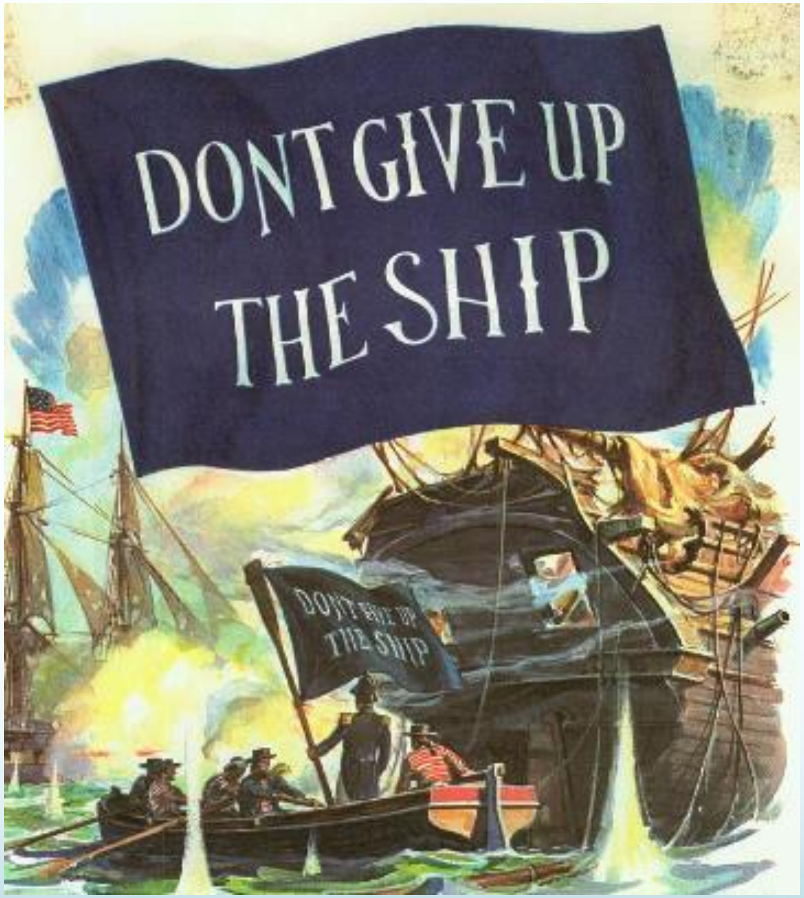
Lake Erie Advocates

Presents

3rd

“The^Battle for Lake Erie”

First Battle for Lake Erie
September 10, 1813



Second Battle for Lake Erie

1950s-60s: Citizen outrage builds as sewage and industrial waste create massive "dead zones"

1969: Cuyahoga River catches fire again

1970-72: Landmark Legislation

EPA
Clean water starts with you and ends with us.

Clean Water Act

Phosphorus

Third Battle for Lake Erie:

Factory "farms" and manure

Photo: ECCSCM

A catfish struggles for a breath in the algae-filled waters in Point Place in Toledo.

THE BLADE/ANDY MORRISON

Lake Erie

- Home to more than 1,500 species of plants and animals
- Prime migratory bird route

- Drinking water for over 13 million people
- Economic resource for multiple states and Ontario

Source: Ohio Environmental Council

Clean water is a right!

The lake belongs to everyone

No person or corporation has the right to impair our water

But factory ““farm’’ corporations do, when they use Lake Erie as a free toilet – and the public pays the cost

- **Toledo Water Customers pay $millions more every year for chemicals to treat drinking water.**
- **$50 million for ozonation, part of a $500 million water treatment plant upgrade**
- **Planned $100 million, billion-gallon reservoir to hold 20 days water supply**

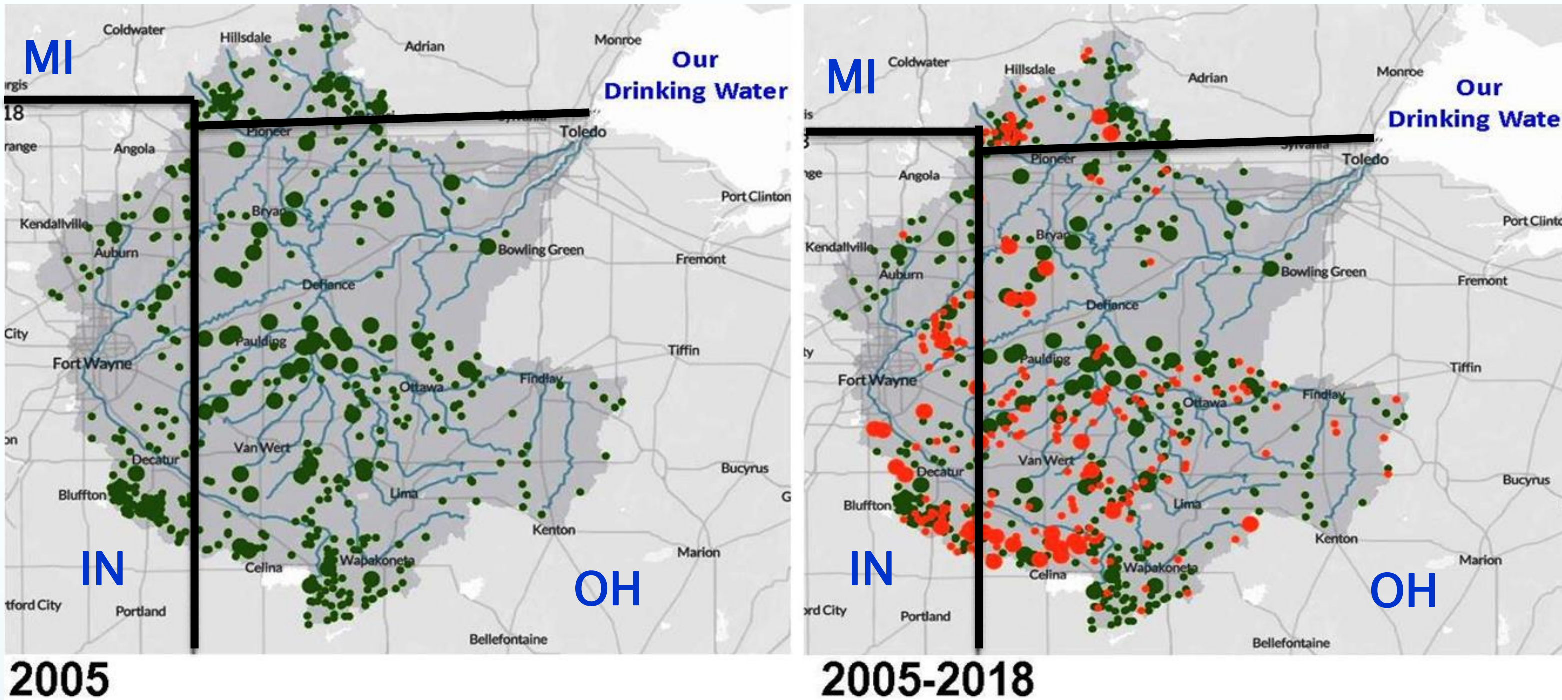
When factory ‘‘farm’’ corporations use Lake Erie as a free toilet

Photo taken during Toledo’s 2014 water crisis.
400,000 people without water for four days.

9 years later some people are still trying to find the problem!

800+ factory "farms" Western Lake Erie Watershed

- Animals increased from 9 to 25 million
- Phosphorus from commercial fertilizer use went down



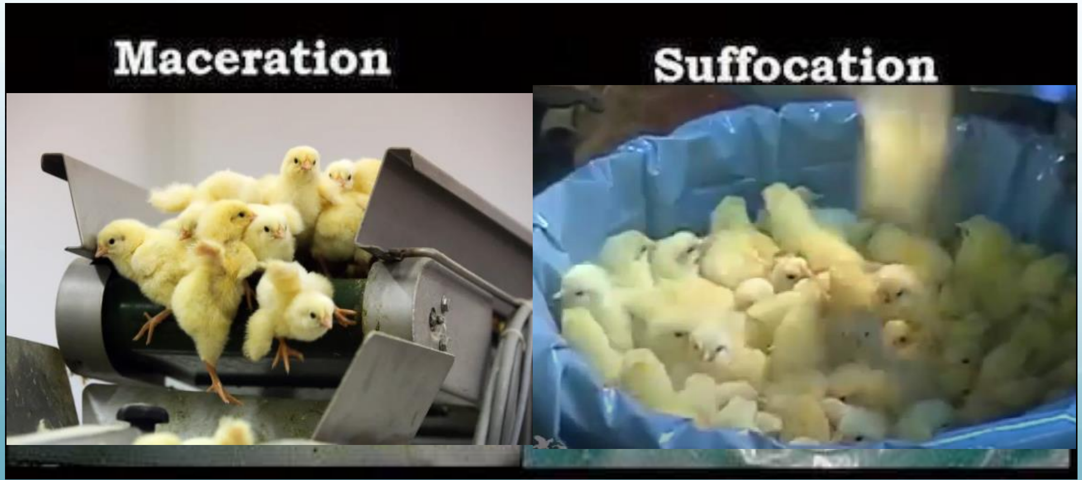
ewg

ENVIRONMENTAL LAW & POLICY CENTER

excrete Phosphorus equal to what's in all the sewage from <u>Ohio, Indiana, Chicago and Atlanta</u>

Inside factory "farms"

"Cage free"



Male chicks day 1


Gestation crates


Farrowing crate

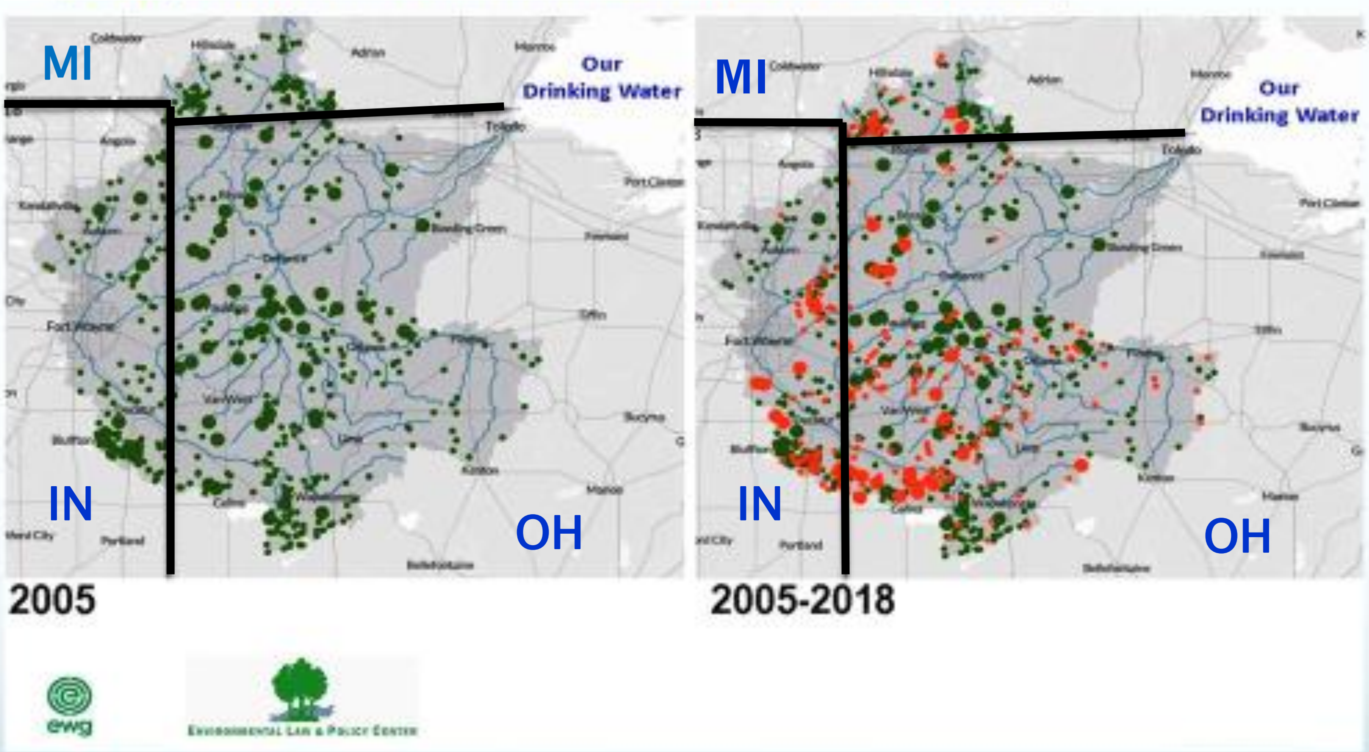

Open pens


Milking time

Veal calves in crates

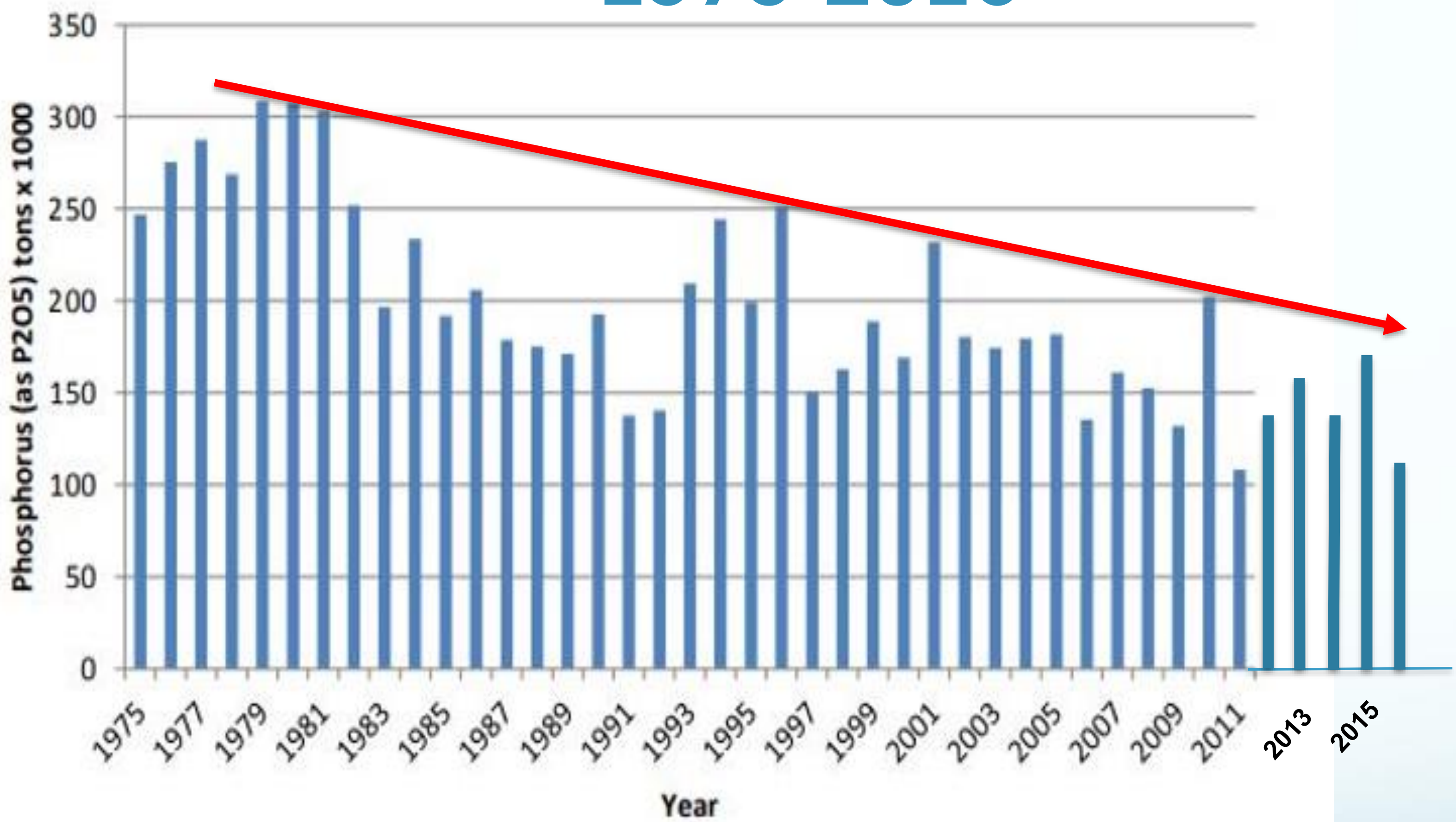
800+ factory "farms" Western Lake Erie Watershed

- Animals increased from 9 to 25 million
- Phosphorus from commercial fertilizer use went down



excrete Phosphorus equal to what's in all the sewage from
<u>Ohio, Indiana, Chicago and Atlanta</u>

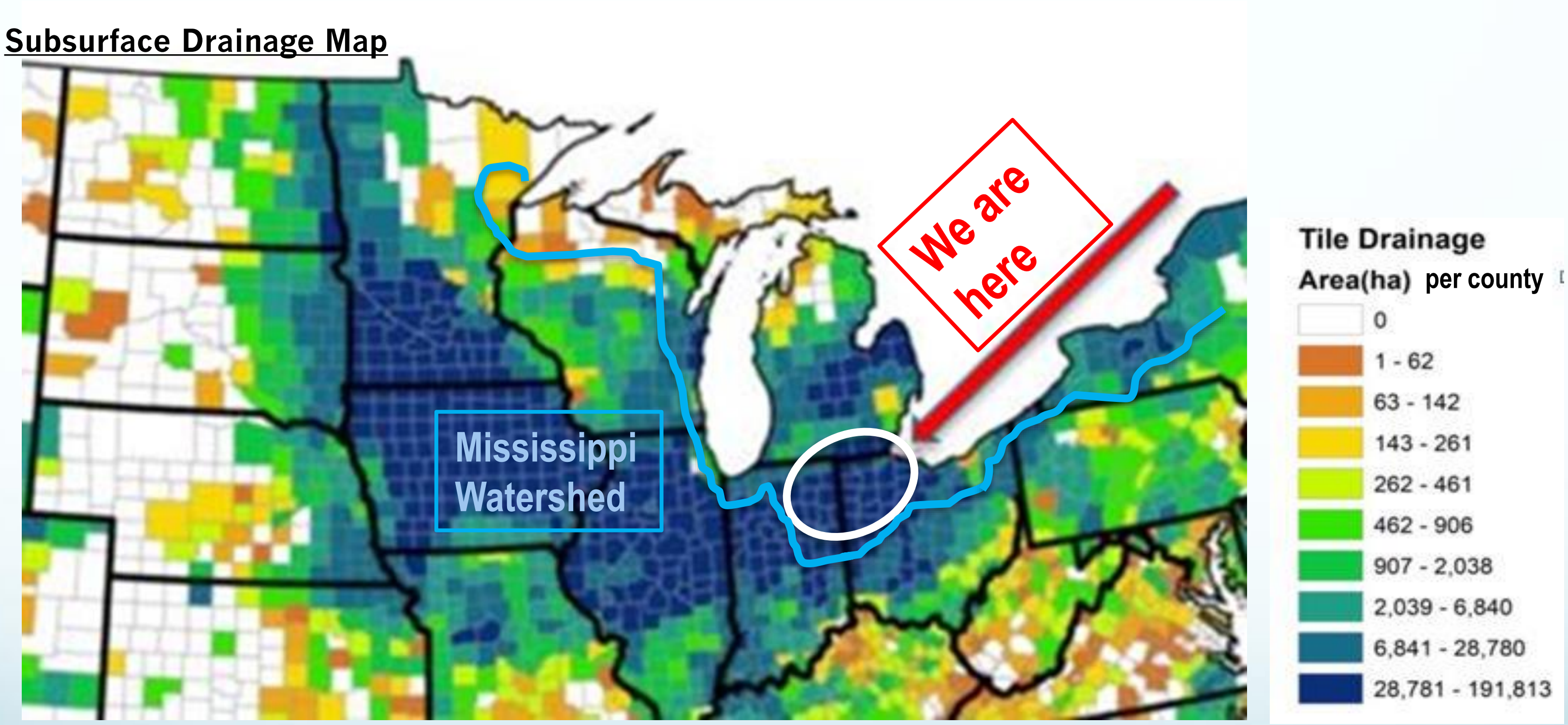
Ohio commercial fertilizer sales (P2O5) 1975-2016



Source: American Assoc. of Plant Food Control Officials

Lake Erie's perfect storm

- **Shallowest, warmest Great Lake**
- **Highest concentration of subsurface drains**
- **Annual "toxic algal blooms"**



Prasanth Valayamkunnath
National Center for Atmospheric Research

www.nature.com/articles/s41597-020-00596-x
Published 8/5/2020

In this case green is not good

- **Overabundance of nutrients**, primarily **Dissolved Reactive Phosphorus (P),** feed the **microcystis bacteria** (toxic algae), creating **microcystin toxins**

- **88% of excess nutrients in W. Lake Erie Basin from agriculture,* >50% of that via subsurface drainage.****

* OEPA: *Nutrient Mass Balance Study for Ohio's Major Rivers*

** USDA and Royal Swedish Academy of Sciences: *Phosphorus losses from monitored fields with conservation practices in the Lake Erie Basin*

How toxic is Microcystin?

Toxin	Dosage Required to Kill 50% of Lab Rats
Dioxin	0.000001 mg/kg/d
Microcystin LR **Liver toxin.** Nausea, vomiting, diarrhea, fever and death in high doses	**0.000003 mg/kg/d (3 millionth mg)**
PCBs	0.00002 mg/kg/d
Methylmercury	0.0001 mg/kg/d
DDT	0.0005 mg/kg/d
Cyanide	0.02 mg/kg/d
Chlorine	0.1 mg/kg/d

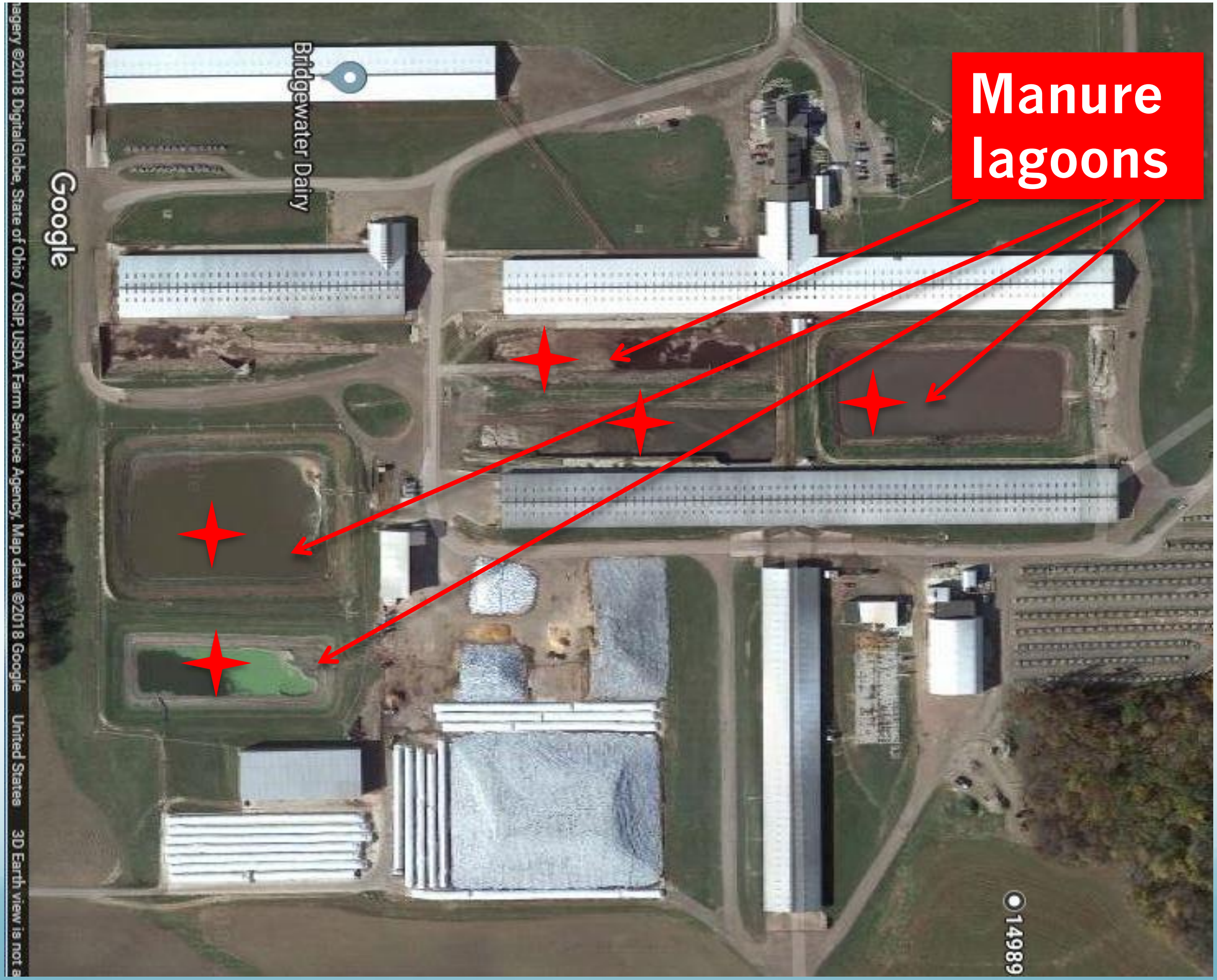
Treating the water makes it drinkable, but…

- Chlorination produces **carcinogens like Trihalomethanes.** Reducing it adds to water treatment costs -- $50M for ozonation at Toledo Water Treatment Plant

Source: Water Research Center

Now let's follow the manure…

3,900 cows at Bridgewater Dairy in Williams County, generate more waste every year than Perrysburg, Sylvania, Maumee, Defiance and Fremont, combined.



From manure lagoon to field with no treatment…

Photo: courtesy of ECCSCM

…through the soil, to underground drainage or surface runoff…

Photo: courtesy of ECCSCM

…into streams that feed Lake Erie…

Photo courtesy ECCSCM

… poisoning our Great Lake.

What we're doing doesn't work

- H2Ohio Practices <u>reduce</u> sediment, nitrates and TP
- Liquid manure + subsurface drainage + H2Ohio often <u>increase</u> DP

And here's the proof:

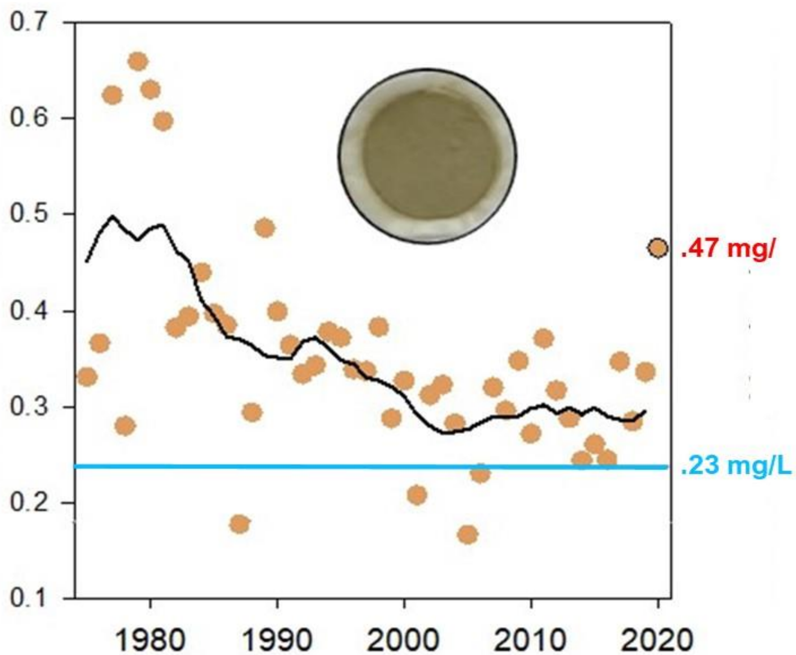
Maumee River in Waterville March - July

Flow-weighted mean concentrations (mg/L)

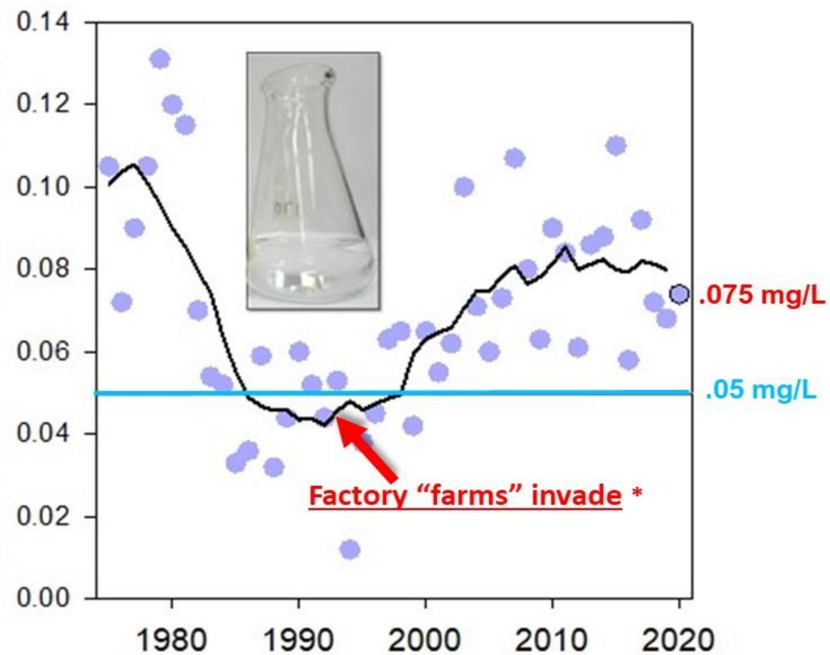
—— 5 – year running average

—— Concentration goal

Total Particulate Phosphorus



Dissolved Reactive Phosphorus



National Center for Water Quality Research
HEIDELBERG UNIVERSITY

* LEA note

Lake Erie Advocates recommends:

- **Recognize nature has rights**
  <u>Water is life, not property.</u>

- **There is no fixing this industry.**
  <u>Ban factory ““farms!””</u>

www.LakeErieAdvocates.org

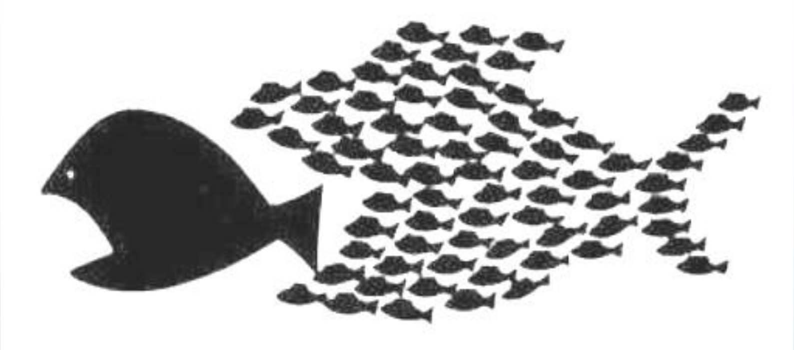
This is a political fight

- **Former OEPA Deputy Chief worked 19 years as Ohio Farm Bureau lobbyist.**
- **H2Ohio Best Mgt. Practices = Good money after bad**
- **Factory "farms" receive $$$billions in public support. Not so for sustainable ag.**
- **Big political decision: <u>who will pay to clean up Lake Erie?</u>**
  - **Farmers who've reduced their commercial fertilizer usage?**
  - **Water and sewer ratepayers who've already paid billions?**
  - **Factory "farm" corporations that use Lake Erie as a free toilet?**

www.LakeErieAdvocates.org

We can win…
we've done it before!

- In the 1960's Lake Erie was considered a dead lake.
- Concerned citizens demanded politicians do their jobs.
- Lake Erie was brought back to health!
- This time the problem is manure.
- **<u>The power of democracy can save Lake Erie again!</u>**



www.LakeErieAdvocates.org

What you can do

- **Spread the word** to friends, relatives, neighborhood groups, churches, unions
- **Get involved with Lake Erie Advocates.**
- **Think about what's on the end of your fork.**
- ***We are not going away until Lake Erie is healthy!***

www.LakeErieAdvocates.org

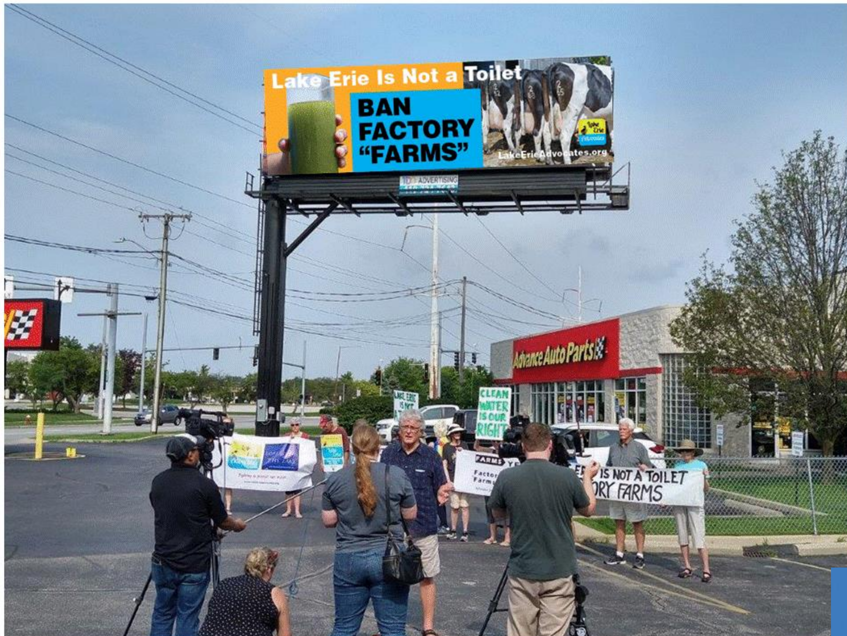
"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."

Margaret Mead

www.LakeErieAdvocates.org

Lake Erie Advocates

The following slides are for background and discussion


Lake Erie Is Not a Toilet
BAN FACTORY "FARMS"
LakeErieAdvocates.org
Advance Auto Parts
CLEAN WATER IS OUR RIGHT
IS NOT A TOILET


BAN FACTORY "FARMS"
Lake Erie Advocates
LakeErieAdvocates.org


Lake Erie Advocates
LAKE ERIE ≠ TOILET. BAN FACTORY FARMS


FIFTH

Great Lakes Watershed

Western Lake Erie Watershed


Mishka Henner, "Coronado Feeders, Dalhart, Texas," 2013

EXCERPTS FROM SCIENCE OF THE TOTAL ENVIRONMENT
1 DEC 2017, VOL 601-602, PGS. 580-593

A Review on Effectiveness of Best Management Practices (BMP) in Improving Hydrology and Water Quality: Needs and Opportunities

"Increasing numbers of BMPs have been studied in research projects and implemented in watershed management projects, but a gap remains in quantifying their effectiveness through time. In this paper, we review the current knowledge about BMP efficiencies, which indicates that most empirical studies have focused on short-term efficiencies, while few have explored long-term efficiencies."

Yaoze Lin, Bernard A. Engel, Dennis C. Flanagan, Margaret W. Gitau, Sara K. McMillan, Indrajeet Chaubey
engelb@purdue.edu 765.494.1162

tps://www.sciencedirect.com/science/article/abs/pii/S0048969717313207?via%3Dihub

Literature Citation	BMP's Reviewed	Reductions by BMP's	# Studies
Hoffman Et al 2009	Buffer Strips with overland flow	Dissolved Reactive P -71% to 95%	9
Dodd & Sharpley 2016	Buffer strips/ Constructed Wetlands	DRP -72% to 94%	6
	Grass Waterways	DRP -83% to 81%	2
Kay et al 2009	Buffer strips	DP -475% to 30%	11
	Wetlands	DP -33% to 33%	11
Roberts et al 2012	Vegetated Buffer strips	DRP -64% to 42.7%	5
Dinnes et al 2004	Drainage management	TP −100% to 50%	12
Dorioz 2006	Grass Buffer Strip	DP −83% to 93%	11

KANSAS STATE UNIVERSITY

Cover crop and phosphorus fertilizer management effects on phosphorus loss and nutrient cycling

Carver, Robert Elliott 2018
https://krex.k-state.edu/dspace/bitstream/handle/2097/39057/RobertCarver2018.pdf?sequence=3

Phosphorus (P) loss from non-point agricultural sources has been identified as a main contributor to degraded surface water quality throughout the United States. Excessive P inputs to surface waters can lead to eutrophication, increased water treatment costs, and negative health impacts. Therefore, agricultural best management practices (BMP) that promote water quality, through minimizing P loss, must be identified. Studies outlined in this thesis aim to determine the impacts of cover crops and P fertilizer placement on P loss in surface runoff and nutrient cycling in a no-till corn (Zea mays)-soybean (Glycine max) rotation and provide insight into how cover crop species selection and termination method affects potential P loss from crop tissue. The first study examined combined effects of cover crop and P fertilizer placement on total P, dissolved reactive P (DRP) and sediment losses in surface runoff from natural precipitation events. This large-scale field study was conducted near Manhattan, Kansas, at the Kansas Agricultural Watershed (KAW) Field Laboratory during the 2016 and 2017 cropping years. Two levels of cover crop **[no cover crop (NC) and cover crop (CC)]** and three levels of P fertilizer management [no P (CN), fall broadcast P (FB), and spring injected P (SI)] were used. Flow-weighted composite water samples were collected from precipitation events generating greater than 2.0 mm of surface runoff. Results from this study found the **Cover Crop treatment increased DRP losses compared to No Cover Crop** in both cropping years; however, CC reduced sediment loss by over 50% compared to NC. Application of P fertilizer increased DRP losses compared CN in both cropping years, although SI resulted in lower quantities of DRP loss compared to FB. In addition, this study found that CC reduced biomass and yield of corn compared to NC and therefore decreased nutrient uptake, removal, and deposition during the 2017 cropping year. However, no negative impacts of CC on biomass or yield were observed during the 2015 (corn) and 2016 (soybean) cropping years. Application of P fertilizer increased the concentration of Melich-3 P and total P in the top 0-5 cm of soil compared to CN; however, no differences between P fertilizer management practice were observed for concentrations of Melich-3 P at 5-15 cm. A greenhouse-based study determined the impacts of cover crop species (brassica, grass, and legume), termination method (clipping, freezing, and herbicide), and time after termination (1, 7, and 14 days after termination) on total P and water-extractable P (WEP) release from cover crop biomass. **Freezing increased WEP concentration of crop tissue by more than 140% compared to clipping and herbicide**. Additionally, at 7 and 14 days after termination, both concentration of WEP and fraction of WEP compared total P increased compared to 1 DAT. **Findings from these studies suggest the use of cover crops may unintentionally result in greater DRP losses in surface runoff**. However, addition of a cover crop can dramatically reduce erosion losses. In addition, cover crop species selection can directly impact the quantity of P being taken up and released by crop tissue. Understanding the impact of crop species selection may help create new BMPs which aim to reduce P loss.

U.S. DEPARTMENT OF AGRICULTURE

Swine Manure Injection with Low-Disturbance Applicator and Cover Crops Reduce Phosphorus Losses

J.L. Kovar, T.B. Moorman, J.W. Singer, C.A. Cambardella, M.D. Tomer

Journal of environmental quality 2011 v.40 no.2 pp. 329-336

https://pubag.nal.usda.gov/catalog/2329016

Abstract:

Injection of liquid swine manure disturbs surface soil so that runoff from treated lands can transport sediment and nutrients to surface waters.

We determined the effect of two manure application methods on P fate in a corn (Zea mays L.)–soybean [Glycine max (L.) Merr.] production system, with and without a winter rye (Secale cereale L.)–oat (Avena sativa L.) cover crop.

Treatments included: i) no manure; ii) knife injection; and iii) low-disturbance injection, each with and without the cover crop.

Simulated rainfall runoff was analyzed for **dissolved reactive P (DRP) and total P (TP).** Rainfall was applied 8 d after manure application (early November) and again in May after emergence of the corn crop.

Manure application increased soil bioavailable P in the 20- to 30-cm layer following knife injection and in the 5- to 20-cm layer following low-disturbance injection. The low-disturbance system caused less damage to the cover crop, so that P uptake was more than threefold greater.

Losses of DRP were greater in both fall and spring following low-disturbance injection; **however, application method had no effect on TP loads in runoff in either season**. The cover crop reduced fall TP losses from plots with manure applied by either method.

In spring, DRP losses were significantly higher from plots with the recently killed cover crop, **but TP losses were not affected.** Low-disturbance injection of swine manure into a standing cover crop can minimize plant damage and P losses in surface runoff while providing optimum P availability to a subsequent agronomic crop.

USDA

KUNGL. VETENSKAPS AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES

"Phosphorus losses from monitored fields with conservation practices in the Lake Erie Basin, USA"
http://link.springer.com/article/10.1007/s13280-014-0624-6/fulltext.html

Authors: Smith, Douglas; Francesconi, Wendy; Livingston, Stanley; Huang, Chi Hua
Prepared by: United States Department of Agriculture   Agricultural Research Service

From the Abstract:

No-tillage doubled SP loading compared to rotational tillage (e.g., tilled only before planting corn); however, no-tillage decreased TP loading by 69 % compared to rotational tillage. Similarly, **grassed waterways were shown to increase SP loads**, but not TP loads. A corn–soybean–wheat–oat rotation reduced SP loads by 85 % and TP loads by 83 % compared to the standard corn–soybean rotation in the region. We can potentially attain TP water quality goals using these Farm Bill practices; however, additional strategies must be employed to meet these goals for SP.

Subsurface tile

Early work with tile suggested that little P was transported via this pathway (Kladivko et al. 1991; Brady and Weil 1999). However, more recent work indicates that **significant amounts of P (40–50 %) can be transported through subsurface tile** (Schoumans and Breeuwsma 1997; King et al. 2014). Recent work in Belgium has shown that P leaching in watersheds occurs quicker than previously recognized (de Bolle et al. 2013). In a study of transport pathway from the fields used in the current study **20–80 % of the P lost was via the tile network** (Smith et al. 2014). Hodgkinson and Withers (2007) found that **between 31 and 55 % of P loss in three English headwater catchments occurred via tile drainage**. None of the conservation practices tested made an impact on concentrations and loads of SP or TP through subsurface tile discharge. Many conservation practices, including no-tillage, grassed waterway, and blind inlets, were primarily designed to minimize erosion from agricultural fields.

Conclusion:

Most of the conservation practices applied to fields were developed to decrease sediment loss from fields. While sediment losses were not explored in this paper, **when these practices were developed, the common knowledge was that if you stop the sediment you will stop the P. This mindset has been disproven.** No-tillage decreased surface runoff TP loads by 223 g ha^{-1} compared to rotational tillage, but SP was nearly double from no-tillage. Soluble P and TP were 34 and 52 g ha^{-1} less in surface runoff and tile discharge from the conservation crop rotation than the corn–soybean rotation. Grassed waterways decreased SP by 67 g ha^{-1} and TP by 42 g ha^{-1} in surface runoff. Blind inlets decreased SP and TP loads in surface runoff by 14 and 87 mg L^{-1}, respectively, compared to the tile risers.

Between 2005 and 2013, there were 36,112 ha of conservation practices applied within the 281,232 ha St. Joseph River watershed. On the land base of applied conservation practices, we estimate that SP was decreased from 2010 to 1670 kg P per growing season and TP was decreased from 15 200 to 6400 kg per growing season. This represents a decrease of 17 and 58 % in SP and TP loads, respectively, for the treated acres. Adoption of these practices on many fields predates the 2005–2013 period when we were able to collect these records, so it is difficult to discern how many more acres would need adoption of these practices to achieve the goal of a 39 % decrease in total P loading; however, it does appear that this level could be achieved through adoption of these practices. However, based on the relatively low impact on SP, it does not appear adoption of these practices will achieve the target of a 41 % decrease in SP loading to Lake Erie. Thus, our results concur with other reports in that greater adoption of these practices in addition to new strategies will need to be adopted in order to achieve water quality goals.

Journal of Environmental Quality

Phosphorus Mitigation to Control River Eutrophication: Murky Waters, Inconvenient Truths, and "Postnormal" Science

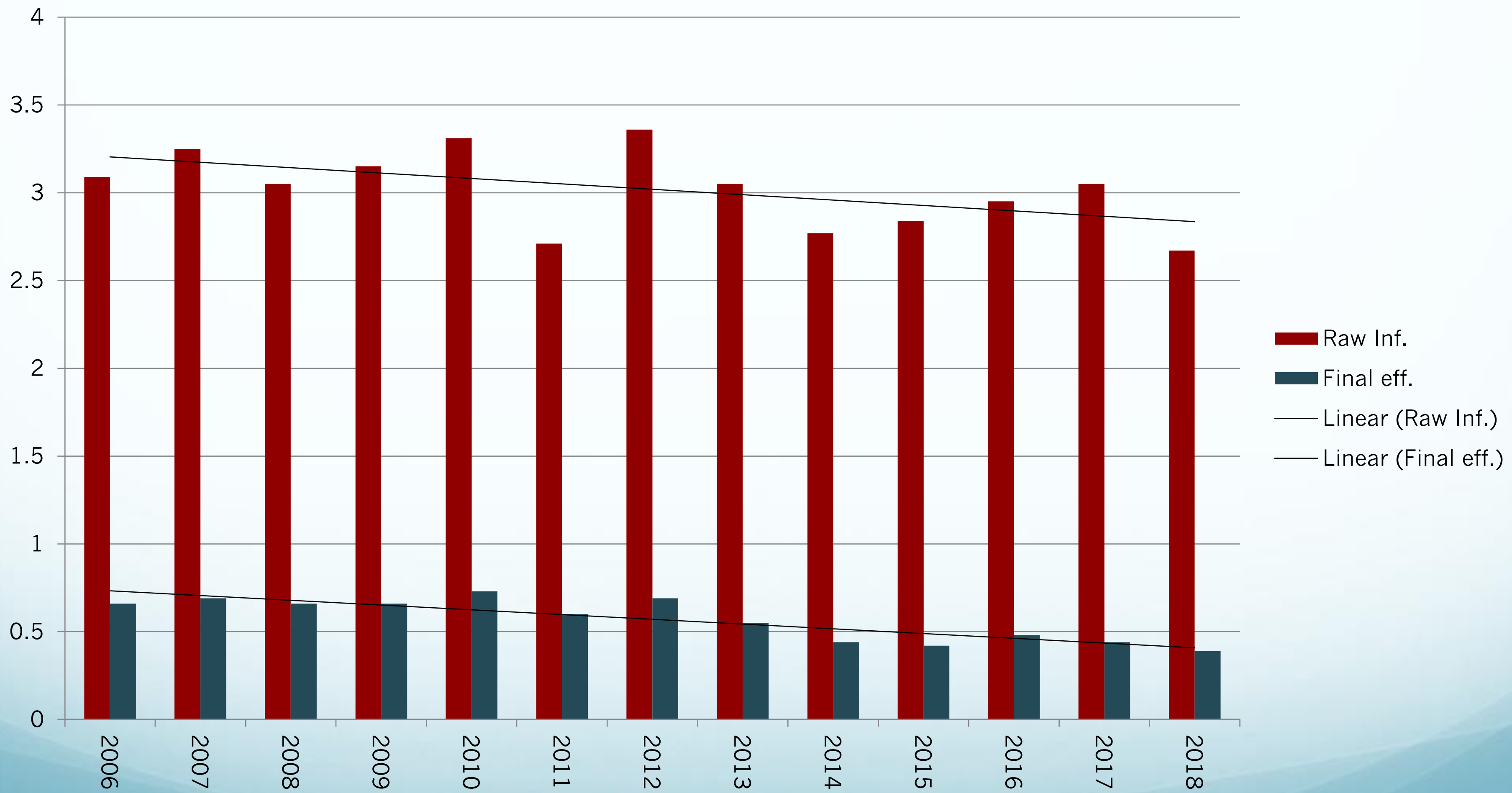
Helen P. Jarvie, Andrew N. Sharpley, Paul J. A. Withers, J. Thad Scott, Brian E. Haggard, Colin Neal March 2013

https://doi.org/10.2134/jeq2012.0085

For watershed management, P is regarded as the primary limiting nutrient for nuisance algal growth in freshwaters (Smith and Schindler, 2009), and over the last 40 years, mitigating P inputs from wastewater (point) and agricultural (nonpoint) sources has been adopted as the main watershed management tool to control freshwater eutrophication (Daniel et al., 1994; Sharpley et al., 1994).
However, eutrophication-control policies based solely on P are coming under increasing scrutiny as **evidence to support ecological improvements with P-based mitigation is proving elusive, especially regarding costly measures to reduce P loads from agriculture. Over the past four decades, many watershed nonpoint source projects have reported little or, in some cases, no net improvement in P loss reduction, even after extensive best management practice (BMP) implementation** (Meals et al., 2010). In some cases, reduced P concentrations, largely associated with point-source P controls, have resulted in improvements in river ecology (Bowes et al., 2011; Kelly and Wilson, 2004). **In other cases, however, even after dramatic reductions in river-water P concentrations have been achieved through P source mitigation, ecological improvements have not occurred and, in some instances, nuisance algal growth has actually increased** (Bowes et al., 2012; Jarvie et al., 2004; Neal et al., 2010b). The difficulties of demonstrating benefits of watershed management measures are not restricted to the impacts of reducing land-based P inputs on river eutrophication; more widely, **the successes and benefits of water resource management, river restoration, and agri-environment schemes have proved elusive** (Bernhardt and Palmer, 2011; Harris, 2012; Harris and Heathwaite, 2012).

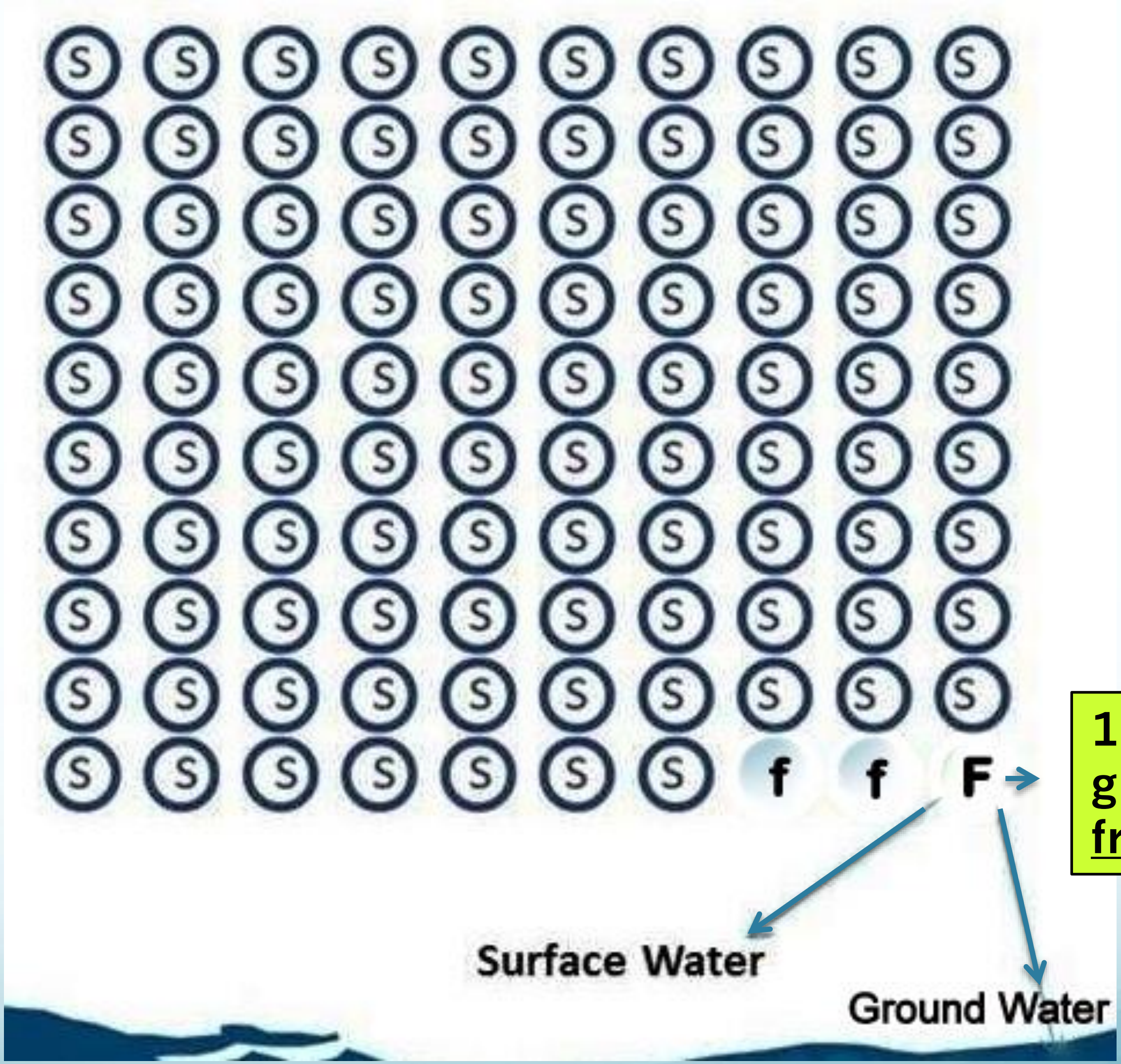
Bay View Wastewater Treatment Plant

Phosphorous: average raw and final effluent mg./liter 2006 - 2018



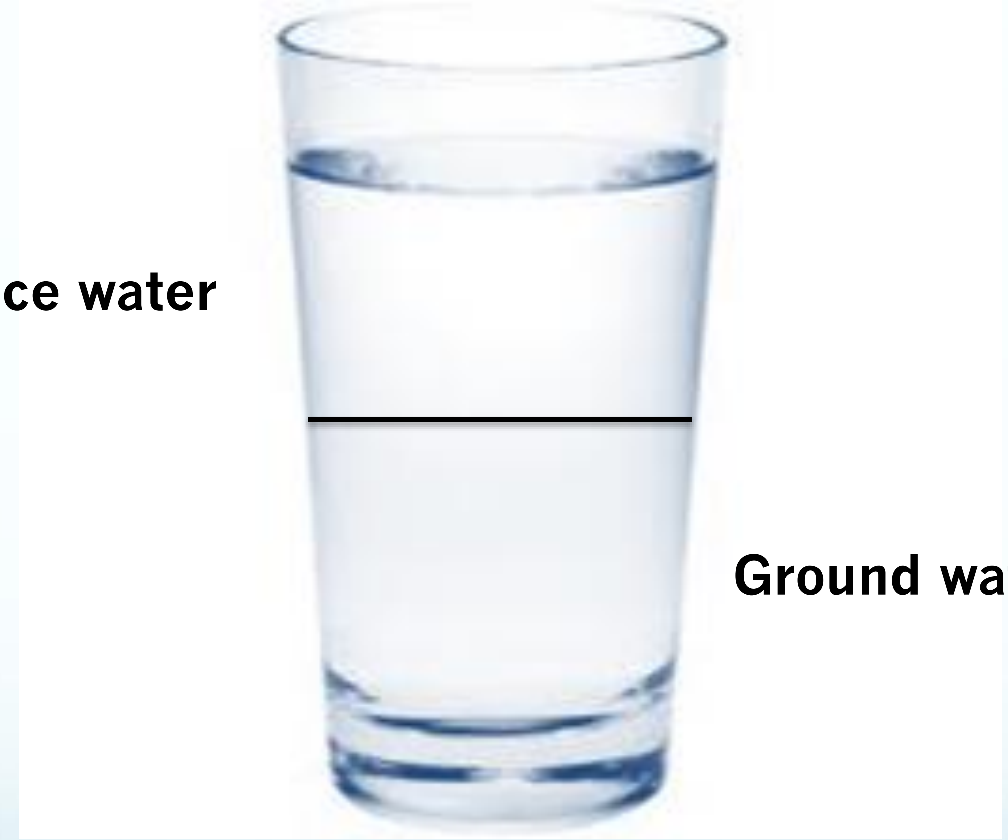
All Earth's Water in 100 Glasses

97 are saltwater

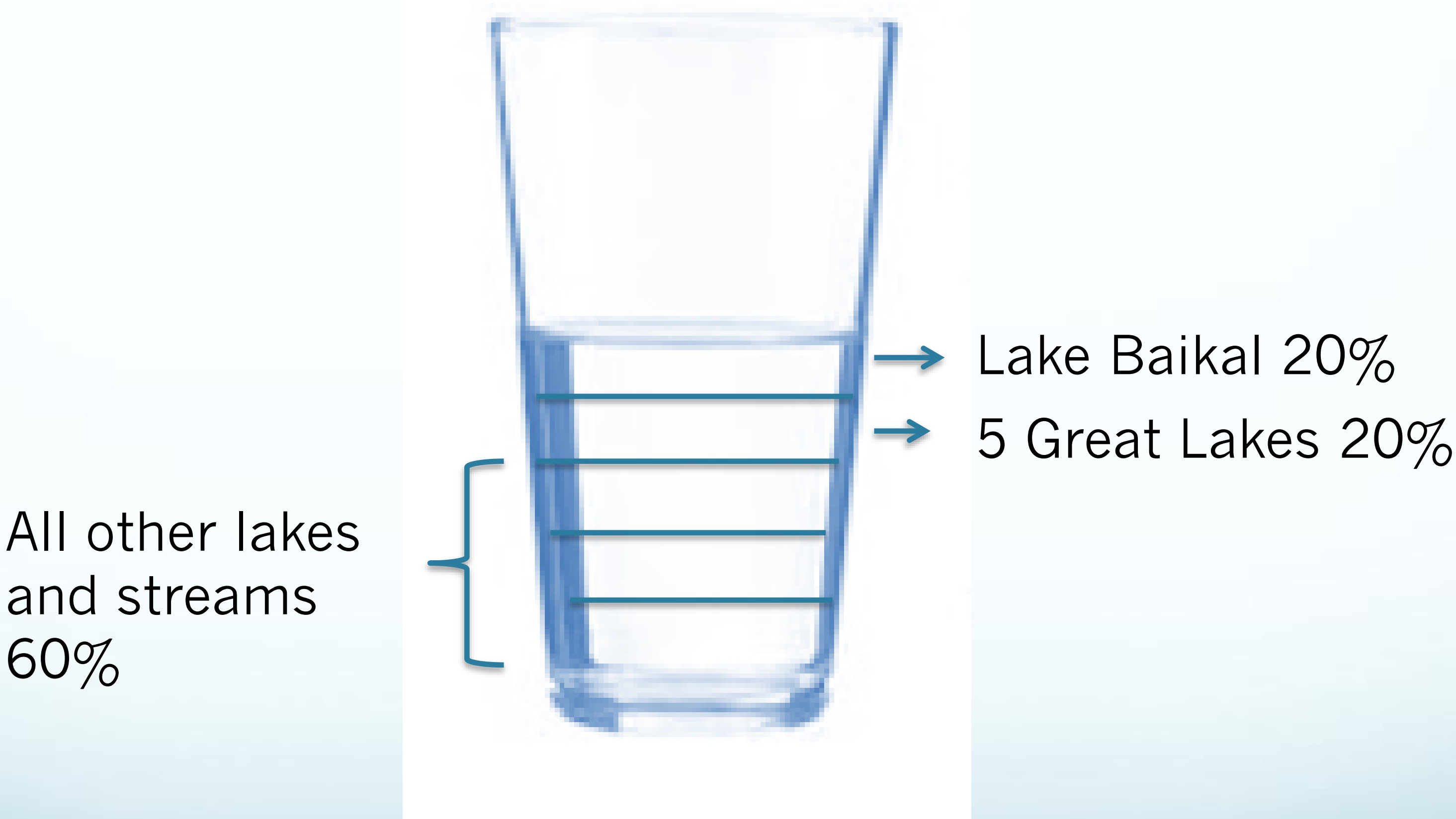


1 usable glass of <u>fresh</u> H2O

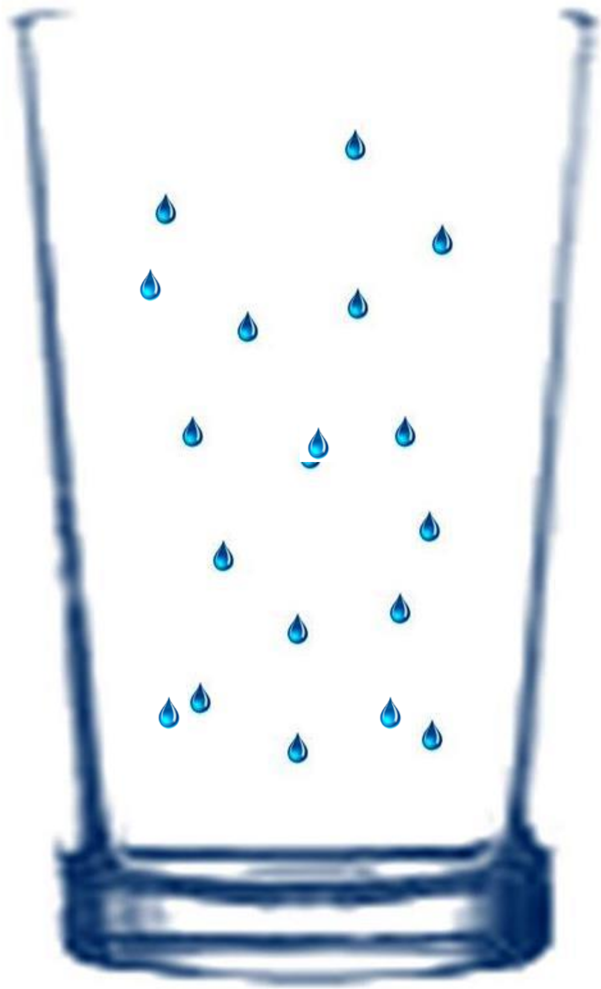
All Earth's usable, fresh water



All Earth's usable, fresh, surface water



Lake Erie’s share of Earth’s usable, fresh, surface water: 19 Drops



Your Tax Dollars At Work

Grand Lake St. Mary's

Celina Daily Standard 4-27-2018