THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

On-Field Ohio !

Revised Ohio P Risk Index using Field-Scale Edge-of-Field Monitoring Data

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On-Field Ohio!

Intended to Provide Users a Field-Scale Estimate of P Runoff Risk

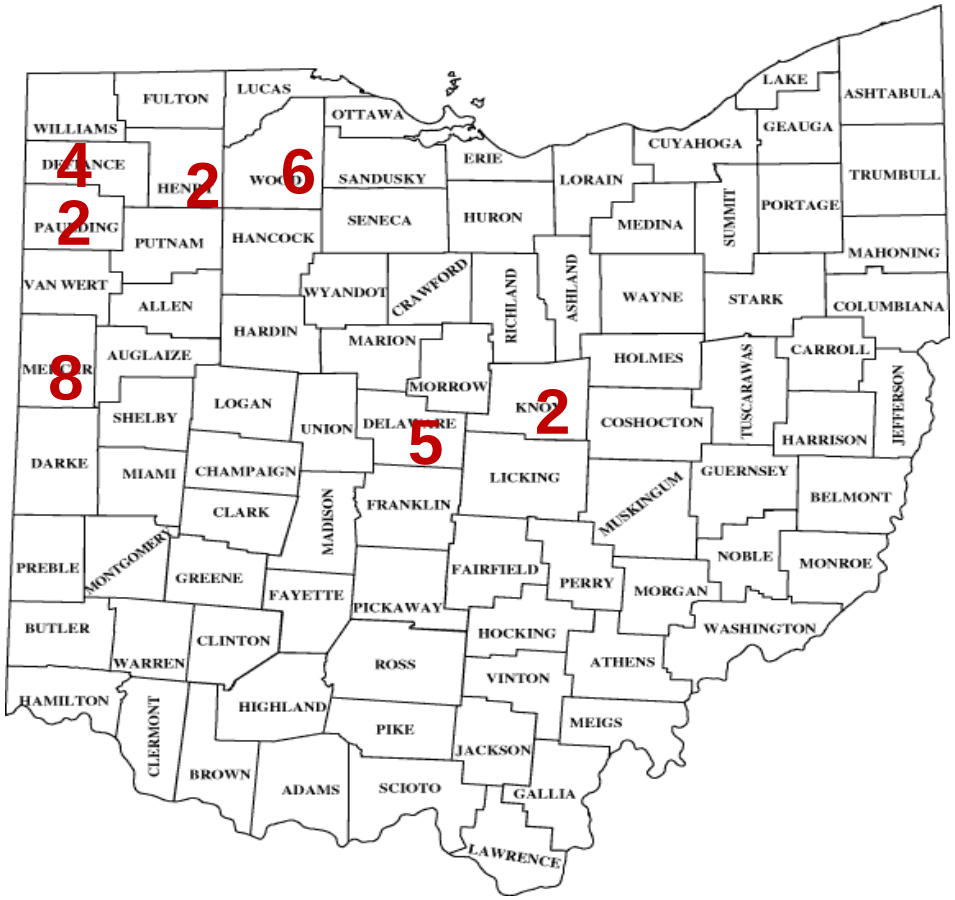
Increasingly Used to Judge Farmer Performance So We Have to Get it Right !

- Background
- Research Process
- Findings/Implications

Illustrate Quantify How Voluntary Changes in Practices Can Contribute to Achieving Water Quality Targets

Agenda

Counties with Project Sites



29 Field sites

- **8 Grand Lake St. Marys**
- **7 in Scioto**
- **14 in WLEB**

Most with Surface & Tile runoff samplers

Special Thanks to our Participating Farmers

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Tile Runoff

Surface Runoff

- Identify contributing areas
- Install sampler
- Measure water flow (Q)
- Collect runoff samples

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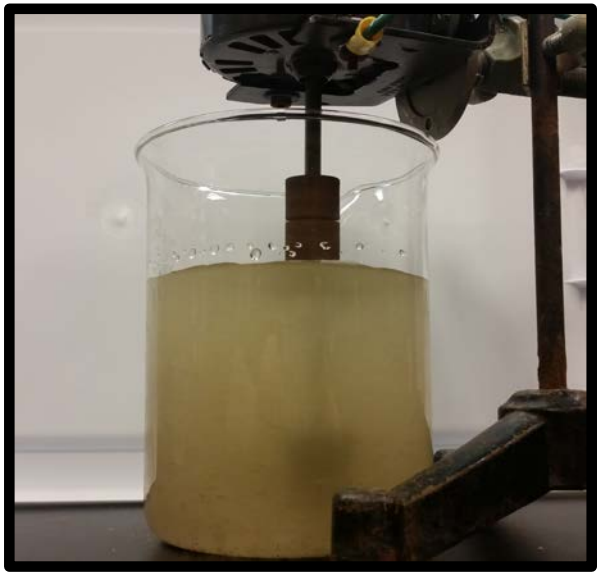
What Did We Measure?

Runoff Concentrations Surface & Tile



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Particulate (RPP)

Total (RTP)
unfiltered/digested

Dissolved (DRP)
filtered

Concentration X Flow = Load (lb P/A)

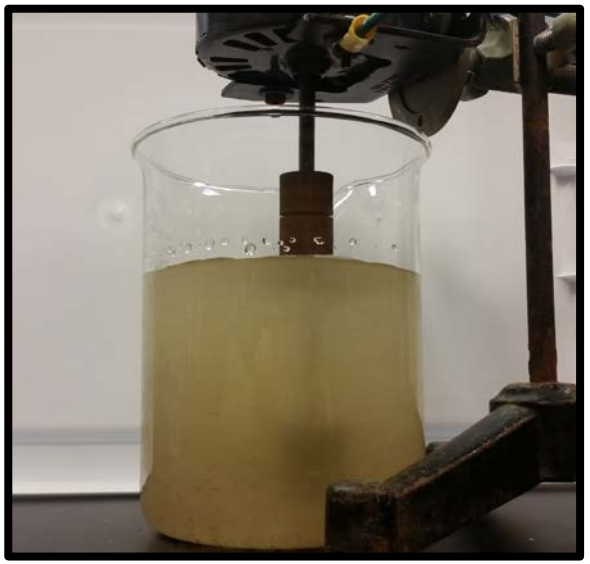
Erosion Potential

Revised Universal Soil Loss Equation v2 (RUSLE2)

Soil Loss (t/a/y)
Related to
RSS & RPP

Muddy Runoff Water

- **How much sediment?**
- **How rich in P is sediment?**



Every Runoff Event

Surface & Tile Runoff:

- DRP Dissolved P
- RPP Particulate P
- RTP Total P
- RSS Suspended Sediment
- Runoff Flow Volume

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Erosion Potential

- Each crop year and average for rotation

Annual Soil Test P (M3-P)

Annual Farmer Management

Revising Ohio P Risk Index

Proce

- **Esta**
- **Eva**
  fert/
- **Prov**

Correlating
Edge-of-Field Runoff Results
With
On-Field Properties and Practices

Empirical relationships based on EOF data

Calibrating APLE* using EOF data

Measured EOF vs OFO Estimates

*APLE = Annual Phosphorus Loss Estimator

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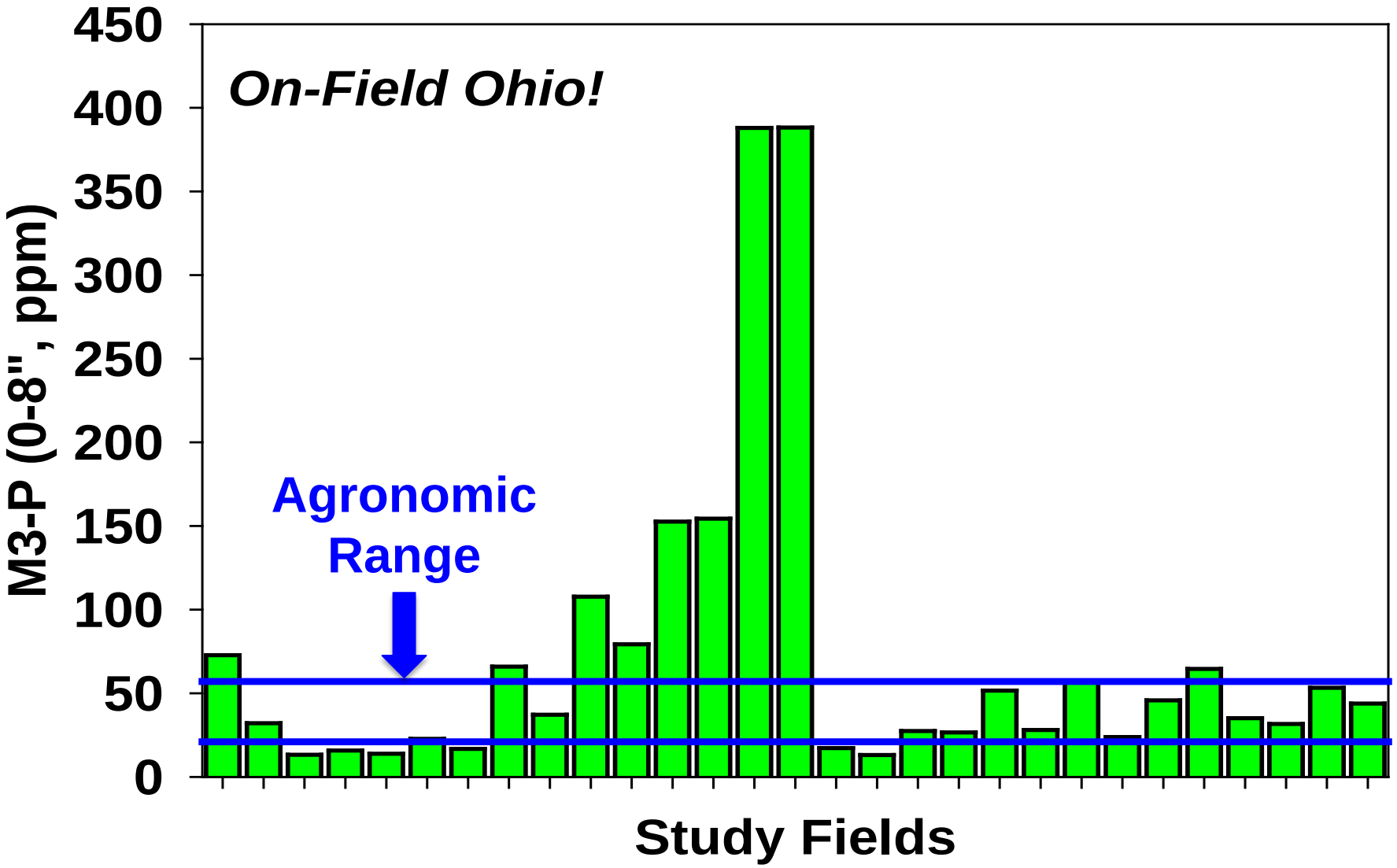
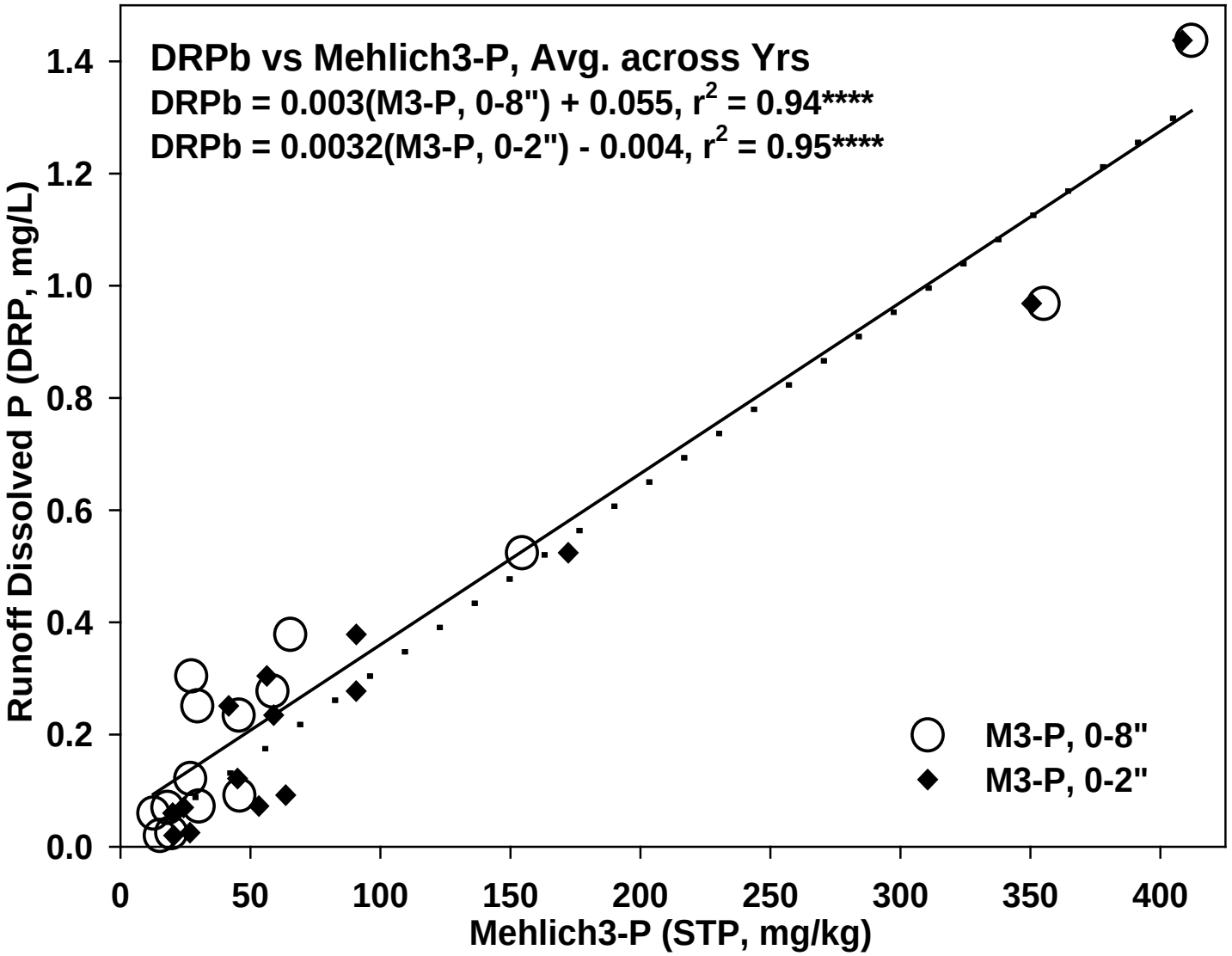
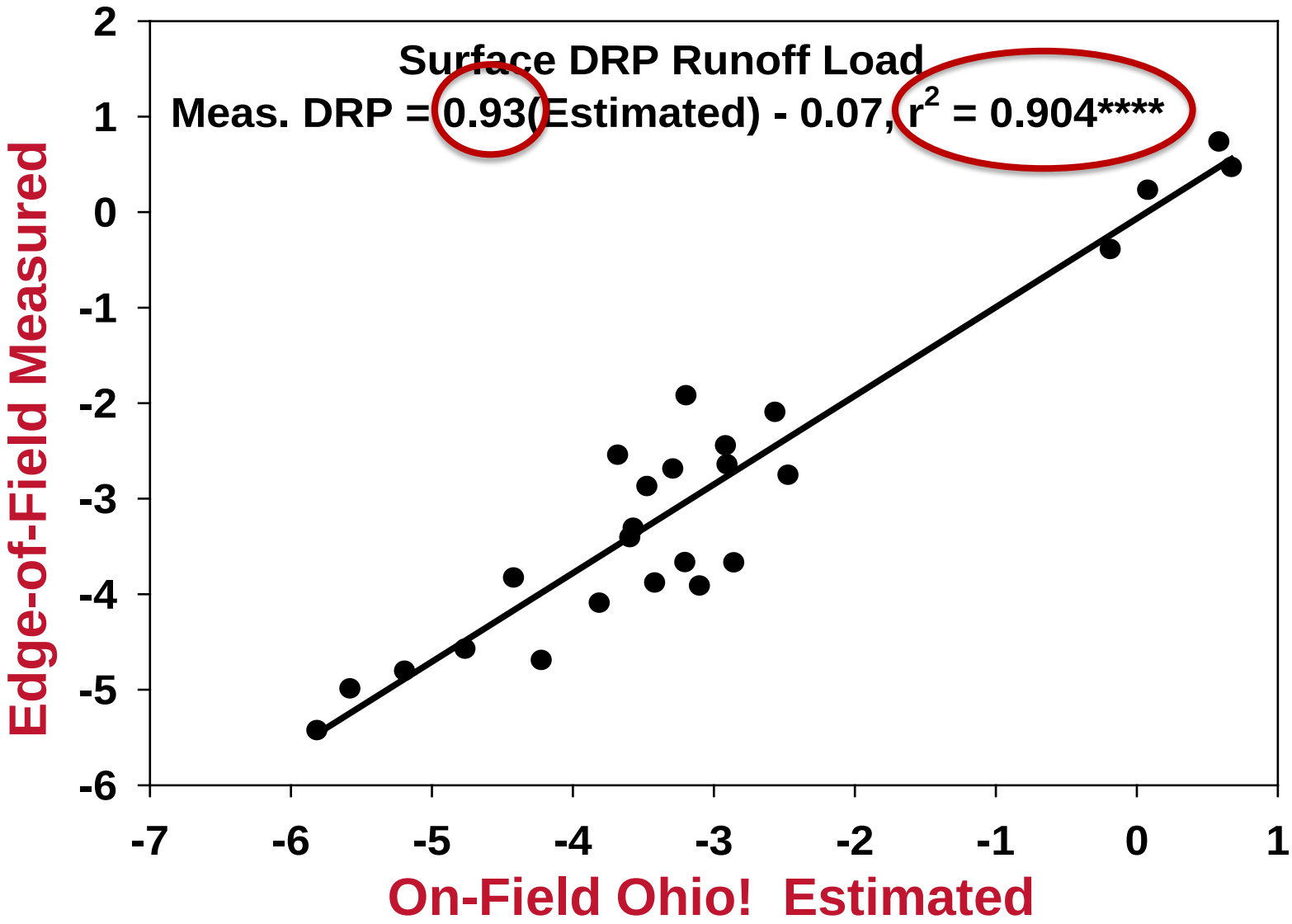


Surface DRP vs M3-P 0-8” & 0-2” Concentration



Measured vs Estimated Surface Runoff DRP (lb/A)



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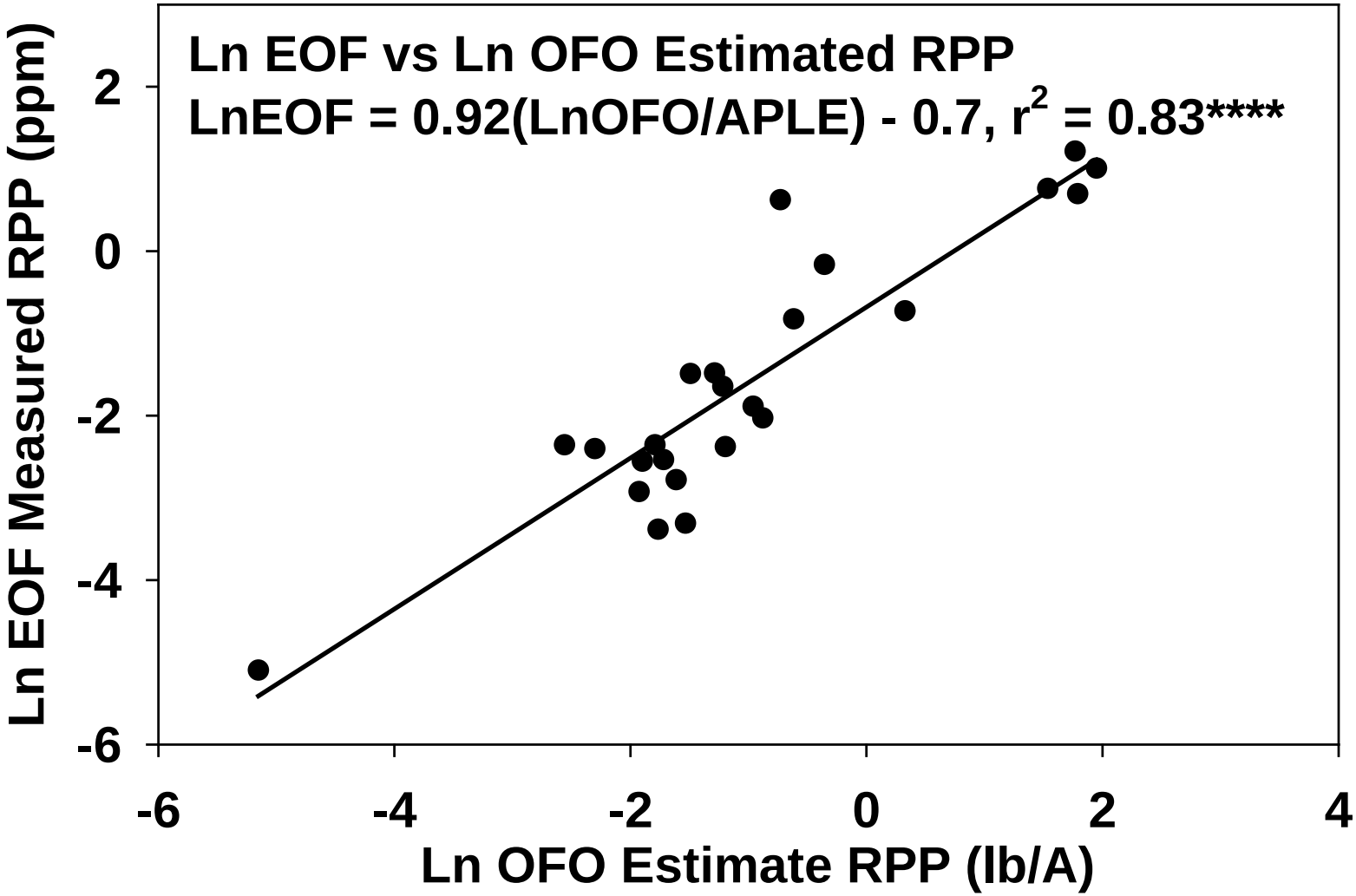
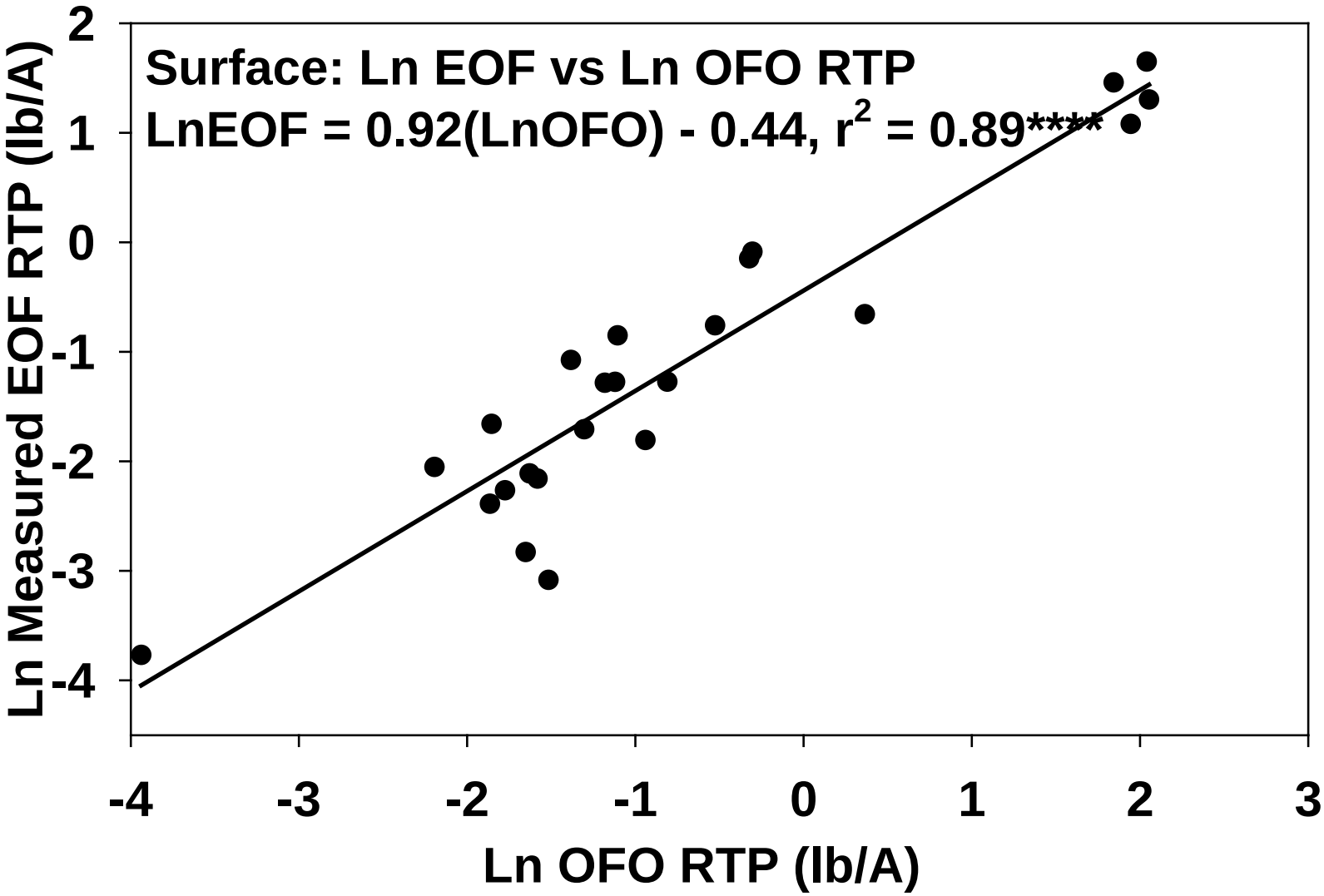
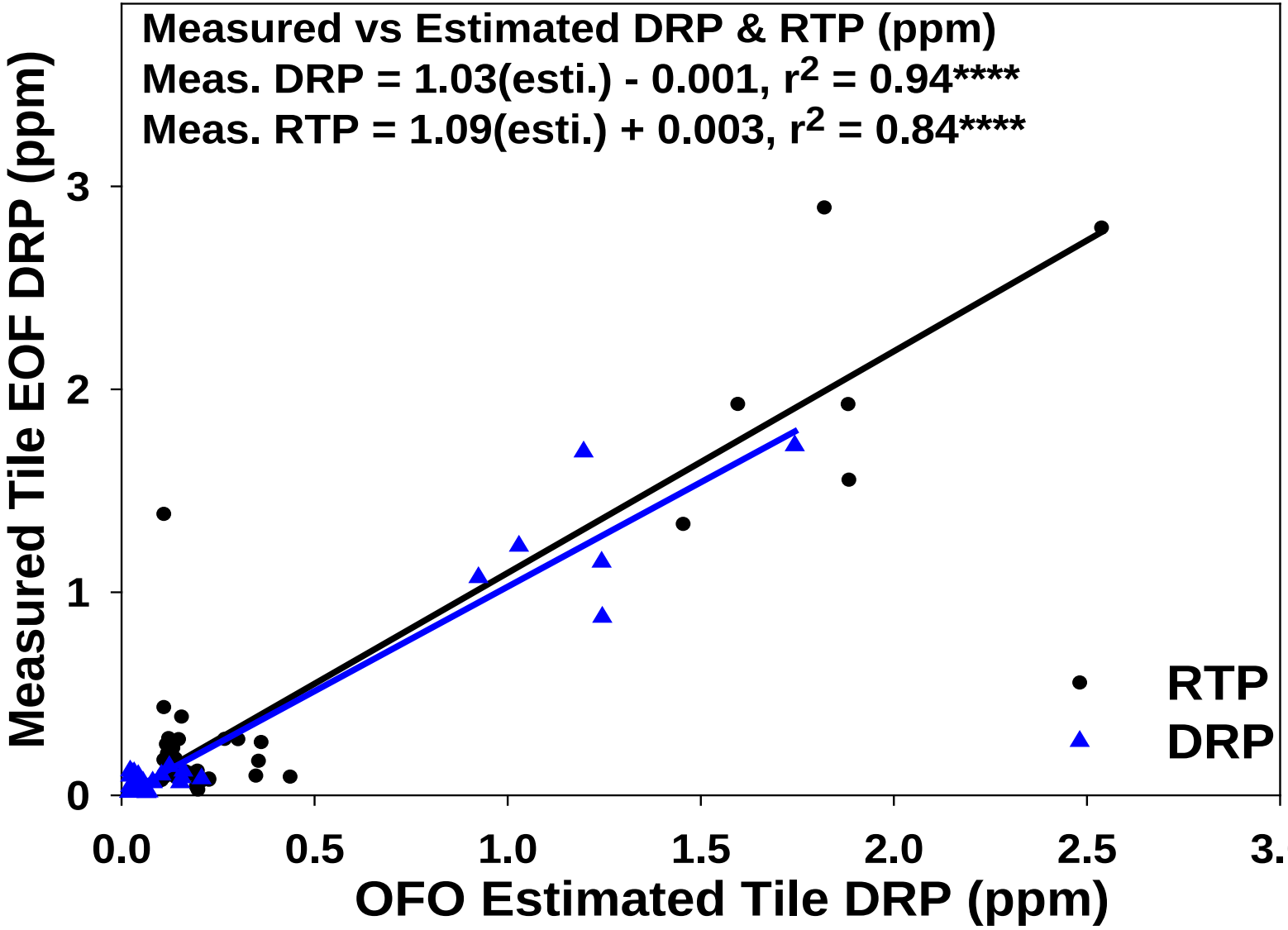


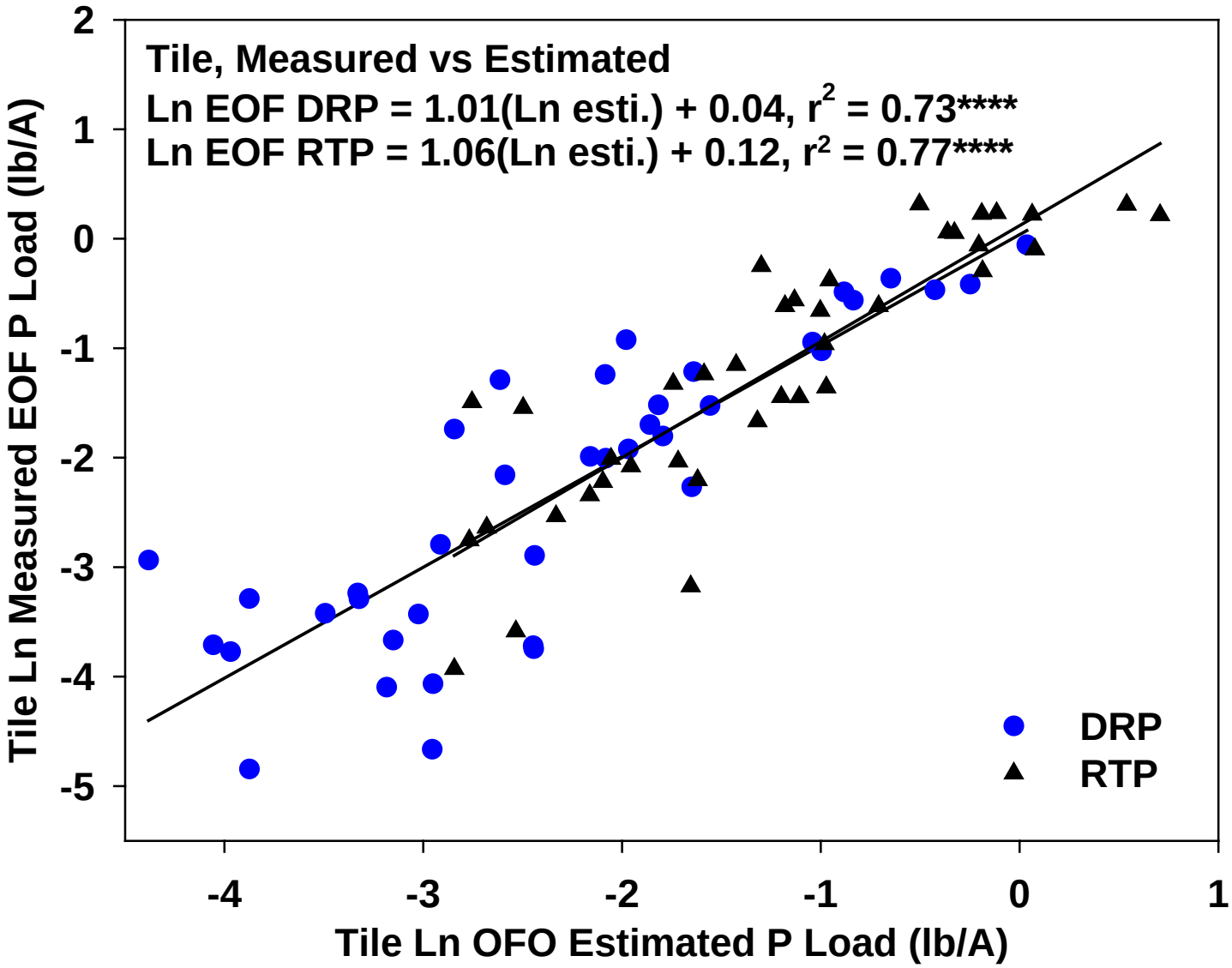
Measured vs Estimated Surface RTP (lb/A)



Measured vs Estimated Tile DRP & RTP (ppm)



Measured vs Estimated Tile DRP & RTP (lb/A)



Using These Equations
How's Ohio Doing

On-Field Ohio!

Statewide Simulations

OHIO SOYBEAN COUNCIL

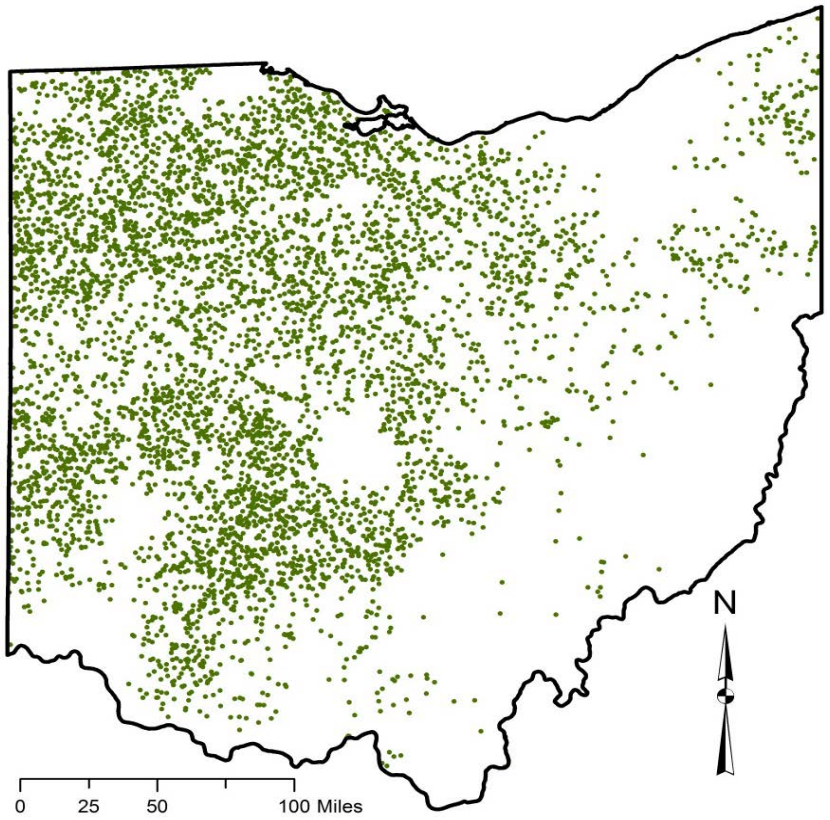
Uses:

- On-Field Ohio Equations
- RUSLE2

Assigns:

- Crop Mngmnt Scenario
- Soil Test P Level

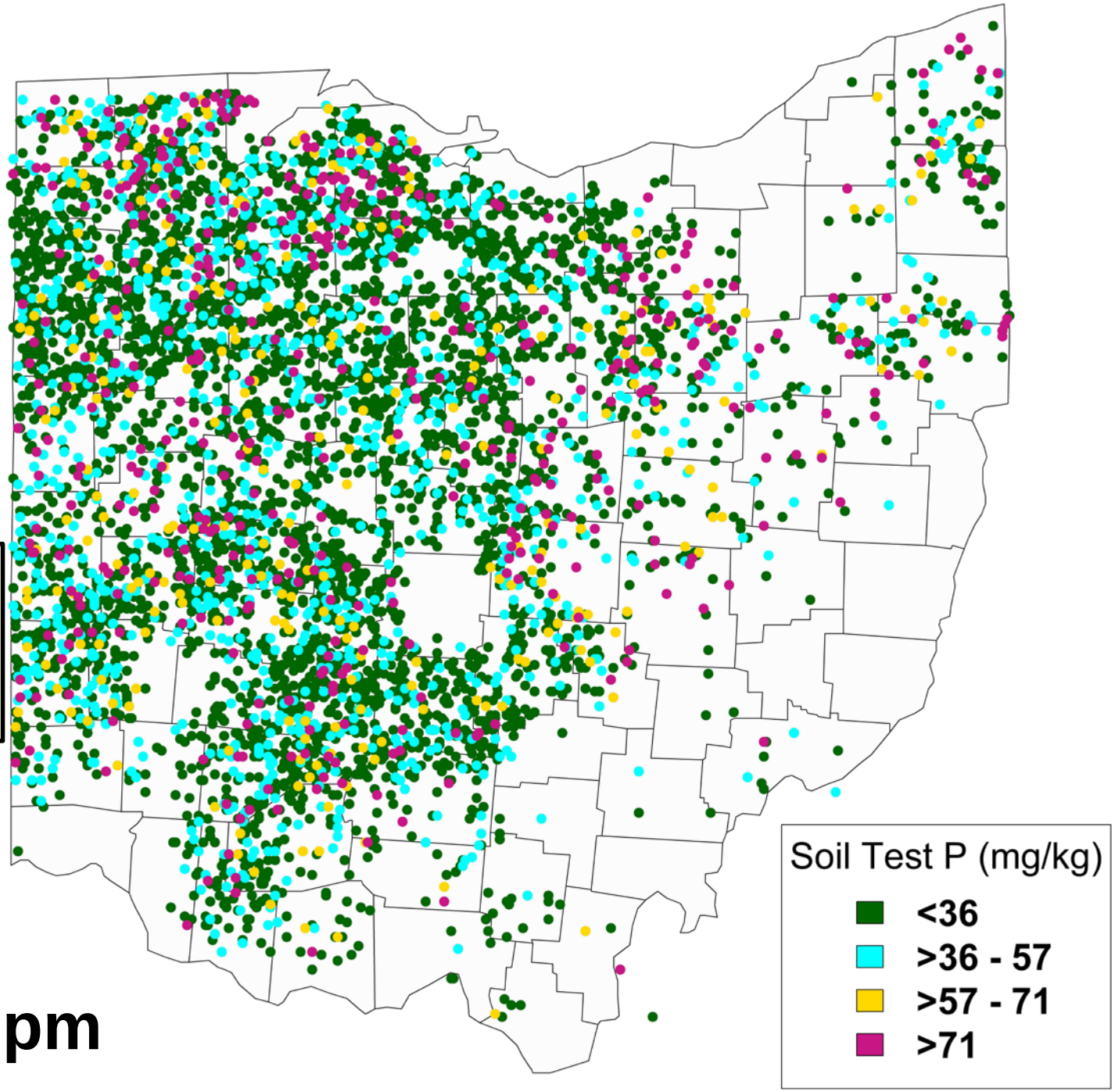
STP, Random Selection
Thanks to Survey:
A&L Great Lakes Labs
Brookside Labs
Spectrum Analytic



>6000 Point Locations

Statewide
M3P
STP (ppm)

Mirrors Ohio Soil Test Lab Data Survey



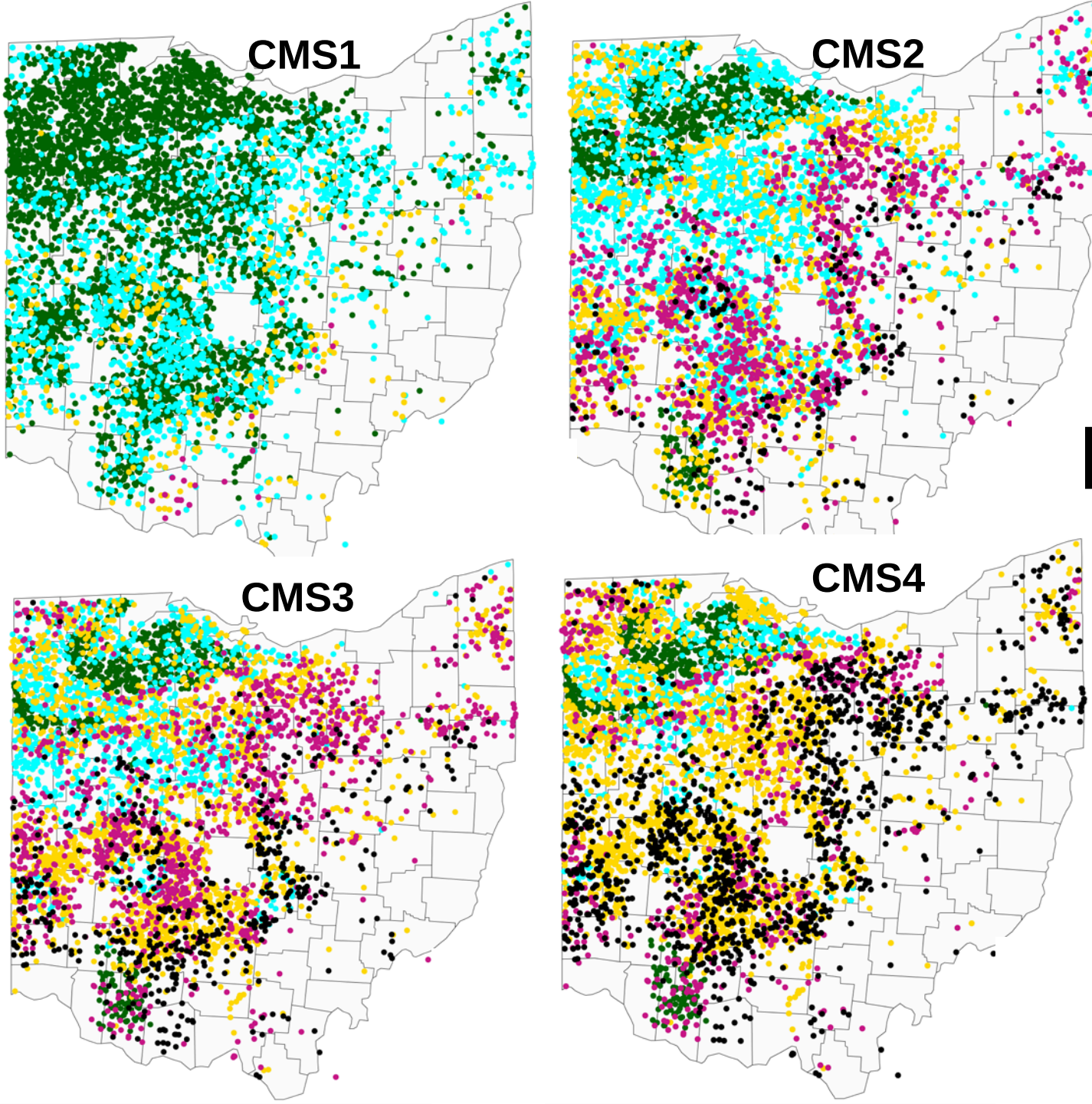
Range
3 to 1011 ppm

Compare Crop Management Scenario (CMS)

Soybean/Corn Rotations

Soil Tillage Intensity Rating (STIR, 0 - 100)

CMS	STIR	CMS
1	2.6	CY1: No-Till Beans CY1: No-Till Corn
2	7.8	CY1: No-Till Beans, Fall Vertical Till CY2: No-Till Corn
3	38	CY1: No-Till Beans, Fall Chisel CY2: Spring Cultivate, Corn
4	94	CY1: Spring Chisel/Cultivator, Beans, Fall Moldboard plow CY2: Spring disk/cultivate, Corn



RUSLE2
Erosion
(t/a/y)

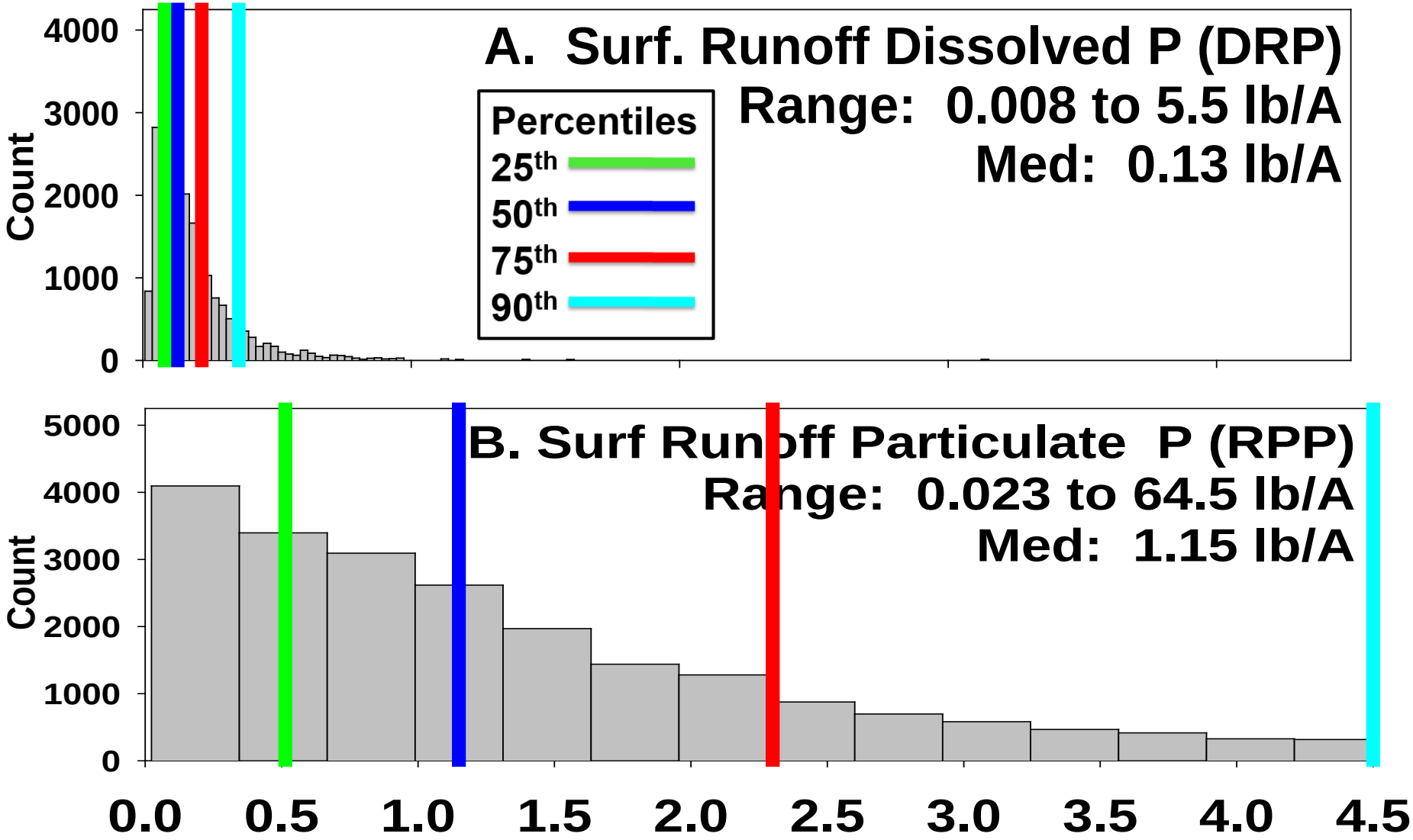
Erosion (t/a/y)

- <0.25
- >0.25 to 0.8
- >0.8 to 2
- >2 to 4
- >4

NOTE

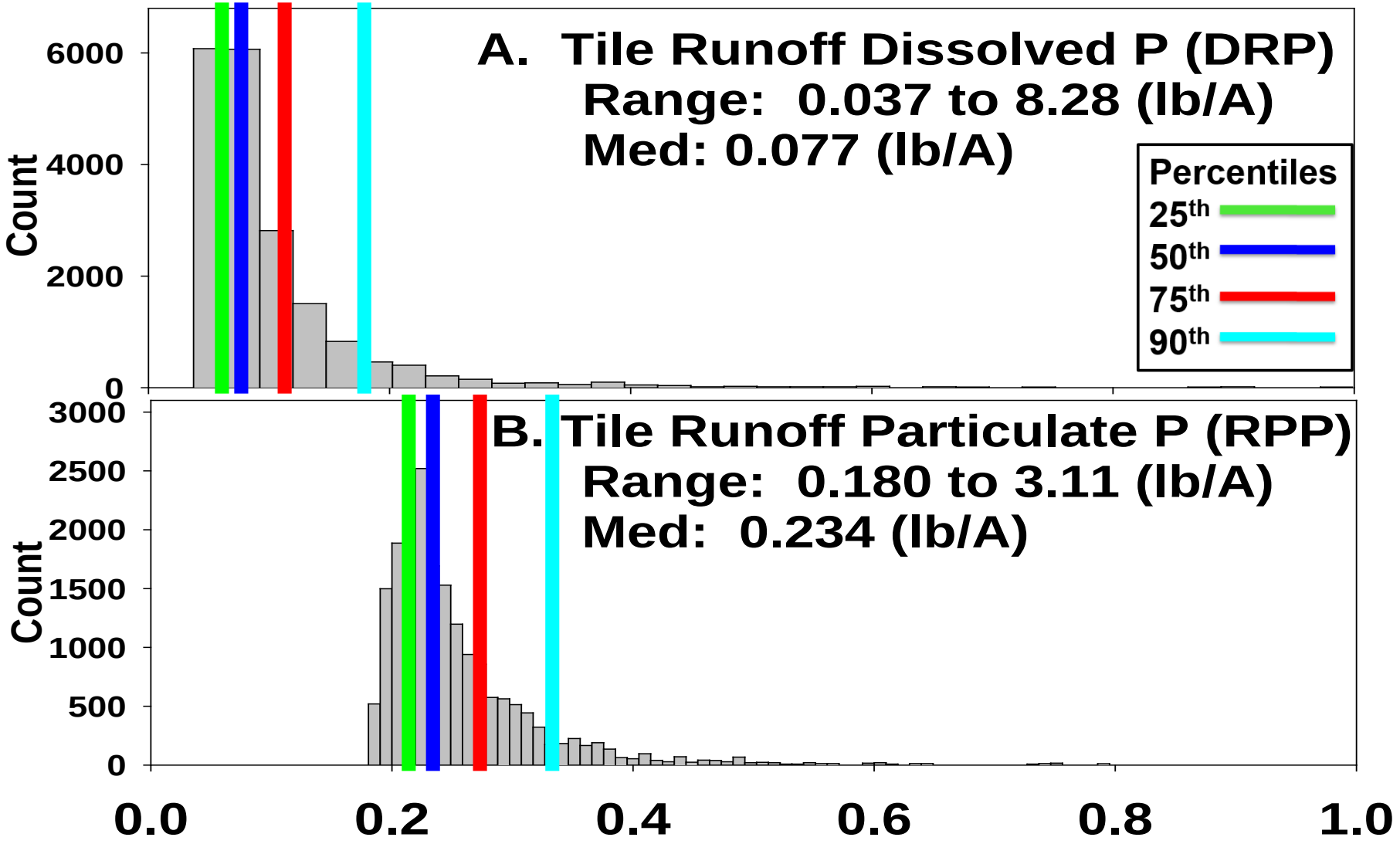
RPP ≈ 10x > DRP

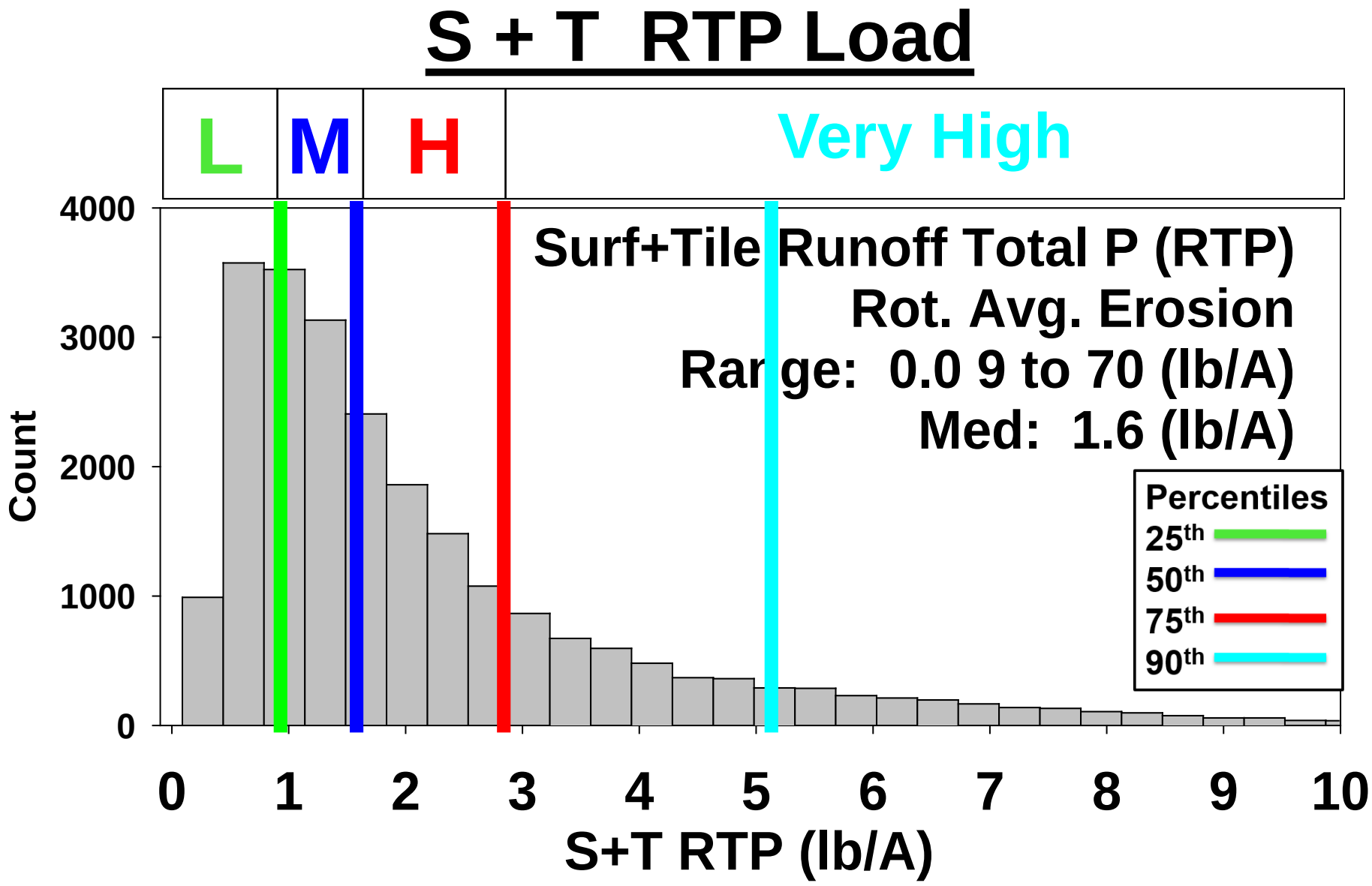
Surface DRP and RPP Load



NOTE
RTP ≈ 3x > DRP

Tile DRP and RPP Load




S + T RTP Load
L
M
H
Very High
Surf+Tile Runoff Total P (RTP)
Rot. Avg. Erosion
Range: 0.0 9 to 70 (lb/A)
Med: 1.6 (lb/A)
Percentiles
25th
50th
75th
90th
Count
4000
3000
2000
1000
0
0 1 2 3 4 5 6 7 8 9 10
S+T RTP (lb/A)

On-Field Ohio!

The Power for Farmers is in Comparisons

Power of Comparison

Example Field: Blount Silt Loam with 2 – 4% Slope corn/bean rotations

2 crop management scenarios (CMS A & B)

A: No-till Beans, Fall Chisel, Spring Cultivate, Corn
B: No-till Beans, No-till Corn

3 Soil Test P levels (mg/kg):

Low: 15
Med: 50
High: 150

Crop Rotation Average Results

	CMS A	CMS B	CMS A	CMS B	CMS A	CMS B
Soil Test P (mg/kg)	15		50		150	
Erosion (t/a/yr)	2.2	0.43	2.2	0.43	2.2	0.43
	Runoff P Loss (lb P/acre)					
Surface Particulate	1.1	0.32	1.7	0.49	2.9	0.84
Tile Particulate	0.16	0.16	0.21	0.21	0.37	0.37
Surface Dissolved	0.05	0.04	0.15	0.12	0.46	0.36
Tile Dissolved	0.04	0.04	0.08	0.08	0.29	0.29
Total P Loss	1.4	0.56	2.1	0.90	4.0	1.9

Power of Comparison Results

Move from Rotational Till to No-Till

80% Reduction in erosion
Resulting in
71% Reduction in Surface RPP

STP Increase 15 to 150 mg/kg increases:

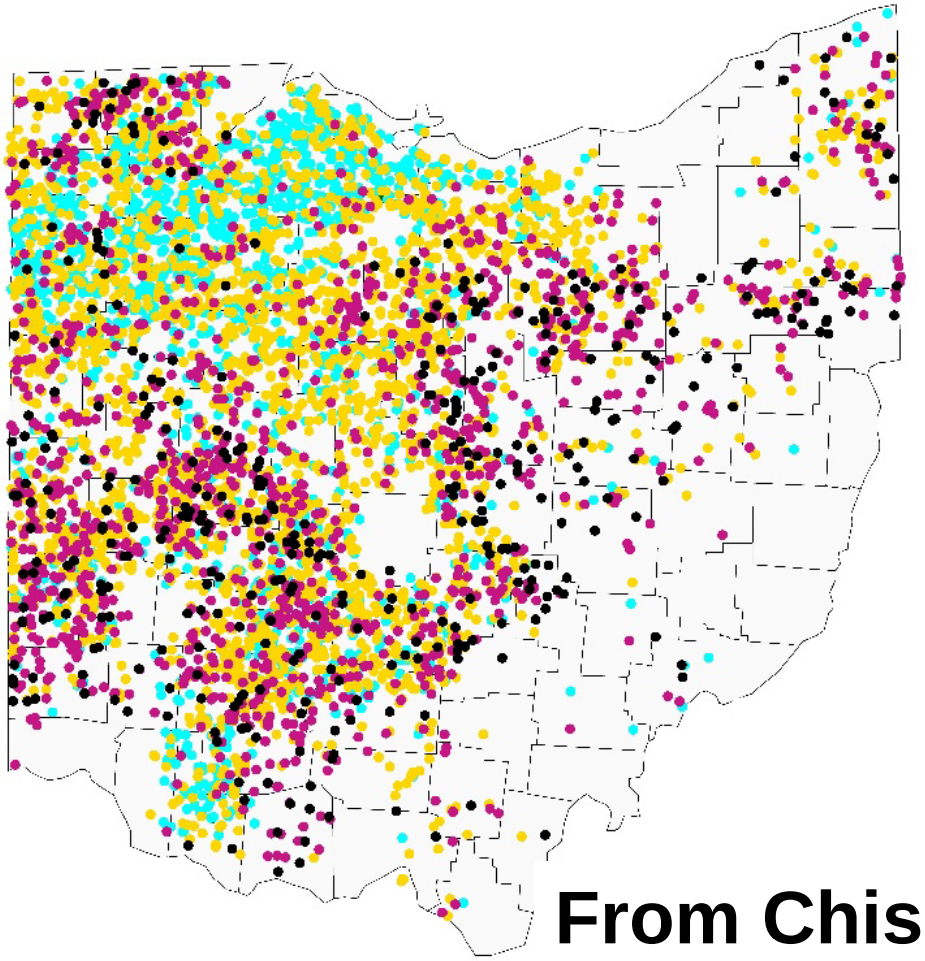
Tile: >2x particulate P, >7x dissolved P
Surface: >9x dissolved P


On-Field Ohio!
Using Simulations
Set Results Interpretation
to Achieve
40% Reduction Target

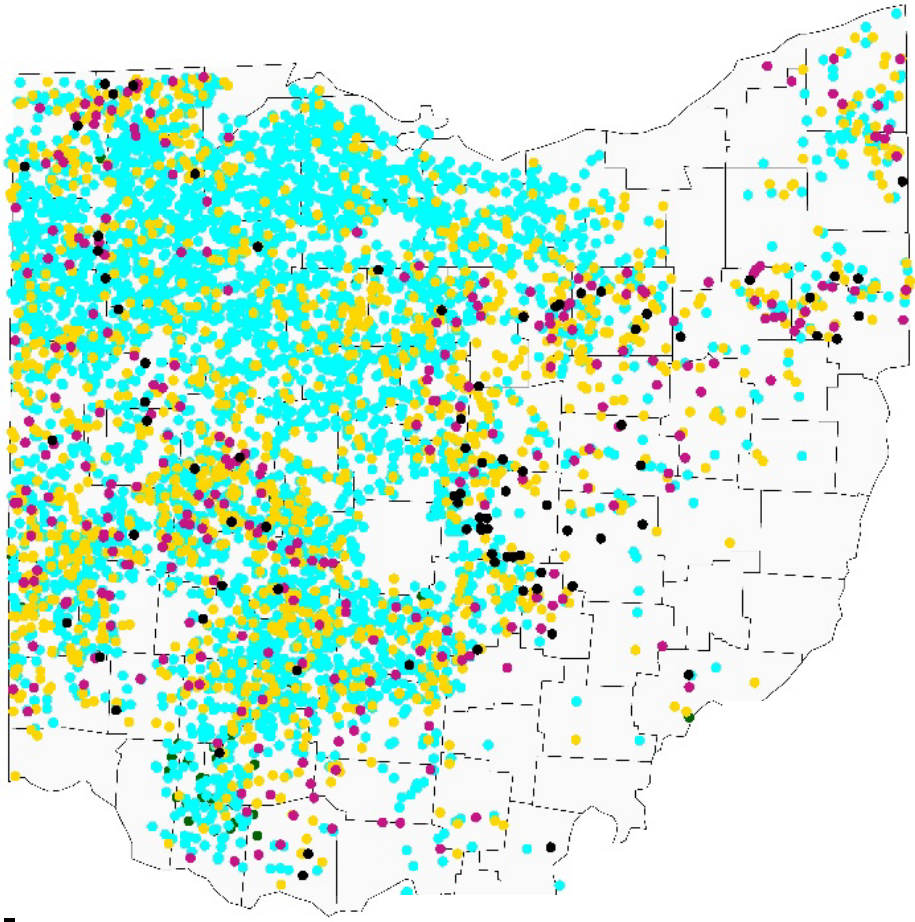
% Red. RPP (lb/A)

- <50
- >50 to 72
- >72 to 80
- >80 to 86
- >86

Surf. RPP (lb P/A) % Red.
Move To: No-Till

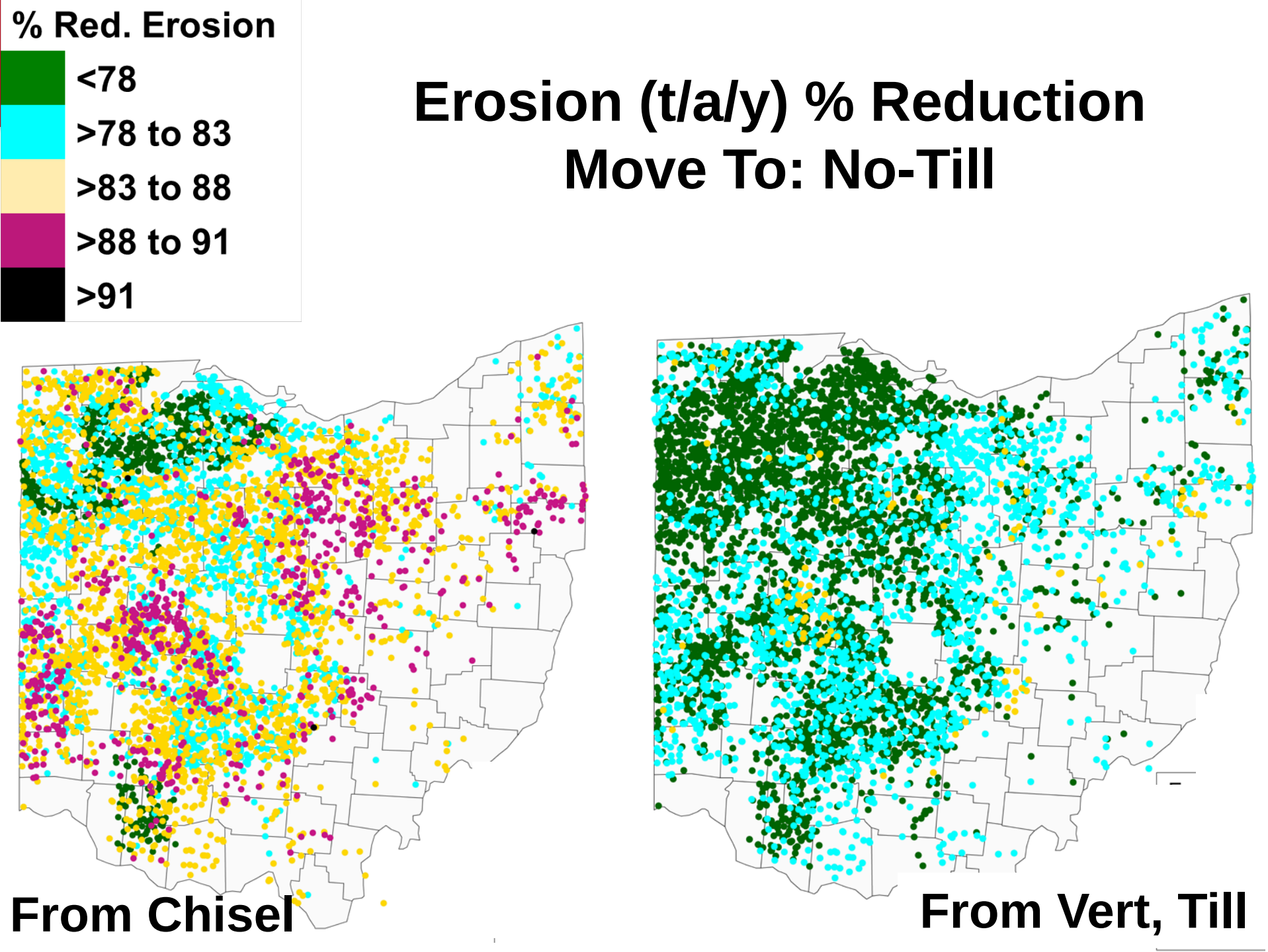


From Chisel

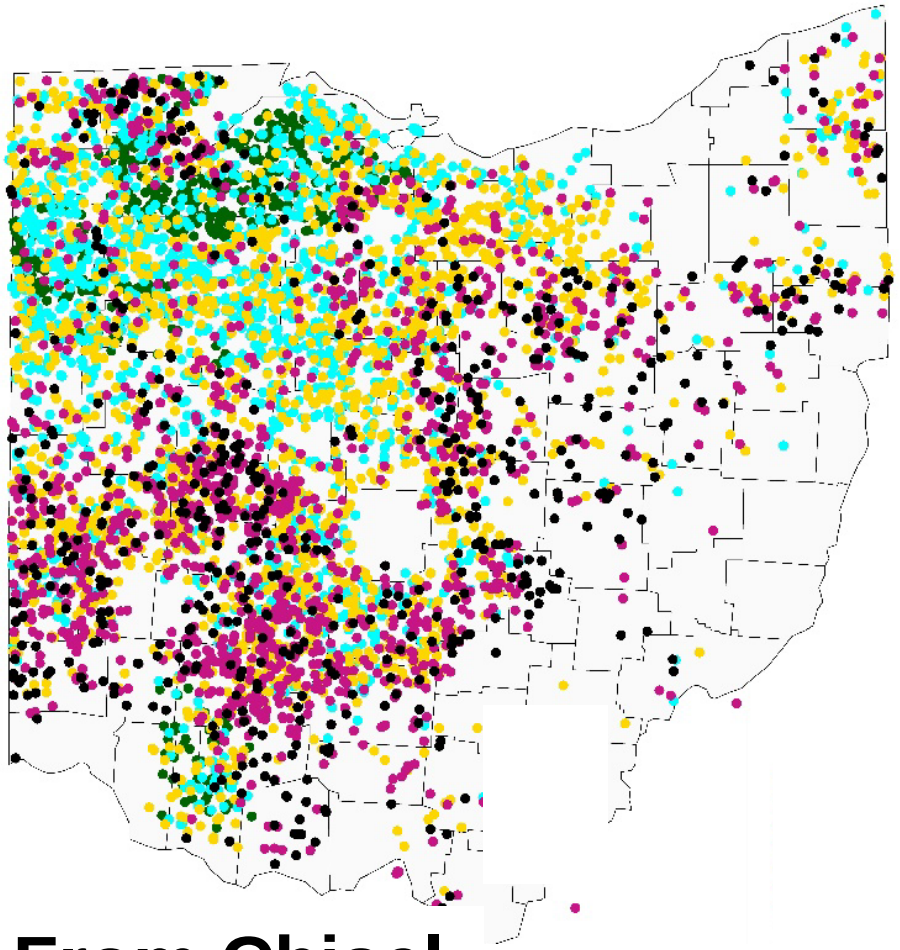


From Vert. Till

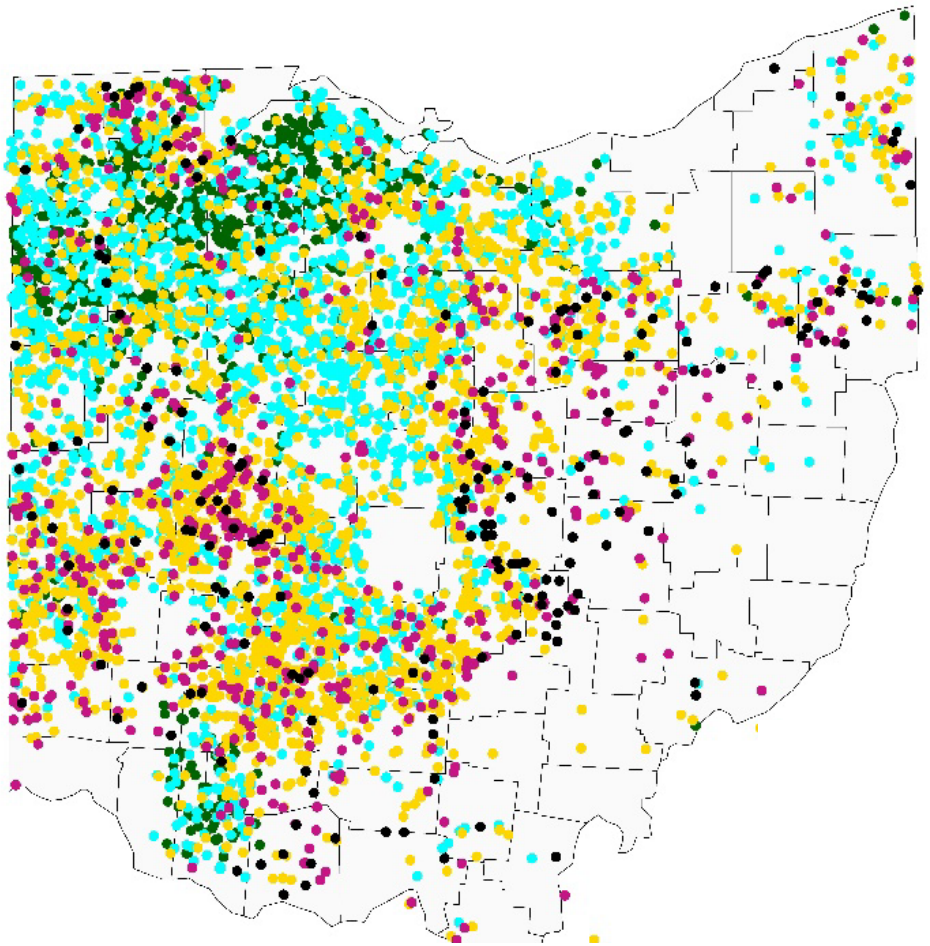
Erosion (t/a/y) % Reduction
Move To: No-Till



S + T RTP (lb P/A) % Reduction
Move to No-Till



From Chisel



From Vert Till

Coming Soon

On-Field Ohio!
On-line Tool

Using:
Developed Equations

- **Erosion (t/a/y)**
- **Surface & Tile (lb/A)**
  DRP, RPP, RTP
- **Fertilizer/Manure**
  additional DRP (lb/A)
- **Interpretation**

Conclusions

BIG MOVE for Ohio P Risk Index From Qualitative to Quantitative

- **Allows farmers to prioritize time and resources to make effective management decisions**
- **Need to REDUCE P load to Ohio surface waters**
  - **Reduce Erosion**
  - **Reduce Soil P Levels**
- **Big opportunities for reductions**

Thank You

Questions?

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