Tracking Manure Management of Confined Operations in the Maumee Watershed

Jeffrey Kast

Harmful Algal Blooms: State of the Science: Toledo, OH

9/13/18

Manure Receiving Blame for Lake Erie HABs

COMMENTARY

It's the manure, stupid

BY KEITH C. BURRIS | COLUMNIST FOR THE BLADE

Published on July 17, 2015 | Updated 7:56 a. m.

Toledo Blade

Dairy farms taking a toll on Great Lakes, waterways

Bob Gross, Times Herald Published 6:15 p.m. ET April 23, 2016

Times Herald

Dairy Farm Pollution Fuels Lake Erie's Toxic Algae

By Emily Cassidy, Research Analyst

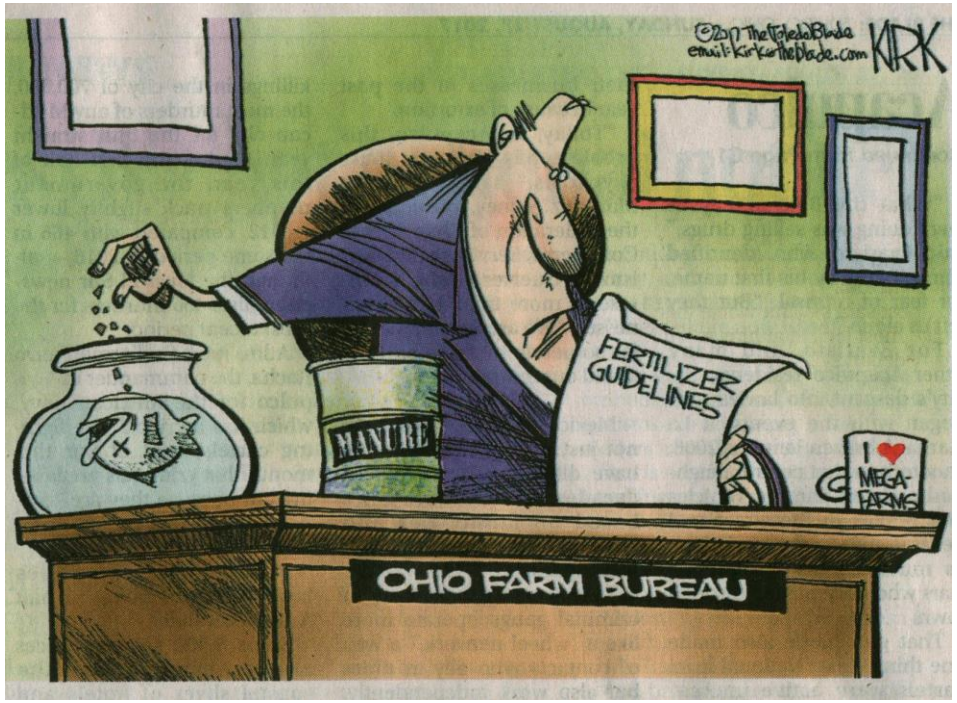
TUESDAY, MAY 3, 2016

Environmental Working Group

The Great Lakes Are Being Poisoned By Poop

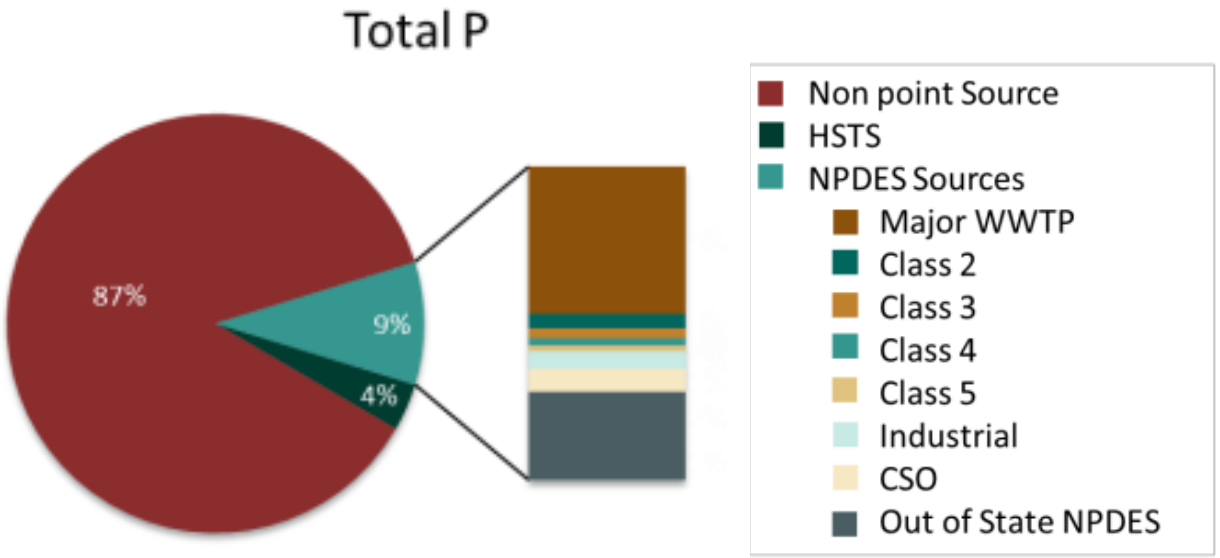
Posted By Jack Lessenberry on Wed, Jun 7, 2017 at 12:03 pm

Cleveland Scene Weekly



Toledo Blade, 2017

Agriculture = Main Source of Phosphorus in the Maumee River Watershed



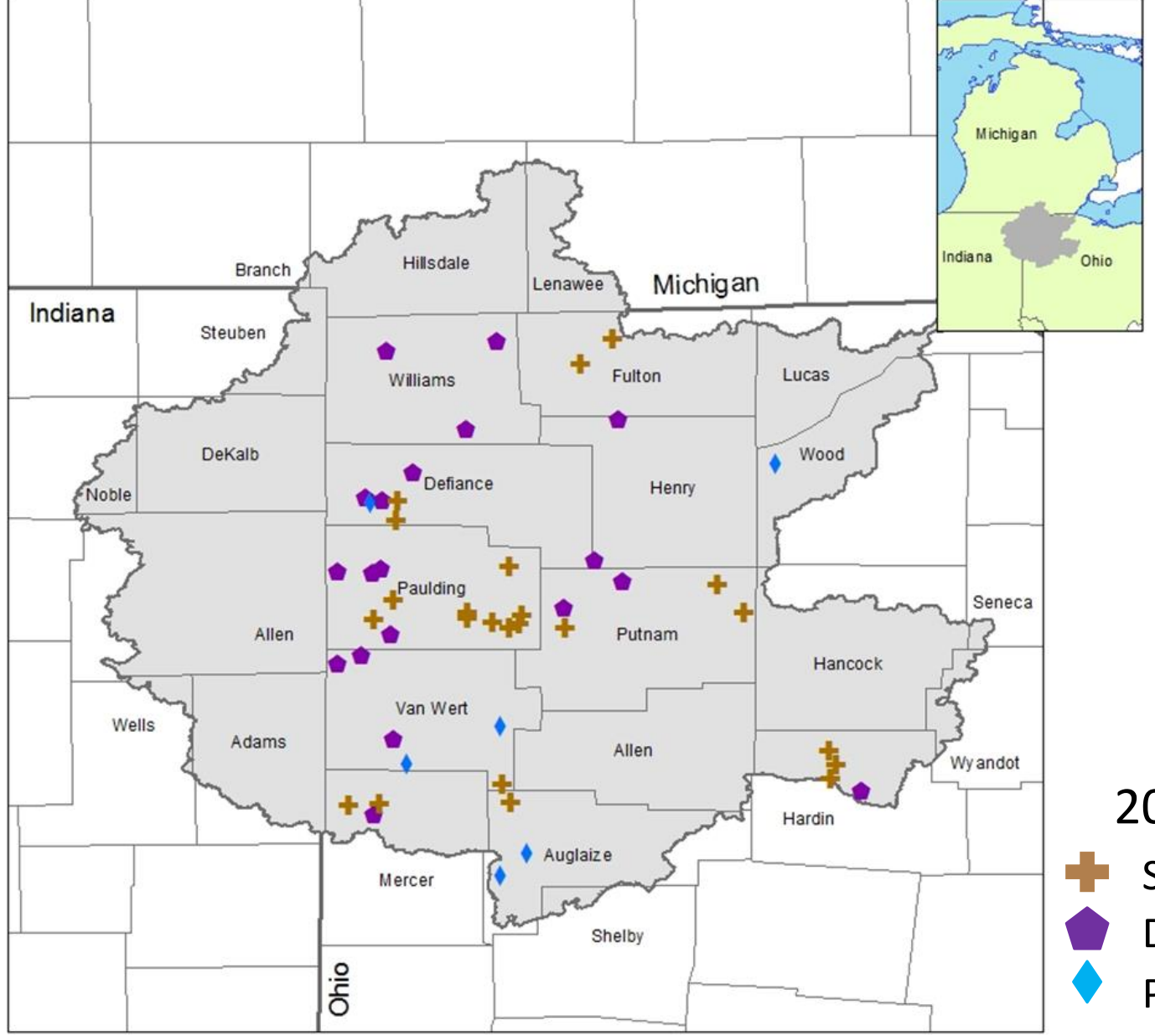
Ohio EPA, 2016

Manure Application Impacts?

1) Manure management: amount known vs. unknown?

2) How is manure managed?

3) Amount of Phosphorus reaching Lake Erie from manure sources?



2015 CAFFs

- Swine (n=23)
- Dairy (n=19)
- Poultry (n=6)

Amount of Manure Management that is Known vs. Unknown

CAFF vs. Non-CAFF Livestock In Ohio

CAFFs

Ohio Department of Agriculture

Livestock Environmental Permitting

>700 dairy cows
>2,500 swine more than 55 lbs
>10,000 swine less than 55 lbs
>82,000 laying hens

Non-CAFF Livestock

- ~80% of swine
- ~80% of cattle
- ~25% of poultry

70% of Manure Phosphorus

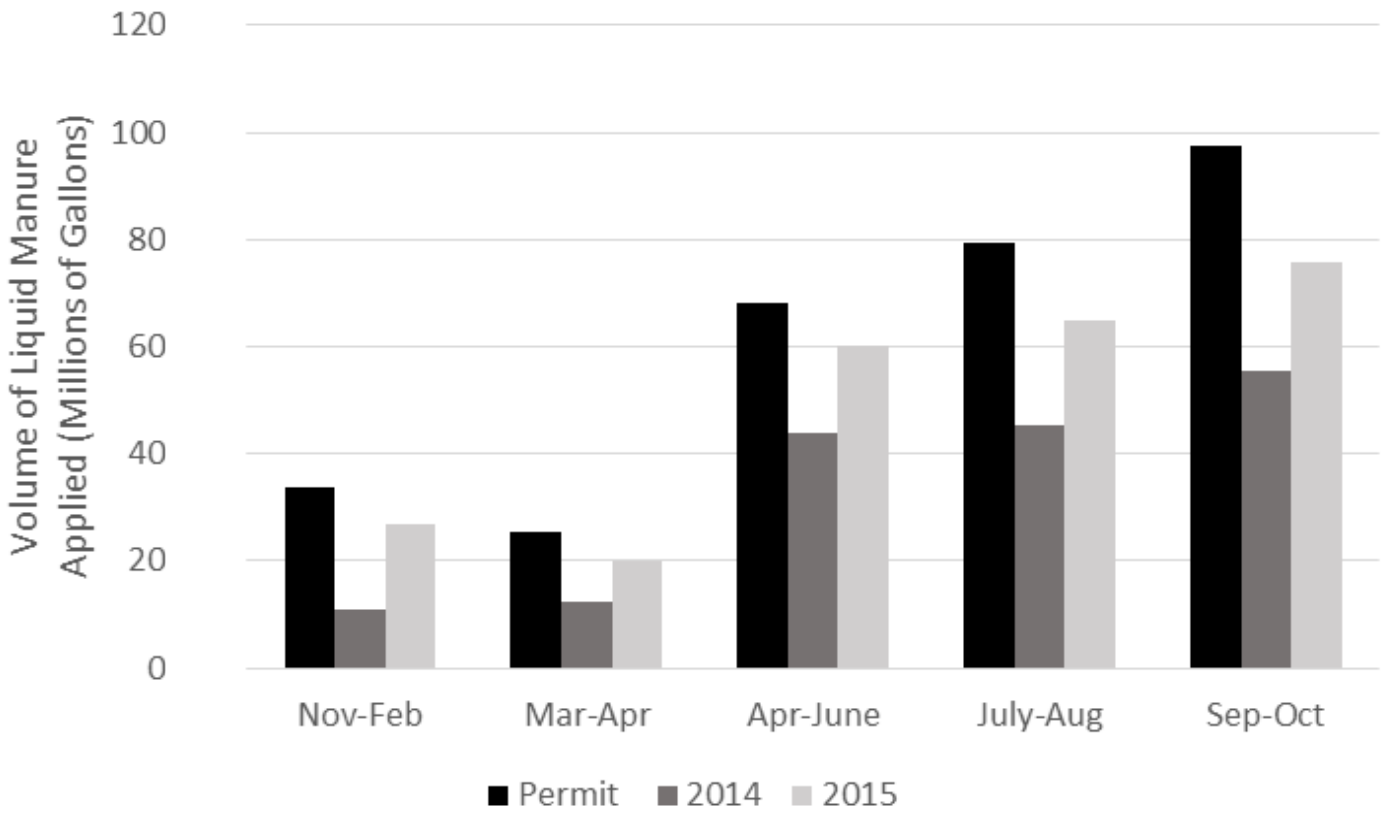
Most CAFF Manure Phosphorus is Managed Through D&U

CAFF Type	Distributed P_2O_5 (lbs)	% CAFF P_2O_5 Generated
Swine	380,000	34
Cattle	1,700,000	63
Poultry	4,500,000	100
Total	6,600,000	-

78% of CAFF Manure Phosphorus

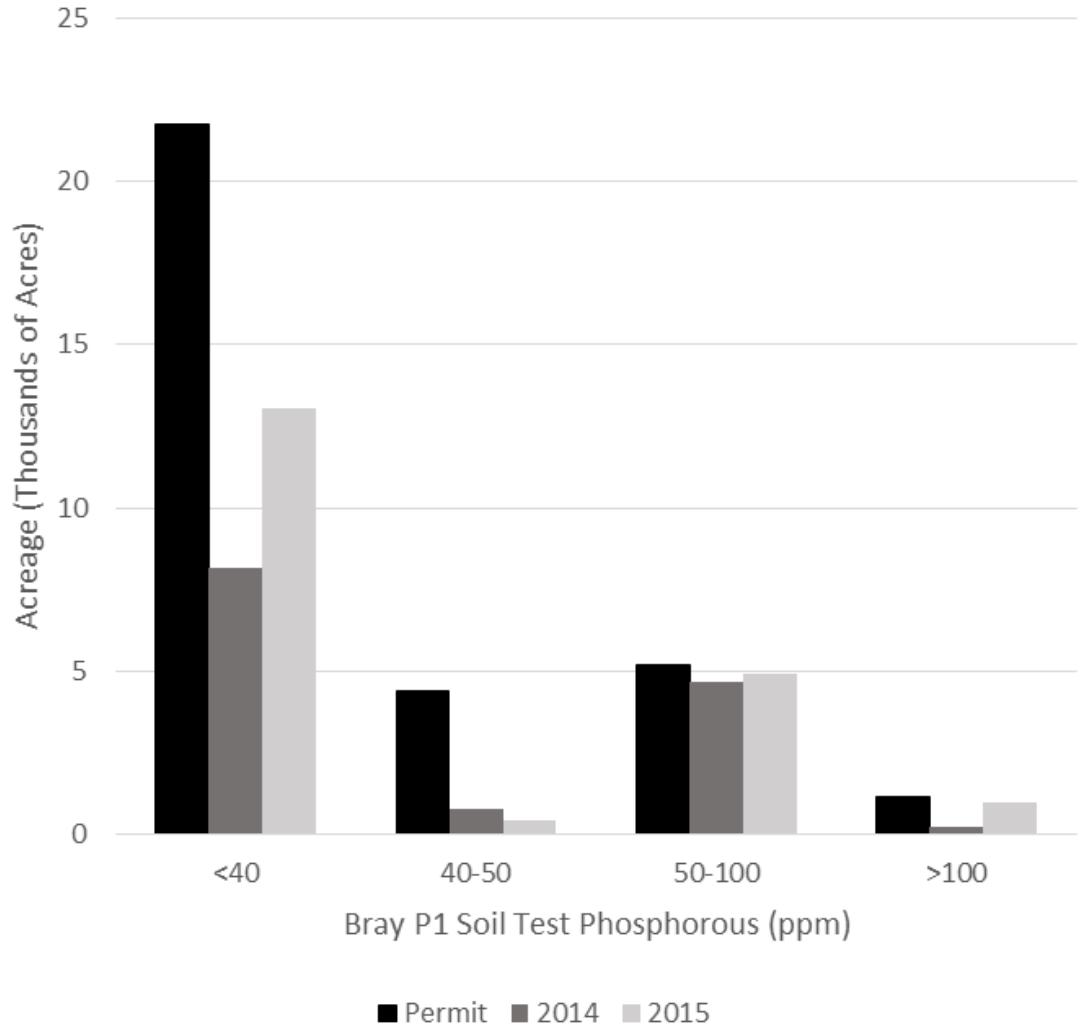
Manure Management of CAFFs

Liquid Manure Application Generally Followed Stated Permit Plans

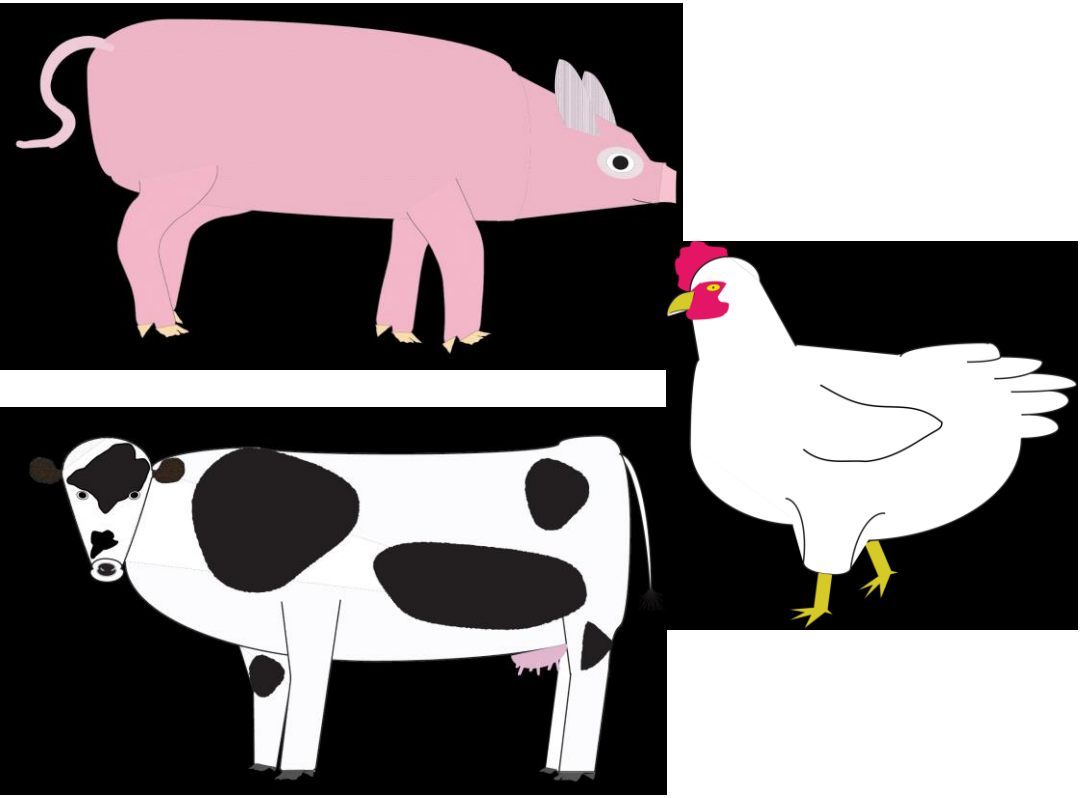


Majority of CAFF Controlled Acreage Receiving Manure had STP less than Tri-State Recommendations

- 2014: 64% of acres less than 50 ppm Bray P1
- 2015: 69% of acres less than 50 ppm Bray P1



Amount of Phosphorus Reaching Lake Erie from Manure Sources

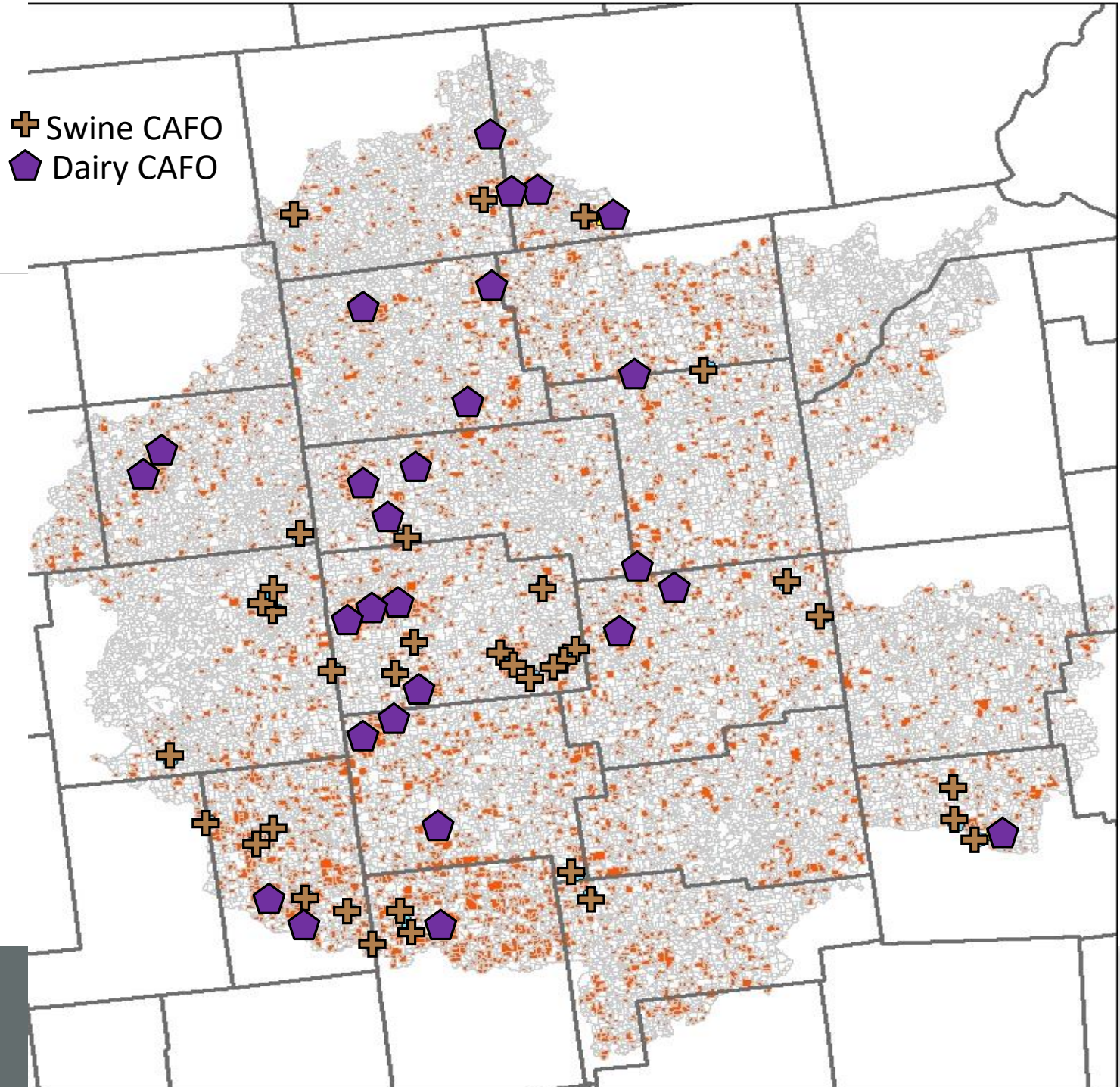


P?

Field-Scale Maumee SWAT Model

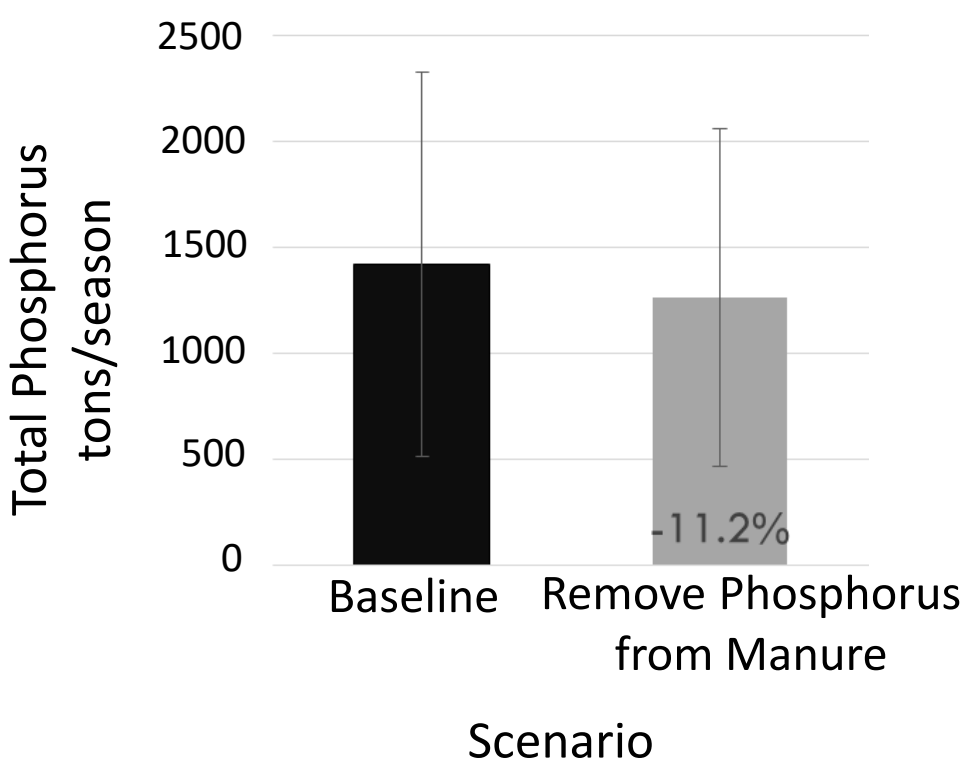
Improvements to better represent manure application practices in the Maumee

- CAFO generated manure constrained closer to facility
- Variability in manure application timing
- Local nutrient compositions

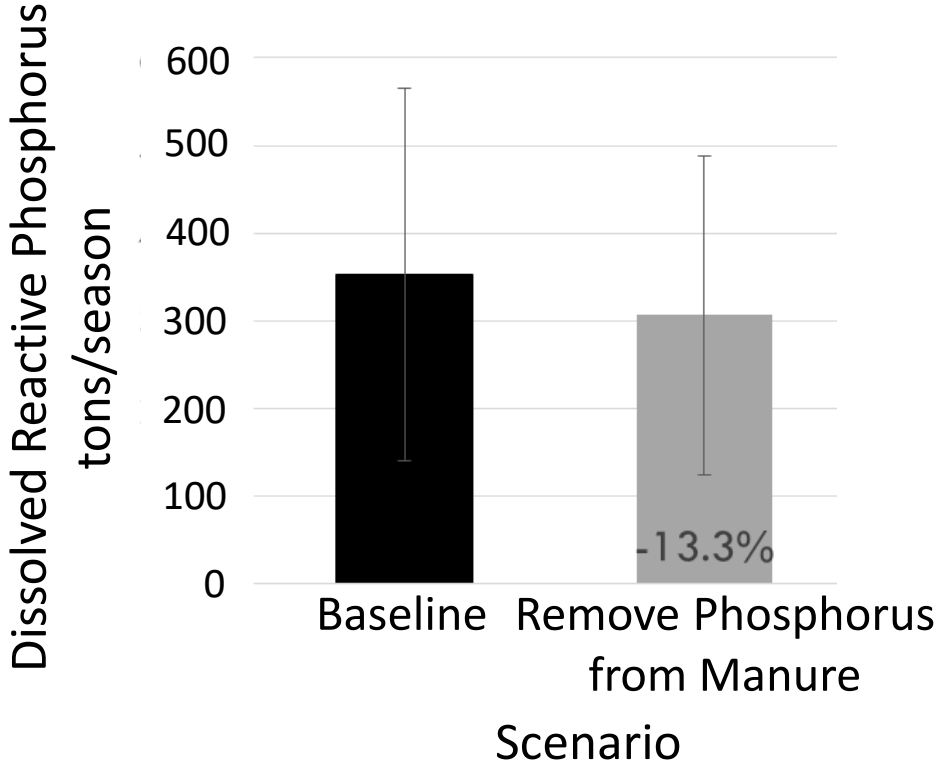


Simulated Spring P Contribution of Manure Applications is less than 40%

Total Phosphorus



Dissolved Reactive Phosphorus



Conclusions

1) Amount of manure management that is known vs. unknown?

Management of a majority of manure in the Maumee River watershed is not reported to ODA or publicly-available

- ~70% of P generated by livestock are from non-CAFF operations
- ~78% of P generated on CAFFs is planned to be distributed through D&U

2) Manure Management of CAFFs?

When CAFFs in the Maumee River watershed apply manure on fields under their control (owned or rented), they are following guidelines to minimize nutrient runoff

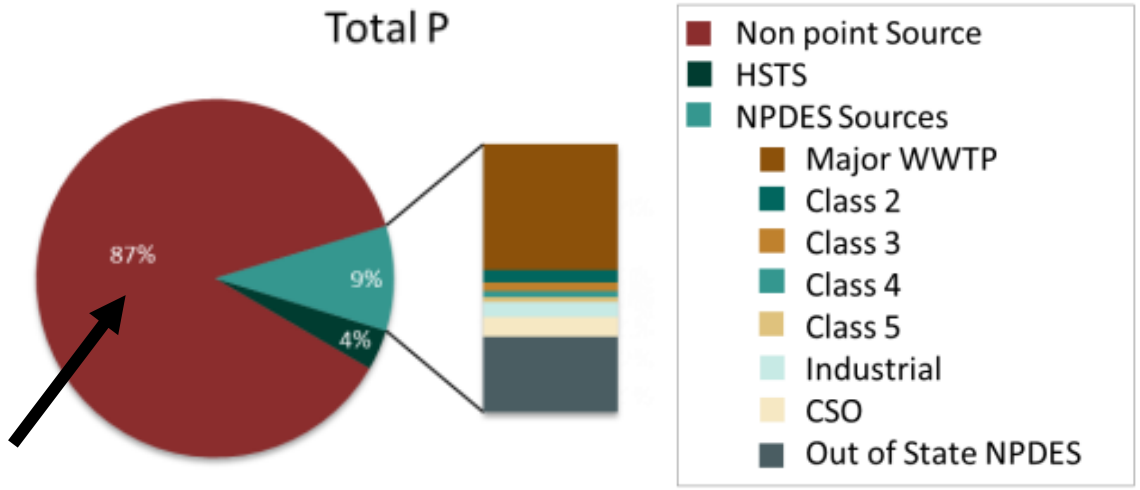
Conclusions

3) Amount of Phosphorus reaching Lake Erie from manure sources?

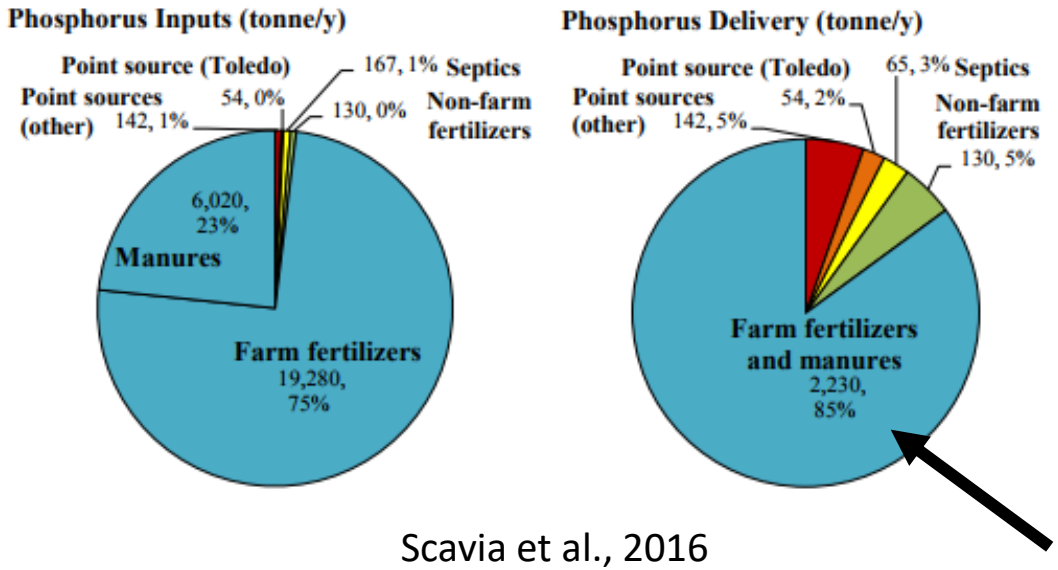
Watershed modeling results demonstrate that when phosphorus in manure is removed as a source, watershed loads reaching Lake Erie decrease by 11% for Total Phosphorus, and 13% for Dissolved Reactive Phosphorus

Manure application BMPs will be needed to be used in conjunction with other BMPs to reach downstream water quality targets (i.e., 40% reduction goal)

Agriculture is Main Source of Phosphorus in the Maumee River Watershed



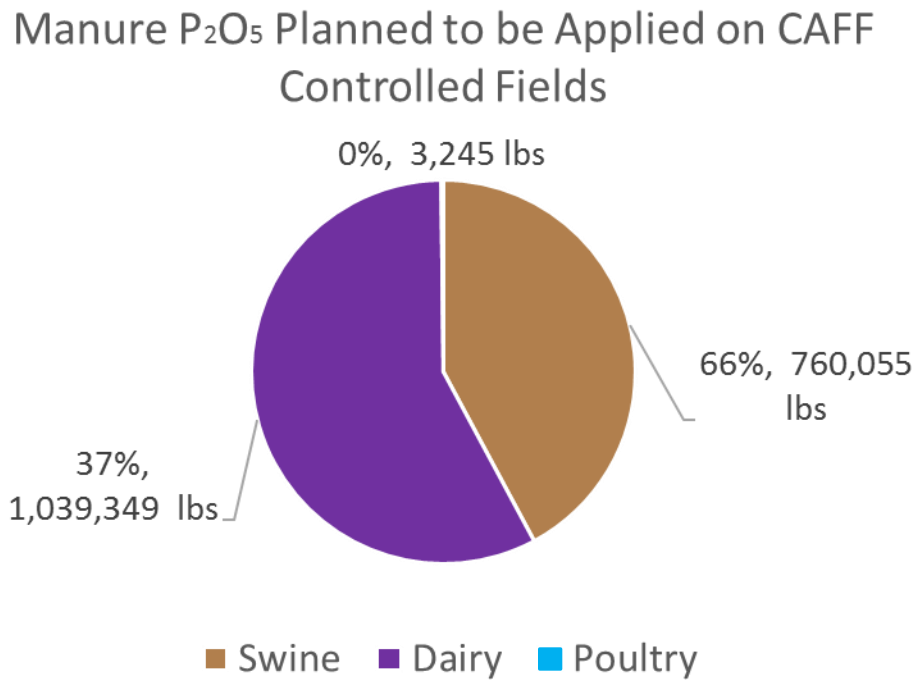
Ohio EPA, 2016

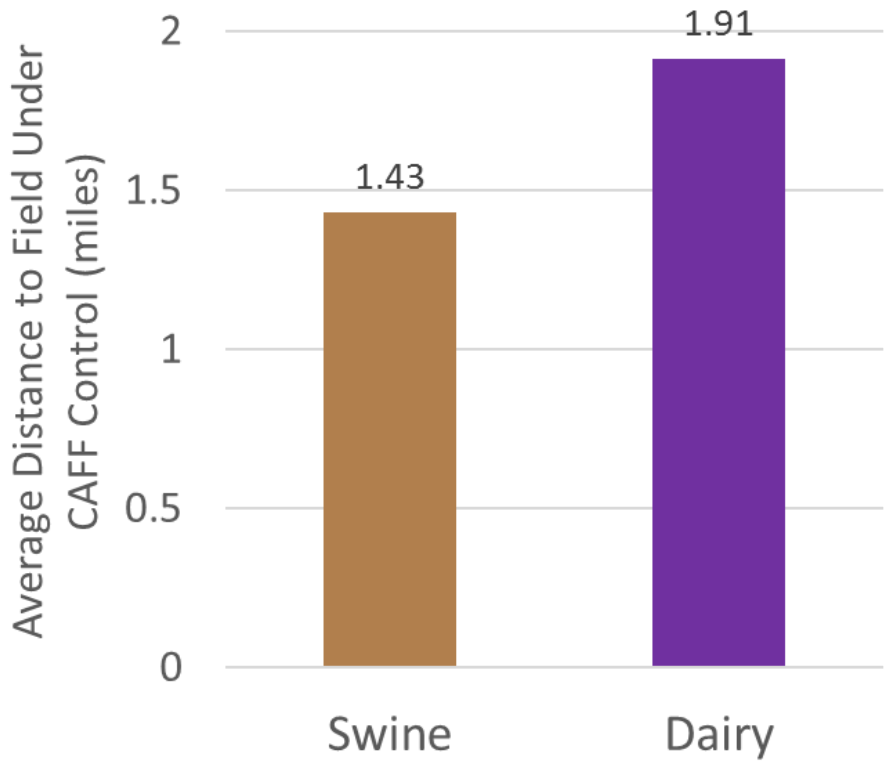


Scavia et al., 2016

Multiple studies show non-point/agricultural sources of phosphorus to be the dominant sources of phosphorus loading to Lake Erie from Maumee River watershed

Manure Transport of Manure on CAFF Controlled Fields

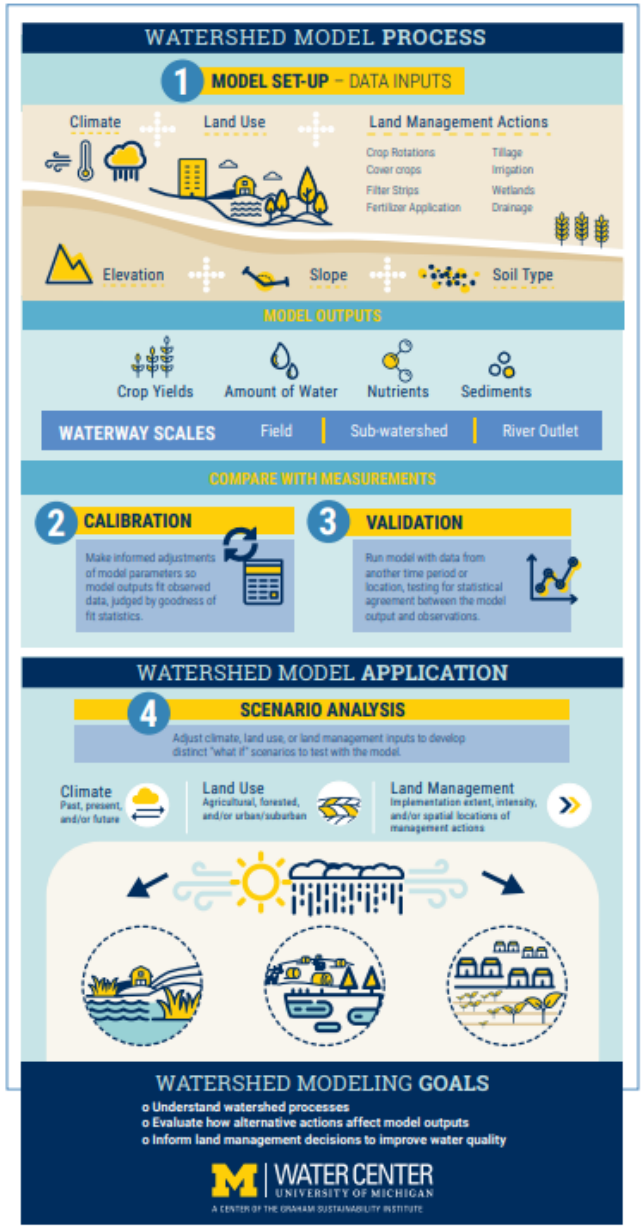




SWAT

Soil & Water Assessment Tool

A spatially referenced watershed model used to simulate the impact of land use, land management, and climate on water quantity and water quality.



Scenario and Sensitivity Analyses

Scenario/ Sensitivity Analysis	TP % Change from Baseline	DRP % Change from Baseline	TN % Change from Baseline	% Acres Affected	% Liquid Manure Affected	% Solid Manure Affected	% Manure P Affected	Corn Yield Rate % Change from Baseline	Soy Yield Rate % Change from Baseline	Wheat Yield Rate % Change from Baseline
No Phosphorus in Manure	-11.2	-13.3	0.0	100	100	100	100	0.0	0.0	0.0
No Phosphorus in Fertilizer or Manure	-59.0	-76.6	-0.1	100	100	100	100	0.0	0.0	0.0
All Incorporated	-4.4	-6.5	-0.2	42.6	38.8	45.5	40.6	0.1	0.0	0.0
Application on Growing Corn	0.0	-0.1	-1.5	24.5	26.0	25.9	26.2	0.2	0.0	0.0
Extend Mercer County Ban	0.2	0.6	-0.3	15.9	14.7	15.2	15.1	-0.8	0.0	0.0
No Irrigation	-0.1	-0.1	-0.4	100	100	0	62.8	0.0	0.0	0.0

Future Research Required…

How is manure produced from non-regulated livestock managed?

How is manure managed in Distribution and Utilization?

What BMPs can be promoted in conjunction with manure incorporation reduce nutrient discharge from the watershed and move closer to the GLWQA reduction targets