. This approach isn't working. We need only look at Lake Erie — which remains green with hazardous algal blooms every summer and fall — to see that. Water testing data for nutrients and *E. coli* pollution only confirm that conclusion.

One problem is that there are not enough farmers willing to voluntarily adopt BMPs. The state's signature program has only been adopted by 17% of farmers in the Western Lake Erie Basin. Another key reason is that many BMPs do not work in Michigan's most CAFO-heavy watersheds; some can even make pollution worse. Indeed, the State of Michigan concluded years ago that even if 100% of farmers in the Western Lake Erie Basin were to adopt three voluntary BMPs each, that would still not be enough to stop the recurring harmful algal blooms.

Big Polluters Have Big Responsibilities

Michigan's 290 CAFOs — which constitute less than 1% of all farms in the state — produce an outsized proportion of agricultural pollution. For instance, CAFOs make up only 8.5% of all dairy "farms" in the state, but house 62% of the state's dairy cows. In just the past five years, 700 dairy farms closed in Michigan as the economics of running a smaller-scale farm get more difficult. By operating under permits which are both ineffective and inadequately enforced, CAFOs profit from economies of scale while unfairly externalizing their waste management costs onto Michigan's waters and the public that depends on those waters. Michiganders end up paying for CAFO pollution through taxes, utility bills, and lost access to safe clean water. The state's BMP approach adds to that burden by asking smaller farmers and producers to voluntarily take on costly, labor-intensive practices, which complicate their operations and may not even be effective. In unpacking the problem and seeking solutions, this report also asks a fundamental question about fairness:

> **Is it fair to continue putting the burden of cleaning up our water on the shoulders of Michigan's taxpayers and family-scale farmers?**

This report argues that the fairer approach is to treat CAFOs like the industrial-scale polluters they are. The "polluter pays" principle is widely accepted: if a steel mill or an oil refinery generates pollutants, they are responsible for making sure those pollutants do not harm the environment. The same principle should apply to CAFOs, which state and federal law recognize as industrial polluters like any other factory or mill. In practice, though, CAFOs are not held to the same standards.

If CAFOs were regulated like other industrial operations, they would have to either treat their waste before disposing of it, spend the resources to safely manage it, or produce less waste. And they — not taxpayers or other farmers — would be required to foot the bill. It is within Michigan's power to change that, and there is no justification for continued delay.

Michigan Can and Must do More to Tackle Pollution

This comprehensive report will provide recommendations for how Michigan can achieve cleaner water, including by better regulating CAFOs. **In short, CAFO permits and water standards need to be stronger, they need to be properly enforced, and the state needs to stop spending money on things that aren't working.**

This report also proposes new regulatory and statutory measures that could, if adopted, provide additional pathways for cleaning up Michigan's water. Finally, to the extent the state continues to employ voluntary BMP programs, this report recommends how those programs must be changed for there to be any hope of their effectiveness. The report will proceed in the following sections:

1. What are CAFOs and How Do They Pollute Michigan's Waters?

2. CAFOs Benefit from Lax Regulation and Taxpayer Subsidies

3. Recommendations to Reduce CAFO Pollution

4. Conclusion

There is no single, silver bullet that will solve Michigan's CAFO water pollution problems. But there are policy changes at every level that could make a difference in turning the tide. These changes will shift the burden from taxpayers and family-scale farmers, who now carry the load, to the largest industrial-scale operations who can afford to do more, and must, given their legal obligations.

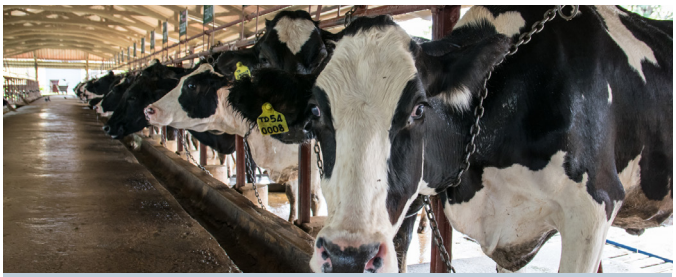
SECTION 1

What are CAFOs and How Do They Pollute Michigan's Waters?

I. The Rise of the CAFO Business Model — "Get Big or Get Out"

Over the last 40 years, CAFOs have transformed animal agriculture. Unlike traditional, family-scale farms that kept a manageable number of animals at pasture and used their manure to fertilize crops on the farm, the CAFO model — in which animals are confined indoors most of the time — creates an imbalance between nutrient intake (grazing) and nutrient output (manure). This means that the animals confined on a CAFO generate more waste than the nearby land can absorb. Even the USDA recognizes that CAFOs are not farms in this traditional sense and refers to them as "large, industrialized livestock operations."

Industrialization of agriculture became a national priority in the 1970s under USDA Secretary Earl Butz, who was known for saying that farmers should "get big or get out" of agriculture. By the end of the 1990s, much of agricultural production had, indeed, gone "big" and many farms have, indeed, gotten out. The CAFO business model now dominates livestock production. In 1964, more than 1 million farms nationwide were raising about 54 million hogs; by 2022, just 56,000 farms were raising more than four times that many hogs (240 million).[1] Michigan's fate was no different: as the number of farms has shrunk dramatically, the number of animals being raised has risen over time — see Figures 1 & 2 below.



Under Michigan law, an '[a]nimal feeding operation (AFO)' means a lot or facility . . . where the animals . . . will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period." Michigan Administrative Code Rule 323.2102(i).

A large CAFO is an AFO that confines a minimum number of animals, including: 700 dairy cows; 1,000 cattle; 2,500 swine over 55 pounds; 125,000 chickens, and/or discharges pollutants from its production area.

Figure 1: Michigan has gained 91,704 dairy cows while losing 5,018 dairy farms since 1987

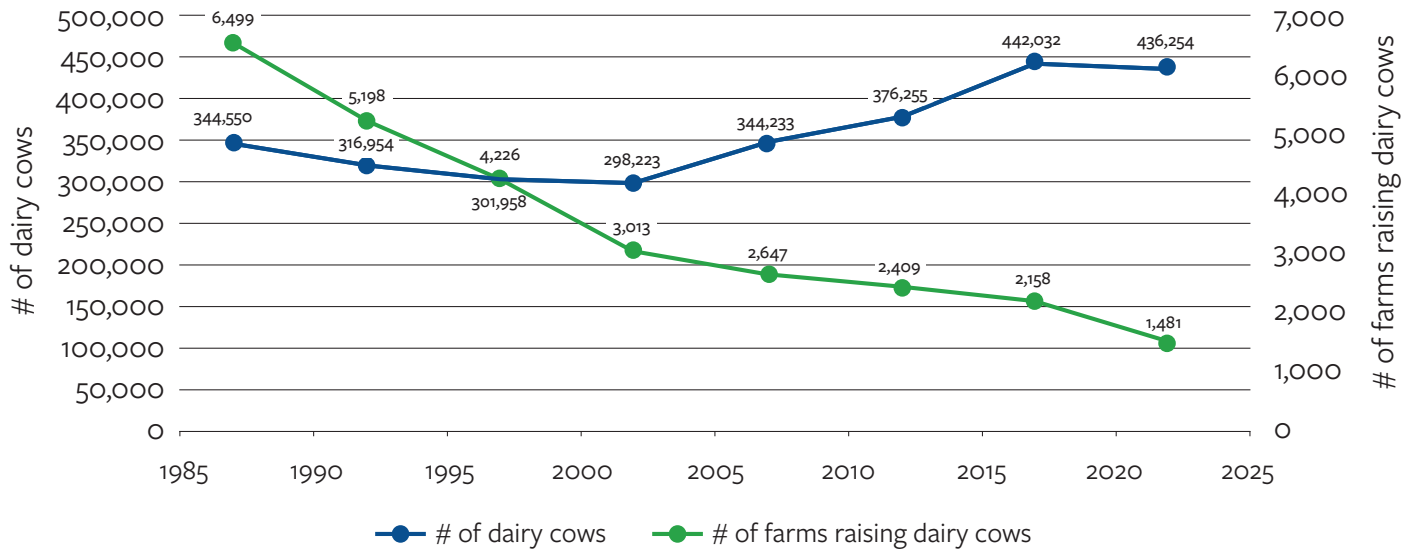
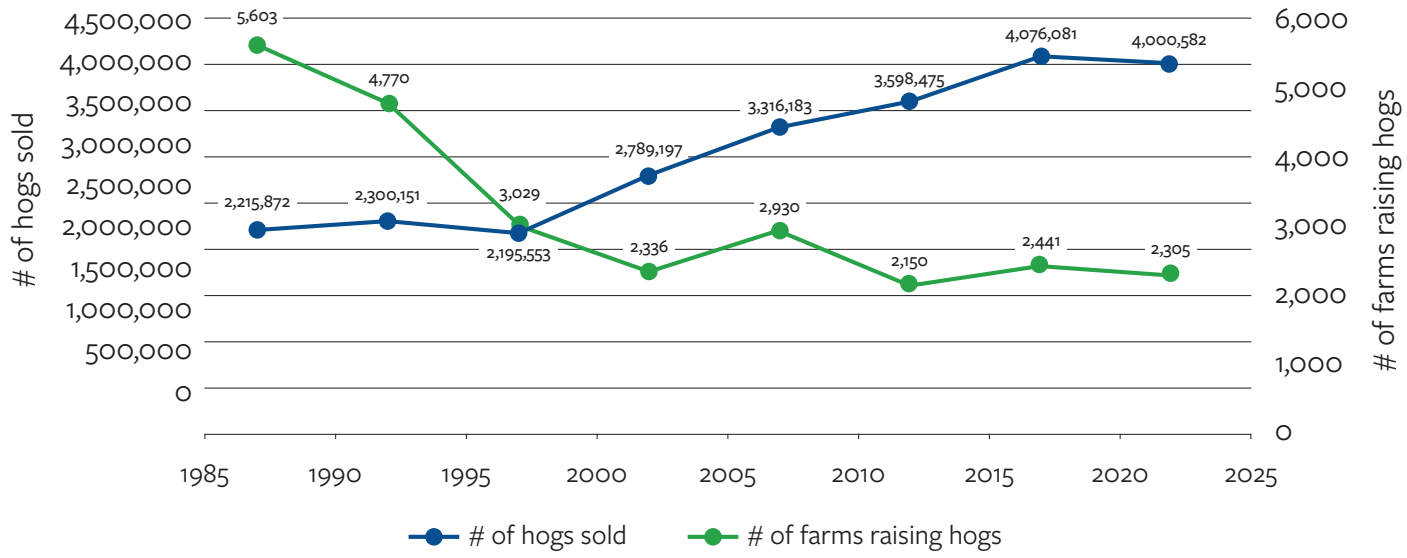


Figure 2: Michigan gained 1.78 million hogs while losing 3,298 hog farms since 1987. Source: USDA Agricultural Census



II. CAFOs Generate Massive Volumes of Dangerous Waste

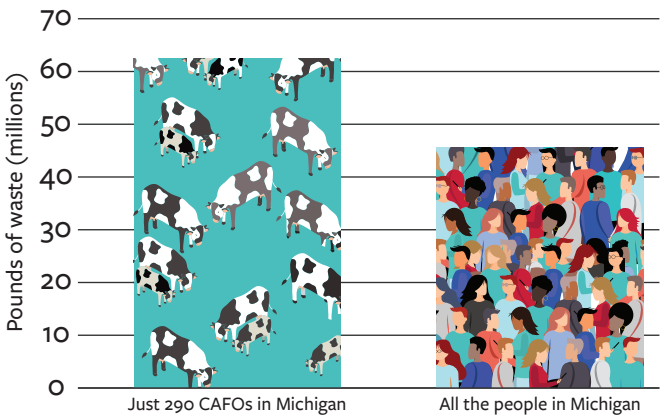
As of 2012, large CAFOs in the United States produced more than 20 times the volume of fecal wet mass produced by all of the country's humans.[2] In Michigan, permitted CAFOs (not including small and medium-sized AFOs which do not have to get permits) reported producing 3.9 billion gallons of liquid waste and 1.3 million tons of dry waste in 2020 alone.[3] According to MSU calculations, that translates to approximately 62.7 million pounds of waste per day,[4] which is 17 million pounds per day more than is produced by the state's entire human population of over 10 million.[5] Livestock waste can be dangerous in small amounts, but it is worse in vast concentrations, especially in the way it is collected, stored, and disposed of on CAFOs.

Most dairy and many hog CAFOs use wet manure systems, storing manure and other waste in liquid form, often in open cesspits euphemistically called "lagoons." As the lagoons fill up, CAFO operators or third-party manure haulers apply the untreated waste to crop fields—ostensibly as fertilizer since manure does contain some nutrients that crops need, like nitrogen and phosphorus.

But liquid CAFO waste is costly to transport and hauling costs generally exceed fertilizer value whenever waste is hauled farther than one mile. As a result, CAFOs apply far more nutrients to nearby agricultural fields than crops need. This is particularly true for phosphorus, which accumulates in soil. And when there are more nutrients than the soil can absorb, those excess nutrients can more easily end up in our water, as we explain on pages 10-13.

Making matters worse, CAFO waste also contains many components which have no agronomic benefit at all or are affirmatively harmful, including wastewater runoff, detergents, antibiotics, *E. coli* and other pathogens, and PFAS.

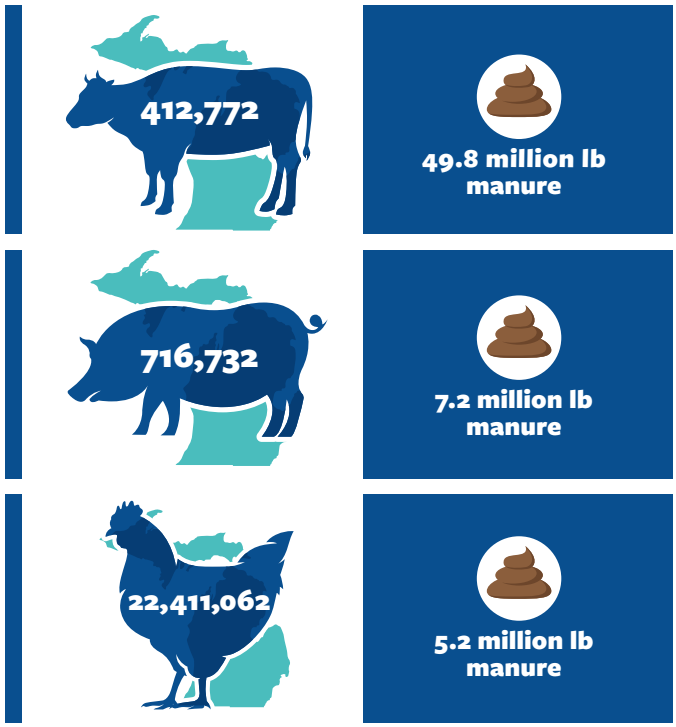
Figure 3: Michigan's 290 permitted CAFOs produce 17 million pounds more waste per day than the state's population of 10 million people.



Sources: EGLE & MSU Extension.

The reality is that the primary goal of CAFO waste spreading is waste disposal, not crop fertilization. CAFOs gain a significant economic advantage by concentrating their industrial production and offloading their waste in this way. This comes at the expense not only of smaller family-scale farmers, but also the environment.

Figure 4: Pounds of manure per day produced by animal categories in Michigan, 2020: dairy cows, beef cattle; swine; turkeys, roasting chickens, and laying hens.



Source: EGLE.

What Pollution do CAFOs Cause?

Excess nutrients and *E. coli* are the CAFO waste components that pose the biggest threat to water quality and human health, both in Michigan and nationally.[6] Indeed, public health agencies have been warning about the dangers of CAFOs for years. In 2010, at the encouragement of the CDC, National Association of Local Boards of Health wrote a report outlining the human health consequences of CAFO-caused pollution. In 2017 and again in 2022, public health organizations signed onto legal petitions asking the U.S. EPA to better regulate CAFOs. These documents and others[7] provide extensive information about the myriad public health and environmental threats created by the CAFO business model. We provide only a high-level summary of CAFO threats to water quality here, focusing on Michigan-specific impacts.

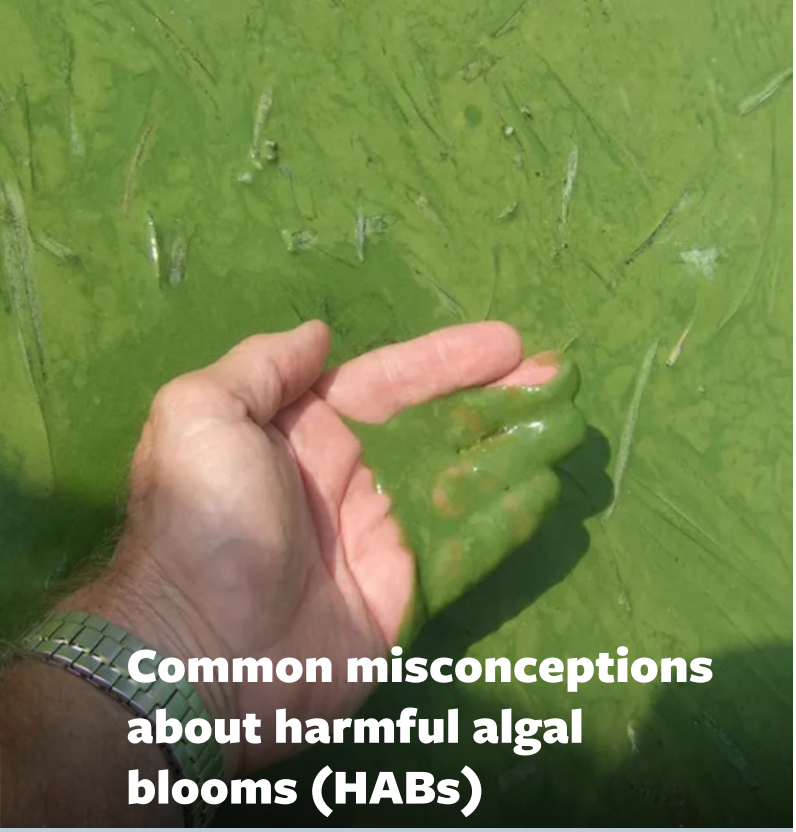
Excess Nutrients (Phosphorus & Nitrates)

Two primary nutrients can pollute water in excessive amounts: phosphorus and nitrogen. Both are essential for plant growth, but there are limits to their benefits. CAFO waste is often overapplied or misapplied, leading to nutrient loss into water. When that happens, nutrients shift from helpful soil additives to harmful contaminants.

Phosphorus

Phosphorus — in particular, dissolved reactive phosphorus (DRP) — is driving the formation of harmful algal blooms (HABs) in many surface waters.[8] Known for their green sludgy appearance and foul odor, HABs are large accumulations of cyanobacteria. HABs are not just aesthetically unappealing; they can also generate dangerous hepatotoxins and neurotoxins which, if consumed, have been linked to kidney and liver damage, gastrointestinal distress, infections, dementia, amnesia, other neurological damage, and even death. As reflected in Figure 5, algal toxins (also called cyanotoxins) are more toxic by orders of magnitude than other toxic compounds, including cyanide and DDT. Even after HABs are no longer visible, the cyanotoxins they generate can persist and even travel downstream.

HABs have become a regular occurrence in western Lake Erie, Saginaw Bay in Lake Huron, and elsewhere across the state, harming local businesses, outdoor recreation, and public health. In 2014, a HAB outbreak forced a shutdown of the Toledo water supply, cutting off water access to 400,000+ people. Under Annex 4 of the Great Lakes Water Quality Agreement,[9] the U.S., Canada, Michigan, Ohio, Indiana, and the Province of Ontario agreed to reduce phosphorus loading into Lake Erie by 40% from 2008 levels by 2025. The region is far from achieving this goal. ELPC and local communities have been fighting to hold state and federal authorities responsible for cleanup ever since. Lake Erie is one of the most visible waterways harmed by HABs, but it is not alone.



Common misconceptions about harmful algal blooms (HABs)

HABs are only a problem if you can see green sludge.

FALSE: Toxicity and visibility are not directly related. Some HABs that are sludgy and highly visible can contain few or no cyanotoxins, while crystal clear water can contain dangerous levels of cyanotoxins.

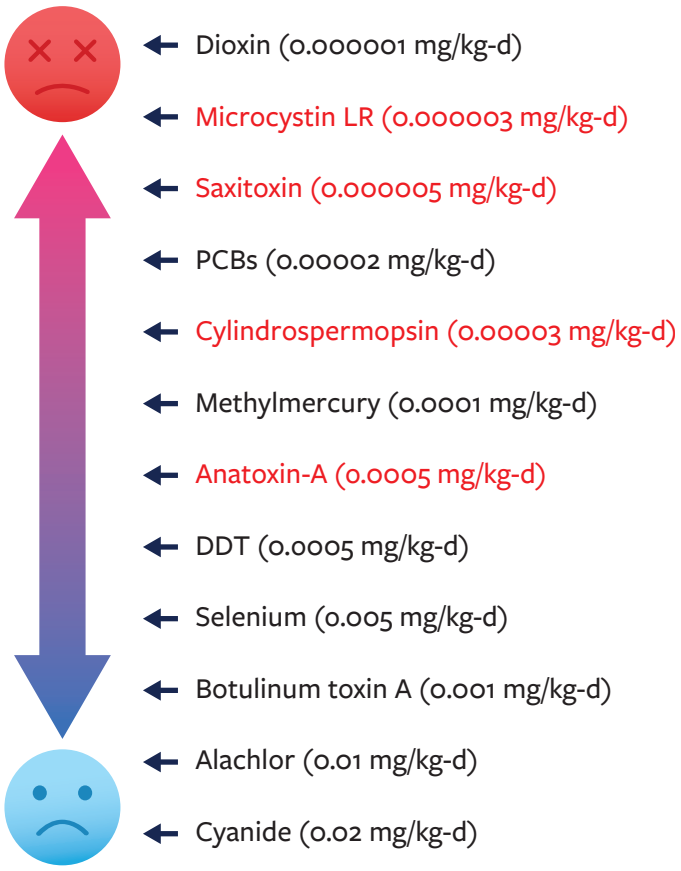
HABs only form in relatively warm, shallow waters like Lake Erie, the shallowest and warmest Great Lake.

FALSE: HABs can form in any temperature or depth of water; recent studies have discovered HABs in Lake Superior (the deepest and coldest Great Lake) and even the Arctic Ocean.

HABs are only a problem in a few places, like Lake Erie.

FALSE: HABs have been documented across the state, including in numerous inland waterbodies and even in the Upper Peninsula, and across the country. HABs can occur in moving water bodies (streams and rivers), not just lakes.

Figure 5: Algal toxins (indicated by red text) are more toxic than other compounds found in water.



Reference dose = amount that can be ingested orally by a person, above which a toxic effect may occur, on a milligram per kilogram body weight per day basis.

Cyanotoxins are not currently subject to regulation under the federal Safe Drinking Water Act, and Michigan has not created water quality standards for them either. Unlike the City of Toledo, Michigan water utilities do not routinely conduct routine water testing for cyanotoxins. The Michigan Department of Health and Human Services (MDHHS) developed a mapping tool to track cyanobacteria blooms, but MDHHS is only made aware of these incidents, by and large, through citizen reporting, not by any systematic water testing program. As a result, the MDHHS mapping data almost certainly understates the HAB threat.

Most people are not even aware of these risks, because cyanotoxins can contaminate water without visible indicators. For example, in Adrian, Michigan, which is in a CAFO-heavy watershed, Wayne State University conducted a study of home tap water

and found disturbing results. Dangerous neurotoxins and liver toxins were detected in an inlet to the city's drinking water system, the Lake Adrian reservoir. And even though the tap water had undergone treatment for safety and potability, samples contained Microcystis aeruginosa (harmful algae), a species of cyanobacteria, and two algal toxins it can produce, microcystin and anatoxin-a.[10]

Nitrogen

HABs generally impact surface waters, but Michigan's groundwater is also at risk from CAFO pollution. Nearly half of Michigan households depend on groundwater aquifers for drinking water.[11] Nitrates from CAFO waste can leach into groundwater — indeed, the "lagoons" that CAFOs use to store millions of gallons of waste unavoidably leak underground.[12] That puts the groundwater aquifers at risk.[13]

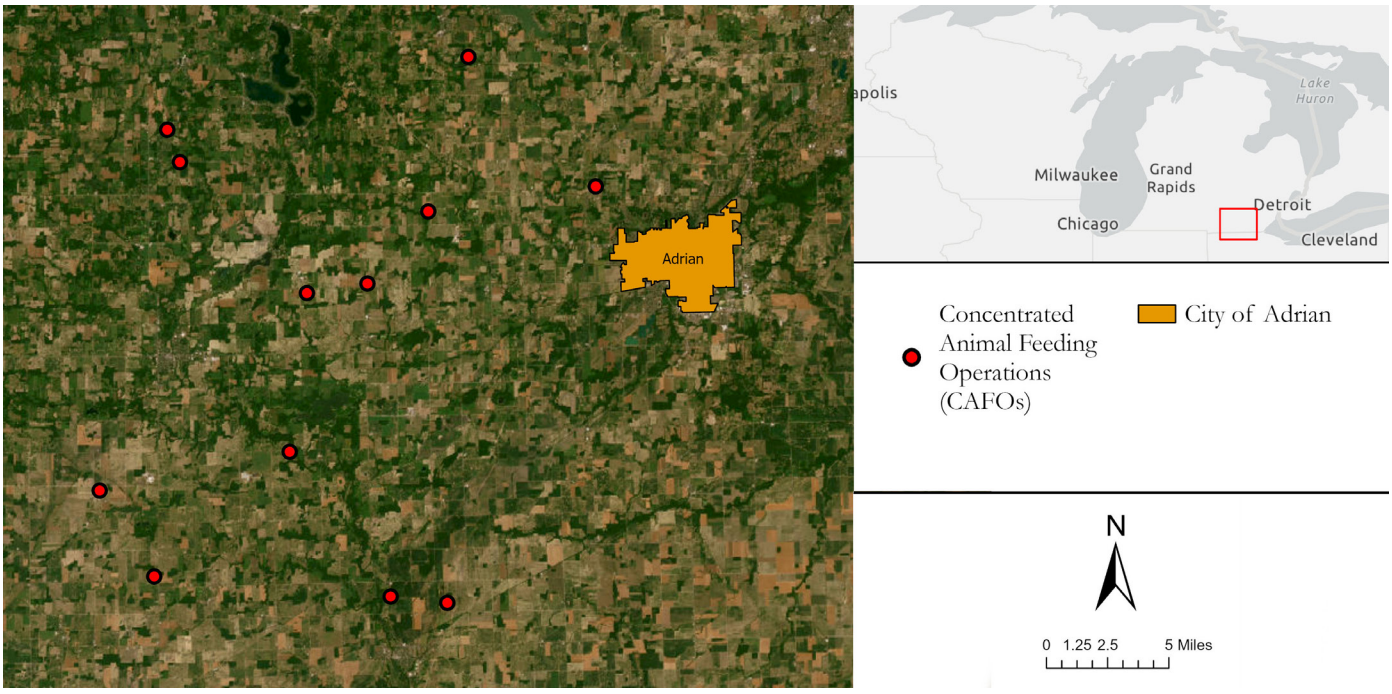
When consumed, nitrates in well water can hinder the ability of blood to carry oxygen, and nitrate exposure has been linked to birth defects, miscarriage, and cancer. Nitrates can be especially harmful to infants, leading to a potentially fatal condition called blue baby syndrome. The public is increasingly paying attention to nitrate pollution and its link to cancer across the Midwest.[14] In June 2023, U.S. EPA agreed to restart its human health assessment of nitrate and nitrite, which had been suspended under the Trump administration, though that process is likely to take years.

E. Coli and Other Pathogens

E. coli is a fecal coliform that lives in the intestines of warm-blooded animals. The Department of Environment, Great Lakes, and Energy (EGLE), which is responsible for regulating CAFOs in Michigan, estimates that approximately 50% of the state's rivers and streams exceed water quality standards for *E. coli*. Because so many waterways are impaired by *E. coli*, Michigan has prepared a statewide pollution diet plan, known as a TMDL (total maximum daily load), specifically for *E. coli*. See Section 2 for more on TMDLs.

Even partial body contact with water containing elevated *E. coli* levels can cause illness by infection of wounds, or indirect entry to the body (e.g., hand to mouth, hand to eyes, etc.). Total body contact can cause gastroenteritis, cryptosporidiosis, cholera, and other intestinal parasites. Given how many of Michigan's waterways are impaired by *E. coli*, Michiganders are at particularly high risk of infection.

Figure 6: Map showing CAFOs near the city of Adrian, in Southeast Michigan."



CAFO Pollution Causes Other Significant Environmental Harms

CAFO-caused water pollution damages biodiversity. HABs deplete dissolved oxygen levels and fuel the growth of toxic organisms, leading to major fish kills, harming the endocrine and reproductive systems of fish, and reducing diversity of fish species. In Michigan, the threatened piping plover bird is sensitive to pollutants from CAFOs, and its range overlaps significantly with areas where CAFOs are concentrated.

CAFOs not only threaten water *quality*; they are also a significant burden on water *quantity*. Livestock production is extremely water-intensive: not only is water needed to irrigate the animals' feed crops, but also to manage and clean CAFOs. Beef and dairy operations are particularly heavy water consumers, with wash water consisting of up to 50% of lagoon volume on a dairy CAFO. Altogether, agriculture uses 70% of the world's fresh water supply.

The Great Lakes provides 90% of the United States' surface fresh water, so access to clean, abundant water may not feel like a concern in coastal regions of Michigan, but MSU and others warn that such security may not last forever. Inland areas of the state, including Ottawa County, are already running out of groundwater, prompting a group of academics, environmentalists, and regulators to release an October 2021 report highlighting the problem. If the region becomes a "climate haven," as many predict, water resources will be further strained.

Water pollution exacerbates water scarcity. Water scarcity has historically been measured from a purely quantitative perspective: how much water by volume will be available under different modeling scenarios. But "clean water scarcity" accounts for not only quantity but also the quality of water, and whether it is able to support human, plant, and animal life. A recent study found that global clean water scarcity would *triple* due to nitrogen pollution worldwide. This translates into an additional three billion more people potentially facing water scarcity by 2050.

Currently, Michigan only requires water withdrawal permits for operations using more than two million gallons per day. A review of MiEnviro, the state's public access website for water permit information, suggests that Michigan does not currently require any CAFOs to carry withdrawal permits, even though collectively, the beef cattle and dairy cows raised on the state's CAFOs consume 20 million gallons of water per day.[15]

CAFO pollution is also linked to other significant environmental and human health harms, including:

- Disease transmission;[16]
- Antibiotic resistance;[17]
- Air pollution;[18]
- Climate impacts;[19]
- PFAS transport.[20]

Figure 7: Piping Plover

How do CAFO Pollutants Travel into Water?

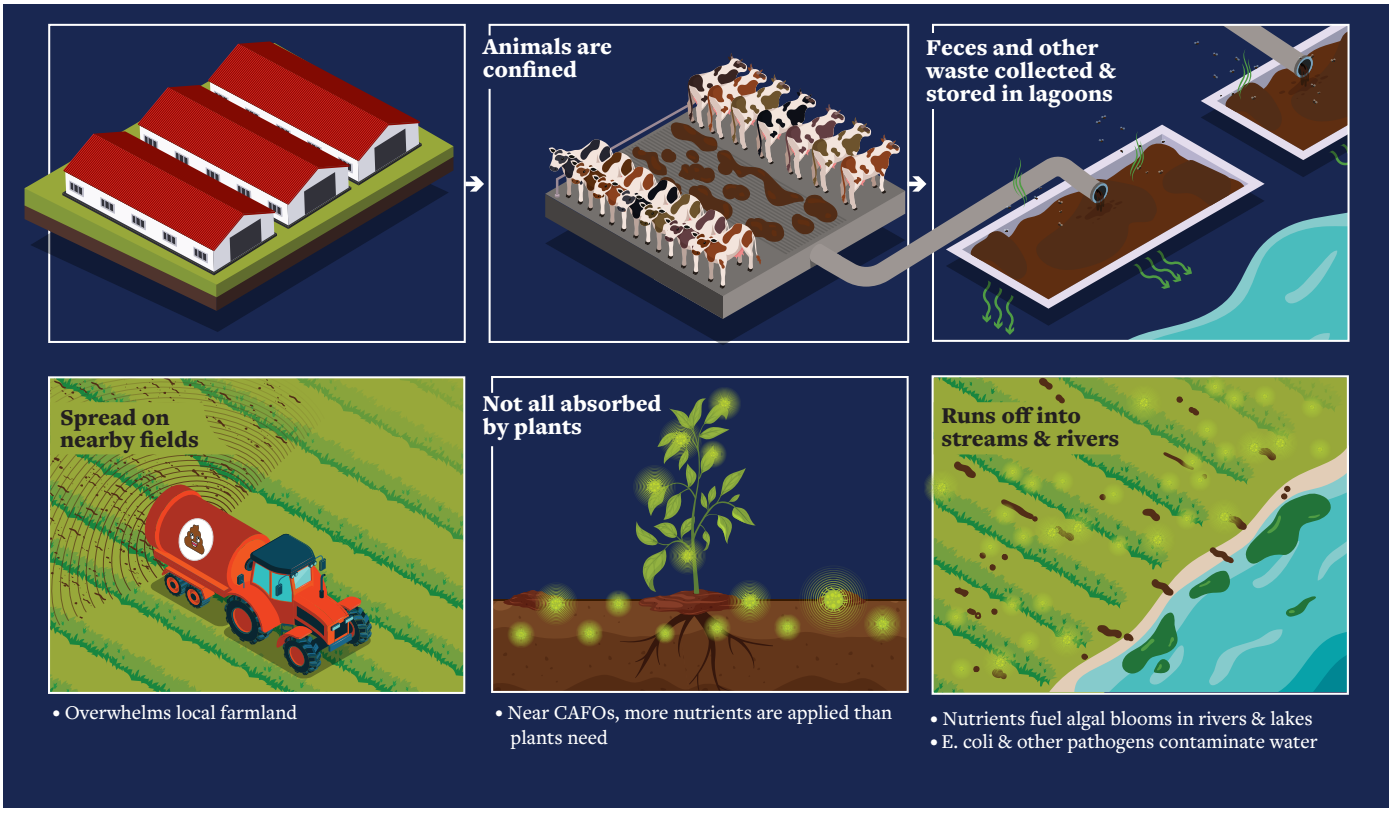
Livestock pollution travels into Michigan's surface waters through two primary pathways: 1) overland runoff and 2) underground tile drainage systems. CAFO pollution can also leach into groundwater, which flows through underground geologic formations of soil, sand, and rocks called aquifers. The excess nutrients and pathogens from CAFO waste can either come directly from the "production area" where animals are confined and waste is stored or from "land application areas," which refers to fields where CAFO waste is spread. Each source and pathway present unique challenges to reducing risk of pollution; we'll get into each of these here.

Overland Runoff

Overland runoff is water that has flowed over farm soil and into an adjacent surface water body. Runoff from fields can carry soil, as well as anything else that was applied to the field, including nutrients, pesticides, pathogens, and other contaminants. When these pollutants run off the field, they don't just disappear. They follow the path of the water in which they are suspended. In Michigan, that means they flow into the statewide system of manmade and natural ditches — also called drains — which all flow into the state's rivers, lakes, and streams.

Runoff is generally associated with land application areas: agricultural fields on which CAFO waste has been applied. But pollutants can also run off from the production area of a CAFO — the barns, milkhouses, lagoons (animal sewage cesspits), and other structures that constitute a CAFO's operations.

Figure 8: Runoff from industrial-scale animal production



Tile Drainage

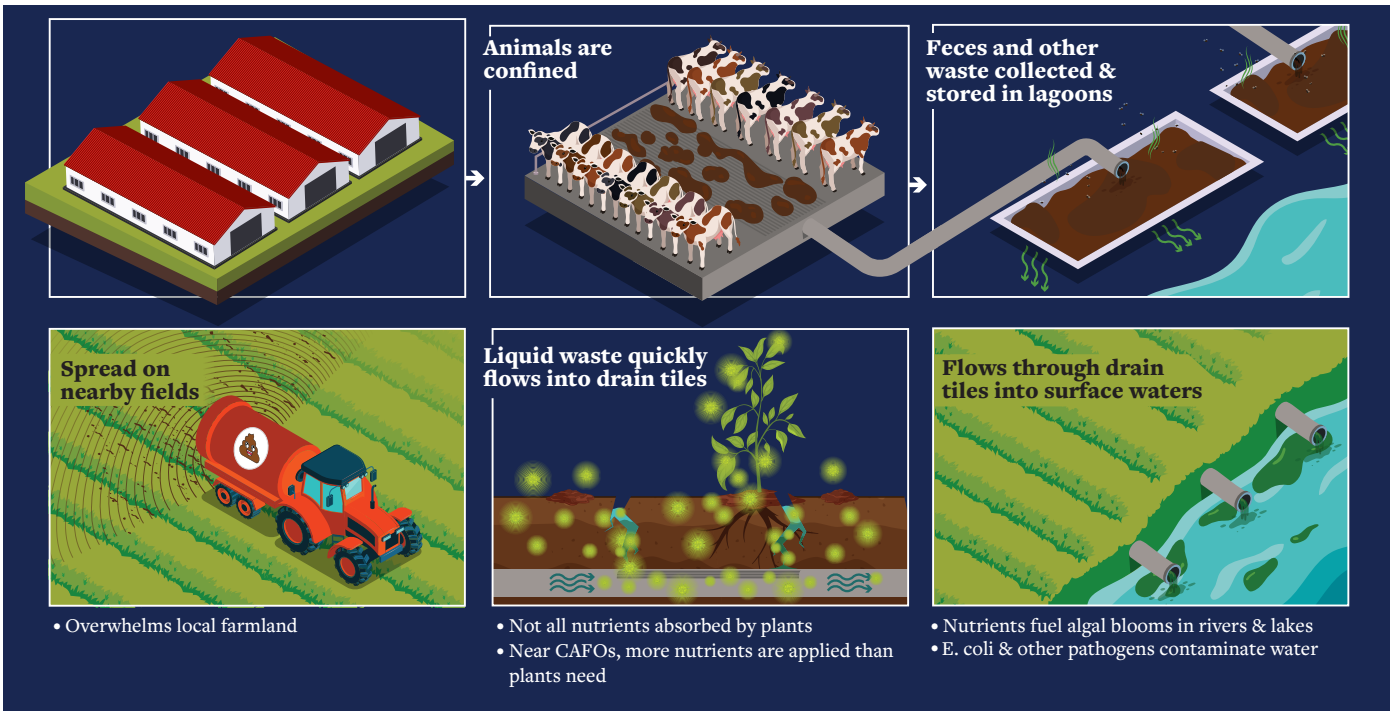
Tile drainage is an often overlooked but critically important pollution pathway, particularly for liquid CAFO waste and particularly in Michigan. Historically, wetlands covered big swaths of Michigan, including major parts of the Western Lake Erie Basin (southeastern corner of the state), and the Thumb (northeastern peninsula in Lake Huron). Tile drainage was installed to make agriculture possible in these once-wet, swampy areas. Tile drainage systems work by drawing liquid from the land's surface into underground pipes. Those pipes discharge into human-made ditches or streams, and eventually into surface waters.

The problem with liquid CAFO waste is that it behaves like water.[21] When liquified manure and other CAFO waste is spread on a tile-drained field, some portion of it flows down into the tile system, bringing dissolved nutrients and other contaminants along with it. Those contaminants are then discharged into surface waters along with the liquid that contains them. Billions of gallons of liquid CAFO waste are applied to Michigan farmland every year. Studies have shown that more pollutants leave the field through subsurface drainage than through overland runoff, and that tile drainage discharges happen even during times of low precipitation, making them particularly challenging to control using conventional methods.

The science on this is well-established and new studies continue to affirm: when liquid waste is spread on tile-drained land, some of its nutrients/pathogens/other pollutants will inevitably end up in the state's waters.[22] This transport can happen even if the waste is applied at what is referred to as the "agronomic rate," or the amount of nutrient that the soil needs to maintain growing crops. But CAFO waste is often applied far in excess of agronomic need; indeed, Michigan's CAFO permit allows waste to be applied at levels five times higher than what plants actually need. These high limits serve no agronomic purpose but instead facilitate CAFOs' ability to cheaply dispose of their waste, as discussed in further detail in Section 2.

Understanding tile drainage is critical to understanding why there has been so little progress in reducing nutrient pollution so far. Rather than grappling with its unique challenges, most proposed solutions understate or ignore the realities of tile drainage. For example, many models used by universities and research institutions to estimate nutrient loss do not account for tile drainage, and the vast majority of voluntary BMPs do not work on tile-drained fields; some BMPs make nutrient loss worse, as explained in further detail on page 23.

Figure 9: Tile drainage discharge from industrial-scale animal production



Tile Drainage 101

Photo credit: J. Frankenberger

What: Tile drainage systems ("tiles") are underground pipes that deliver liquid from the land's surface into human-made ditches or streams. The word "tiles" comes from early use of foot-long sections of clay pipe to accomplish drainage. Now, perforated plastic pipes are generally used.

Why: Tile drainage was installed in the WLEB and the Thumb because the land was too swampy and wet for agriculture without artificial drainage.[23]

How: Tile drainage systems lower the water table and make former swampland dry enough to grow crops. The easiest way to think of these drainage systems is like an underground sewage system that is transporting rain, CAFO waste, fertilizers, and anything else that is applied to tile-drained land from the surface down into the underground drainage system.

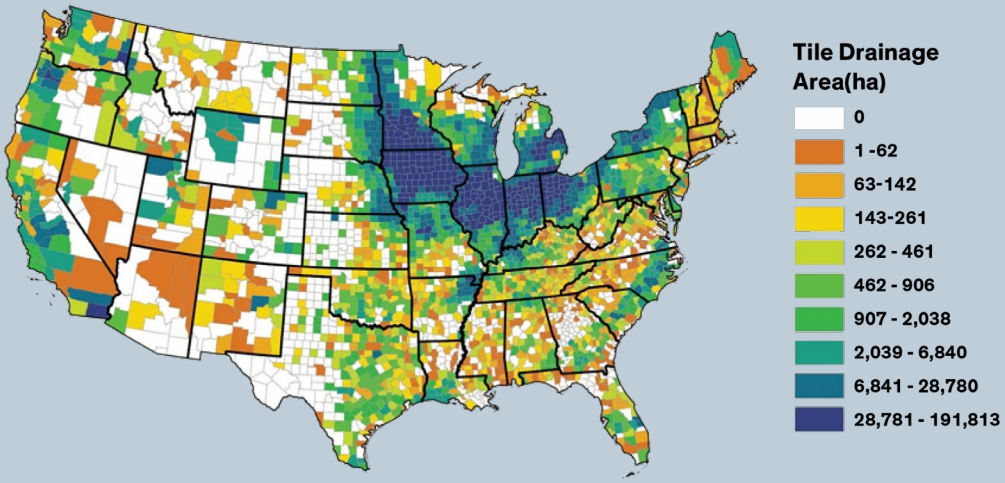
Liquid can enter subsurface drainage systems in two ways. First, it can flow down through the extensive cracks, root holes, earthworm burrows, or other "preferential flow paths" that pervade many of Michigan's soils. Second, liquid can enter manmade devices (inlets, intakes, and risers) installed on field's lowest points which convey the liquid into the subsurface drainage system. Piping is installed at an angle so that it flows by gravity, emptying into a stream or other surface water, or into a manmade ditch (which will eventually flow into a stream or other surface water).

Where: As of 2017, over three million acres of Michigan farmland (about 38%) are drained by tile. The clay and clay loam soils found in the southwest portion of the Lake Erie watershed are among the most intensively drained regions of the United States. In the CAFO-heavy counties in the WLEB and the Thumb, between 60-72% of the agricultural land was tile-drained as of 2017.

Tiles don't just exist on fields. Tiling or other types of underground piping is also used on many livestock production sites to manage waste flow. For example, CAFOs need to move manure, urine, and other waste away from milkhouses and animal barns and into manure storage lagoons. That is often accomplished via underground piping. Even though federal and Michigan regulations require production area waste to drain into lagoons or other waste storage structures, Michigan CAFOs have been caught discharging production area waste into surface waters through tile drainage systems.

WHAT'S THE SOLUTION? When liquid travels through soil into tile pipes and discharges into surface waters, the system is working exactly as designed. The problem is not with the system itself. The problem is with what is being applied to the land's surface: highly liquified, hazardous waste. The only way to prevent water pollution through tile drainage is to not apply liquid waste onto tile-drained fields at all. If CAFO waste is going to applied on tile-drained fields, it needs to be less liquid.[25]

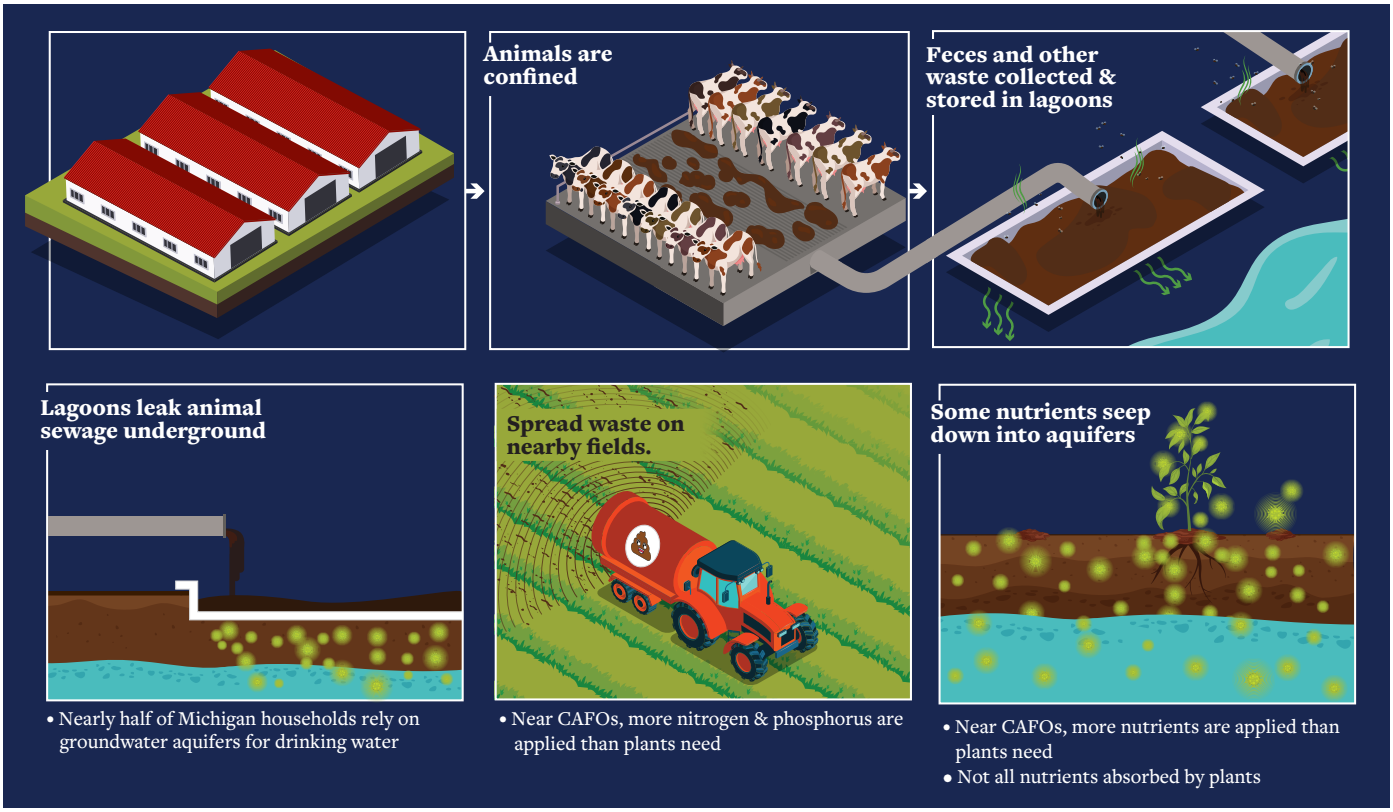
Figure 10: USDA Census of Agriculture tile drainage area, 2017.[24]



Groundwater Contamination

Like surface water, groundwater can also be contaminated by CAFO pollutants. Certain geographic and hydrologic regions are highly susceptible to groundwater contamination, including karstic regions and regions with a shallow depth to bedrock. Groundwater contamination can originate at either a land application area or the production area. When CAFO lagoons leak, their seepage can discharge pollutants directly into the aquifer from the production area. From land application areas, excess nutrients, pathogens, and other pollutants that are not taken up by crops or caught in tile systems can seep down into the soil and leach into groundwater, contaminating drinking wells. As referenced above, many Midwest states are struggling with nitrate pollution and are growing concerned about its link to cancer, blue baby syndrome, and other negative health consequences.

Figure 11: Groundwater contamination from industrial-scale animal production



III. Voluminous Evidence Links CAFOs with Water Pollution

The relationship between CAFOs and water pollution is well-established. The Department of Environment, Great Lakes, and Energy (EGLE) acknowledges that CAFOs contribute to phosphorus pollution in Michigan, and the data that they and others have gathered over the years backs that up.

Water Testing Data

Years of water testing data bears out the connection between CAFOs and water pollution. *E. Coli* is a strong indicator of fecal contamination, and EGLE has water testing data showing *E. Coli* present in Michigan waters for years. Of the 290 permitted CAFOs in Michigan, 83% (or 241) are located in a sub-watershed that EGLE has designated as "impaired" (not meeting water quality standards) by *E. coli* on EGLE's *E. coli* Pollution and Solutions Mapper. Given the large number of animals on a CAFO, even one or two operations can have a huge impact on water quality nearby.

According to the mapper, one impaired subwatershed in the center of the state[26] has just two CAFOs within its boundaries, but the humans are vastly outnumbered by animals (850 humans v. 800 hogs and 3,000 cattle). Another subwatershed in the Thumb[27] has five CAFOs within its boundaries, and the ratio of humans to animals is even more striking (2,100 humans v. 3,000 hogs and 10,000 cattle). Both have a "high" degree of land with subsurface tiling, and in both places, 100% of the water samples taken exceeded EGLE's 30-day total body contact thresholds for *E. coli*.[28]

Environmentally Concerned Citizens of South Central Michigan (ECCSCM) also conducts water testing in the Raisin River and Bean Creek watersheds — both of which feed into Lake Erie — for *E. coli*, and DNA analysis for different genera of cyanobacteria, cyanotoxins, and source species DNA from Bacteroides.[29] Of all sites tested, 85% of samples exceeded EGLE's "total body contact" maximum for *E. coli*—a level of exposure that is linked to serious illness, including cholera and other intestinal parasites. Animal and cyanobacteria DNA were found in a majority of the samples as well.

DNA (sample positive out of samples tested for that parameter)

- DNA Bacteroides – Cattle = 81%
- DNA Bacteroides – Swine = 40%
- DNA Cyanobacteria - Unidentified (2017) or Other than Tested (2018) = 64%
- DNA Cyanobacteria – Microcystis = 50%
- DNA Cyanobacteria – Planktothrix = 50%
- DNA Cyanobacteria – Anabaena = 36%
- DNA Microcystin = 78%
- DNA Anatoxin = 100%

Figure 12: Michigan map shows many areas battling *E. Coli* pollution have a lot of CAFOs as well. Pink areas indicate watersheds under a pollution management plan for *E. Coli*. Green dots represent CAFOs. About 83% of CAFOs exist in a current *E. Coli* TMDL watershed, and many waterbodies have not yet been assessed.

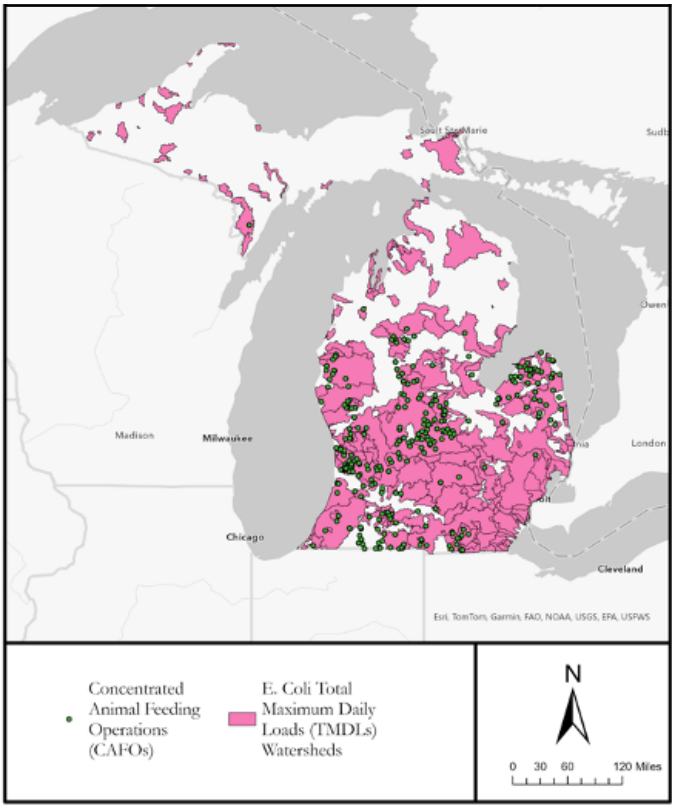
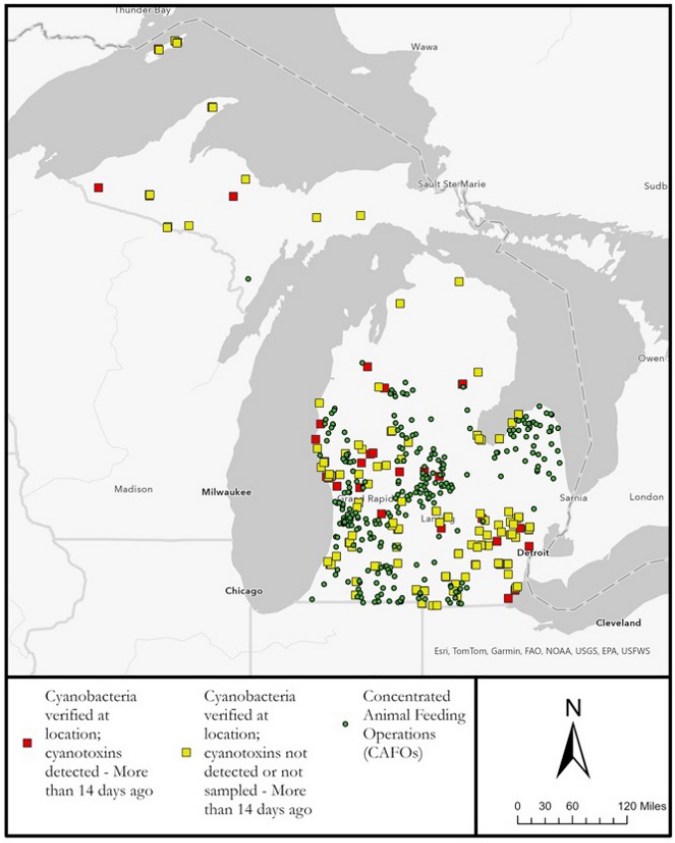


Figure 13: Parts of Michigan with many CAFOs often have abundant cyanobacteria, also known as Harmful Algal Blooms (HABs). HABs can also produce cyanotoxins, which are more dangerous than cyanide. Yellow squares indicate cyanobacteria, while red squares indicate the presence of cyanotoxins as well.



Enforcement Data

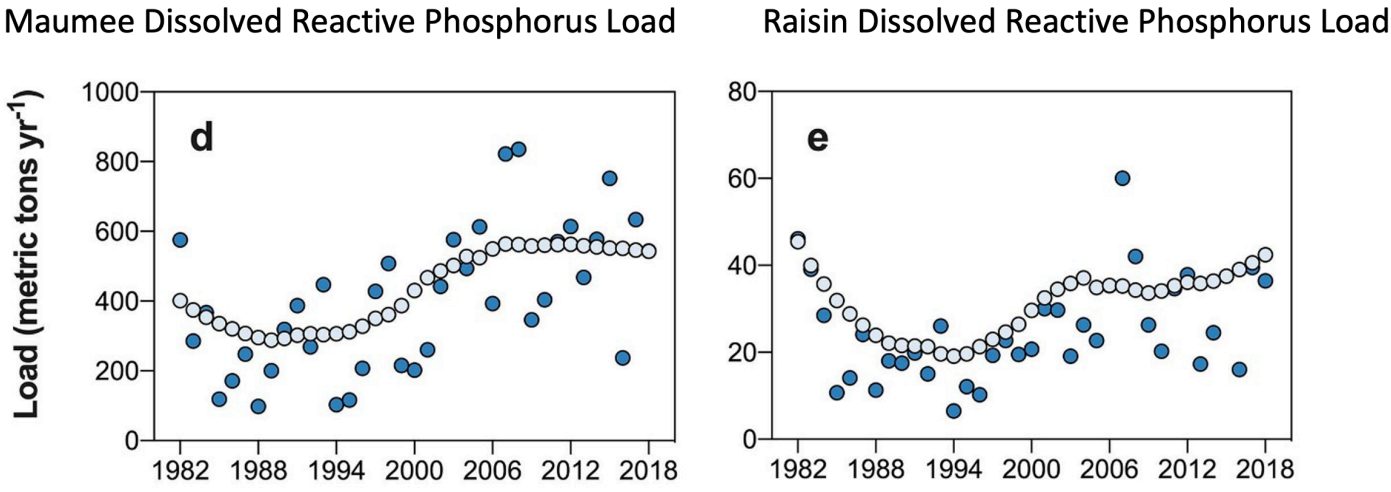
As discussed in further detail on pages 36-37, available enforcement data show that CAFOs frequently violate their permits and/or the environmental laws of the state. According to data available on EGLE's MiEnviro Portal, EGLE has logged over 2,000 violations against Michigan's permitted CAFOs since 2015.[30] This almost certainly underrepresents the problem because many CAFO waste discharges are never identified, and most water pollution is invisible.

Rise in CAFOs Coincides with Rise in Algal Blooms

After implementation of the Clean Water Act in the 1970s, dissolved phosphorus levels steadily decreased, due largely to better regulation of industrial polluters and wastewater treatment plants. But that decline reversed in the 1990s, when dissolved phosphorus levels began a steep rise. This correlated directly with the shift to the CAFO model of livestock agriculture and the use of liquid manure systems, which, as discussed above, deliver large loads of dissolved phosphorus through tile drainage systems.

The charts at Figure 14 show a correlation between the rise of dissolved reactive phosphorus loads into Lake Erie (which is the primary driver of HABs) and the rise of CAFOs in the 1990s.

Figure 14: Maumee River and River Raisin dissolved reactive phosphorus loading declined after the Clean Water Act, then rose again in the 1990s after the CAFO model took hold.

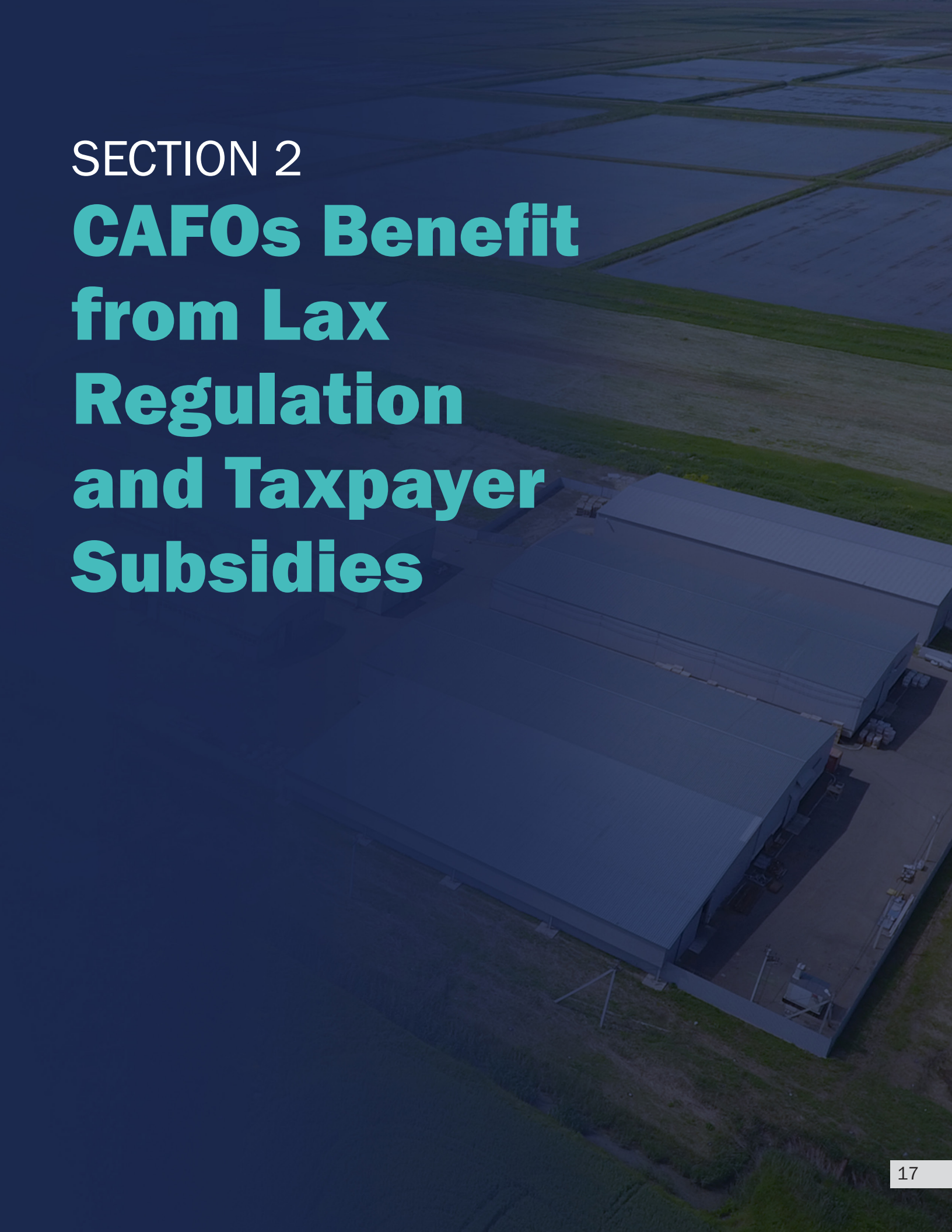


Source: ScienceDirect.

Dr. Tim Boring, the Director of Michigan's Department of Agriculture and Rural Development (MDARD) acknowledges that consolidation in livestock production is contributing to the phosphorus problems in the Western Lake Erie Basin. In a keynote address in December 2023, he noted that livestock production in Michigan has seen "tremendous consolidation," with "fewer and fewer livestock farms" housing "more and more cows and a limited [geographic] footprint."[31] Dr. Boring suggests that livestock producers will need to move away from a "waste disposal mindset" before things will get better.[32] To put an even finer point on it, Dr. Boring noted that Michigan has "a manure location problem, not a manure quantity problem," and that "we are putting too much manure in too few places today." Without "structural" changes and serious thinking about "what the future of ag looks like," the situation is unlikely to get better.[33]

SECTION 2

CAFOs Benefit from Lax Regulation and Taxpayer Subsidies



I. Introduction

Michigan has a stronger regulatory framework for CAFOs than many other states. Environmental protection is built into the state constitution, every large CAFO is required to apply for a water permit, and public agencies are tasked with keeping tabs on them, where other states are flying blind. But Michigan's CAFO permits have so far been ineffective in mitigating pollution and the permitting program has been repeatedly and aggressively challenged by the CAFO lobby.

This section will describe how the Clean Water Act applies to CAFOs, how Michigan administers these protections, and how the CAFO lobby's challenges have handcuffed the state from being most effective. The section will then describe how CAFOs are given significant concessions as compared to other industrial polluters, and how these unfair advantages come at the expense of family-scale farmers and other livestock producers who actually control their pollution, or who do not produce more waste than they can safely manage.

II. The Clean Water Act and NPDES Permits

There is no right to pollute. The Clean Water Act (CWA), however, allows certain entities to pollute a certain amount under certain circumstances. That is what a permit is: limited permission to pollute. But that permission must be carefully managed to avoid overburdening water bodies. The Clean Water Act provides a framework for effectively managing pollution through permits that respond to evolving environmental and technological realities, known as the National Pollutant Discharge Elimination System (NPDES) program.

The Clean Water Act requires all "point sources" of pollution to get NPDES permits before discharging any pollutants. A point source is defined as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, **concentrated animal feeding operation**, or vessel or other floating craft."[34] Traditional point sources include industrial facilities like steel or paper mills and wastewater treatment plants, all of which discharge pollutants through pipes or other "discrete conveyances" as part of their ordinary operations. CAFOs are also point sources, and, in fact, they are the only business model listed by name in the definition of point source.

Lake Erie provides a vivid example of both the strength and limits of the NPDES program. In the early years after its passage, the CWA delivered dramatic successes in cleaning up Lake Erie. The lake's infamous scum (HABs) rapidly diminished in the 1970s and 1980s thanks to the NPDES permitting program limiting phosphorus pollution from point sources like wastewater treatment plants, as well as the wide scale banning of phosphorus in laundry detergent. But starting in the late 1990s, HABs started to reappear in Lake Erie and in other waters across the country due to a pollution source that has proven more difficult to control: agriculture.

Under the Clean Water Act, U.S. EPA delegated authority to Michigan to manage pollution by running its own NPDES program. Michigan law—in particular, the Natural Resources and Environmental Protection Act (NREPA) and related regulations, which are discussed in the next section—includes strong environmental protection, directing EGLE to protect water resources and "take all appropriate steps to prevent pollution." As a result, Michigan requires all CAFOs to apply for NPDES permits––this obligation is sometimes referred to as the "duty to apply."

The CAFO lobby challenged that duty to apply, relying on a line of federal law cases[35] which effectively said that a CAFO could not be forced to get a NPDES permit unless it was caught discharging pollution. The Michigan Court of Appeals rejected that challenge in *Michigan Farm Bureau v. Department of Environmental Quality*,[36] holding that the duty to apply was "squarely" within EGLE's authority. The court emphasized that EGLE "has much broader duties and powers with respect to the regulation of water pollution under Part 31 of the NREPA" than under the Clean Water Act, particularly, the duty to "take all appropriate steps to prevent pollution."

Michigan administers two main types of CAFO permits: general and individual. General permits apply to a category of similar discharges — in this case, to discharges from CAFOs.[37] Currently, 255 CAFOs (or about 88% of CAFOs in the state) carry certificates of coverage under the General CAFO NPDES Permit. An individual CAFO permit, on the other hand, is site-specific. A CAFO may be required to get an individual permit if it has a history of non-compliance, unauthorized discharges, or other circumstances that make it unsuitable for coverage under the General CAFO Permit. Currently, 24 CAFOs (or about 8% of CAFOs) operate under individual NPDES CAFO permits. The remaining 11 CAFOs (about 4%) have non-NPDES state permits, discussed more on page 33.

Unfortunately, at the national level, U.S. EPA has effectively washed its hands of reining in CAFO pollution. EPA attempted to strengthen CAFO water pollution regulations in 2003 and 2008, but those efforts were reversed by legal challenges from the CAFO lobby. Since then, EPA had not undertaken any serious efforts to enforce the Clean Water Act with respect to CAFOs. When citizen and public health groups urged EPA to step up and improve its CAFO regulations in 2017 and again in 2022, the EPA declined. Instead, EPA merely agreed to convene a federal advisory committee and conduct a "detailed study" of CAFO pollution.

On top of that, the EPA, along with USDA, entered into an agreement with the CAFO lobby exempting CAFOs from complying with the Clean Air Act. The exemption was supposed to be temporary, to allow EPA time to develop air emissions estimation methods. As of the date of this report — nearly 20 years later — EPA still has not developed those estimation methods. Given all that, there are currently more opportunities to make a difference at the state level in tackling CAFO pollution.

III. Michigan's Authority to Regulate CAFOs

Michigan's Constitutional and Statutory Mandates to Prevent Water Pollution

The Great Lakes State's ethos of environmental protection is not only reflected in its history, but also embodied in its foundational document, the Michigan Constitution. Article 4 of Michigan's Constitution expressly prioritizes environmental protection and imposes a mandatory duty on the Michigan legislature to "provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction."[38]

Michigan Constitution Article 4:
The Michigan legislature must "provide for the protection of the air, water and other natural resources in the state form pollution, impairment or destruction.

In response, the legislature enacted:

- Michigan Environmental Protection Act (**MEPA**)
- Natural Resources and Environmental Protection Act (**NREPA**), which created the Department of Environmental Great Lakes & Energy (**EGLE**)

In response to that constitutional mandate, the legislature enacted several statutes to protect water and other natural resources, which are now codified as the Michigan Environmental Protection Act (MEPA)[39] and the Natural Resources and Environmental Protection Act (NREPA).[40] NREPA created the department that is currently called EGLE (Department of Environmental Great Lakes and Energy) and gave it a series of responsibilities, including to:

- "[T]ake all appropriate steps to prevent pollution,"
- "[P]rotect and conserve the water resources of the state," and
- Issue permits "that will assure compliance with water quality standards."[41]

Following NREPA, EGLE created water quality standards (called the Part 4 Standards), which set highly technical limits on a variety of pollutants, including toxic and radioactive substances, microorganisms like *E. coli*, and phosphorus.[42] EGLE also created rules for the NPDES permitting program (called the Part 21 Rules), which require the agency to:

- Issue permits that will meet water quality standards,
- Renew NPDES permits every five years, and
- Modify NPDES permits to respond to environmental and scientific changes.[43]

Additionally, MEPA forbids "conduct that has, or is likely to have, the effect of polluting, impairing, or destroying the air, water, or other natural resources" unless there is "no feasible and prudent alternative." MEPA imposes a separate and independent set of obligations from NREPA, and provides a right of action for citizens to sue if those requirements are not met.

Michigan's CAFO General Permit

One of the Part 21 Rules — Rule 2196 — specifically applies to CAFOs, and it lays out the minimum requirements for CAFO NPDES permits.[44] The centerpiece of Rule 2196 is the requirement that each CAFO develop and follow a comprehensive nutrient management plan (CNMP), which, "at a minimum" must include (among other things): adequate storage, best management practices (BMPs) to control runoff, protocols for soil and waste testing, and recordkeeping requirements.

EGLE issued the first CAFO General Permit in 2005 and has reissued new ones every 5 years since. Instead of establishing requirements based on science and local hydrology, the original 2005 General Permit relied primarily on standard industry practices and incorporated heavy input from CAFO lobby groups.[45] The 2010 and 2015 Permits included only marginal improvements over the 2005 version. Acknowledging that the CAFO General Permit was failing to protect water, EGLE set out to make some much-needed improvements in the 2020 Permit.

When EGLE issued a draft 2020 permit for public comment, it contained a number of important provisions that previously had been missing, including prohibiting winter waste application, requiring the use of a specific phosphorus risk assessment tool called the MPRA, and partially closing the loophole for waste that is sold to third parties––provisions that we recommend and discuss in further detail in Section 3. The 2020 Draft Permit still came far short of assuring compliance with water quality standards, but it was an important step in the right direction.

In the face of pressure from the CAFO lobby, however, EGLE's final 2020 Permit backed off of some key improvements in the draft. The result was a compromise permit that EGLE staff expressly acknowledged would be insufficient to protect water quality.

Current Legal Challenges Against the CAFO General Permit

EGLE's concessions on the 2020 Permit were still not enough for the CAFO lobby; they opposed any substantive improvements from the 2015 Permit, no matter how minor, and formally challenged the permit on multiple fronts.

Administrative Challenge

First the CAFOs filed an administrative "contested case," challenging the improvements in the 2020 Permit, arguing they amounted to "unpromulgated rules" under the Administrative Procedure Act and were unnecessary to reduce pollution. ELPC and a coalition of community and environmental groups intervened in that case, presenting extensive evidence that not only were the 2020 Permit changes necessary, but even stronger permit improvements were also needed. The administrative judge heard two and a half weeks of live testimony and the parties submitted exhaustive post-trial briefing, which was completed in July 2022.

Court Challenge

Two and half months after filing the contested case, the CAFOs filed a second, parallel challenge, this time in the Michigan court system, making similar arguments. That lawsuit eventually went up to the Michigan Court of Appeals, which ruled in the CAFOs' favor, incorrectly holding that the 2020 Permit terms were "unpromulgated rules" that should have been issued pursuant to formal rulemaking procedures,[46] effectively invalidating the disputed permit terms.[47]

This is wrong from a legal perspective; it is also catastrophic from a practical perspective because, as of 2006, EGLE has lacked the authority to promulgate new rules. As a result, the Court of Appeals' ruling effectively freezes Michigan's environmental permits in place, and EGLE is permanently handcuffed from strengthening the CAFO Permit, or seemingly any other environmental general permit. Indeed, a group of slaughterhouse operators have already relied on the Court of Appeals ruling to say that *their* new EGLE general permit is invalid, as well, and the fate of that permit remains in limbo. And even if EGLE had rulemaking authority, requiring EGLE to promulgate every permit improvement as a rule would be unreasonably inefficient and prevent the agency from complying with its obligations to issue permits that "assure compliance" with water quality standards.

EGLE appealed the Court of Appeals' ruling to the Michigan Supreme Court, which heard oral arguments in early January 2024. Once again, ELPC and a coalition of community and environmental groups jumped in, filing an amicus brief in support of EGLE's position and participating in oral arguments.

Current Status

The Michigan Supreme Court has taken the case under advisement. Because it is unknown when and how the Court will rule, this report is focused on the substance of permit terms that are required to assure compliance with water quality standards. We may supplement this report after the Michigan Supreme Court rules to address the specific legal mechanisms by which such permit terms can be imposed.

It is also important to understand that amid all these legal challenges, EGLE decided to administratively stay enforcement of the 2020 permit. This decision has allowed all permitted CAFOs to continue operating under the 2015 permit, which EGLE admits is failing to protect water quality. The CAFOs' lawsuits have already bought them four more years of inadequate regulation as they continue polluting the state's waters.

IV. CAFOs Are Not Regulated Like the Industrial-Scale Polluters They Are

While the 2020 CAFO General Permit winds its way through the courts, it is worth considering some of the severe hurdles that complicate CAFO regulation. The CAFO lobby has successfully tugged at the heartstrings of legislators and the public by lumping CAFOs in with small-scale family farmers. But the reality is that CAFOs are not farms in the traditional sense. They are massive industrial operations producing massive amounts of dangerous waste. Even the USDA recognizes this distinction, noting that "[l]ivestock agriculture has undergone a series of striking transformations," and referring to CAFOs as "large industrialized livestock operations."

Corporations have spent decades lobbying against every effort to reduce CAFO pollution. American Farm Bureau Federation is one of the most active lobbying organizations in the country, spending $3 billion dollars on lobbying in 2020; that's more than JPMorgan Chase ($2.8B), Honda ($2.6B), or the National Rifle Association (NRA) ($2.2B) spent that year.[48] Despite being the self-proclaimed "Voice of Agriculture,"® Farm Bureau does not, in fact, speak for all farmers, as noted on page 27. It does, however, speak aggressively on behalf of CAFOs and other industrial-scale agribusinesses. Farm Bureau's efforts — combined with those of other industrial livestock lobbying organizations[49] — have left regulators and communities impacted by pollution with few options at both the state and national levels.

CAFOs are Held to a Lower Standard than Other Polluters

NPDES permits require most industrial dischargers to spend vast sums on treatment technology and to regularly monitor and report the precise volumes of each pollutant they discharge. Wastewater treatment plants, for example, must remove significant amounts of phosphorus and other contaminants from human sewage before discharging effluent into surface waters. By contrast, CAFOs are not required to treat their waste or comply with numeric pollutant limitations. Instead, they are simply required to follow certain best management practices (or "BMPs") under the assumption and hope that doing so will limit their pollution. They need not test the water to confirm whether that is true.

CAFOs enjoy another indulgence not given to any other industrial operations: permission to transfer or "manifest" their untreated waste to third parties who can dispose of it without any direct regulatory oversight. Michigan CAFOs "manifest" enormous volumes of waste (over 1.5 billion gallons in 2019 alone). Manifesting not only poses massive environmental risks, it deprives the state (and the public) of data needed to protect Michigan's waters from CAFO waste.

CAFOs Need Only Comply with BMPs, Many of Which Are Ineffective or Worse

As noted above, Michigan's CAFO permit primarily requires CAFOs to follow numerous BMPs in managing and land applying waste. Many of these BMPs, however, do not help reduce CAFO pollution because they do not address tile drainage. Some BMPs actually make tile-related pollution worse.

Even if BMPs were marginally effective on smaller farms or on land that is not tile-drained, the massive scale of CAFO waste is simply too much for these measures to handle. The sheer amount of waste combined with heavy tile drainage compounds the problem in regions like the Western Lake Erie and Saginaw Bay watersheds and requires more rigorous methods of management. The state of water quality in Michigan demonstrates that the BMP-only approach to controlling livestock pollution is not working.

Best Management Practices	Description	Benefits	Effective on tiles?
No-till or conservation tillage	Refraining from tillage (no-till) or tilling less frequently to maintain plant residues in soil	Intended to reduce soil erosion and overland runoff and improve soil health	No; curbing erosion doesn't address tile loss; in certain soil types, no-till leads to more preferential flow paths, exacerbating tile loss
Cover crops	Crop planted outside the regular growing season. For example, planting a crop of rye or oats after corn harvest	Intended to reduce soil erosion and overland runoff and improve soil health	No; curbing erosion doesn't address tile loss; some cover crops can worsen tile loss because they create deep root holes that serve as preferential flow paths into the subsurface system, especially when combined with no-till
Vegetative Buffers[50]	Strip of dense perennial vegetation, usually at the edge of a field	Intended to reduce overland runoff	No; buffers are above ground and do not interrupt loss through unground tile lines
Manure incorporation/ injection/ knifing[51]	Mechanical processes that physically mixes surface-applied waste into top level of soil	Intended to reduce overland runoff	Not necessarily; injection can actually accelerate tile loss by mainlining waste into the subsurface system
Setbacks[52]	Requiring minimum distance (e.g., 100 feet) between waste application areas and areas that may be vulnerable to water pollution (edge-of-field, wells, etc.)	Intended to reduce overland runoff	No; setbacks are above-ground and do not interrupt loss through underground tile lines
Controlled Drainage	Structures used to raise the depth of a drainage outlet, holding water in the field during periods when drainage is not needed, and delaying the release of liquid for a period of time; structures can also contain filters/treatment media to capture nutrients	Intended to reduce nutrient loss through tile drains	Not necessarily; studies are ongoing as to whether delaying discharges this way actually reduces nutrient loss, but either way these structures are so costly ("equal to or greater than crop revenues") in both money and maintenance time that they are not realistically scalable

Human Sewage is Regulated Far More Stringently Than Animal Sewage

CAFOs are held to significantly laxer waste disposal standards compared to facilities responsible for managing human sewage. Wastewater treatment facilities keep huge amounts of phosphorus out of the state's waters by collecting it and separating nutrients and other components into a by-product called biosolids.

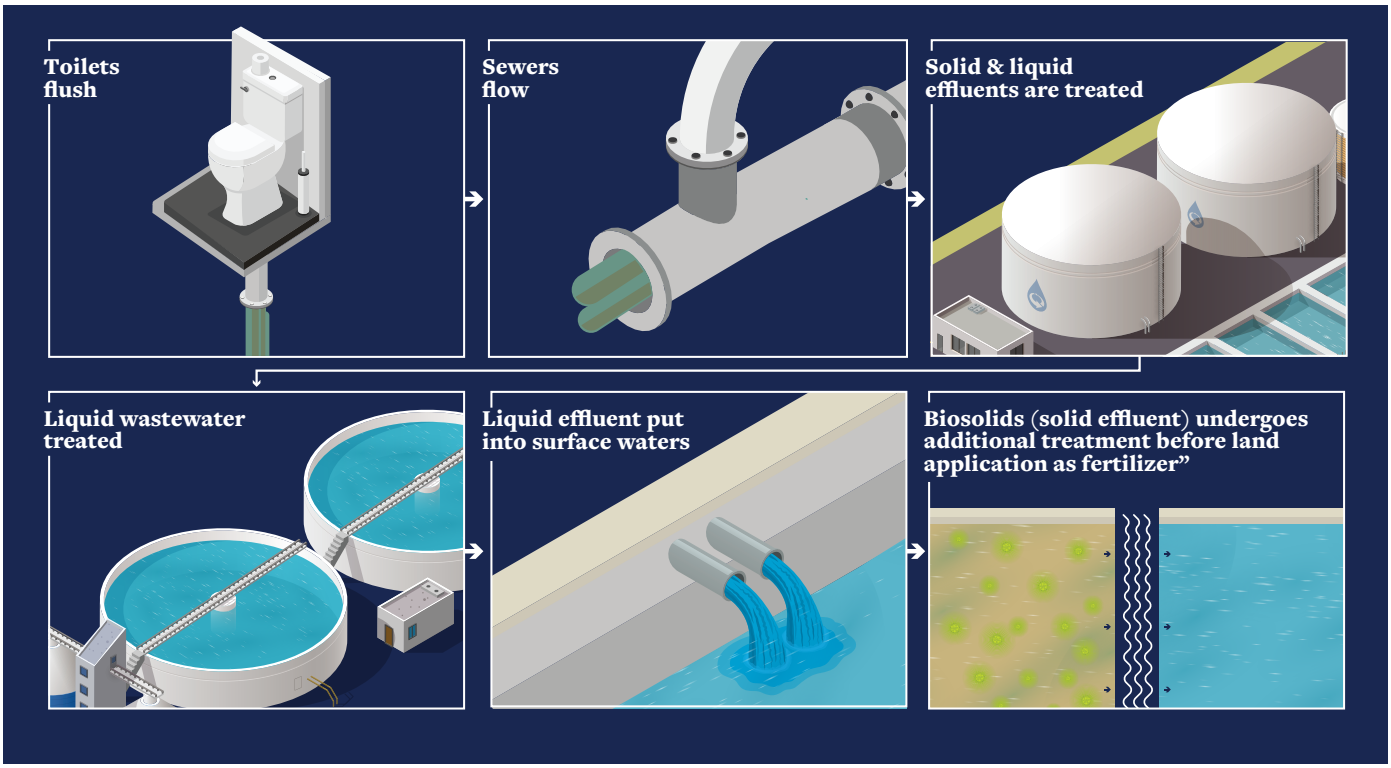
Biosolids, like CAFO waste, can also be land applied as fertilizer. But unlike CAFO regulations, biosolids regulations require extensive treatment to remove contaminants before land application is allowed. And the biosolids permit includes significantly more protective measures than the CAFO permit, including prohibiting application on frozen or snow-covered ground (unless additional treatment is used), requiring advance notice to local governments before land applying, and payment of fees in order to land apply.[53]

Where CAFOs have failed to limit their pollution, other point sources in the Western Lake Erie Basin have stepped up. Since 2008, the state has achieved a 20% phosphorus reduction almost entirely due to the efforts of other point sources in the watershed—including the Great Lakes Water Authority, which provides water and wastewater services to the greater Detroit area.[54] A similar pattern has played out in Ohio, where the City of Toledo has invested hundreds of millions of dollars in public funds in improving its water facilities to both (1) reduce phosphorus loadings into Lake Erie, and (2) ensure the water is safe to drink and free of cyanotoxins.[55]

Wastewater treatment plants also pay much higher permitting fees than CAFOs do. For example, a municipal permit in Michigan for a large wastewater treatment facility, which treats human sewage, costs $213,000 per year. But a CAFO — including one that might produce a similar volume of animal sewage per year — only pays an annual fee of $600 per year.

Bottom line: CAFOs are allowed to reap the economic benefits of mass-scale production while externalizing their water pollution costs onto downstream communities.

Figure 15: Wastewater treatment plants process human waste, cleaning and separating liquid effluent from biosolids (solid effluent), which is used as a fertilizer." Then we're going to have you swap a few boxes



Right to Farm Laws Disproportionately Protect CAFOs Compared to Family-Scale Farmers

CAFOs also benefit from a unique form of legal exceptionalism granted by Right-to-Farm (RTF) laws. RTF laws immunize agricultural operations from nuisance suits so long as they comply with certain minimum standards, which, in Michigan, are known as the Generally Accepted Agricultural Management Practices (GAAMPs). RTF laws were introduced ostensibly to protect farmers from nuisance lawsuits by urban and suburban neighbors moving out to the country. Whatever their original intent, RTF laws have transformed property rights in America, disproportionately benefitting industrial-scale agricultural operations — especially CAFOs — to the detriment of small, family-scale farms and rural communities.

Protecting profits, not farmers

According to a recent study, the biggest beneficiaries of RTF laws are CAFOs, winning in 69% of lawsuits in which they are parties. The biggest losers, on the other hand, were sole proprietor farmers, winning in only 41% of lawsuits in which they are parties.

Go Big and Stay Protected

One fundamental premise of nuisance law is that if a plaintiff "comes to the nuisance," they cannot sustain a claim. For example, if someone buys land next to a 50-head hog farm, they cannot file a nuisance lawsuit about the smell because the nuisance existed when they moved in. But under many RTF laws, including Michigan's,[56] "farms" retain RTF protection even if they are fundamentally transformed, such as converting from a 50-head hog farm (or even an apple orchard) to a 2,000-head hog CAFO. Neighbors have no legal recourse if a longtime family-scale farm transforms into CAFO, creating far worse odors, traffic, and water pollution risks.

Silencing neighbors

Many RTF laws, including Michigan's,[57] allow awards of legal fees and costs to an agricultural operation who succeeds in defending against a nuisance lawsuit, but that same ability to recover legal costs is not available to prevailing plaintiffs. This strongly discourages people impacted by CAFOs from filing lawsuits: if they fail, they could be responsible for paying not only their own lawyers, but the CAFO's lawyers as well. Michigan's RTF law goes even one step further. A citizen can be fined for simply *complaining* about industrial agricultural pollution too many times,[58] as discussed further on pages 38-39.

Handcuffing communities

Finally, many RTF laws, including Michigan's, strip local communities of control over what happens within their boundaries. The Michigan RTF Act does this by preventing local governments from adopting any requirements that conflict or overlap with the generally accepted agricultural and management practices or "GAAMPS" discussed above.

For example, if a town wanted to pass an ordinance saying that manure cannot be stored within 200 feet of a residence, that ordinance would be invalid because the manure management GAAMP says that manure can be stockpiled anywhere, so long as it is covered with a "tarp, fleece blanket, or straw cover."[59] Some of the most basic powers of local government, including zoning and public health protection, are significantly curtailed by RTF laws.

Bottom line, RTF laws silence community members and prevent CAFO neighbors and local governments from protecting themselves against the nuisances posed by CAFOs and the risks of CAFO pollution.

V. CAFOs Externalize Costs onto the Environment and the Public

For a variety of social, political, and economic reasons, CAFOs have an unfair competitive advantage. On the front end, CAFOs receive significant federal and state-level subsidies, many of which are not available to smaller family-scale farms. Even though their large-scale operation leads to more pollution, CAFOs can receive *additional* subsidies to implement voluntary BMPs to try to clean up that pollution on the back end. When that happens, taxpayers are paying for CAFO pollution twice, and with few positive results to show for it.

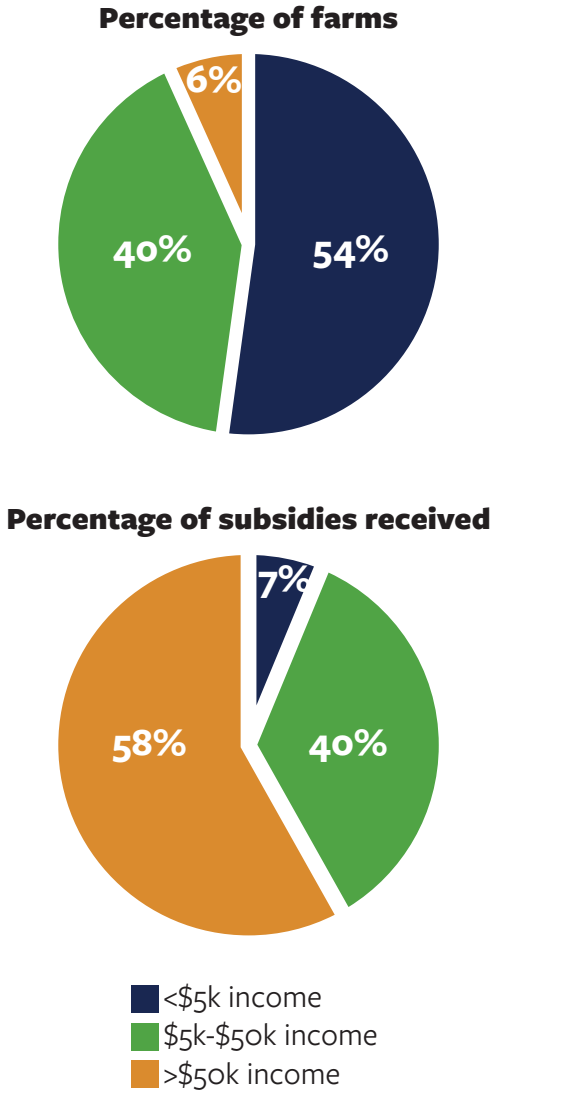
CAFO Receive Generous Financial Subsidies

CAFOs can receive generous subsidies for many waste management practices, such as building manure lagoons, through federal and state funding.[60] CAFOs can similarly offset the cost of complying with the existing, minimal regulations that apply to them, such as preparing Comprehensive Nutrient Management Plans (CNMPs). According to a comprehensive study, CAFOs in Michigan received more than $103 million in direct federal subsidies from 1995 to 2014. That's an average $387,676 per CAFO over that period.

According to recent data released by the USDA's Agricultural Census, in 2022, the largest farms in Michigan received a wildly disproportionate share of federal funds compared to smaller operations. Farms with the highest sales (at least $50,000 in annual income) received 58% of the total subsidies — despite accounting for only 7% of the beneficiaries. The smallest-earning farms (less than $4,999) account for more than half (54%) of aid recipients, but only 6% of the total money.

The Farm Bill is a multiyear law (usually renewed every five years) that governs an array of agricultural and food programs. Generally speaking, the Farm Bill promotes commodity crop production, not food for people to eat.

Figure 16: The most profitable farms receive the most farm subsidies, while small struggling farmers get little help at all.



Corn is the primary U.S. feed grain, accounting for more than 95 percent of total feed grain production and use. The vast majority of that grain (76%) is fed to animals raised in confinement or used for biofuels; about 10% is exported; and the rest used to make high-fructose corn syrup and other food products. As a result, these subsidies give CAFOs an unfair advantage over farmers who graze their livestock in the form of reduced feed costs.

Additionally, many CAFO products also receive price supports. The USDA web page dedicated to dairy policy lists no fewer than ten programs transferring taxpayer money to dairy producers, including food purchase programs (which reimburse schools, food banks, and other institutions for milk purchases) to pandemic assistance payments (averaging $10,000 per recipient).

Perhaps the most unique subsidy dairy producers benefit from is the American Cheese Stockpile. Americans today drink 47% less milk than in 1975, but dairy producers have not slowed production. Instead, the U.S. government has stepped in to buy up excess milk from the marketplace, which it turned into cheese, and stored in massive underground caves in Missouri. In 2015 alone, the USDA gave the dairy industry an extra $7 billion in payments, on top of the existing structural and direct price supports. In apparent reaction to the incentives, dairy farmers in 2016 dumped over 40 million gallons of excess milk. Excess production continues to be a recurring problem, with milk processing plants dumping milk again in the summer of 2023 due to over-supply.

Agricultural Consolidation Harms Family-Scale Farmers, Many of Whom Support Stronger CAFO Regulation

The shift from family-scale farming to industrial-scale agriculture has brought significant social problems to rural America, including unemployment, increased poverty, and depopulation. The 1980s saw a recession referred to as the "farm crisis" in which farmland values dropped 60% in some parts of the Midwest. In 1982, the suicide rate among male farmers peaked to its highest level, and those numbers have remained high. In 2016, the CDC identified seven occupational groups with suicide rates that were significantly higher than average; two were in agriculture.[61]

Indeed, the USDA acknowledges that "get big or get out" pressures of industrialized agriculture have "squeeze[d] smaller farms," causing many to exit the industry altogether. Between 1987 and 2022, Michigan lost over 5,000 dairy farms (a 77% loss), even though there are nearly 100,000 more dairy cows (a 27% increase) in the state.[62] In that same period, Michigan lost over 3,200 hog farms (a 59% loss), even though the number of hogs being raised in the state has nearly doubled to over four million.[63] In just the 5-year period between 2017-2022, Michigan lost nearly 700 dairy farms (a 30% loss). That's more than twice the overall number of CAFOs of *all kinds* in the state (290 CAFOs), reflecting that CAFOs truly are the biggest of the big operations, and cannot be conflated with family-scale operations, many of whom are struggling to survive. Indeed, CAFOs make up only 8.5% of all dairy "farms" in the state (127 out of 1,481), but they house 62% of the state's dairy cow population (217,079 out of 436,254).[64]

Many of the strongest advocates for clean water — and for proper regulation of industrial-scale agriculture — are farmers. The National Farmers Union, founded 1902, explicitly calls for stronger CAFO regulation in its policy agenda, supporting many of the same restrictions we argue for in this report in Section 3, including:

- Requiring all CAFOs to get Clean Water Act permits
- Holding CAFO owners and/or manure haulers responsible for waste disposal
- Implementing reasonable setback distances from residences and other locations
- Prohibiting the application of waste on frozen or highly sloped fields
- Imposing appropriate penalties for permit noncompliance
- Implementing a temporary moratorium on new CAFOs to protect human health
- Allowing family farmers and rural residents to gain legal compensation against CAFO nuisances

"As we look around our agricultural systems [we have to ask]: Is this what success looks like? Do you want to have to grow your farm simply by adding more acres and more cows, to the detriment of your neighbor? Because at some point we can't all be farmers anymore if everybody has to have more and more land. Is this the agricultural system that is in line with our values of what we want to see?"

- Tim Boring,
2023 WLEB Conference Keynote Address

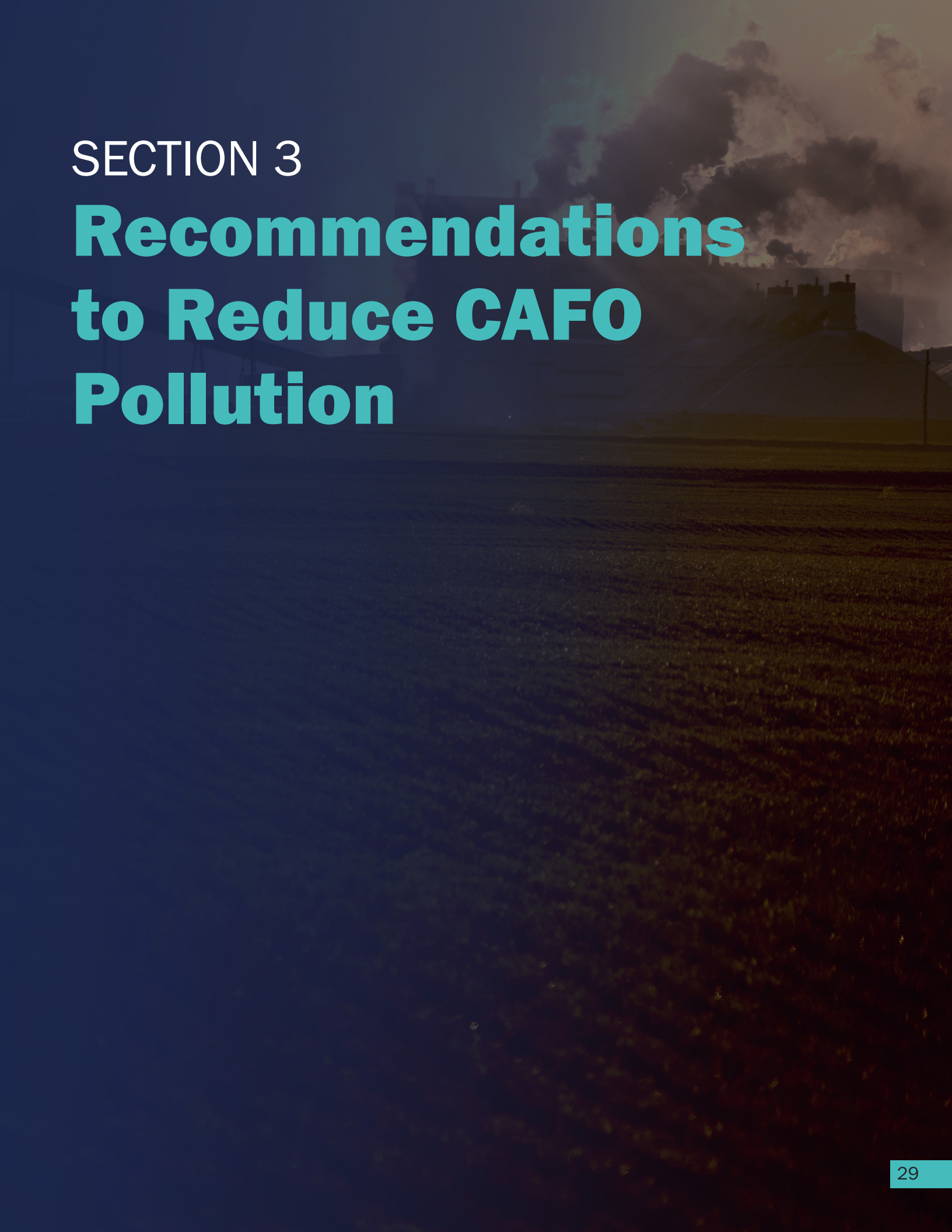
CAFOs Cause Other Negative Social Impacts

Once again, the focus of this report is on clean water, but the industrial livestock industry has also been linked with:

- Loss of tourism dollars[66]
- Increased drinking water treatment costs[66]
- Reduced property values[67]
- Unsafe workplaces,[68] including for child workers[69]
- Inadequate farmworker housing[70]
- Animal welfare concerns[71]

VI. Conclusion

The seemingly "high efficiency" CAFO model rests on a system of legal protections, financial incentives, and lack of accountability that allows CAFOs to externalize their waste disposal costs onto the public while receiving market-distorting subsidies that artificially prop up the value of their products. To restore fairness and protect water quality, CAFOs should be regulated like the massive industrial facilities that they are.



SECTION 3

Recommendations to Reduce CAFO Pollution

I. Introduction

The legal landscape in which CAFOs operate is complicated. There are also unique, practical challenges to controlling CAFO pollution. That said, there are clear opportunities to step up and rein in CAFO pollution, and there is no excuse not to.

As explained on page 18, CAFOs are point sources and must be regulated as such. CAFOs are, however, also fundamentally different from many other point sources such as steel mills or wastewater treatment plants. These operations discharge wastewater from a handful of outfalls, after treating it to reduce pollutants. Permits at these facilities require regular sampling of wastewater for every controlled pollutant and regular submission of regular (monthly or weekly) reports reflecting those test results. These facilities must also promptly report any known, potentially dangerous discharges or exceedances (which the regular testing can help them identify).

CAFOs, by contrast, apply *untreated* waste over large swaths of cropland (thousands of acres) and can discharge from multiple tile outlets or field edges, with the largest discharges often happening during rain events. These realities make it genuinely more difficult to gather real time discharge data and set numeric load limits for CAFOs. Some amount of practical difficulty does not, however, justify the current state of CAFO regulation, which EGLE admits is failing to control CAFO water pollution as required by NREPA.

This section provides our recommendations for how Michigan can reduce CAFO pollution. Many of these recommendations require minimal additional public resources, but instead involve deploying current resources more effectively. Failing to act has costs, too: the longer Michigan fails to make CAFOs internalize their pollution costs, the longer Michigan's taxpayers, family-scale farmers, and the environment will continue to pay the costs.

Requiring Waste Treatment or Pasturing Animals Would Be the Fairest, Most Comprehensive Solutions

If CAFOs were treated like every other industrial polluter, they would be required to treat their waste before discharging it. CAFO pollution could also be solved by no longer confining huge numbers of animals in one place, and instead putting animals back to pasture, as family-scale farmers have been doing for generations. Short of these system-wide changes, there are a number of steps that the state could take to reverse the tide of CAFO pollution in Michigan's water.

II. Proposed Solutions

Create and Enforce a Statewide Nutrient TMDL for Dissolved Reactive Phosphorus, Total Phosphorus, and Nitrates/Nitrites

The Clean Water Act created a regulatory tool called a Total Maximum Daily Load (TMDL) — sometimes called a "pollution diet" — which is basically a formal plan for cleaning up an impaired water. The state has already developed a statewide TMDL to address *E. coli* pollution (although, as discussed below, this TMDL is not being adequately applied to CAFOs). In order to address nutrient pollution, Michigan urgently needs an effective statewide nutrient TMDL as well.

Michigan acknowledges that a TMDL will probably be necessary to clean up Lake Erie.[72] But instead of getting to work in the Western Lake Erie Basin, Michigan has decided to wait until 2025 to see if it can meet its goal of reducing nutrient pollution by 40% from 2008 levels, as promised in the Lake Erie Collaborative Agreement. This delay is not justified. The state has acknowledged that it is not meeting its agricultural pollution reduction targets.[73] Indeed, the 2022 phosphorus load from agriculture was higher than the 2008 load. There is no reason to believe things will suddenly turn around between now and 2025 if "business as usual" continues.

Moreover, given the statewide scale of nutrient pollution, a statewide TMDL would be the most comprehensive and effective approach to solving the problem. Beyond Lake Erie, HABs are in waters across the state (see Figure 13). Saginaw Bay is highly eutrophic and regularly suffers from HABs. Although there are a handful of nutrient TMDLs (phosphorus or nitrate) for isolated water bodies across the state, they are too few and far-between to address the scale of the problem. A statewide TMDL will allow EGLE to start with the most severely impaired watersheds (like Lake Erie) and then add additional impaired waterbodies later on without needing to go through the formal EPA approval process each time. And Michigan is well-versed in statewide TMDLs, having employed them to address a variety of pollutants, including *E. coli*, mercury, and polychlorinated biphenyls (PCBs).

Michigan needs an effective statewide nutrient TMDL now.

When Michigan does finally get to work on a nutrient TMDL, it is critically important that it avoid making the same mistakes as its neighbor, Ohio. In June 2023, Ohio submitted a TMDL for the Maumee River watershed, only after it was compelled to do so following successful litigation brought by ELPC and the Board of Lucas County Commissioners. That TMDL falls far short of what is needed to clean up Ohio's portion of the Western Lake Erie Basin. Michigan should not repeat the mistakes made there.

Michigan's statewide nutrient TMDL must:

- Address both dissolved reactive phosphorus (DRP) and total phosphorus;
- Address nitrates and nitrites;
- Assign wasteload allocations to all NPDES permittees, including CAFOs;
- Include appropriate nitrogen and phosphorus application limits based on the soil-type and hydrology of the TMDL zone;
- Ban the application of manure and CAFO waste during winter months and on frozen or snow-covered ground during other times of the year within the TMDL region;
- Incorporate rigorous water testing and data collection, including by third-party contractors, if needed, to ensure there are sufficient boots on the ground during periods of high CAFO waste application, especially in the spring and fall;
- Include interim pollution-reduction targets and contingency plans for how to pivot if those interim goals are not met;
- Plan for sufficient enforcement resources to ensure the goals are met.

Michigan should also consider:

- Requiring smaller confined livestock operations within the TMDL zone to develop and comply with a nutrient management plan that takes tile drainage into account;
- Requiring the addition of solids (at least 8%) to liquid CAFO waste before spreading on tile-drained fields within the TMDL zone to reduce the risk of loss through tile drains;[74]
- Pausing any new construction or expansion of CAFOs in TMDL zones until pollution is brought under control and EGLE can demonstrate that it will be able to reverse the impairment even with additional point source discharges.

Finally, once the TMDL is established, EGLE must actively and effectively enforce its requirements, including by incorporating TMDL limits into CAFO permits and ensuring that CAFOs are reducing their discharges along with the region's other industrial point sources. As discussed on page 39, EGLE has delayed implementation of its existing statewide *E. coli* TMDL for nearly ten years; that mistake needs to be corrected and cannot be repeated for this TMDL.

Recommendation.

- EGLE should immediately start drafting a statewide TMDL to address dissolved reactive phosphorus (DRP), total phosphorus, and nitrates/nitrites.
- Once it is finalized, EGLE needs to immediately begin the process of requiring compliance of all point sources, including CAFOs.

Improve EGLE's CAFO Permit

The CAFO permitting program is the single most effective tool available to EGLE to reduce nutrient and *E. coli* pollution. But a permitting system only works if:

(1) all discharging operations have a permit (Full Permit Coverage);

(2) the permits contain terms that actually and effectively limit the amount of overall pollution (Adequate Permit Terms), and

(3) all permittees are abiding by the limitations of their permits (Effective Enforcement).

Michigan's CAFO permitting program falls short on all three measures.

Full Permit Coverage: EGLE Needs to Ensure that All Discharging CAFOs Carry a Permit

Michigan imposes a "duty to apply" for a NPDES permit on all livestock operations that meet the definition of a "Large CAFO," as discussed in Section 2. This is more than many other states require and Michigan is an example that other states should follow. This is not enough, however.

The law is clear that animal feeding operations (AFOs) which meet the definition of "Medium CAFOs" and also discharge to waters of the United States must also apply for and obtain NPDES permits.[75] An AFO can be defined as a "Medium CAFO" if it confines a certain number of animals and discharges "through a manmade ditch, pipe, tile, swale, flushing system, or other similar manmade conveyance."[76] The subsurface tile pipes that pervade many of the state's agricultural areas are unquestionably "manmade pipe[s]." As discussed in Section 1, when waste is applied onto fields with subsurface tile drainage, at least some of that waste will flow straight into the tile lines and inevitably reach surface waters. Consequently, any medium-sized AFO that applies liquid waste onto tile-drained fields meets the definition of a Medium CAFO and must apply for and receive an NPDES permit, too.

To be clear, we are not recommending that EGLE start

regulating small, family-scale livestock operations, or any livestock operations that graze their animals. This recommendation is limited to "Medium CAFOs" many of which fall just under the numeric cutoff for "Large CAFOs" (sometimes called "one-unders"), but who still confine huge numbers of animals in one place and who engage in the dangerous practice of spreading liquid waste onto tiled fields.

Medium CAFO
Discharges "through a manmade ditch, pipe, tile, swale, flushing system, or other similar manmade conveyance." Includes facilities that raise:
- 200-699 mature dairy **cows**
- 750-2499 **swine** weighing more than 55lbs
- 16,500-54,999 **turkeys**

Finally, discussed above in Section 2, EGLE has not required 11 large CAFOs to get NPDES permits. Instead, EGLE has issued "no potential to discharge," non-NPDES permits on the apparent theory that if the CAFO is not land applying waste itself, it has "no potential to discharge" pollution. This theory is incorrect. EGLE needs to require NPDES permits for all large CAFOs, regardless of whether they land apply their own waste or someone else does.
Recommendations:

- EGLE should begin identifying livestock facilities in heavily-tiled areas — especially in the WLEB and Saginaw Bay — that meet the definition of "Medium CAFO" and also spread on tile-drained fields for potential coverage under the NPDES CAFO Permitting program.
- EGLE should stop issuing and renewing "no potential to discharge" permits and should instead issue individual permits or certificates of coverage under the General Permit to the 11 facilities with these permits.

Adequate Permit Terms: EGLE's Permit Terms Must Be Well-Tailored and Strong Enough to Prevent Pollution

A permitting program can only be effective if permit terms are designed to protect water quality. EGLE acknowledges that CAFOs are polluting and that the current permit is not good enough, noting that "industry continues to excessively pollute Michigan's water resources, even though the department determined over three years ago that the existing permit allowed pollution that was 'unreasonable and against the public interest in view of the existing conditions' in the many waters of the state currently subject to, or in the process of becoming subject to, TMDLs."[77]

This section lays out the baseline permit terms that must be included in Michigan's CAFO NPDES permits going forward:

1. Prohibit Spreading Liquid Waste on Tile-Drained Fields

As described above, applying liquid waste to tile-drained fields inevitably leads to water pollution. Liquid CAFO waste acts like water, and subsurface tile systems pull that waste down into the subsurface pipes, which drain into ditches, streams, and rivers. Most existing BMPs do not stop this pollution pathway, and some can make it worse (see page 23). The only way to solve this problem is to ban the application of liquid waste on tiled fields altogether. If not implemented statewide, this restriction needs, at the very least, to be implemented in TMDL zones.

CAFOs that currently engage in this dangerous practice have other options. They can apply liquid waste onto land that is not tile-drained or add solids to the liquid waste (at least 8%) before applying on tile-drained fields, which makes the waste less likely to drain into tile systems. Of course, CAFOs are also free to employ municipal-grade wastewater treatment processes or to send their animals back to pasture. Any of these approaches would significantly and positively impact Michigan's waters.

2. Prohibit Winter Application of CAFO Waste

Applying CAFO waste to land during the winter months is among the most dangerous practices for water quality. It is completely unjustified from an agronomic perspective since there is no growing crop to "fertilize." The sole purpose of winter waste application is cheap waste disposal.

The current CAFO Permit allows winter waste application if certain BMPs are followed (injection, setbacks, etc.). But EGLE's experience and scientific

research have shown that these BMPs are ineffective and do not stop the inevitable runoff that is associated with winter waste application.[78] CAFOs are also required to have six months' worth of waste storage capacity; they should not need to apply waste in winter.

Figure 17: Spreading CAFO waste on snowy ground in the winter.

3. Increase Transparency and Accountability for Manifested Waste

As noted earlier, manifesting is the practice of selling or giving away CAFO waste to a third party for disposal. By law, the NPDES requirements "apply to all animals in confinement" at a CAFO, as well as all waste "generated by those animals."[79] The current CAFO permit, however, allows manifesting with few restrictions and with minimal obligations. This leaves a huge gap in EGLE's ability to prevent pollution from millions of gallons of waste — hundreds of millions of gallons in 2020 alone, or roughly half of the total amount of CAFO waste that was generated in the state. In the real world, manifested waste presents the exact same pollution risk as any other CAFO waste; the permit should reflect that reality.

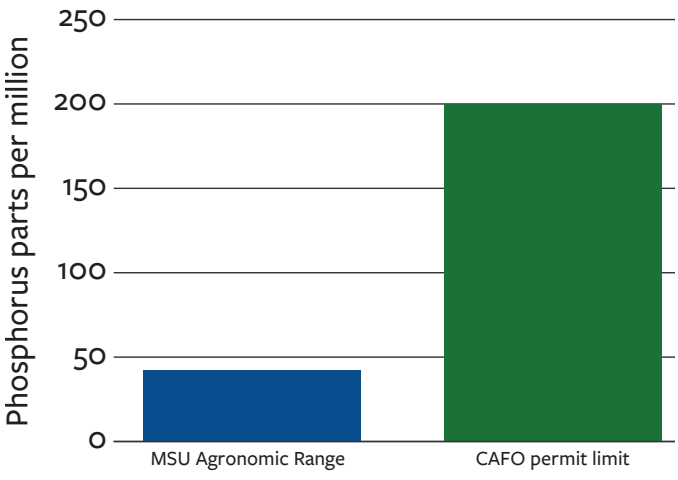
4. Require More Monitoring and Sampling, Especially for Water Leaving Tile-Drained Fields

As noted above, most point sources have numeric limits on how much of any given pollutant they can discharge, and they must regularly measure and report those numbers. Since CAFOs are not required to follow numeric standards or submit detailed reporting data to EGLE, however, a critical data gap exists about how much pollution CAFOs are responsible for. CAFOs often exploit this data gap to argue — as they have in their challenges to the 2020 Permit — that EGLE doesn't have enough data to prove CAFOs are causing water pollution. That data gap can and must be closed.

5. Prohibit Application of CAFO Waste Above MSU's Agronomic Maintenance Ranges

The current CAFO permit allows too much leeway in how much waste can be applied to any given field. Manure can be used as fertilizer and MSU has issued detailed standards (Tri-State Fertility Guidelines) for how much nutrient is needed to maximize crop growth."[80] For corn and soybeans, MSU determined that if soil test phosphorus levels are above **40 ppm** on the Mehlich-3 scale, there is "no agronomic reason" to apply more phosphorus. The current CAFO permit allows CAFO waste application up to **202 ppm** on the Mehlich-3 scale[81] — more than five times the Tri-State limit. There is no agronomic justification for this discrepancy; it merely facilitates cheap and easy waste disposal for CAFOs. As MDARD's Dr. Tim Boring acknowledges: "there's going to have to be discussions about how we continue to move away from waste disposal mindsets to more of a crop fertility-based approach."

Figure 18: CAFO waste is allowed to be applied at rates that put far more phosphorus in the ground than needed. Crops can only take up so much, so adding five times more will only lead to runoff.



6. Require CAFOs to use the Michigan Phosphorus Riks Assessment (MPRA)

Limiting CAFO waste application to MSU's phosphorus maintenance range is a necessary step, but it is also insufficient, especially for fields that are tile-drained. As a result, Michigan's CAFO permits must also require CAFOs to consider field-specific conditions, including tile drainage, soil type, and slope, to determine risk of nutrient loss and guide CAFO waste application. The Michigan Phosphorus Risk Assessment (MPRA) is the best available tool for predicting phosphorus loss from waste application, and CAFOs should be required to use it before land applying waste.

7. Require Accurate, Detailed Data Submissions

Currently, the General CAFO Permit only requires CAFOs to submit yearly reports of their waste application activities, and there is no requirement that precision data be submitted even if such data is readily available. Manure haulers routinely use GPS technology that precisely records when, where, and how much CAFO waste is applied; indeed, other farm equipment can be outfitted with similar GPS technology.[82] CAFOs, however, are not required to submit this data, even if it is readily available to them. If EGLE had that detailed data, it could better assess permit compliance and the extent to which additional permit restrictions or other measures might be needed to prevent pollution in given areas of the state.

8. Require Certification Under Penalty of Perjury about Illicit Tile Drain Discharges.

As we explained before, it is not uncommon for CAFOs to use subsurface tile pipes to transport CAFO waste from one area of the CAFO to another (for example, from the milkhouse to the manure lagoon). This type of transport is permissible. But it is also possible to connect those production area[83] pipes to other lines which — instead of draining into a lagoon — drain directly or indirectly into a ditch or stream. That is impermissible but EGLE's publicly-available documents show that multiple CAFOs have been caught engaging in precisely this activity for years; one facility was recently sued by the state for, among other things, production area discharges. When they have, EGLE has, in the past, often responded with a slap on the wrist — a noncompliance notice letter or something similar. As far as ELPC is aware, EGLE has never revoked a CAFO's permit for such an activity, despite the fact that it is a clear and intentional violation of both Michigan and federal law to directly discharge pollutants into waters of the state.

Recommendation: Michigan CAFO permits should:

- **Liquid waste** - Prohibit the spreading of liquid waste onto tiled fields.
- **Winter** - Prohibit application of waste beginning January 1 through March 31 with no exceptions. AND Prohibit application of waste any time there is two or more inches of frost[84] in the ground and/or two or more inches of snow on the ground.
- **Manifesting** - Require the same inspections and field-by-field assessments for fields receiving manifested waste as are required for land receiving non-manifested CAFO waste. Require disclosure of the name, address, and contact information for all beneficial owners of the recipient, or, in the alternative, a signed verification under penalty of perjury that the recipient has no common ownership with the CAFO. Require certification by the recipient, under penalty of perjury, that the recipient will comply with the permit's land application and inspection requirements, including any applicable TMDL guidance. Prohibit manifesting for the purposes of land application between January 1 and March 31. Require that manifesting recipients provide the CAFO with soil test results not older than three years.
- **Monitoring** - Require grab sampling of any discharge observed coming out of a tile drain on a field receiving waste within 24 hours after application, and as soon as possible after the first rain. Submit the sample to EGLE for analysis or to a verified laboratory for analysis and then report the results to EGLE.
- **STP Limits** - Limit waste application to the Tri-State recommended maintenance range.
- **MPRA** - Require the use of the MPRA for evaluating fields before waste application. An even better approach would be for the state to develop watershed-specific tools — based on field-level information and actual water testing data — that can be used to identify the potential risks on a given field. One such tool has already

been developed for the River Raisin watershed, and similar tools can and should be developed for other watersheds, especially watersheds that are already impaired by one or more CAFO pollutant (*E. coli*, phosphorus, nitrates, etc.).

- **Data** - Require CAFOs to submit waste application activities quarterly, not just annually. If CAFOs employ manure haulers or apply waste with GPS-enabled waste tracking technology, Michigan's CAFO permit should require them to submit that data as part of their required reporting.
- **Illicit Discharges** - Require all CAFOs to submit annual certifications, under penalty of perjury, that they are not discharging production area waste via subsurface tile drainage. EGLE and/or the Department of Justice should impose criminal penalties, up to and including permit revocation, on CAFOs if they do engage in such discharges.

Effective Enforcement: EGLE Needs to Step Up and Require Compliance with CAFO Permits

Even if all the recommendations listed above are adopted into CAFO permits, that will not, on its own, protect water quality unless EGLE steps up and enforces those permits. EGLE is empowered to enforce CAFO permits and to take legal action against anyone who discharges unlawful pollution. All too often, though, EGLE turns a blind eye or gives CAFOs multiple get-out-of-jail free cards, all while penalizing citizens for reporting pollution that impacts them.

Over the past couple of years, the Attorney General's office has publicized its efforts to step up enforcement against polluting CAFOs, filing a handful of actions against facilities with long histories of non-compliance and serious, documented discharges.[85] But EGLE's recent efforts — while welcome — are still nowhere near enough.

To be fair, the Attorney General faces real roadblocks when filing civil enforcement actions for environmental violations. In particular, NREPA requires EGLE to first offer to meet and resolve any issues by agreement before filing suit. The state cannot file a formal action until that offer has been pending, unanswered, for at least 60 days. These procedural barriers, combined with the real-world challenges of identifying and measuring CAFO pollution, present real challenges for formal enforcement efforts.

The Vast Majority of CAFO Permit Violations Remain Unresolved

MiEnviro is EGLE's public access website for water permit information. It tracks a variety of data, including:

(1) the type(s) of permit(s) each facility carries,

(2) the number of enforcement actions and permit violations associated with each facility,

(3) a collection of underlying enforcement-related documents and communications.

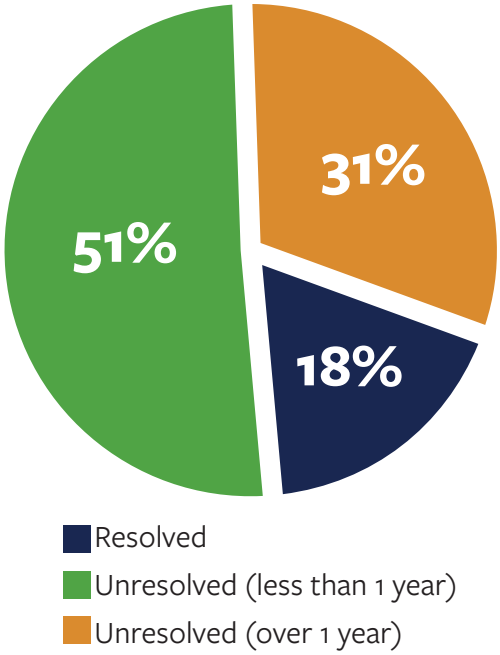
When ELPC reviewed this data, we found serious gaps in EGLE's enforcement of CAFO permits.

1. Too Many Enforcement Actions Remain Unresolved

We analyzed the data available for the sites categorized as CAFOS and identified 2,065 violations since 2015, attributed to 267 distinct CAFO sites.[86] Violations can include everything from a paperwork omission to a significant discharge leading to a fish kill. Of the 2,065 recorded violations, EGLE has completed the enforcement process or fully resolved only 630 of them (31% of all violations).[87] The remaining 1,435 violations (69% of the total) are unresolved.

Of the 69% of enforcement actions that remain unresolved (1435 out of 2065), the majority (1057 out of 1435) have been open for more than a year.

Figure 19: The majority of EGLE's enforcement actions remain unresolved for over a year.



2. EGLE Is Too Lenient with Repeat Violators

Most of the CAFOs cited for permit violations are repeat offenders. Only 16% (or 43 out of 267) of cited CAFOs have just one violation on their record. The vast majority have more, including some with more than 20, 30, and even 60 violations. One CAFO has received 266 violations. See Figure 20 below.

Indeed, state policies encourage leniency with violators. EGLE is required by law to first offer to meet to resolve any environmental violations by agreement before the state can file an enforcement lawsuit.[88] The majority of the time, even when violation notices are issued, CAFOs are required to do little more than fix whatever problem led to the incident in the first place. There are rarely fines or other serious punishments. We are not aware of a single instance in which a CAFO permit has been revoked as a result of repeated or serious noncompliance.

One of the primary functions of law enforcement is to deter harmful behaviors in the first place. When laws are weakly enforced, that deterrent effect evaporates. In other words, when would-be polluters know that they will receive little more than a slap on the wrist for violating their permits, there is very little incentive for them to clean up their acts. EGLE needs to step up and show that it takes compliance seriously by imposing sanctions proportionate to the seriousness of the offenses. Evidence of repeated or intentional misconduct, in particular, must result in serious consequences.

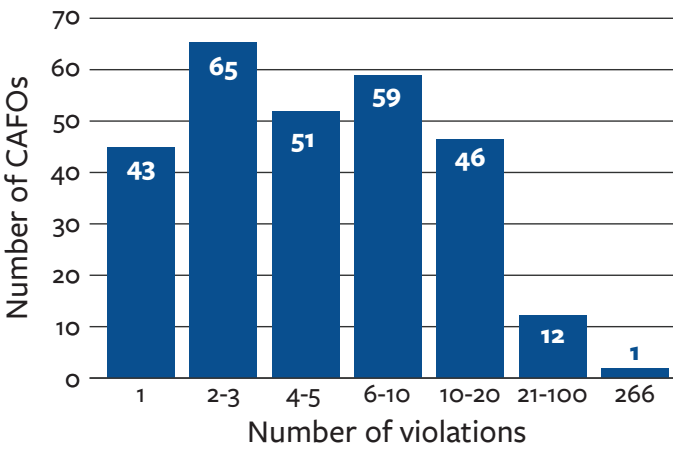
3. EGLE's Enforcement Numbers Underrepresent the Amount of Pollution

Even though the volume of enforcement actions described above is significant, it almost certainly understates the amount of pollution that CAFOs are discharging.

First, our manual review of historical documents shows that the MiEnviro database often understates the number of enforcement actions certain CAFOs have received. EGLE staff has admitted that the MiEnviro data is not always complete; indeed, the portal's disclaimer warns that "the records contained [on MiEnviro] should not be considered complete."[89]

Second, there have been significant discharge events that don't result in any officially recorded incidents. One of the most striking recent examples involved repeated manure discharges lasting nearly two weeks, in which CAFO waste visibly flowed off a field into a ditch that feeds into a federally-protected wetland. Citizens notified EGLE daily about what was happening and took photos. EGLE never collected any samples, only visited the site twice, and never issued a citation or even a warning to the responsible

Figure 20: *2,065 CAFO permit violations, 2015 to 2023. Most CAFOs that violated permits did so repeatedly. Many had dozens if not hundreds of permit violations, and one CAFO had 266 violations.*



CAFO. In fact, EGLE staff has admitted that EGLE "does not necessarily send a violation notice for every violation." This admission conflicts with EGLE's own enforcement policy requiring EGLE to communicate violations "no more than 30 calendar days following EGLE's determination that a violation has occurred,"[90] as well as EGLE's statutory duty to "take all appropriate steps to prevent pollution."[91]

Third, MiEnviro doesn't reflect discharges that go entirely unnoticed. EGLE currently has only nine staff members dedicated to permitted CAFOs around the state, and their duties are certainly not limited to (or even necessarily include) regularly driving around, taking water samples, and looking for signs of potential discharges. This is facially insufficient to monitor all of Michigan's 290 CAFO facilities across the state, let alone the thousands of acres on which CAFO waste is spread. Moreover, unlike the example above, much CAFO water pollution is invisible. As a result, many if not most CAFO discharges will go undetected.

Fourth, EGLE's enforcement data only goes back to 2015, but many CAFOs have been operating for decades.

Finally, EGLE admits that it relies almost entirely on citizen reporting to know whether CAFO pollution has taken place. This de facto reliance on citizen reporting is problematic on its own, but it is also undermined by the Right to Farm (RTF) Act, as discussed in the next section.

EGLE's Reliance on Citizen Reporting is Problematic and Severely Jeopardized by the Right To Farm Act.

As EGLE itself acknowledges, EGLE depends almost entirely on citizen reporting to know whether livestock waste discharges have taken place. This raises serious problems, particularly in light of the "three complaints" provision of Michigan's Right to Farm Act.

1. Citizens Should Not be Responsible for Policing Industrial Pollution

EGLE is empowered and obligated to protect Michigan's water resources.[92] Unfortunately, EGLE relies heavily on citizen reporting to carry out CAFO permit enforcement. Citizens do not have any law enforcement powers, and they should not be asked to jeopardize their social relationships (or, potentially, their safety) by reporting on their neighbors, particularly when they are the ones who are already bearing the brunt of the environmental harms caused by CAFO discharges.

Moreover, citizen reporting is not a very effective way to identify water pollution. Most water pollution is invisible and can only be detected through water sampling and testing, processes that EGLE staff, not citizens, have the resources (and obligation) to conduct.

2. The Right to Farm Act Deters Citizen Reporting

There is an even more pernicious deterrent at work when it comes to citizen reporting of CAFO discharges: Section 4 of Michigan's Right to Farm Act. That provision states that any "complainant who brings more than three unverified complaints" may be ordered to pay the Michigan Department of Agriculture and Rural Development (MDARD) the "full costs" of investigating any complaints.[93] Under the RTF Act, EGLE and MDARD agreed to a procedure for jointly investigating potential pollution incidents. Given the close coordination between the agencies dictated by the RTF Act, citizens who report potential CAFO pollution violations to EGLE risk their identity being exposed to MDARD and becoming subject to the "three strikes" provision in the Right to Farm Act.

This risk is particularly acute because EGLE's actions — which the citizen cannot control — are the key factors in whether a complaint ends up "verified" or "unverified." In the example above, even when manure was visible in a ditch, EGLE never took any water samples, and it never issued a violation. As a result, the complaint would likely have been considered "unverified." Citizens cannot be asked to take this kind of risk to help EGLE fulfil its own statutory obligation to protect water quality.

EGLE could substantially mitigate this risk by allowing

citizens to report potential violations anonymously. While EGLE's website says that it allows anonymous complaints, it requires all complaints to be made through the MiEnviro portal, which does not allow citizens to submit a report without submitting their name and contact information. This puts citizens at risk for backlash if CAFO operators find out who reported them. Moreover, the MiEnviro portal is not straightforward to use. Citizens who are not computer-savvy — and even ones who are — may find the process confusing and time-consuming.

Each of these policies has a chilling effect on the number of reported incidents, an outcome which the CAFO lobby supports. In its policy prerogatives for 2023, the Michigan Farm Bureau explicitly seeks to undermine the citizen complaint process, saying that it "do[es] not support anonymous [] complaints" and "strongly urge[s] MDARD to recoup the costs of investigating unverified complaints." Indeed, according to MDARD and EGLE's joint procedures, "MDARD will not accept anonymous complaints and cannot investigate complaints without the name and address of the complainant."[94]

Fear of reprisal is precisely what you don't want when you have an underfunded enforcement program that depends almost entirely on citizen reporting. EGLE's failure to allow anonymous reporting is also unnecessary: nothing in the Right to Farm Act obligates EGLE to collect citizens' names just in case MDARD wants to fine a citizen for someone making "unverified complaints." Indeed, NREPA obligates EGLE to "take all appropriate steps to prevent pollution," including — at a bare minimum — taking all citizen reports seriously and not silencing citizens for fear of retaliation.

EGLE Must Require Compliance with TMDL Limits in the CAFO General Permit

There is another critical area in which EGLE's failure to enforce existing laws is harming water quality: TMDL enforcement. Remember, TMDLs are one of the few legal tools available to clean up impaired waters. If EGLE fails to enforce TMDLs, however, they are worth little more than the paper they are printed on. Unfortunately, when it comes to CAFO permits, the statewide TMDL for *E. coli*, biota, and dissolved oxygen (the "*E. coli* TMDL") is largely a dead letter. EGLE is allowing CAFOs to continue polluting at levels that are incompatible with reducing *E. coli* pollution as the TMDL demands.

The 2015 CAFO permit required CAFOs in *E. coli* TMDL watersheds to comply with EGLE guidance regarding additional pollution control measures. That guidance — which EGLE did not issue until 2020 — requires CAFOs in TMDL zones to conduct a self-evaluation within two years of notification to determine if additional pollution control measures are needed to prevent *E. coli* discharges, and to prepare a plan for adopting such measures.

It is now 2024, and EGLE still has not notified the vast majority of CAFOs in *E. coli* TMDL zones to begin preparing these self-evaluations and comply with the guidance. The initial burden on CAFOs could not be more minimal (two whole years to conduct a self-evaluation), but the stakes could not be higher, especially as more and more of the state's waters become burdened with *E. coli*. EGLE needs to step up and require CAFOs to comply with existing TMDL guidance.

Recommendation: EGLE's failure to enforce NREPA is putting Michigan's waters at risk. EGLE needs to promptly step up its enforcement activities by:

- Escalating and closing out unresolved enforcement actions
- Conducting more unannounced audits and inspections
- Beginning to impose real consequences on polluting CAFOs, particularly repeat or intentional offenders, up to and including suspension of their permits
- Complying with EGLE's already-established testing protocols, including by taking water samples, when responding to all potential manure discharges, spills and field runoff incidents
- Allowing anonymous reporting
- Enforcing the 2015 Permit's *E. coli* TMDL provisions
- Pausing any new construction or expansion of CAFOs in *E. coli* and nutrient TMDL zones until pollution is brought under control and EGLE can demonstrate that it will be able to reverse the impairment even with additional point source discharges

III. Stop Spending Money on Things That Don't Work

The previous section was focused on proactive changes for controlling CAFO water pollution. This section explores two pathways to control water pollution from CAFOs and other agricultural facilities that the state should stop pursuing: (1) pushing its voluntary BMP program, the Michigan Agriculture Environmental Assurance Program (or "MAEAP"); and (2) hoping that manure management "innovations" will, on their own, save the day.

The State's Voluntary Incentive Programs are Ineffective

The poor state of Michigan's water quality cannot be blamed on a failure to spend money. According to MDARD's Director Dr. Tim Boring, Michigan spends $50 million a year on nutrient pollution reduction from agriculture.[95] But the state's most recent data show that agricultural loading was higher in 2022 than it was in 2008, the benchmark year from which when the original goal to reduce Lake Erie phosphorus loadings are supposed to be reduced by 40%.[96] In other words, many years and about $700 million later, things are not getting better. While unfortunate, this trajectory is not unique to Michigan; it matches the experience of other states — including Ohio — which have tried and failed to reduce nutrient pollution primarily by urging farmers to adopt voluntary BMPs.[97] As Dr. Boring acknowledges, agriculture "is nowhere near" where it needs to be in reducing nutrient pollution.[98] He goes on to warn: "We can't keep doing what we've been doing and expecting different results."[99]

Unfortunately, that is precisely what Michigan is doing.

Michigan's Agriculture Environmental Assurance Program (MAEAP) is Failing by Every Measure

The state has called the Michigan Agriculture Environmental Assurance Program (MAEAP) its "primary tool for working with agriculture" to reduce nutrient pollution. Established in 1998, it is a voluntary program that pays farms of any size, including CAFOs, to "adopt cost-effective practices that reduce erosion and runoff into ponds, streams, and rivers." In effect, a farm can select from a menu of BMPs, and it will then receive financial and technical support to implement them.

Importantly, MAEAP does not measure actual environmental outcomes.[100] Instead, the program measures "success" simply by keeping track of the number of farms and facilities that sign up. The more farms there are enrolled, the more "successful" MAEAP is. Even by this measure, MAEAP is failing. Despite offering free funding, technical assistance, and a free road sign declaring "This Farm is Environmentally Verified,"[101] MAEAP has only enrolled 17% of cropland in the Western Lake Erie Basin,[102] and only 12% of farms statewide.

So why aren't more farmers enrolling in MAEAP? An entire academic discipline has sprung up to study that very question, apparently with no clear answers in sight.[103] Indeed, the "Science Advisory Panel" of the 2023 Western Lake Erie Basin Conference recommended that the state spend more money on social science research to understand how to encourage more farmers to enroll in MAEAP and similar programs.[104]

But MDARD's Director Tim Boring is not mystified. As he explained in his keynote address at the 2023 WLEB Conference, it is perfectly rational for farmers to be reluctant to adopt these practices because economic realities demand that farms grow bigger and more efficient at all costs, which means streamlining and simplifying management processes.[105] Asking farmers to adopt labor-intensive BMPs, however,[106] is

"basically telling farmers to make their management more complicated" and "asking farmers to adopt suites of practices that the market is sending them signals to grow in exactly the opposite way."[107]

And why isn't MAEAP actually reducing water pollution? Once again, the WLEB and many other parts of the state are heavily tiled. Most BMPs promoted by MAEAP are ineffective at reducing pollutant loss through subsurface tile lines; some BMPs make pollution through tile lines worse. See page 23 above. That is especially true for CAFOs, whose waste tends to be over-applied close to the production area. BMPs may trim pollution loss around the edges, but they ultimately fail because they allow the existing paradigm — in which industrial-scale CAFOs generate too much waste and apply it in too few places, too many of which are tile-drained — to continue. Without a change to that fundamental paradigm, implementing a few BMPs here and there (or even a lot of BMPs everywhere) in the hope that they will turn the tide is an exercise in magical thinking.

Both EGLE and MDARD have acknowledged this. In Michigan's 2021 Adaptive Management Plan to Reduce Phosphorus Loading Into Lake Erie, the state conducted modeling to determine how much BMP adoption would be needed to achieve the state's 40% phosphorus reduction goals. It concluded that "[e]ven 100 percent adoption of [] three stacked BMPs" would be insufficient to meet the goals. Indeed, "[n]o scenario" that the state modelled would "achiev[e] the annual or spring goals through agricultural practice adoption only."

Aware of these realities but apparently choosing to ignore them, the state, by all accounts, intends to continue funding and promoting MAEAP as its primary method to reduce agricultural nutrient pollution. In other words, the state apparently intends to keep on doing what it's been doing and expecting different results.

Spending on Voluntary BMP Adoption, Without Tracking Outcomes, Wastes Taxpayer Money

MAEAP reportedly costs around $7.5 million per year.[108] If the state insists on continuing to spend taxpayer money on this program, it should be dramatically redesigned. Any funds that are available to reduce nutrient pollution can be put to better use by investing in outcome-based programs, expanded water quality monitoring, and programs that promote sustainable agricultural practices.

1. MAEAP Should Pay for Results, Not Adoption of Practices

"Pay-for-performance" programs pay farmers to achieve measurable water quality improvements, rather than to simply adopt conservation practices, regardless of their effectiveness (sometimes referred to as the "pay-for-practice" approach, like MAEAP). According to one report, pay-for-performance can "empower farmers to play an active, cost-effective, and significant role in meeting conservation and water quality goals."

One of the primary downsides of pay-for-performance, however, is that it requires a lot of resources: people to maintain engagement with farmers, people to provide technical assistance, and people to carry out the ongoing testing and monitoring that is needed to measure improvement. And, of course, money.

Fortunately, MAEAP already has many of these necessary resources; in particular, staff and funds. As a result, MAEAP could be a good candidate for a pay-for-performance program. Instead of paying farmers to simply adopt BMPs — which may or may not achieve any beneficial results and could make water quality worse — the state should instead pay farmers for actual, measurable water quality improvements that have been achieved. And to ensure that the selected practices are likely to be successful, the state should provide farmers with access to a tool like the one discussed above on page 36 developed for the River Raisin watershed, which incorporates field-level data to identify which practices are likely to be successful.

2. Michigan Should Use Available Funds for More Water Monitoring and Programs that Promote Sustainable Agricultural Practices (not CAFOs)

Beyond MAEAP, the state and its agencies receive funding from a variety of other sources, including, among other things, the Great Lakes Restoration Initiative (GLRI). To the extent the state is using these funds for any MAEAP-style, pay-for-adoption programs, they should stop doing so and, instead, should direct funds to projects that are most likely to result in positive outcomes. The state could use available funds to build out a more robust network of water quality monitoring, and to invest in farmers employing sustainable agricultural practices.

During the December 2023 WLEB Conference, EGLE presented on its expanding water monitoring program in the Western Lake Erie Basin (WLEB). The presentation was welcome news; the monitoring strategy appears to be comprehensive and well-considered. EGLE needs to take these efforts to the next level by expanding them both within the WLEB, and to wherever they are needed statewide. Importantly, the monitoring program should be expanded to conduct more testing throughout the entire year. For example, the National Oceanic and Atmospheric Administration (NOAA)'s sampling program for Lake Erie generally takes place between June and November, the so-called "ice-free months";[109] this misses half the year. This limitation was arbitrary even when weather patterns were theoretically "normal," but given climate change, recent weather patterns are warmer and more unpredictable. There are shorter periods of deep freeze, repeated freeze-thaw cycles throughout the winter, and heavy rainfall throughout the year, meaning that how — and when — pollutants travel into water is changing. Michigan should ensure that its expanded program measures nutrient loadings throughout the year and also must include both upstream and downstream monitoring. With more accurate and robust data, the state can make better-informed decisions about where to focus money and efforts to reduce agricultural pollution.

In addition, Michigan should invest in the people that have long been the state's agricultural engine: family-scale farmers who are growing food sustainably and responsibly. Michigan's voluntary BMP adoption programs, including MAEAP, provide funding and support to "farms" of all sizes, including CAFOs. But as described in Section 2 above, industrial-scale operations already have unfair advantages over smaller, diversified farms, thanks to access to significant federal financial subsidies, and the ability to externalize waste disposal costs. Farmers who grow "specialty" crops (i.e., fruit, vegetable, and fiber crops) or who raise livestock sustainably are ineligible for (or often get overlooked for) many federal subsidies, especially those reserved for to commodity crops like corn, soy, and wheat.

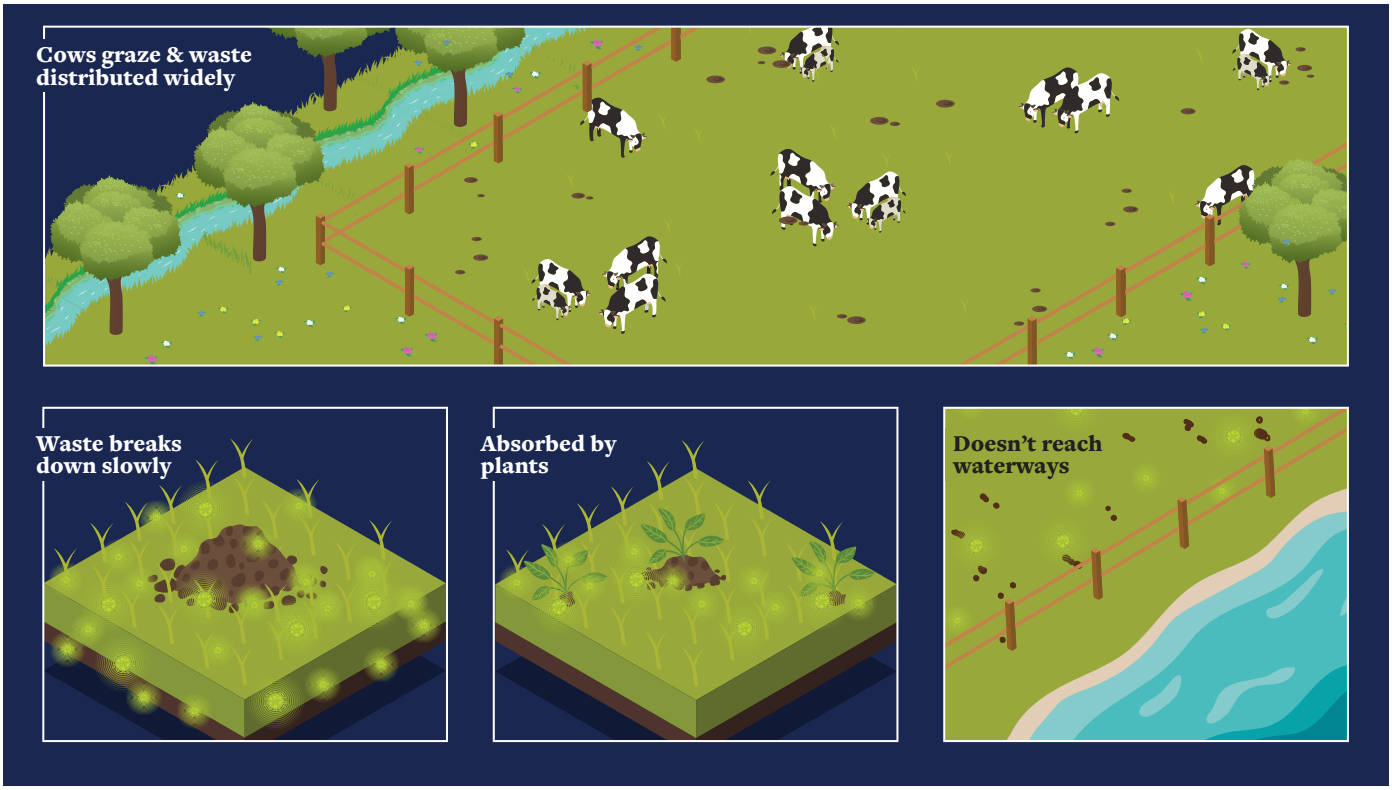
Michigan is the nation's capital for cherries, apples, asparagus, pickling cucumbers, and many other fruits and vegetables. These crops are central to the state's agricultural economy, tourism industry, and cultural fabric, they should not be shut out of much-needed funding. CAFOs should be disqualified, or at least de-prioritized, from receiving any state-issued funds so that state-level funds can go to the farmers who are growing food sustainably and responsibly.

With respect to meat and dairy production specifically, rotational grazing has long been recognized as an environmentally-friendly alternative to the CAFO production model. Grazing not only promotes soil health and reduces climate impacts, it also reduces water pollution risk by distributing smaller amounts of manure across more land. Grazing also has biodiversity benefits. MSU recently launched a Center for Regenerative Agriculture, and the state should work with MSU and others engaged in regenerative agricultural practices to identify ways to support Michigan farmers who are producing food sustainably.

Recommendations: The state should:

- Stop investing in MAEAP and similar BMP-adoption programs and reallocate funds to:
  - Pay-for-performance programs;
  - Water quality monitoring; and/or
  - Programs that support family-scale farmers engaging in sustainable and regenerative agricultural practices.

Figure 21: Pastured Livestock Waste



Technology, on its Own Will Not Solve This Problem

Technology, without regulation, will not solve nutrient or *E. coli* pollution. It is always tempting to hope that we can innovate our way out of manmade problems; and promises to turn waste into something valuable are particularly attractive. Unfortunately, promises to turn manure into gold have failed to deliver, and many come with serious environmental trade-offs.

Without Regulatory Requirements, CAFOs Will Not Voluntarily Adopt Manure Treatment Technologies

When it comes to CAFO-caused pollution, hoping for technological salvation is fundamentally misguided for at least three reasons.

First, we already have technology that would significantly improve CAFO pollution; it just isn't being used.

Wastewater treatment plants have existed since the 1800s and they are very effective at keeping pollutants and human sewage out of surface waters. (See Figure 15 above.) Wastewater treatment plants could be deployed to do the same for animal sewage, but they cost money and, so far, CAFOs have not opted to voluntarily employ the technology. Given the choice between an option that costs money (employing municipal-grade wastewater treatment technology) and a status quo that does not (being allowed to spread *untreated* waste on farmland that doesn't need it), CAFOs unsurprisingly choose the status quo. This is why regulation is so critical: when CAFOs have no economic incentives to treat their waste (as is currently the case), they will not do so. After all, oil refineries, slaughterhouses, and other point sources did not voluntarily stop dumping their untreated waste into rivers, lakes, and streams; they stopped doing it when laws changed and forced them to clean up their acts.

Every other manure management technology faces the exact same problem: if a treatment technology costs more than the status quo — and every single one *will* cost more because the status quo is free —

it is unlikely to be widely adopted voluntarily.[110] As a result, the problem isn't that we haven't yet found a technology that works: it's that CAFOs operate in a regulatory environment that allows them to use no technology at all.

The problem isn't that we haven't found a technology that works. It's that CAFOs are allowed to use no technology at all.

Second, no manure management technology can make nutrients magically disappear.

Phosphorus and nitrogen are elements, and elements cannot be destroyed. Most manure management technologies offer, at most, nutrient separation: either separating nutrients from each other (nitrogen from phosphorus), and/or separating nutrients into different states (solid from liquid).

Theoretically, once the nutrients are separated from each other and/or exist in a lighter, less liquid format, they can more easily be sold as high-end "organic" fertilizers and shipped to farms outside of the CAFO's watershed where nutrients may actually be needed. But the fertilizer market is constantly changing, and these "organic" fertilizers are generally more expensive than readily available synthetic ones. As a result, there is no guarantee that they will be purchased at all, let alone purchased by farms outside an impaired watershed.[111] And if the fertilizers stay in the watershed — absent any regulatory or legal changes — there is every reason to assume that they will share the same fate as other CAFO waste: as excess nutrients dumped on land that doesn't need them, causing more nutrient pollution.

Third, we are not currently aware of any technologies or practices — whether old or new — that are effective at preventing nutrient loss through tile drains if applied in liquid form.

As discussed in Section 2 above, most BMPs do nothing to stop loss through tile drains and some can make the problem worse. Researchers have recently worked on developing BMPs that will specifically address nutrient loss through tile drains, but so far none have proven effective.[112] And even if they were, they would cost money and likely require maintenance, making them unlikely to be widely and effectively adopted unless regulations required it.[113]

At bottom, without changes to regulatory and/or economic realities, there is no guarantee that nutrients processed by a manure management technology will experience a fate that is any different than untreated CAFO waste.

Anaerobic Digesters Are Not Treatment Technologies, Do Not Improve Water Quality, and Overpromise on Greenhouse Gas Reductions

Recently, anaerobic digesters have been touted as being able to address all the environmental ills of modern livestock production.[114] They don't. Given the increased attention that digesters have been garnering recently — as well as the increased availability of public and private funds for digesters — this report briefly clarifies what the technology is; what it does and does not do; and why widespread adoption of livestock waste digesters could make Michigan's waters worse.

Even if digesters actually delivered as many climate benefits as they promise (and they do not), it would come at the cost of continued, and likely worsening, CAFO-caused air and water pollution. Incentivizing digesters also extends the reliance on fossil fuel infrastructure (especially natural gas pipelines) and delays a much-needed shift to a truly green energy system.[115]

Finally, digesters further entrench the unfair advantages that CAFOs enjoy over smaller-scale, sustainable operations. Sustainable livestock farms don't have massive manure lagoons, which means they don't have pollution to capture through installing a digester. Instead, these smaller operations prevent methane emissions in the first place by not storing waste in a manure lagoon (a practice which, itself, generates methane). But they are unable to access the generous subsidies available for digesters.

Anaerobic Digestion

WHAT IS ANAEROBIC DIGESTION?
Anaerobic digestion is a process by which microorganisms break down organic matter in the absence of oxygen. The process requires an input or "feedstock" (e.g., manure, food waste, and other organic waste), and generates two primary outputs: (1) "digestate," the physical material remaining after the digestion process, and (2) "biogas," a combination of gases, which can be collected and burned for energy production.

WHAT DOES ANAEROBIC DIGESTION OFFER?
Proponents claim that anaerobic digesters can mitigate the climate impacts of animal livestock production by capturing the methane and other gases emitted from manure management and using them to generate energy.[116] However, there is little data to back that up. Indeed, many studies suggest that digesters may *contribute* to climate change rather than mitigate it.[117] This is due in part to methane leaking out of digesters and pipelines,[118] and also due to the fact that digestate releases significant amounts of nitrous oxide, which has nearly ten times the global warming potential as methane.[119] This latter omission is critical because models used to estimate greenhouse gas reductions do not account for digestate's significant emissions. Additionally, other approaches — sometimes called "alternative manure management" practices — can deliver significantly more climate benefits than anaerobic digestion,[120] and for a much lower cost.[121]

DO DIGESTERS IMPROVE WATER QUALITY? No. In fact, the USDA warns that the technology presents "higher risk for both ground and surface water quality problems" than raw manure. This is because nutrients in digestate "become more soluble due to anaerobic digestion and therefore have higher potential to move with water." Studies have also raised concerns about digestate's higher concentrations of heavy metals and antibiotics. In short, digesters do not improve water quality and may make it worse.

Michigan Needs to Step Up Its Regulation of Digesters

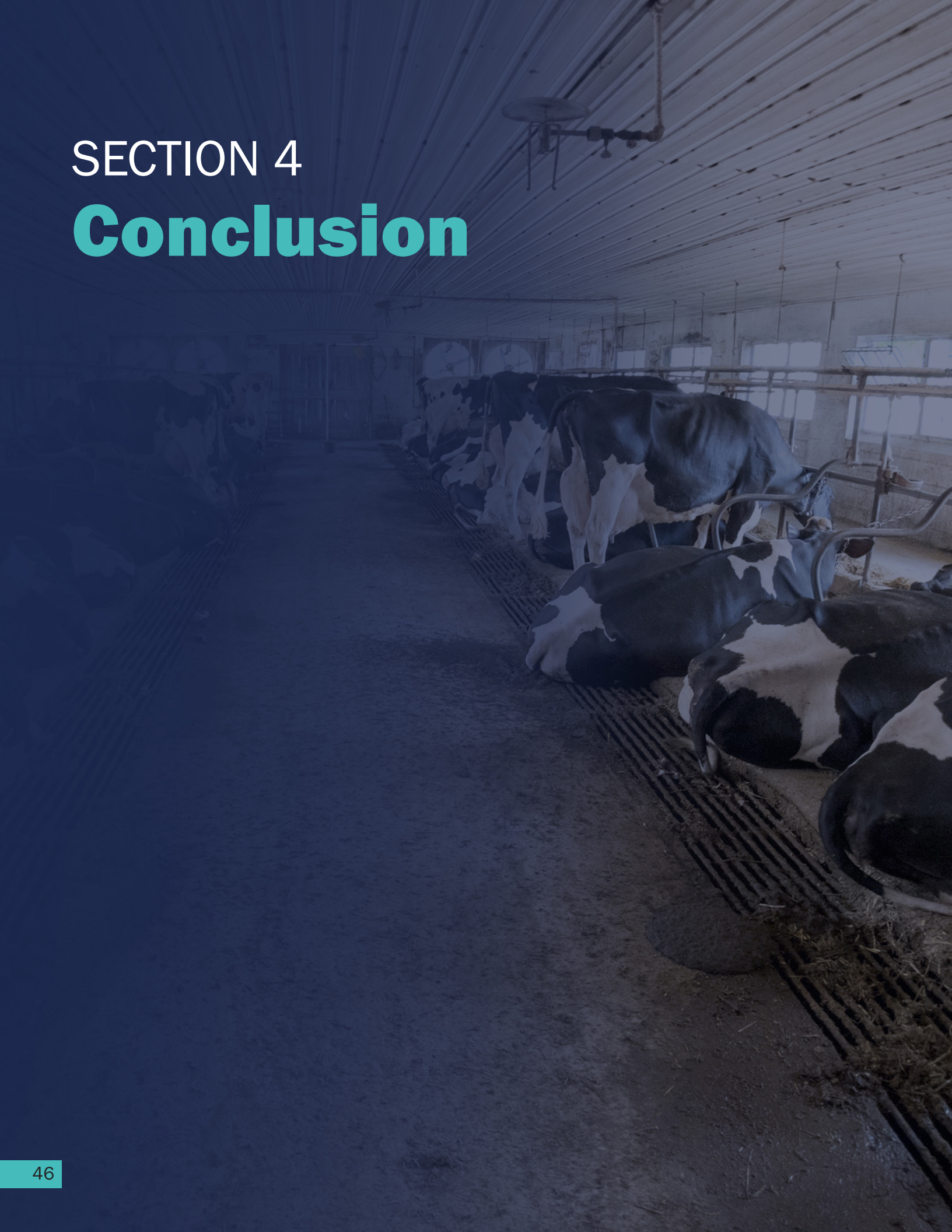
Given all the questions around (and limitations of) digesters, it is critically important that they be adequately regulated. When it comes to water quality permitting, EGLE regulations basically treat digesters as if they are extensions of CAFOs. For the most part, as long as a digester is associated with a CAFO, the digestate will be treated the same way that CAFO's waste is treated—it will be put back into a lagoon and land spread onto nearby fields. EGLE does not impose any additional or more stringent requirements on digestate, despite USDA's warning that digestate presents "higher risk for both ground and surface water quality problems."

Recommendations: At the very least, EGLE must revise its digester permitting practices to:

- Subject digestate to land application requirements that are at least as stringent as those for biosolids, which is the physical material that most closely resembles digestate;
- Ensure digesters carry appropriate air quality permits.

SECTION 4

Conclusion



Michigan's approach to cleaning up CAFO pollution is failing. CAFOs account for a tiny percentage of the state's agricultural facilities (less than 1%), but they produce an outsized proportion of the pollution by concentrating a massive number of animals and creating huge volumes of waste. Excess nutrients, pathogens, and other contaminants are not adequately managed, and they end up in waters across the state, fueling harmful algal blooms, tainting drinking water resources, and blocking Michiganders from using their treasured waterways. CAFOs get the benefits of consolidation without the responsibility, and the burden has fallen onto their neighbors and taxpayers to clean up the mess instead.

At every level, the state takes too light a hand, and doesn't treat CAFOs like the industrial polluters they are. Fortunately, there are concrete steps which, if taken, could start making a difference. It starts by focusing on the facilities that cause the most harm. In short, Michigan needs a statewide nutrient TMDL; CAFO permits need to be stronger; they need to be properly enforced; and the state needs to stop spending money on things that don't work. These changes will shift the burden from taxpayers and family-scale farmers, who now carry the load, to the largest industrial-scale operations who can easily afford to do more, and must, given their legal obligations. Michigan should get to work.

Actions Michigan Can and Must Take Now

As described in more detail in Section 3 above, there are dozens of actions Michigan can and should take immediately to reduce agricultural pollution. They are consolidated and summarized here.

1. Create and enforce a statewide TMDL for dissolved reactive phosphorus, total phosphorus, and nitrate/nitrites.

2. Improve EGLE's CAFO Permit by:

- Requiring permit coverage for "Medium CAFOs" that spread on tile-drained fields, as required by federal law.
- Tightening CAFO permit terms to, at minimum:
  - Prohibit the spreading of liquid waste onto tiled fields;
  - Prohibit application of waste during winter months or when ground is frozen or snow-covered;
  - Close the manifesting loophole;
  - Require more monitoring and sampling, especially water leaving tile-drained fields;
  - Prohibit application of waste above MSU's agronomic maintenance ranges;
  - Require the use of MPRA or another watershed-specific tool to evaluate fields for waste application;
  - Require accurate, detailed data submissions;
  - Clarify restrictions on illicit tile drain discharges.

3. Improve EGLE's enforcement of the CAFO Permit.

- Escalate and close out unresolved enforcement actions.
- Conduct more unannounced audits and inspections.
- Start imposing real consequences on repeat offenders, up to and including suspension of their permits.
- Reinstate anonymous citizen reporting of potential pollution discharges.
- Respond promptly and appropriately to all reports of potential CAFO discharges, spills, and field runoff, including by taking water samples.
- Begin enforcing the 2015 Permit's *E. coli* TMDL provisions.

4. Radically redesign the state's voluntary incentive programs or scrap them altogether.

5. Invest in expanding the state's water monitoring program.

6. Invest in family-scale farmers engaging in truly sustainable, regenerative agriculture (not CAFOs).

7. Step up regulation of anaerobic digesters.

Other Changes*

Beyond the actions listed above, there are a number of measures that the legislature, governor's office, and EGLE should prioritize in order to reduce nutrient pollution.

- Improve groundwater protections by lowering the threshold for groundwater permit coverage from 5,000 animal units to 1,000 animal units.
- Provide EGLE with more money for CAFO permit enforcement and water quality monitoring.
- Pass legislation ensuring that fossil fuel companies that are operating anaerobic digesters are adequately regulated.
- Revise the Right to Farm Act to restore communities' rights to pass commonsense measures to protect their citizens from the human health impacts of CAFOs and to stop discouraging citizen reports of manure discharges.
- Increase annual NPDES permitting fees for CAFOs.
- Better protect workers on CAFOs.

*This is a preliminary, high-level list; it is not intended to be comprehensive or to provide verbatim recommendations for actual legislative and/or regulatory language. Please reach out to ELPC directly for detailed recommendations.

Acronym Glossary

AFO – Animal Feeding Operation

BMP – "Best management practice"

CAFO – Concentrated Animal Feeding Operation

DRP – Dissolved Reactive Phosphorus

E. coli – Escherichia coli, a fecal coliform

EGLE – Michigan's Department of Environment, Great Lakes, and Energy

GAAMPS - Generally Accepted Agricultural Management Practices

GLWQA – Great Lakes Water Quality Agreement

HABs – Harmful algal blooms; Known for their green sludgy appearance and foul odor, HABs are large accumulations of cyanobacteria.

MAEAP - Michigan's Agriculture Environmental Assurance Program

MDARD – Michigan's Department of Agriculture and Rural Development

MEPA - Michigan Environmental Protection Act

MiEnviro – EGLE's public access website for water permit information

MPRA – Michigan Phosphorus Risk Assessment

MSU – Michigan State University

NPDES - National Pollutant Discharge Elimination System; a permitting program established by the Clean Water Act

NREPA – Michigan's Natural Resource Environmental Protection Act

RTF Acts – Right to Farm Acts

STP – soil test phosphorus

TMDL – Total maximum daily load

USDA – United States Department of Agriculture

U.S. EPA – United States Environmental Protection Agency

WLEB – Western Lake Erie Basin

End Notes

1 USDA Agricultural Census Data, 1974-2022, available at <https://agcensus.library.cornell.edu/wp-content/uploads/1974-Livestock_Poultry_Livestock_and_Poultry_Products_Fish-1974-02-full.pdf> (1940-1974) and <https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1,_Chapter_1_US/st99_1_001_001.pdf> (1992-2022).

2 This number reflects only "large" CAFOs, and excludes the thousands of small and medium-sized confined animal feeding operations across the country. Earthjustice, *Petition to Adopt a Rebuttable Presumption That Large CAFOs Using Wet Manure Management Systems Actually Discharge Pollutants Under the Clean Water Act*, p. 3-4, available at <https://earthjustice.org/wp-content/uploads/cafo_presumptionpetition_withexhibits_oct2022.pdf>

3 EGLE, Regulated Concentrated Animal Feeding Operations (CAFOs) map, available at: <https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=0fae269e1c45485f876c99391403bd3e> [Click "OK", click arrow on the bottom of the screen to "Open Attribute Table"] (sum of "Waste Total Dry Tons" and "Waste Total Liquid Gallons" for all registered CAFOs).

4 These calculations are supported by the following two sources: (1) EGLE's CAFO website data table (EGLE, Regulated Concentrated Animal Feeding Operations (CAFOs) map <https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=0fae269e1c45485f876c99391403bd3e> [Click "OK", click arrow on the bottom of the screen to "Open Attribute Table"]), and (2) MSU Extension, Small Farm Manure Management Planning, <https://www.canr.msu.edu/resources/small-farm-manure-management-planning>. Likely, these calculations dramatically underestimate the volume of waste produced by CAFOs, as MSU's numbers only account for "manure" and not all sources of wastewater that are consumed on a CAFO, incuding wash water, and all precipitation that comes into contact with CAFO waste.

5 MSU Extension estimates that humans produce between three to six pounds of wet manure per day. MSU Extension, *Cows, Streams, and E. Coli: What Everyone Needs to Know* (*E3103*), p. 1, <https://www.canr.msu.edu/uploads/resources/pdfs/cows,_streams,_and_e._coli_-_what_everyone_needs_to_know_(e3103).pdf>. For the calculation in this report, a median of 4.5 pounds per day was used. According to US Census Bureau, the human population of Michigan was roughly 10.037 million as of July 2023. US Census Bureau, *Michigan QuickFacts People Population: 2023*, available at: <https://www.census.gov/quickfacts/fact/table/MI#>.

6 According to the US EPA's most recent National Rivers and Streams Assessment, phosphorus and nitrogen were the most widespread stressors to the nation's waters; and bacteria (E. coli) exceeded EPA's recreational benchmark in 20% of river and stream miles. See <https://riverstreamassessment.epa.gov/webreport/>; <https://www.michigan.gov/egle/newsroom/mi-environment/2022/07/06/the-state-of-knowledge-on-harmful-algal-blooms-of-cyanobacteria-in-the-great-lakes>

7 See, for example, CAFO operations ordinances adopted by towns to address the public health risks presented by CAFOs, like the one available here, which catalogues negative health and economic/property value impacts of CAFOs in Wisconsin. <https://wisconsinwatch.org/wp-content/uploads/2023/06/Final-Concentrated-Animal-Feeding-Operations-Ordinance-22-01.pdf> And a significant number of studies have been done in North Carolina to examine the negative health impacts of CAFOs, particularly on environmental justice communities, including these two: <https://www.sciencedirect.com/science/article/abs/pii/S0013935121001560?via%3Dihub> <https://ehp.niehs.nih.gov/doi/10.1289/ehp.121-a182>

8 Phosphorus is generally considered to be the primary nutrient responsible for harmful algal blooms, but nitrogen also plays a role in their formation. See U.S. Army Corps, "Harmful Algae Blooms (HABs)," available at: <https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd518784.pdf>

9 To learn more about the binational Great Lakes Water Quality Agreement, including its history, you can review the following websites: https://binational.net/; and https://www.epa.gov/glwqa/recommended-binational-phosphorus-targets.

10 Andrew Aman James, "Molecular Detection of Cyanobacteria in Local Drinking Water," available at: <https://digitalcommons.wayne.edu/oa_theses/860/>

11 See John Fleisher, "Even in water-rich Michigan, no guarantee of enough for all," dated Feb. 26, 2022, available at: <https://www.opb.org/article/2022/02/26/even-in-water-rich-michigan-no-guarantee-of-enough-for-all/> ("Despite all that surface water, nearly half of Michigan's residents get their supplies from underground. The state has the most household wells in the U.S.")

12 The current Michigan CAFO General Permit requires manure storage lagoons to meet the 2014 standards laid out by USDA's Natural Resource Conservation Service (NRCS), also called the "NRCS 313 standard." <https://lancasterconservation.org/wp-content/uploads/Waste-Storage-Facility-313.pdf> The NRCS 313 standard, in turn, provides a specific "discharge rate" (sometimes called the "exfiltration" or "seepage" rate) that all lagoons (or "ponds") must comply with. In other words, lagoons are allowed to leak a certain amount per day as determined by the discharge rate, with the current standard being 0.028 ft./day (1 x 10-5 cm/sec). <https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/CAFO/Guidance-Compacted-Earth-Structure.pdf?rev=958c60744f5343b1a12fabd9044fc609>

13 The state has not updated its well contamination nitrate map for over 20 years (data from 1998-2003). At the time, the state did not report significant levels of nitrate contamination in eastern parts of the state, including the Western Lake Erie Basin, possibly due to the soil types and hydrology of that area, which are not particularly susceptible to subsurface seepage. But nitrates were found in much higher concentrations in Western parts of the state with sandier soils. See EGLE's statewide nitrate map, available at: <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/DWEHD/Contamination-Investigation/nitrate-michigan.pdf?rev=7608d9c32d0c401caf108d6454c8b3d0>

14 See, for example: "We Can't Sit Back" – Amid Polluted Water and Climbing Cancer Rates, Iowa Eyes Farm Chemicals - Circle of Blue <https://www.circleofblue.org/2023/world/we-cant-sit-back-amid-polluted-water-and-climbing-cancer-rates-iowa-eyes-farm-chemicals/>; Nitrate contamination of Minnesota waters shows little sign of going away, despite years of effort <https://www.startribune.com/nitrate-pollution-minnesota-groundwater-farm-fertilizer-mpca-wells-epa/600310942/>; and Press Release: Environmental groups petition EPA to use emergency authority to address imminent threat to drinking water from nitrate pollution in SE Minnesota | Minnesota Center for Environmental Advocacy <https://www.mncenter.org/press-release-environmental-groups-petition-epa-use-emergency-authority-address-imminent-threat>; and Study: Nitrate in Wisconsin's Drinking Water Linked to Cancer, Preterm Births and Up To $74 Million in Yearly Healthcare Costs | Environmental Working Group <https://www.ewg.org/news-insights/news/study-nitrate-wisconsins-drinking-water-linked-cancer-preterm-births-and-74>; and In Wisconsin, Nitrate Water Contamination is a Public Health Threat (verywellhealth.com) <https://www.verywellhealth.com/wisconsin-water-contamination-public-health-threat-5094052>.

15 This is based on MSU's estimate of needing 50 gallons of water per cow per day, multiplied by the 412,772 beef cattle and dairy cows on CAFOs in Michigan (excluding veal calves), a number derived from EGLE's data here: <https://www.michigan.gov/egle/about/organization/water-resources/water-use/permits>

16 Data from a recent study suggest that agriculture has been associated with more than 50% of zoonotic diseases transferred to humans. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8784678/#:~:text=Recent%20evidence%20suggests%20CAFOs%20may,et%20al.%2C%202020>

17 CAFOs often administer low-dose antibiotics to prevent disease, even among healthy animals. <https://earthjustice.org/wp-content/uploads/cafopresumptionpetitionfinal_oct2022.pdf> This practice is harmful for animals as well as humans: consistent exposure to antibiotics encourages bacteria to develop antibiotic-resistance genes, making many pathogens resistant to common antibiotics.

18 According to recent studies, agriculture is responsible for 81% of the country's ammonia emissions, and ammonia emissions from CAFO waste management practices cause at least 6,900 deaths per year. <https://www.sciencedirect.com/science/article/pii/S0301479722018588> <https://earthjustice.org/wp-content/uploads/cafo_presumptionpetition_withexhibits_oct2022.pdf>

19 As of 2017, livestock waste was the country's fourth-largest source of two harmful greenhouse gases: methane and nitrous oxide. <https://earthjustice.org/wp-content/uploads/cafo_presumptionpetition_withexhibits_oct2022.pdf>

20 PFAS, or per- and polyfluoroalkyl substances—sometimes referred to as "forever chemicals"—are a group of man-made chemicals that can't break down easily and can build up in the environment and our bodies. PFAS can build up or "bioaccumulate" in animals' bodies, as well, including their tissues (i.e., meat and eggs) and excretions (urine, feces and milk). <https://pubmed.ncbi.nlm.nih.gov/23441933/> When PFAS-containing manure is spread on land, PFAS can transfer into the soil and growing plants, and according to recent research, water acts as "a perfect avenue" for PFAS. <https://michiganadvance.com/2023/12/07/sampling-research-breaks-down-pfas-contamination-pathways-in-food-sources/> Thus, CAFO water pollution can perpetuate the cycle of PFAS uptake into the bodies of the animals or humans who drink that water, and/or eat plants grown in PFAS-laden soil. The state does not currently have a program for testing PFAS levels in soil or manure.

21 The majority of CAFOs in Michigan—especially dairy and hog operations—generate liquid or slurry waste and use wet manure management systems. Many poultry operations produce and apply dry CAFO waste, called litter. But egg facilities also generate significant volumes of wash water, which is also applied to fields and is heavily laden with phosphorus and other pollutants.

22 See Kleinman, J.A. et al., Phosphorus Fate, Management, and Modeling in Artificially Drained Systems. Journal of Environmental Quality (2015); Wang, Y.T. et al, Solid Cattle Manure Less Prone to Phosphorus Loss in Tile Drainage Water. Journal of Environmental Quality (2018); Hauda, Jessica K. et al, Adsorption Media for the Removal of Soluble Phosphorus from Subsurface Drainage Water. International Journal of Environmental Research and Public Health (2020) ("Soluble P (SP) from subsurface drainage is nearly all bioavailable and is a significant contributor to freshwater eutrophication."); Letter of J. Weatherington-Rice re: Ohio's phosphorus TMDL for the Maumee River, available at: https://elpc.org/wp-content/uploads/2023/03/ELPC-Maumee-TMDL-comments-FINAL.pdf (see Exhibit 1).

23 Although tile drainage was installed hundreds of years ago, it is systematically replaced on farmland to ensure that it functions properly. Farmers can receive federal subsidies to install tile drainage because it is considered a "conservation" practice according to the USDA NRCS. See *Drainage Water Management Practice Standard 554*, Drainage Water Management (Ac.) (554) Conservation Practice Standard | Natural Resources Conservation Service. <https://www.nrcs.usda.gov/resources/guides-and-instructions/drainage-water-management-ac-554-conservation-practice-standard> If you've ever driven past a farm fields that is being dug up and huge coils of rolled-up white plastic are visible, you are probably seeing tile drainage being installed.

24 Figure 1.a from Valayamkunnath, P., Barlage, M., Chen, F. et al. Mapping of 30-meter resolution tile-drained croplands using a geospatial modeling approach. Sci Data 7, 257 (2020). https://doi.org/10.1038/s41597-020-00596-x

25 According to USDA soil scientist Frank Gibbs, "The problem is simple. We're watering manure down to where it behaves like water. Let me repeat that. We're watering manure down to where it behaves like water. You don't need to be a rocket scientist to understand that." He recommended requiring at least 8% solids (most liquid waste is around 2% solids). See Frank Gibbs: Liquid Manure is Too Wet, by David Green, Stateline Observer, Aug. 20, 2006.

26 Subwatershed number 040500050504, called the "Reynolds and Sessions Drain-Maple River" subwatershed.

27 Subwatershed number 040801030304, called the "Pinnebog River" subwatershed.

28 See the Michigan EGLE *E. coli* Total Maximum Daily load, available here: <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/GLWARM/TMDL-Ecoli/statewide-ecoli-tmdl.pdf?rev=0f276901de2345698fb8ee58db46d218&hash=C2BFDB612E229A1BD3CEAFA0D15ABE78>, at p. 98, 103.

29 See NoCAFOs.org, *Monitoring Projects: 2001-2020* <https://nocafos.org/water-sampling-data>; Environmentally Concerned Citizens of South Central Michigan (ECCSCM), a non-profit organized to educate the public on the health risks and the environmental damage of CAFOs, also tested for orthophosphate, nitrates, ammonia, dissolved oxygen, and temperature.

30 ECCSCM has compiled more than 4,700 documented violations of water quality standards from just 12 CAFOs between 2001-2021. <https://nocafos.org/violations>

31 See Dr. Tim Boring's keynote address, starting at around 8:10, available at: 2023 WLEB Conference: Keynote Address (youtube.com).

32 See Dr. Tim Boring's keynote address, starting at around 8:20, available at: 2023 WLEB Conference: Keynote Address (youtube.com).

33 See Dr. Tim Boring's keynote address, starting at around 9:00 and 14:00, available at: 2023 WLEB Conference: Keynote Address (youtube.com).

34 33 U.S.C.. § 1362(14).

35 *Waterkeeper Alliance, Inc. v. U.S. EPA*, 399 F.3d 486 (2d Cir. 2005) and *National Pork Producers Council v. U.S. EPA*, 635 F.3d 738 (5th Cir. 2011).

36 292 Mich App 106; 807 NW2d 866, 889 (2011).

38 Const 1963, Art IV, § 52

39 MCL 324.1701 et seq

40 MCL 324.101 et seq

41 MCL 324.3103; 324.3106

42 Mich Admin Code, R 323.1041, et seq

43 Mich Admin Code, R 323.2101, et. seq

44 Mich Admin Code, R 324.2196

45 In the contested case proceedings for the 2020 General CAFO Permit, a member of EGLE's staff testified that the original 2005 permit was based on "standard industry practices, instead of establishing new requirements from the water quality perspective."

46 See https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Laws-Rules/EGLEs-Rulemaking-Process-Overview.pdf?rev=683f3d57c6ab450bbcf6ac072e6a084f.

47 See a description of the procedural and factual background of the lawsuit in the amicus brief filed by ELPC and a coalition of other community and environmental groups, available here: <https://elpc.org/wp-content/uploads/2023/02/Amicus-Brief.pdf> at pp. 23-25.

48 Search https://www.opensecrets.org/federal-lobbying. The Farm Bureau's close ties to the fossil fuel industry and its work advocating for climate denialism are well-documented. https://insideclimatenews.org/news/24102018/farm-bureau-climate-change-denial-farmers-crop-insurance-subsidies-drought-future-at-risk/

49 Other large lobbying organizations include Tyson Foods, Pork Producers Council, Milk Producers Federation, etc.

50 The current General CAFO Permit allows CAFOs to choose between a vegetative buffer or a setback.

51 The current General CAFO Permit requires incorporation under certain circumstances (e.g., applying waste to frozen or snow-covered ground).

52 The current General CAFO Permit allows CAFOs to choose between a vegetative buffer or a setback.

53 PFAS chemicals in biosolids have led to problems for some farmers, including in Michigan. According to EGLE, some PFAS chemicals have made their way into biosolids through wastewater treatment plants that have received discharges of PFAS chemicals from industrial and commercial sources (including manufacturers of firefighting foam, cookware coatings, etc.). <https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/Biosolids/biosolids-pfas-facts-landowners-farmers.pdf?rev=641c693b-d1c24188a5a12a83704302cf> Because PFAS chemicals build up in the environment and are very difficult to destroy if they make their way to wastewater treatment plants, they will also make their way into biosolids. <https://www.technologyreview.com/2023/10/26/1082292/

the-race-to-destroy-pfas-the-forever-chemicals/> Then, when biosolids are spread onto farmland as fertilizer, they will transmit those PFAS chemicals into the soil, where they will continue to persist and accumulate. Some farmers who have historically used biosolids as fertilizer have later found their land to be contaminated with the chemicals. One farm in Michigan was shut down in 2022 due to PFAS contamination, but the problem is nationwide. <https://www.dtnpf.com/agriculture/web/ag/livestock/article/2022/05/06/michigan-farm-cautionary-tale-pfas> A group of senators from New Hampshire and Maine introduced bipartisan legislation to try to address this problem, called the "Relief for Farmers with PFAS Act." <https://www.shaheen.senate.gov/news/press/shaheen-helps-reintroduce-bipartisan-bill-to-support-farmers-affected-by-pfas>

54 See this video at approx. 8:48 ("We met our aspirational 20% reduction through the point source reductions.") https://youtu.be/z9nCkLcEz4w?si=7xSvtPBFV3jkYRLd&t=528

55 A report by the Alliance for the Great Lakes has estimated that "a family of five in Toledo is paying close to an additional $100 per year to deal with HABs." https://greatlakes.org/wp-content/uploads/2022/05/FINAL-COI-Report-051622.pdf

56 See MCL 286.473.

57 See MCL 286.473b.

58 See MCL 286.474(4).

59 Although the specifics of the requirements embodied in the GAAMPs are beyond the scope of this report, there are a number of critical changes that must be made to the GAAMPs themselves, including: (1) implementing neighboring property setbacks, (2) considering cumulative impacts on a given water body when determining where a new CAFO or AFO can be located in the Siting GAAMPs, (3) sufficiently considering water quality impacts in the Manure Management GAAMPS, and (4) explicitly prohibiting direct connections between production area wastewater and tile drainage systems.

60 The USDA's Natural Resources Conservation Service (NRCS) administers a number of conservation programs that pay agricultural producers to implement certain "conservation practices," including manure storage lagoons, nutrient management plans, buffer strips, and other common BMPs. Michigan's list of available practices can be reviewed in the Field Office Technical Guide.

61 The occupational groups were: (1) fishing and hunting workers (part of the Farming, Fishing, and Forestry major occupational group); and (2) farmers, ranchers, and other agricultural managers (Management major group). <https://www.cdc.gov/mmwr/volumes/69/wr/mm6903a1.htm.>

62 For 1992-2022 data, see the 2022 Agricultural Census data for Michigan available here; for the 1987-2017 data, see the 2017 Agricultural Census Data for Michigan available here: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Michigan/st26_1_0001_0001.pdf

63 *Id.*

64 These calculations are based on two sources. CAFO numbers from EGLE reflect that, as of 2020, there were 271,079 dairy cows being confined on 127 different CAFOs. https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=0fae269e1c45485f876c99391403bd3e (click on the "Attribute Table" arrow to pop up the data table). Additionally, the most recent USDA agricultural census data reflects that as of 2022, there were 436,254 diary cows residing on 1,481 different farms. https://www.nass.usda.gov/Publications/AgCensus/2022/index.php

65 According to MSU, tourism is a $20+ billion industry in Michigan, accounting for over 214,000 jobs, "[i]f the tourism industry did not exist in Michigan, the cost to each household would be in the order of $640 per year." https://www.canr.msu.edu/news/michigans_tourism_industry_continues_to_grow A recent study by the National Oceanic and Atmospheric Administration showed that HABs cause $82 million annually in economic losses in fishing and tourism. https://coastalscience.noaa.gov/news/cscor-provides-testimony-to-congress-in-support-of-harmful-algae-and-hypoxia-law/#:~:text=Harmful%20algal%20blooms%20and%20hypoxia%20cost%20the%20U.S.,approximately%20%2482%20million%20per%20year%2C%20according%20to%20NOAA.

66 After Microcystin contaminated its drinking water in 2014, Toledo had to invest hundreds of millions of dollars to

upgrade its water utilities. One study determined that an average family in Toledo has to pay an additional $100 per year in water costs due to ongoing HAB outbreaks. https://greatlakes.org/wp-content/uploads/2022/05/FINAL-COI-Report-051622.pdf

67 Proximity to CAFOs has been demonstrated to have negative impacts on property values. A 2015 article examined a number of studies and empirical data about property values and concluded that there was a negative valuation impact of up to 26% for nearby properties, for an estimated total negative impact on property values in the United States of $26 billion. http://www.greenfieldadvisors.com/wp-content/uploads/2015/08/animaloperationsJKwinter2015.pdf The article noted that properties immediately abutting a large livestock operation could be diminished as much as 88%.

68 Most agricultural work is difficult, low-paying, and often dangerous. According to a 2023 ProPublica piece, dairy farms are among the most dangerous job sites in America, and worker injuries and deaths are rarely investigated. https://www.minnpost.com/other-nonprofit-media/2023/10/dairy-workers-on-wisconsins-small-farms-are-dying-with-many-deaths-never-investigated/ EGLE conducted a study in 2006 about the health impacts of working on a CAFOs, noting that negative health effects such as respiratory disorders, cardiovascular complications, and premature death were "well documented." https://www.michigan.gov/-/media/Project/Websites/mdhhs/Folder1/Folder50/CAFOs-Chemicals_Associated_with_Air_Emissions_5-10-06.pdf?rev=ac7b6d7bb56c4b85a378ce8fb9a30442

69 According to the Department of Labor, the number of minors employed in violation of child-labor laws in 2023 was more than double what it was in 2021 and more than five times what it was in 2015. https://www.dol.gov/agencies/whd/data/charts/child-labor In particular, the Labor Department found at least 102 children had been illegally employed at meat processing facilities. USDA's Secretary of Agriculture Tom Vilsak sent a letter to the meat and poultry industry, calling on it to "help reduce systemic violations and abuses" of child labor laws. https://www.usda.gov/sites/default/files/documents/usda-letter-combating-illegal-child-labor.pdf

70 In 2018, two dairy workers died in a fire at farm-provided housing in southwest Michigan. A year later, the Michigan Department of Civil Rights commissioned a report about conditions impacting migrant and seasonal workers, warning that the state needed to increase oversight of dairy worker housing. https://www.michigan.gov/mdcr/-/media/Project/Websites/mdcr/msfw/progress-report-2019.PDF?rev=a5621e9c8cb7402486b438a9e4dfa823&hash=0A78B6ABF1F65E66FAA81119EB5E8831 The state has not done so. Currently, for the vast majority of dairy workers living in employer-provided housing, there is no oversight for the safety of their living conditions. A recent article highlighted the legislative changes that need to be made. https://www.bridgemi.com/michigan-government/michigan-dairy-farm-housing-invisible-workers-suffer-state-looks-other-way

71 Many aspects of life inside a CAFO are considered harmful to animals and contrary to their natural behaviors, including: serial, forced pregnancies followed by forced separation of mother and child; inability to roam or move, which can lead to self-harm and/or aggression between animals; light and air deprivation; risk of heat stroke and suffocation; debeaking, dehorning, castration, and tail docking. https://www.sierraclub.org/sites/default/files/2023-08/SC%20CAFOs-Farm%20Animal%20Cruelty%20by%20Design.pdf

72 See Michigan's 2022 Integrated Report, available at: <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/GLWARM/IR/2022-Integrated-Report.pdf?rev=0b7c9c7ae69d4c04930a65959b9aaf20&hash=6500C5867EA4BFE2CFA3647A3084EFD5> ("While Michigan remains strongly committed to reducing phosphorus loadings to western Lake Erie as outlined in the Domestic Action and Adaptive Management Plans, the development of a TMDL will be the likely route forward if target reductions leading to the support of designated uses are not met by the 2025 goal of the Collaborative Agreement.").

73 See Dr. Boring's keynote address at the 2023 Conference, here, at approx. 2:40.

74 *Frank Gibbs: Liquid Manure is Too Wet*, by David Green, Stateline Observer, Aug. 20, 2006.

75 40 C.F.R. 122.23(a) & (d)(1)

76 Mich Admin Code R 323.2103(m)(i)

77 See BRIEF ON APPEAL OF APPELLANT-CROSS-APPELLEE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY, Michigan Supreme Court No. 165166 (Court of Appeals No. 356088), filed on July 26, 2023.

78 In the contested case hearing challenge to the 2020 CAFO permit, EGLE staff testified that the existing winter restrictions are "ineffective because there have been continued issues with winter spreading and runoff, land application in general, and lack of proper waste tracking. We also have seen additional water bodies listed as impaired, in part due to our ineffective control of CAFOs. Farms have continued to exploit the weaknesses of the permit by winter spreading when it is not necessary, and have created additional entities to avoid retaining responsibility for their waste."

79 Mich Admin R. 323.2196(1).

80 See the Tri-State Fertilizer Recommendations, at p. 27. https://www.canr.msu.edu/soilfertility/Files/Main-page/FINAL%20PRINT.pdf

81 The 2015 CAFO Permit allows application up to 150ppm on the Bray-1 scale, which is the equivalent of about 202 on the Mehlich-3 scale. Older versions of the Tri-State Recommendations used the Bray-1 scale, but the current versions use the Mehlich-3 scale, which is considered 35% higher than Bray phosphorus values. See Tri-State Fertilizer Recommendations (msu.edu) at 31. https://www.canr.msu.edu/soilfertility/Files/Main-page/FINAL%20PRINT.pdf

82 See this article describing a "drag hose system that will typically deliver manure from hog or dairy lagoons or pits up to three miles for application on farmland," which includes a GPS tracker which which can track both location and application rates. https://www.manuremanager.com/precision-pumping-2850/

83 "Production areas" of a CAFO include barns, milkhouses, manure lagoons, leachate pads, storage sheds, and any other buildings or structures "used for animal product production activities." Production areas are distinguished from "land application" areas, which are fields on which CAFO waste is applied. 2015 CAFO Permit (Permit No. MI0010000 at 23-24). https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/CAFO/MIG010000-General-Permit-2020.pdf?rev=cb5d071f0e174361a17d69a143419f9d

84 MSU has developed a tool called EnviroImpact which predicts the likelihood of runoff based on precipitation, temperature, soil moisture, and landscape characteristics. https://enviroimpact.iwr.msu.edu/ This tool can even identify frost depth up to four inches below ground.

85 See, for example State v. Brenner (March 2024) https://www.michigan.gov/ag/-/media/Project/Websites/AG/releases/2024/March/JD-Brenner-Farms-Complaint-Exhibits-Filled-2024-02-28.pdf State v. Hoolloo (March 2022) https://www.michigan.gov/ag/news/press-releases/2022/03/28/ag-nessel-takes-action-against-holloo-farms-on-behalf-of-egle (currently pending in appellate court).

86 This section of the report analyzes data that was accessed from the MiEnviro portal on February 9, 2024 (available at https://mienviro.michigan.gov/nsite/map/export/filtersv) by setting the site type filter to "Concentrated Animal Feeding Operations" (CAFOs), revealing a total of 358 historic CAFOs. This data includes site details such as site ID, name, address, city, zip code, and geographical coordinates. The data only goes back to 2015.

87 For purposes of this calculation, a violation was considered "resolved" if it had been assigned a status of either: (1) "Inactive-Resolved," which is EGLE's terminology for violations that have been closed out through a formal, escalated enforcement process (lawsuits, legal settlements, etc.), or (2) "Addressed – Not Resolved," which is EGLE's terminology for violations that have been closed out through informal processes (i.e., it did not require escalated enforcement to bring the CAFO back into compliance with its permit).

88 MCL § 324.1511(1).

89 See MiEnviro's "Disclaimer" on the Site Map Explorer: https://mienviro.michigan.gov/nsite/map/help.

90 EGLE Policy No. 04-003A.3.a.

91 MCL 324.3106

92 See MCL 324.3103; MCL 324.3106 (EGLE must "protect and conserve the water resources of the state" and "**take all appropriate steps** to prevent any pollution the department considers to be unreasonable and against public interest") (emphasis added).

93 MCL 286.474(4).

94 See MDARD and EGLE's Water Complaint Response Procedures dated January 2019.

95 Comments at WLEB December 2023 conference. <https://www.bridgemi.com/guest-commentary/opinion-we-cant-fix-lake-erie-until-we-force-farmers-stop-polluting>

96 Michigan's "quality of life" agencies — MDARD, EGLE, and Michigan Department of Natural Resources (DNR) — convened the State of the Western Lake Erie Basin Conference on December 12, 2023, which included presentations from EGLE about progress toward pollution reduction goals. The conference is available on YouTube at Michigan's Inaugural State of the Western Lake Erie Basin Conference (December 2023): https://www.youtube.com/playlist?list=PLkpBjHvzRryqATwY2eqAPjjAC4JkV8za2 The relevant chart can be viewed at approximately 8:50 in this video: https://youtu.be/z9nCkLcEz4w?si=se1Dzv_LBlhx5dCX&t=529

97 Ohio allocated roughly $80 million for just 2020 and 2021 on nutrient pollution via its H2Ohio program and it is nowhere near meeting its pollution reduction targets. <https://greatlakes.org/wp-content/uploads/2023/02/AGL_WLEB_AgReport_2023_Final-WITH-CHARTS.pdf> Maryland has reportedly spent over $6.5 billion over seven years to clean up the Chesapeake Bay, but state and federal leaders have acknowledged that they will not meet their 2025 clean-up targets. <https://www.npr.org/local/305/2022/01/07/1071255416/some-chesapeake-bay-states-are-missing-their-cleanup-goals>

98 See Dr. Boring's keynote address at the 2023 Conference, at approx. 3:00. https://youtu.be/fxLj3qYoTFg?si=R3m9IgBpOS1V-JKG&t=180

99 *Id.*

100 Every year, MDARD submits a MAEAP Legislative Program Report (available here: https://www.michigan.gov/mdard/about/reports-and-notices/boilerplate-reports), which includes a section called "Environmental Outcomes." However, these "outcomes" do not reflect actual, measured reductions in pollution. Rather, they reflect estimates of projected reductions based on hypothetical formulas that assign a set amount of pollution reduction to each BMP, regardless of where it is implemented, for how long, or how effectively. These formulas are inherently flawed and overestimate reductions because, among other things, they ignore the fact that tile drainage negates (or worse) any benefits associated with most BMPs promoted by MAEAP. Indeed, the academic literature notes that "reductions from BMP implementation predicted by models routinely over estimate measured reductions." (Osmond et al. 2012 https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.13010#jawr13010-bib-0018; Lintern et al. 2020 <ADD LINK HERE>); Confronting our Agricultural Nonpoint Source Control Policy Problem - Stephenson - 2022 - JAWRA Journal of the American Water Resources Association - Wiley Online Library https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.13010#jawr13010-bib-0013. These formulas also presume the continuous, ongoing use of these BMPs — apparently into perpetuity — despite the fact that MAEAP verification does not require any follow-up to ensure the practice is still being implemented. As a result, the purported pollution reductions that MAEAP touts are not reliable, and the state does not use them when calculating their actual phosphorus reduction achievements for the Great Lakes Water Quality Agreement.

101 MAEAP also purports to offer "regulatory protection" from needing to comply with nutrient reduction goals in TMDL zones but such protection can only be "granted" to non-CAFO farmers who would never be required to comply with mandatory reduction targets anyway. CAFOs, as NPDES permit holders, must comply with those permits and the Clean Water Act and cannot be granted a blanket exemption from TMDL requirements.

102 See 2023 WLEB Conference: Agriculture Environmental Assurance Program (youtube.com) Slide deck visible at 6:57.

103 Dozens of studies––including multiple literature reviews of those studies — have been published in the last 15-20 years examining the phenomenon of farmer resistance to voluntarily adopting conservation practices. For example, in this October 2022 article in Nature, academics from all over the globe — from Columbus, OH to Accra, Ghana — conducted a "scoping review" of nearly 18,000 papers which all studied "whether incentive-based programmes lead to the adoption of sustainable practices. . . ."

104 See presentation of Dr. Adam Reimer, Science Panel, available at: 2023 WLEB Conference: Farmer Engagement https://www.youtube.com/watch?v=IuzIE6G1yYg&list=PLkpBjHvzRryqATwY2eqAPjjAC4JkV8za2&index=18

105 See Dr. Tim Boring's keynote address, starting at around 9:40, available at: 2023 WLEB Conference: Keynote Address https://youtu.be/fxLj3qYoTFg?si=syp88gMtcII8lMvW&t=580

106 See Dr. Tim Boring's keynote address, starting at around 10:10, available at: 2023 WLEB Conference: Keynote Address https://youtu.be/fxLj3qYoTFg?si=JOyCAzL_ZJTRdJK7&t=610

107 See Dr. Tim Boring's keynote address, starting at around 10:30, available at: 2023 WLEB Conference: Keynote Address https://youtu.be/fxLj3qYoTFg?si=hrV-SsWJMdWTRFbH&t=630

108 MDARD absent when ag, conservation partners talk MAEAP | Michigan Farm Bureau Family of Companies https://www.michfb.com/about/news-media/mdard-absent-when-ag-conservation-partners-talk-maeap

109 Boegehold, Anna G. et al. Routine monitoring of Western Lake Erie to track water quality 2 changes associated with cyanobacterial harmful algal blooms (2023), at Figure 2. Available at: https://essd.copernicus.org/preprints/essd-2023-62/essd-2023-62.pdf.

110 A number of manure management technologies have been developed over the years, with limited adoption rates, including Varcor by Sedron technologies https://www.sedron.com/varcor/ (approximately ten in operation); Livestock Water Recycling https://www.livestockwaterrecycling.com/ (fewer than 30 in operation); and Super Soils a/k/a Terra Blue https://agresearchmag.ars.usda.gov/2010/aug/pigs/ (only a handful, if any, in operation).

111 Varcor, discussed in the endnote above, purports to solve this problem by having contractual agreements with commercial fertilizer retailers to sell the nutrients. These relationships are intended to guarantee that the nutrients will be sold as "high-end organic" fertilizers, which are not likely to be over-applied within a CAFO's watershed given their high cost. Again, there are only about ten Varcors in operation, but it is a technology worth watching to see whether the business model performs as hoped.

112 Ehsan Ghane of MSU, an agricultural engineering researcher, has recently been studying BMPs to specifically address nutrient loss through tile drains. So far, he has not uncovered any silver bullets, but his research is worth watching. See, Funding backs research on 'Edge-of-Field' drainage systems https://www.farmprogress.com/management/funding-backs-research-on-edge-of-field-drainage-systems

113 A 2020 paper published by MSU academics, inducing Dr. Ghane, identified various "filter media" that could theoretically be added to "drain water management systems" to catch and store nutrients – specifically, dissolved phosphorus. The researchers determined that "implementation costs" for adopting any of the filter media scenarios were "equal or greater than crop revenues." See Hauda, Jessica K. et al, Adsorption Media for the Removal of Soluble Phosphorus from Subsurface Drainage Water. International Journal of Environmental Research and Public Health (2020) ("Soluble P (SP) from subsurface drainage is nearly all bioavailable and is a significant contributor to freshwater eutrophication.")

114 See, e.g., https://farmandenergyinitiative.org/projects/biodigesters/anaerobic-digesters-faq/

115 For more information on digesters, review these reports (https://www.foodandwaterwatch.org/2024/01/07/what-is-biogas/, https://www.foodandwaterwatch.org/2024/01/09/the-big-oil-and-big-ag-ponzi-scheme-factory-farm-biogas/#why-is-it-greenwashing, https://www.foodandwaterwatch.org/2024/02/01/new-analysis-identifies-significant-methane-releases-at-california-mega-dairies/) and this article: https://www.circleofblue.org/2023/world/will-energy-from-manure-help-or-harm-water-quality-in-michigan/

116 Digesters can also be used to process other organic materials such as food waste, animal carcasses, and biosolids ("fertilizer" made from treated human waste).

117 'Renewable' natural gas may sound green, but it's not an antidote for climate change https://theconversation.com/renewable-natural-gas-may-sound-green-but-its-not-an-antidote-for-climate-change-138791; See also: this report from Food & Water Watch: https://www.foodandwaterwatch.org/wp-content/uploads/2024/01/RB_2401_LCFS_Methane.pdf; Flesch, T. K., Desjardins, R. L., & Worth, D. (2011). Fugitive methane emissions from an agricultural biodigester. Biomass and Bioenergy, 35(9), 3927–3935. https://doi.org/10.1016/j.biombioe.2011.06.009.; Miranda, N. D., Tuomisto, H. L., & McCulloch, M. D. (2015). Meta-analysis of greenhouse gas emissions from anaerobic digestion processes in dairy farms. Environmental Science & Technology, 49(8), 5211–5219. https://doi.org/10.1021/acs.est.5b00018: Hijazi, O. et al. (2016). Review of life cycle assessment for biogas production in Europe.

118 Flesch, T. K., Desjardins, R. L., & Worth, D. (2011). Fugitive methane emissions from an agricultural biodigester. Biomass and Bioenergy, 35(9), 3927–3935. https://doi.org/10.1016/j.biombioe.2011.06.009.; Miranda, N. D., Tuomisto, H. L., & McCulloch, M. D. (2015). Meta-analysis of greenhouse gas emissions from anaerobic digestion processes in dairy farms. Environmental Science & Technology, 49(8), 5211–5219. https://doi.org/10.1021/acs.est.5b00018: Hijazi, O. et al. (2016). Review of lifecycle assessment for biogas production in Europe. Renewable and Sustainable Energy Reviews. 54:1291-1300. http://dx.doi.org/10.1016/j.rser.2015.10.013; Bakkaloglu, S., Cooper, J., & Hawkes, A. (2022). Methane emissions along biomethane and biogas supply chains are underestimated. One Earth, 5(6), 724–736. https://doi.org/10.1016/j.oneear.2022.05.012

119 Kong, F., et al. (2023). Does the application of biogas slurry reduce soil N2O emissions and increase crop yield?–A systematic review. Journal of Environmental Management, 342: 118339. https://doi.org/10.1016/j.jenvman.2023.118339

120 See Montes, F., et al. (2013). Mitigation of methane and nitrous oxide emissions from animal operations: II. A review of manure management options. J. Anim. Sci. 91:5070–5094. https://doi.org/10.2527/jas.2013-6584; IPCC, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 10: Emissions from Livestock and Manure Management (2019). https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf See tbl 10.14

121 See https://foe.org/wp-content/uploads/2024/02/Factory-Farm-Gas-Brief_final-v2.pdf, at p. 6.

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