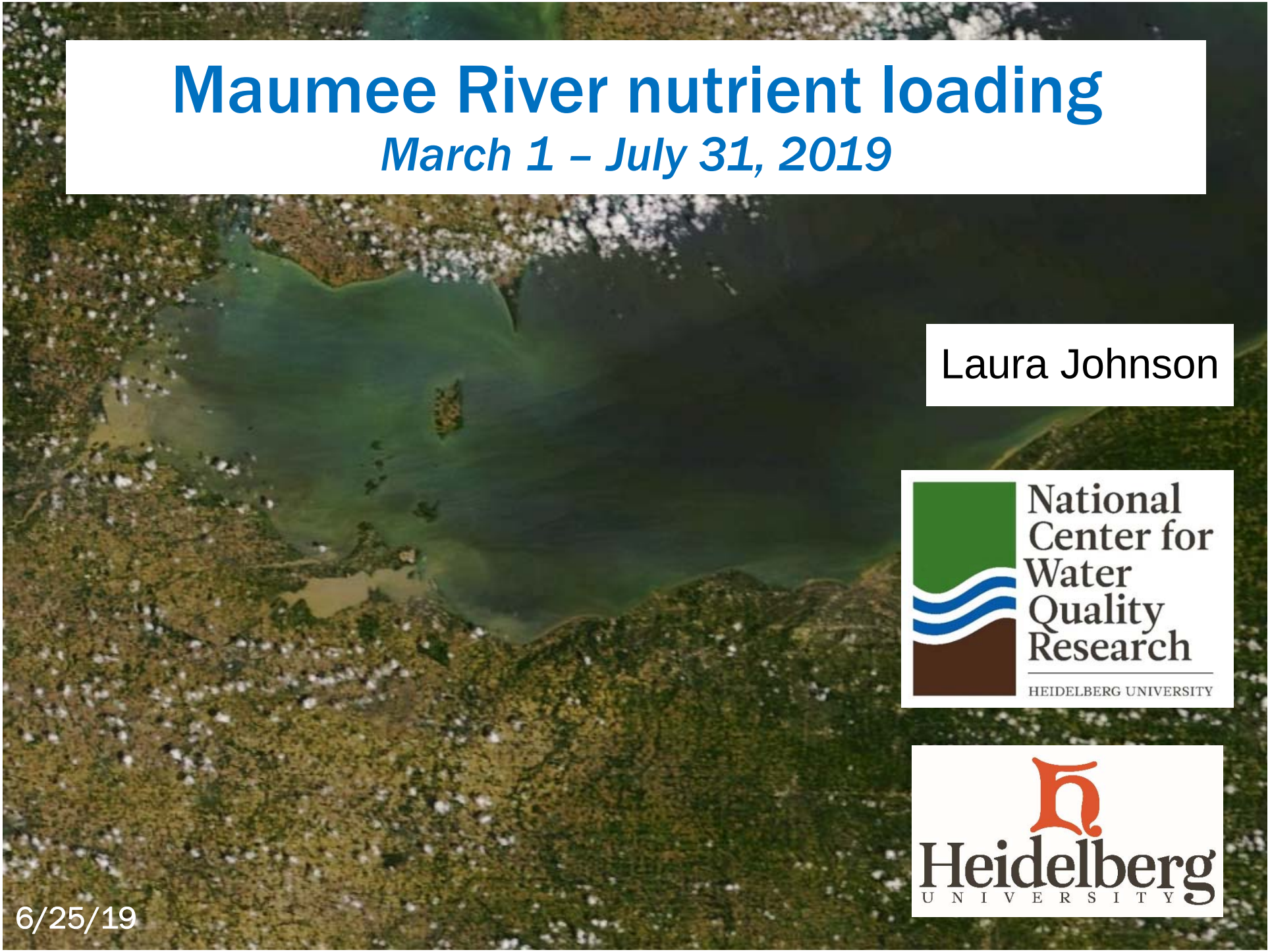
Maumee River nutrient loading

March 1 – July 31, 2019



Laura Johnson

National Center for Water Quality Research
HEIDELBERG UNIVERSITY

Heidelberg UNIVERSITY

6/25/19

Heidelberg Tributary Loading Program

- We sample the Maumee River at Waterville, Ohio
- One of 24 stations
- Samples are collected 3x a day*, year-round and retrieved weekly for analysis in the laboratory
- Sampled since 1974 for all major nutrients and sediments

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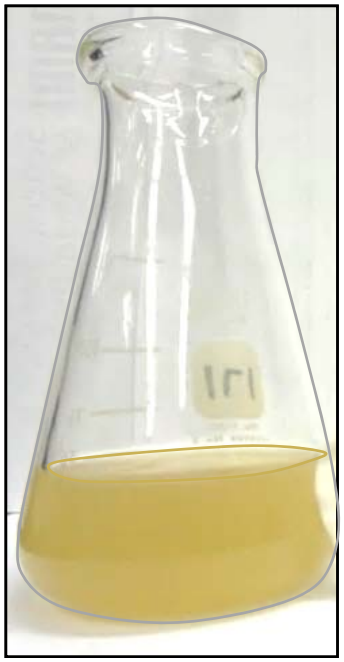
TP = DRP + TPP

Total P



Dissolved Reactive P

Total Particulate P

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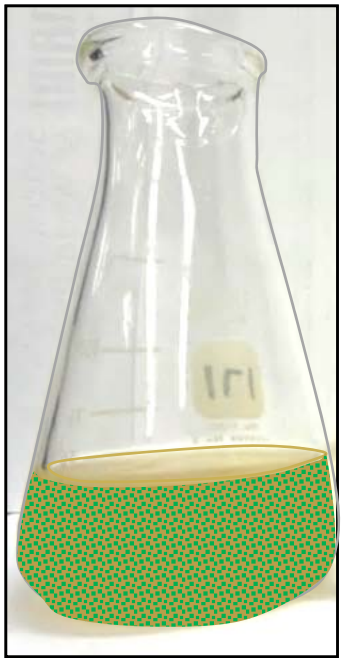
TP = DRP + TPP

Total bioavailable P is the portion of P available to algae that doesn't settle between Waterville and the lake

TBP = DRP + 0.08*(TPP)

Total Bioavailable P



Dissolved Reactive P

Total Particulate P

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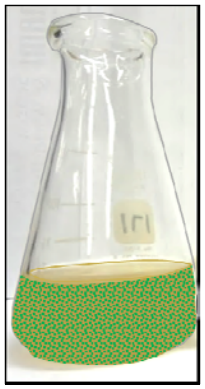
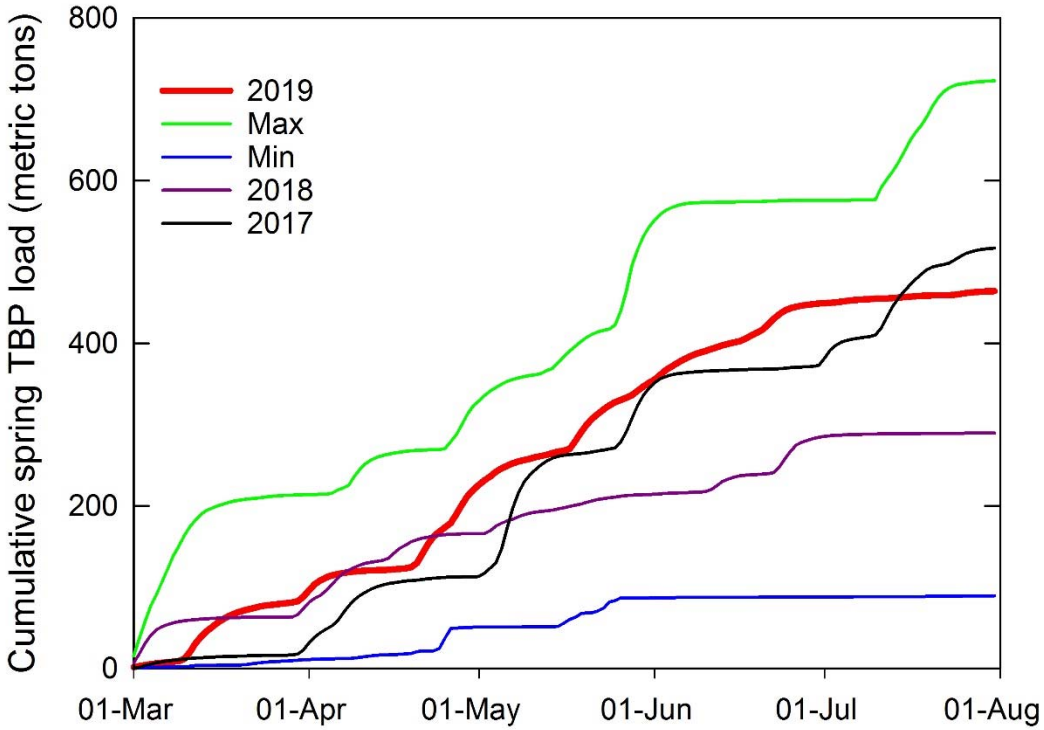
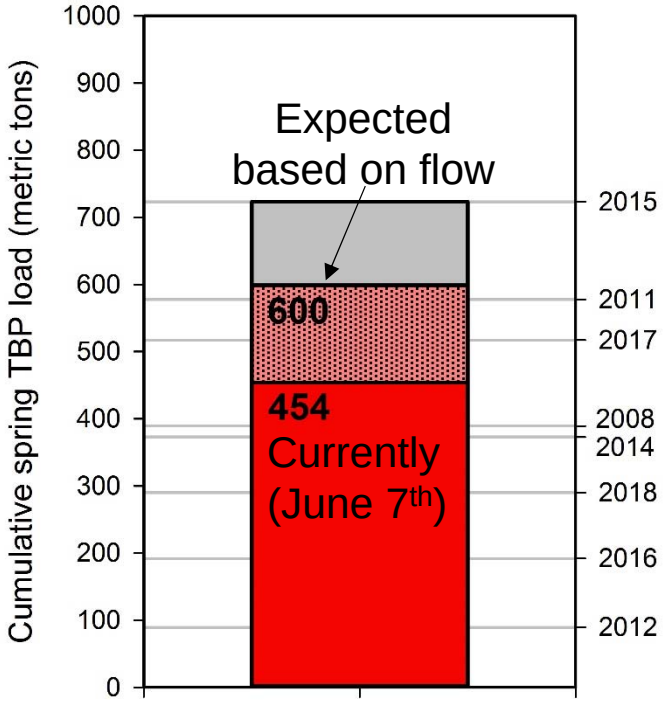


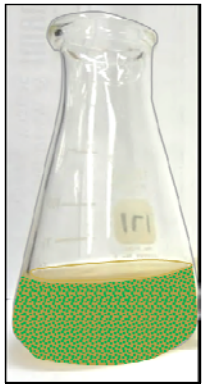
Total bioavailable phosphorus Maumee River in Waterville

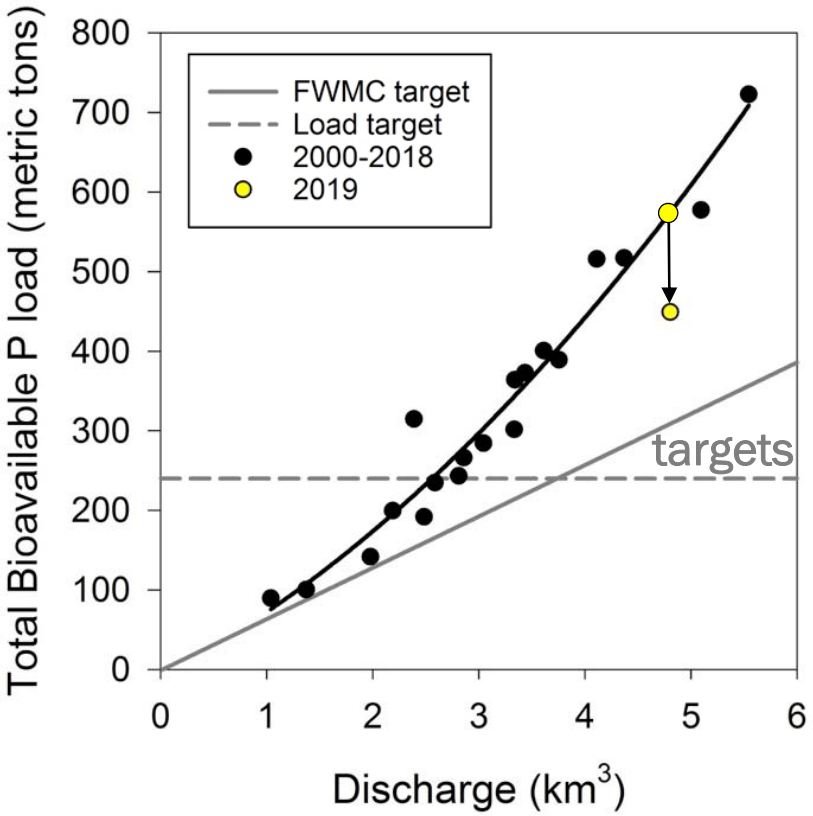
March 1 – July 7, 2019; projected to July 31 with data from the NWS Ohio River Forecast Center





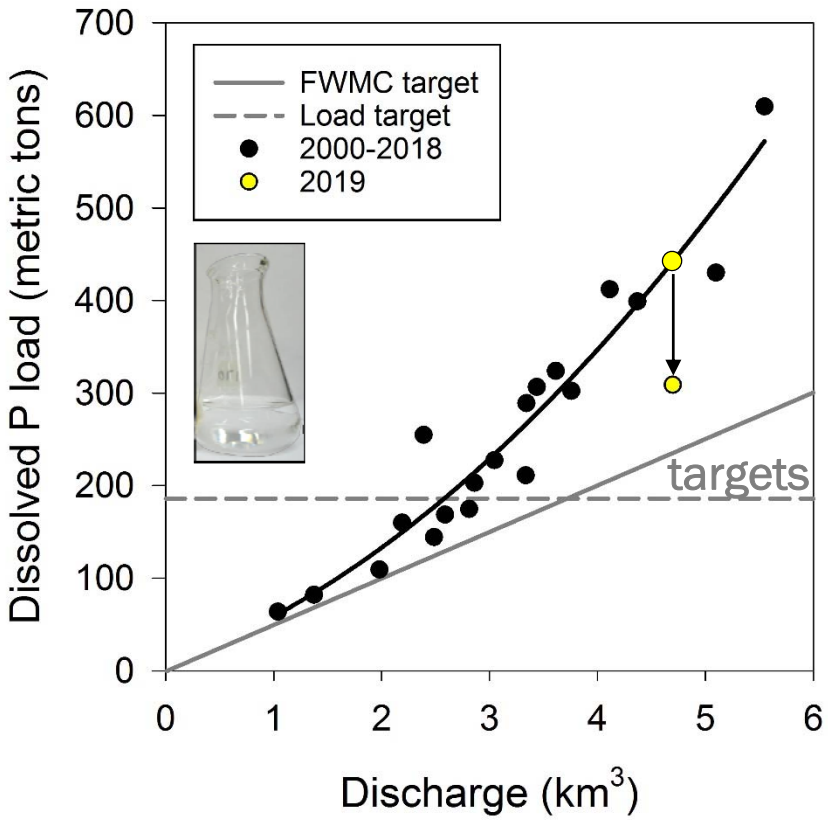
TBP loads are 24% lower than expected based on flow

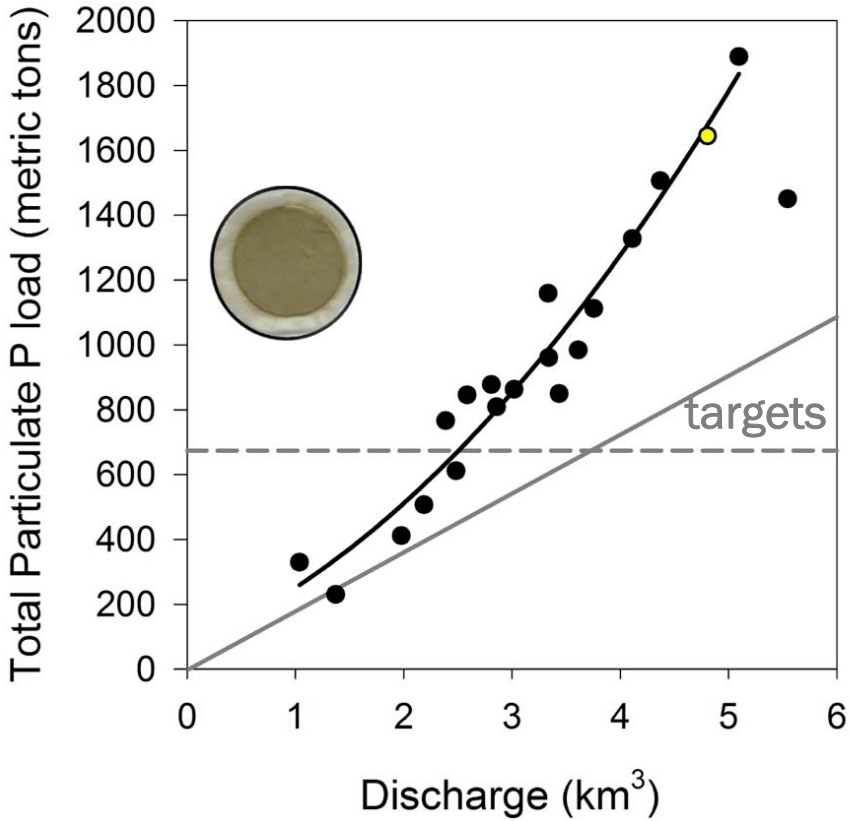




TBP = DRP + 0.08*(TPP)

DRP loads are 31% lower than expected based on flow, TPP loads are where you would expect



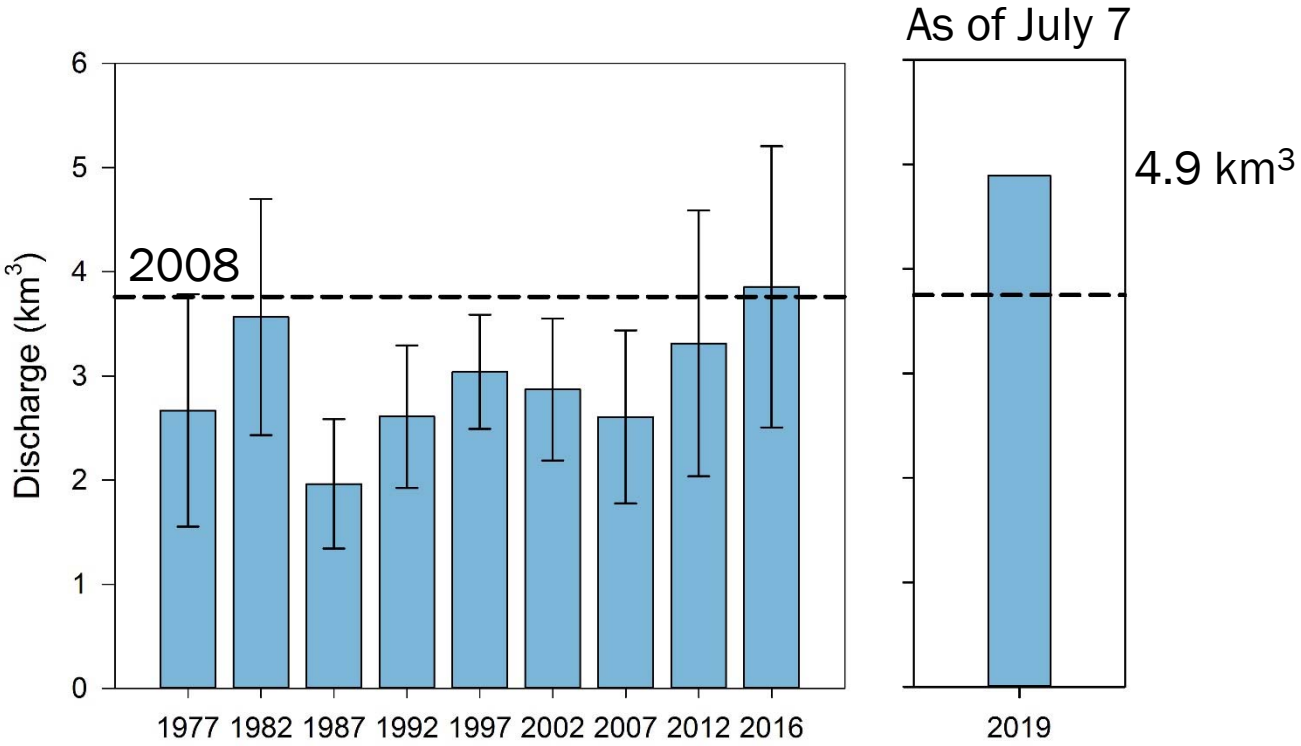


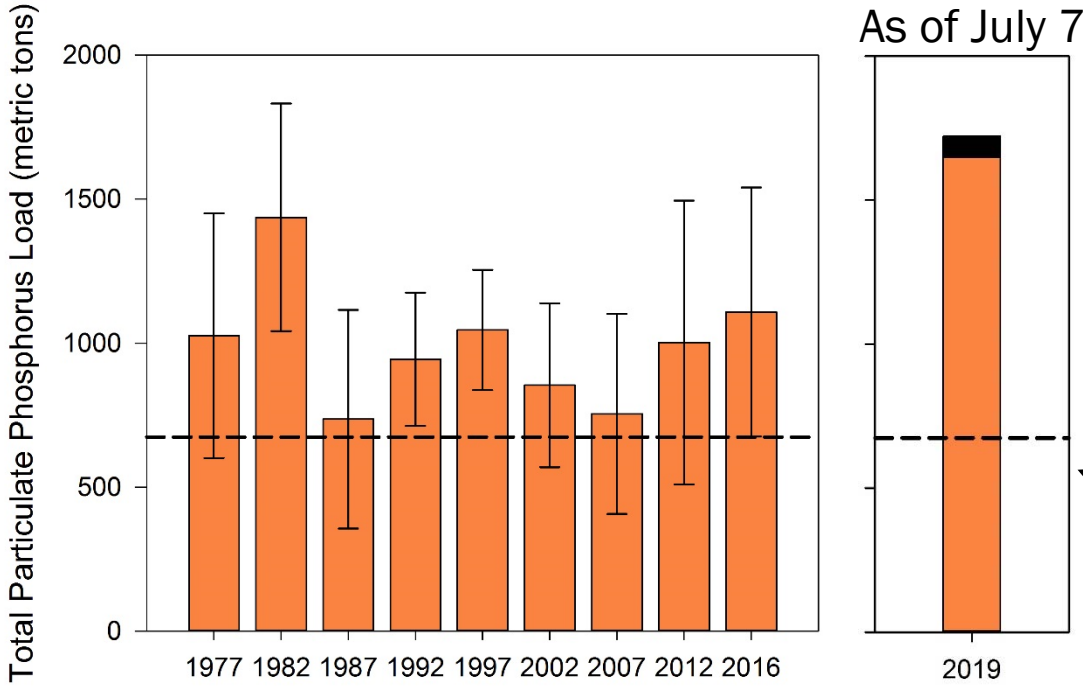
Lower DRP concentrations likely due to lack of P fertilizer application last fall and this spring

March - July flow at the Maumee River in Waterville

1975 – 2018 Averaged over 5 year periods

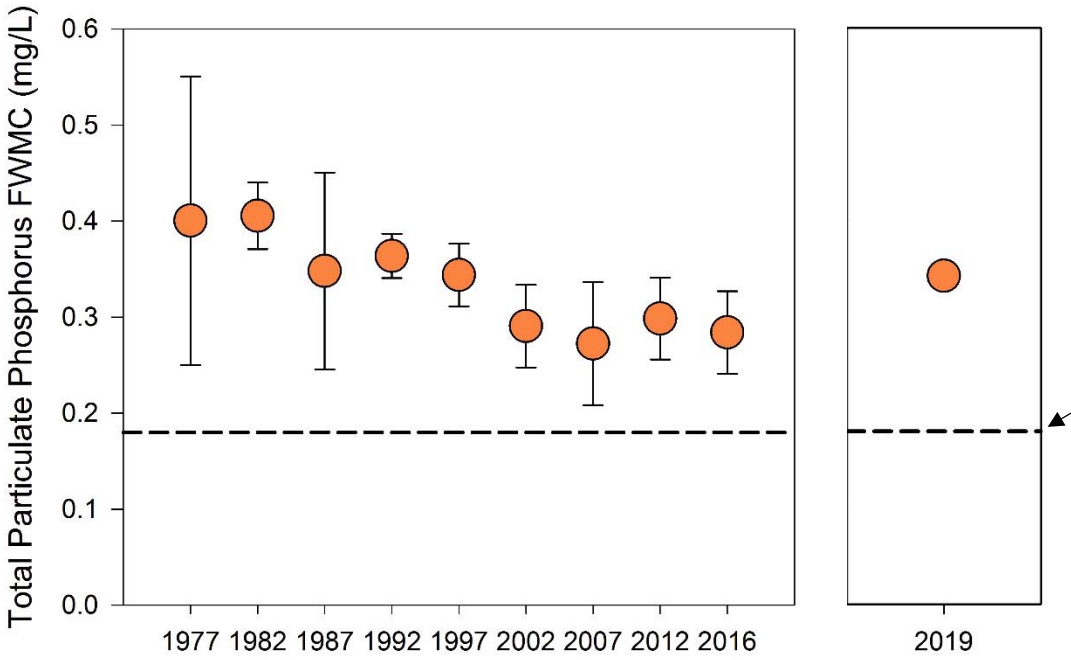
*except 2015-2018





March - July Total Particulate P Maumee River in Waterville *1975–2018 Averaged over 5 year periods*

- 1650 metric tons currently
- 1720 metric tons expected
- 674 metric tons target



- 0.34 mg/L currently
- 0.35 mg/L expected
- 0.18 mg/L target

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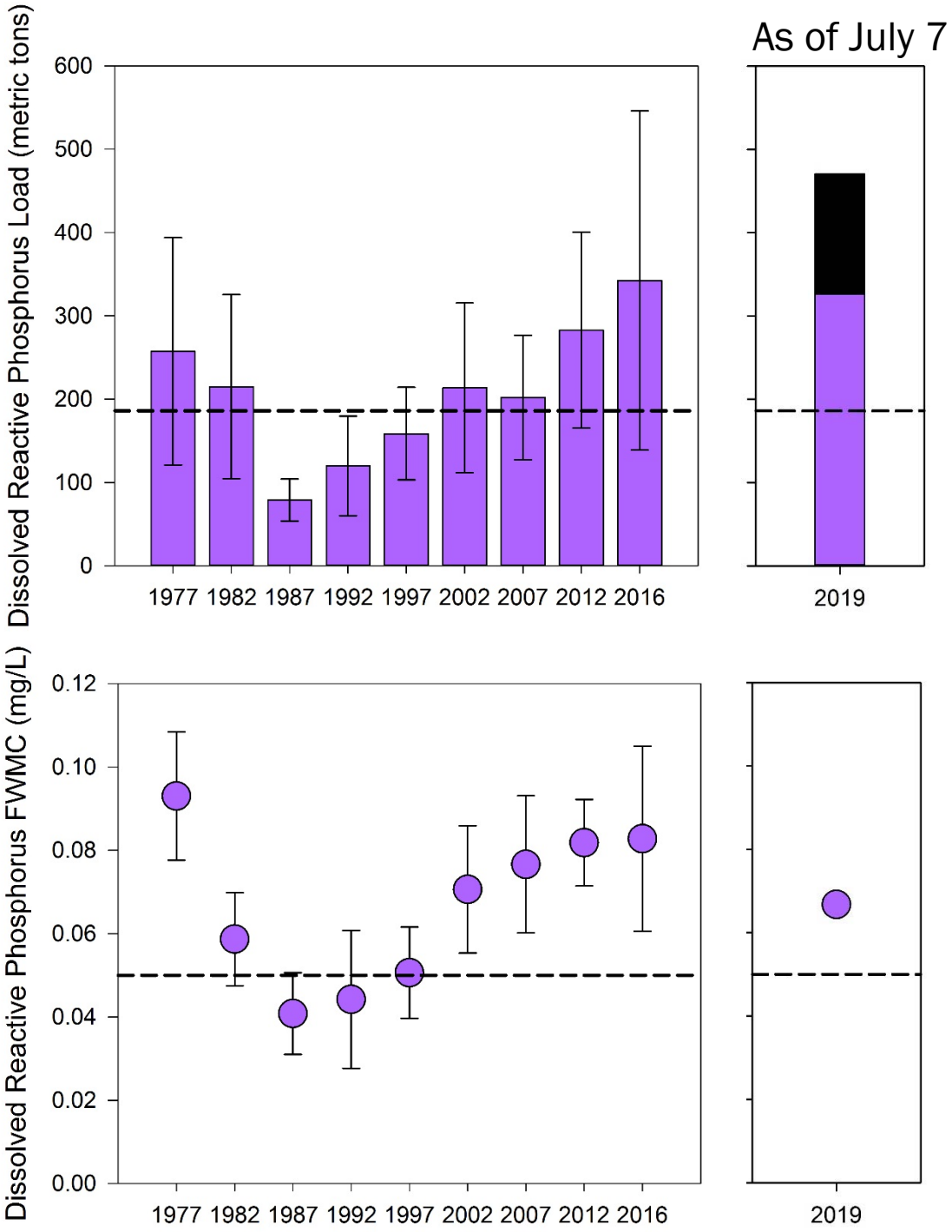

March - July Dissolved P
Maumee River in Waterville
1975 – 2018 Averaged over 5 year periods

- 326 metric tons currently
- 470 metric tons expected
- 186 metric tons target

- 0.067 mg/L currently
- 0.096 mg/L expected
- 0.050 mg/L target

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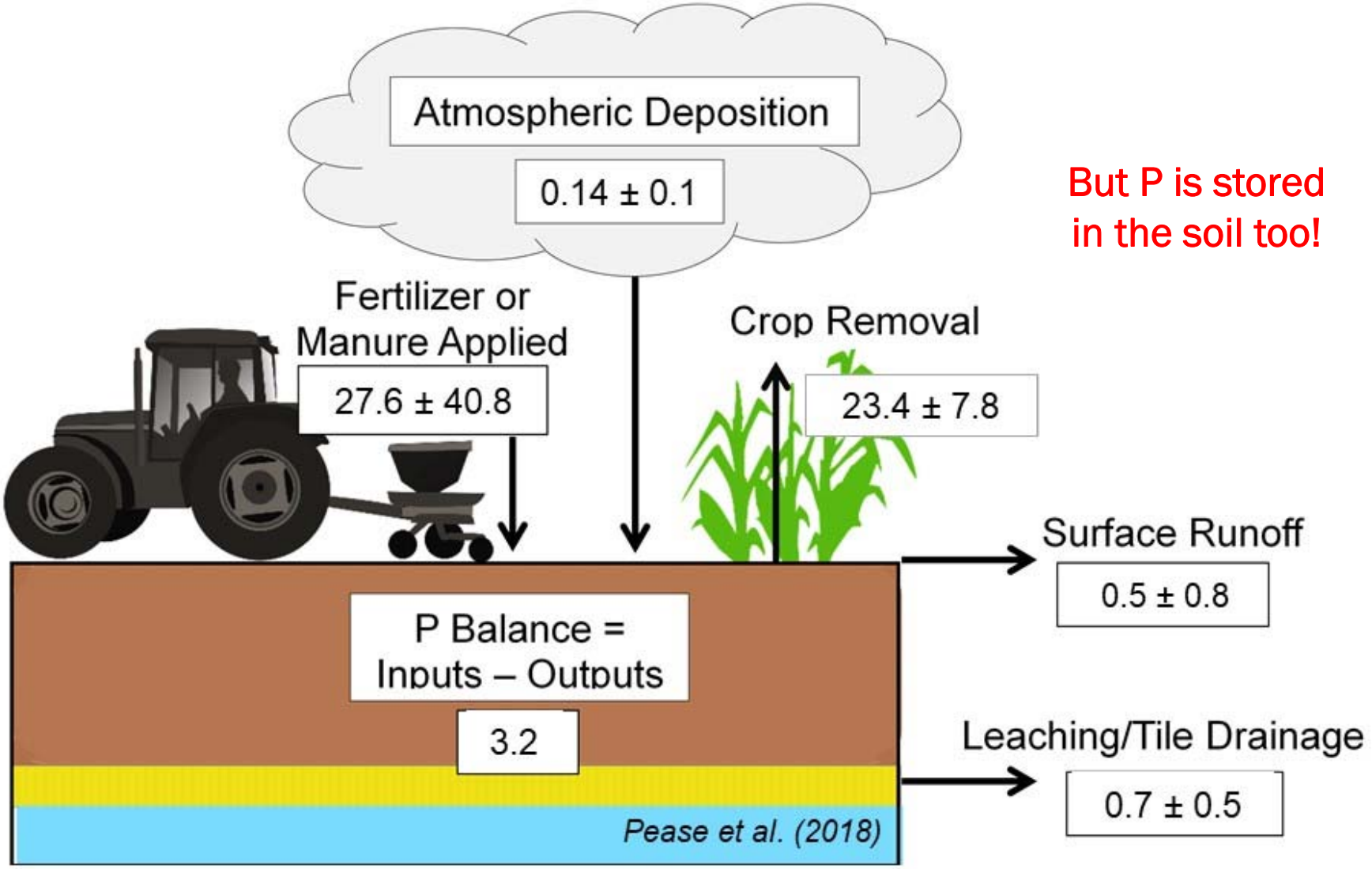
A 30% decrease in DRP load is substantial; current year fertilizer application matters

Nutrient management is key; especially subsurface placement

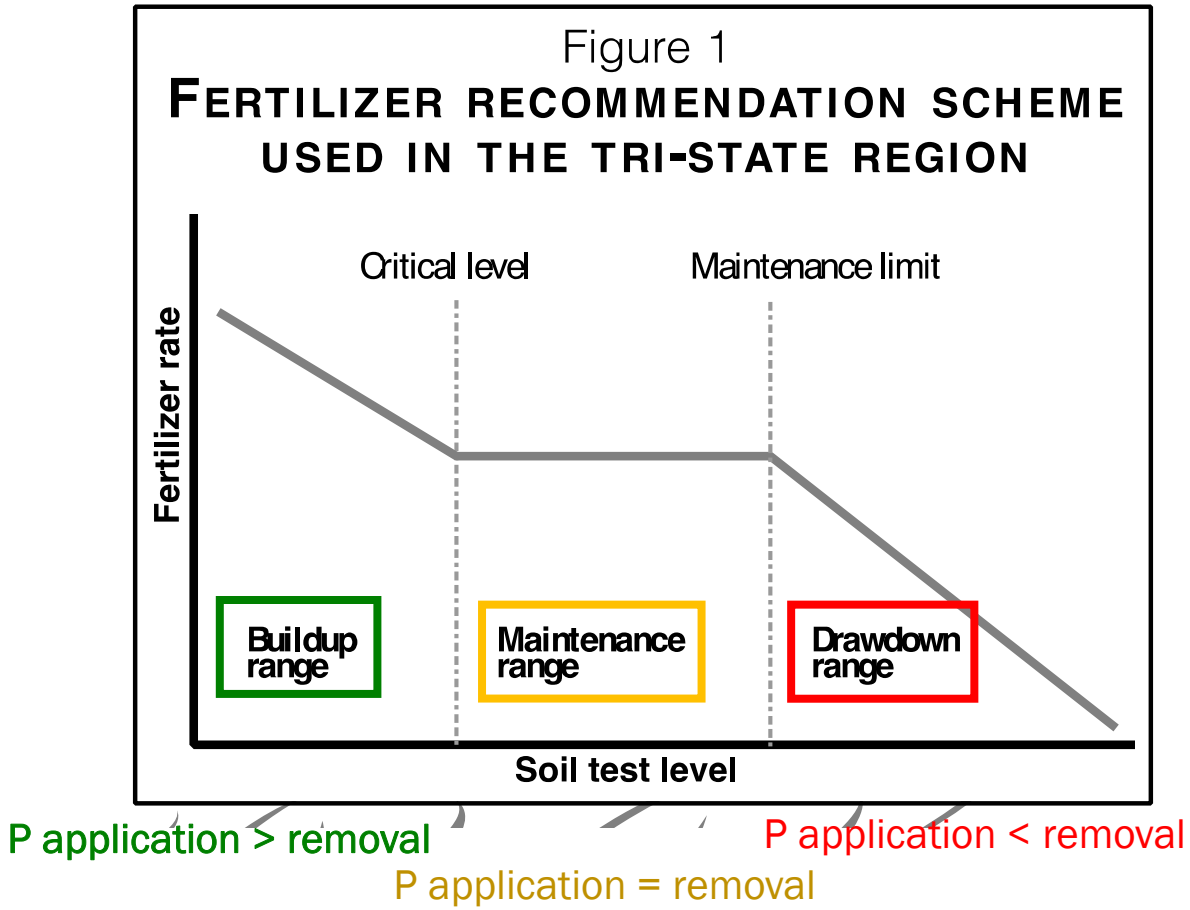
Average Total Phosphorus Budget (lb/ac)



But P is stored in the soil too!

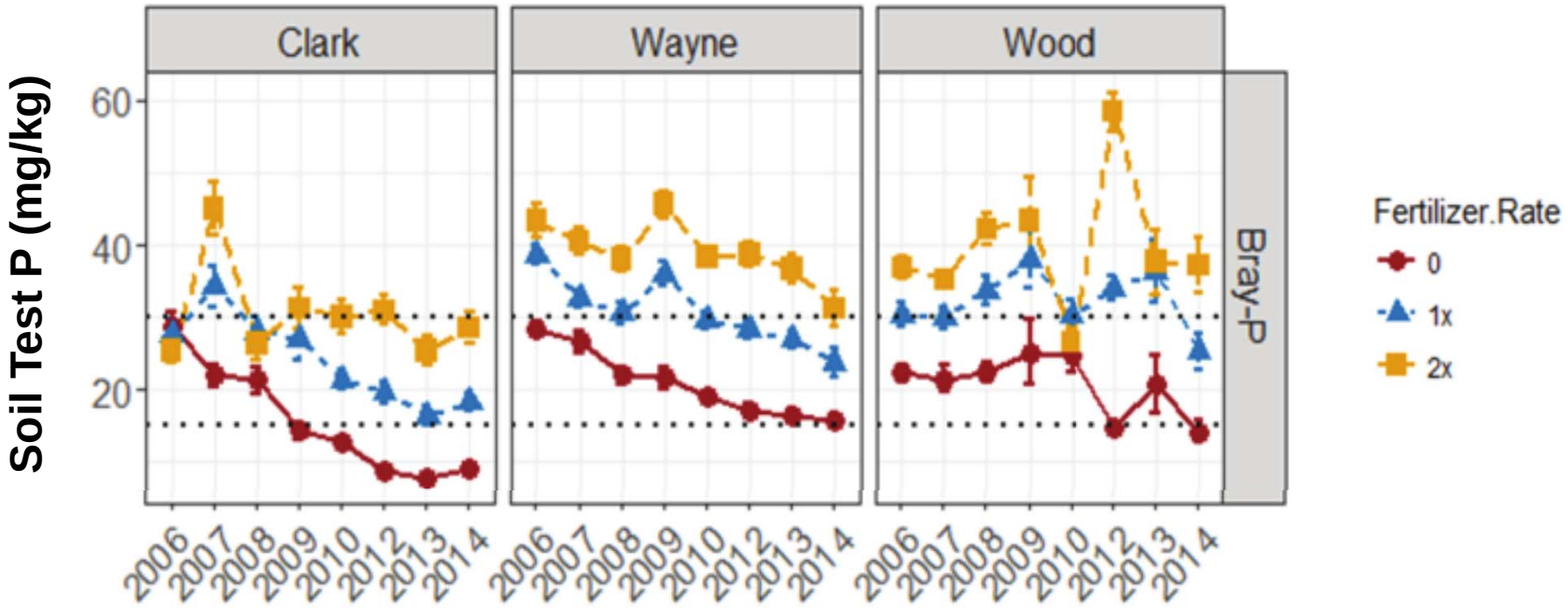
Pease et al. 2018

A 30% decrease in DRP loads in one season implies improvements can be made quicker than expected!



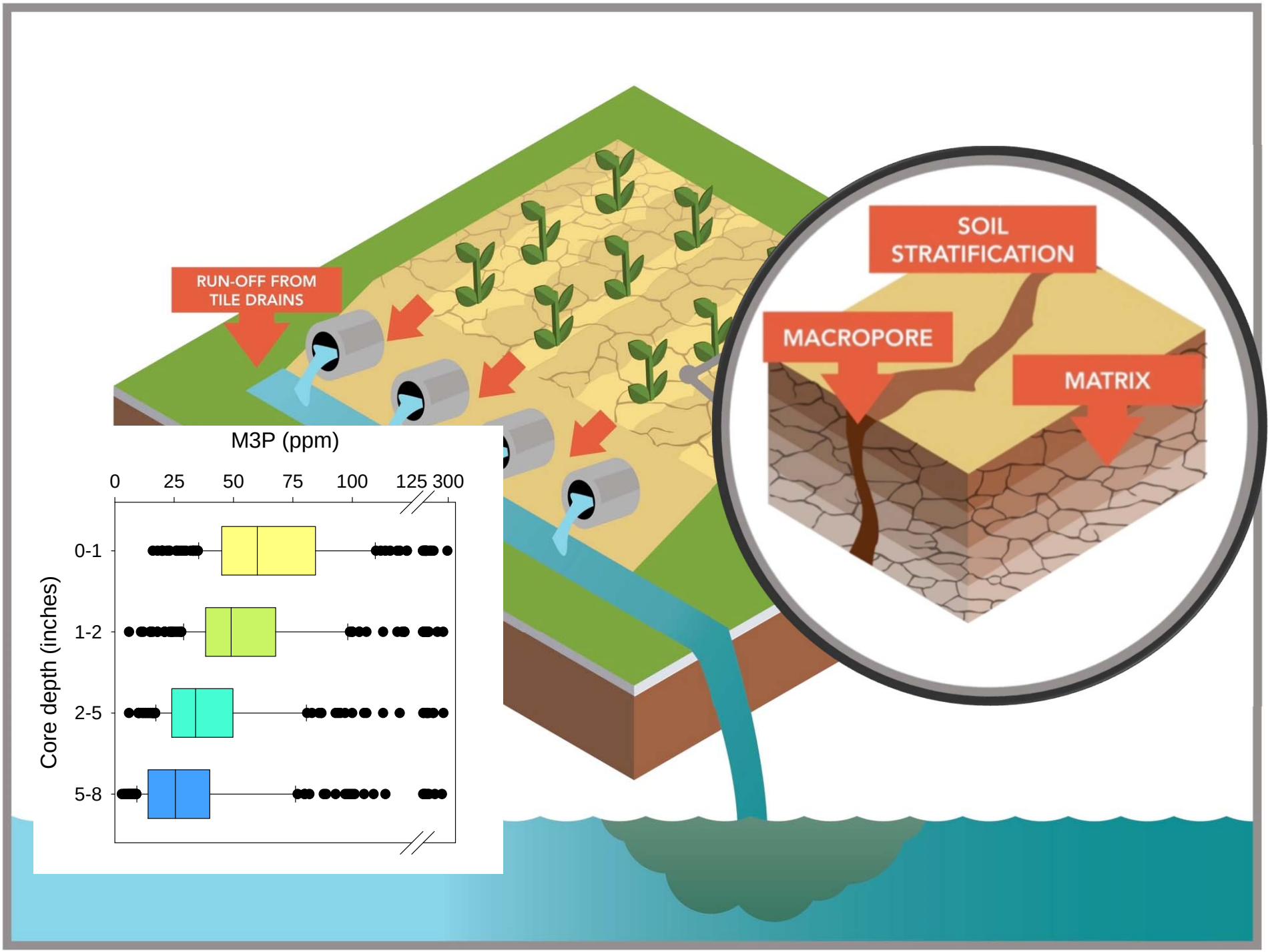
The current strategy is to maintain a bank of crop-available P in the soil such that you don't have a yield loss if you miss one or more years of application

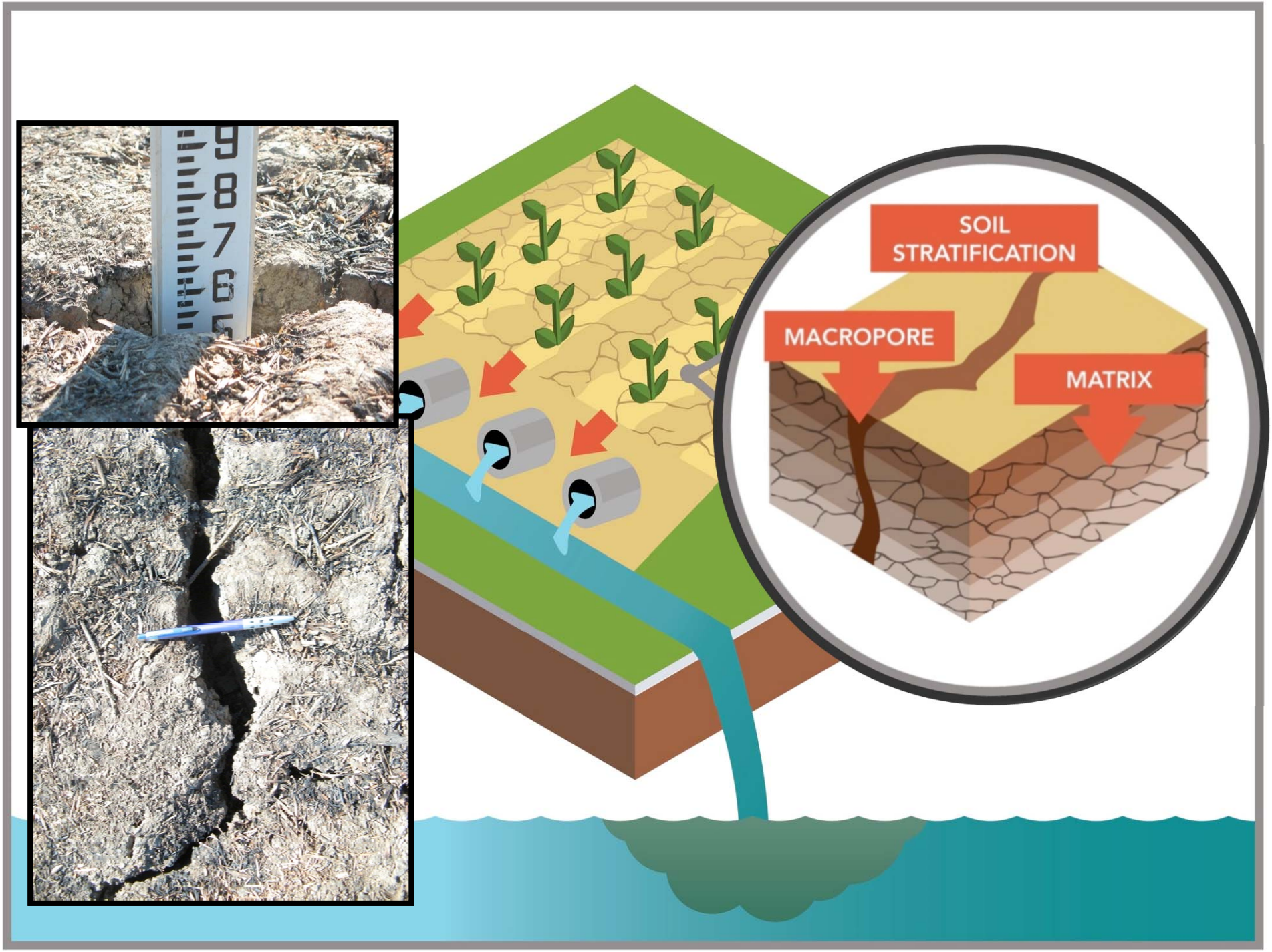
What caused the 30% decrease in DRP? A change in soil test P?



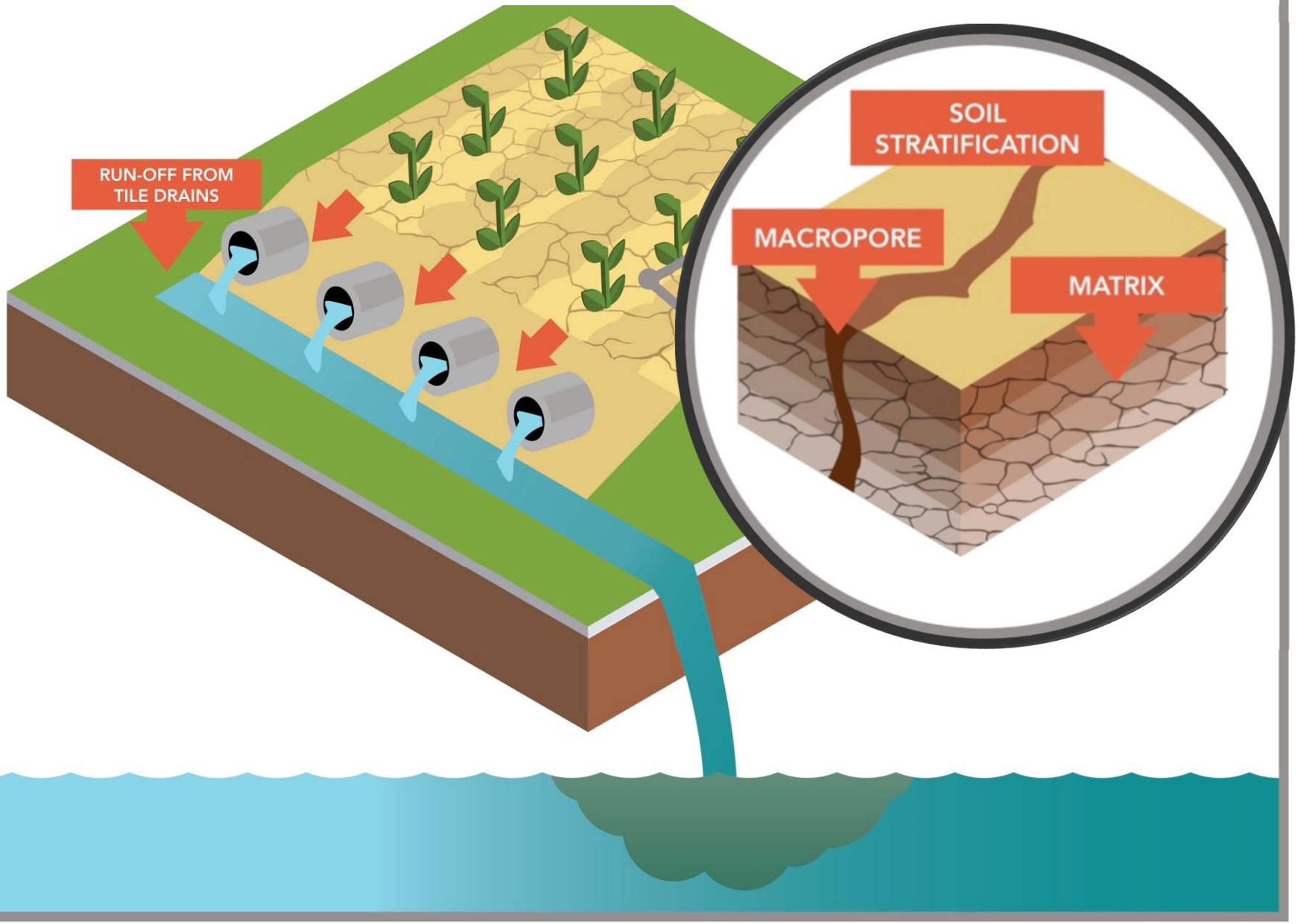
*note, there was no yield differences among these rates

Fulford and Culman 2016, 2018


RUN-OFF FROM
TILE DRAINS
SOIL
STRATIFICATION
MACROPORE
MATRIX
M3P (ppm)
0
25
50
75
100
125
300
0-1
1-2
2-5
5-8
Core depth (inches)


SOIL
STRATIFICATION
MACROPORE
MATRIX

Decreased DRP could imply the 1-2” soil surface is less enriched due to lack of application



- All sources of fertilizer are accounted for in the nutrient recommendation.

- Soil tests, used to make nutrient recommendations are less than four years old.
- Nutrient application equipment is calibrated annually.

- The timing of phosphorus and nitrogen application avoids spreading on frozen or snow-covered fields.
- Nutrients are not broadcast applied prior to a predicted heavy rainfall.

- Phosphorus is applied below the soil surface whenever possible.
- Nutrient application setbacks are followed in sensitive areas.

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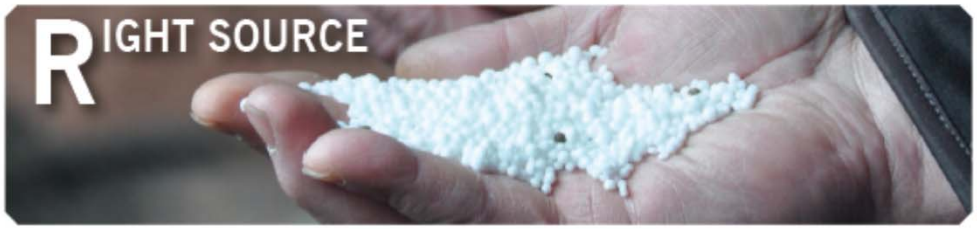

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4R Nutrient Stewardship Certification Program

Agricultural Fertilizer Certification Program

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

OACI
Ohio Agriculture Conservation Initiative

Ohio Agriculture Conservation Initiative

- establishing a baseline understanding of current conservation and nutrient management efforts
- building farmer participation in a new certification program

Thanks!

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