# Heidelberg CIG: Field Data, SWAT, & the Nutrient Tracking Tool (NTT)

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# Collaborators/Partners

**Producers**
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**Texas Institute for Applied Environmental Research (TIAER),**
**Tarleton State University**
**IPM Institute of North America**
**USDA-Agricultural Research Service**

# Acknowledgment


## USDA-NRCS
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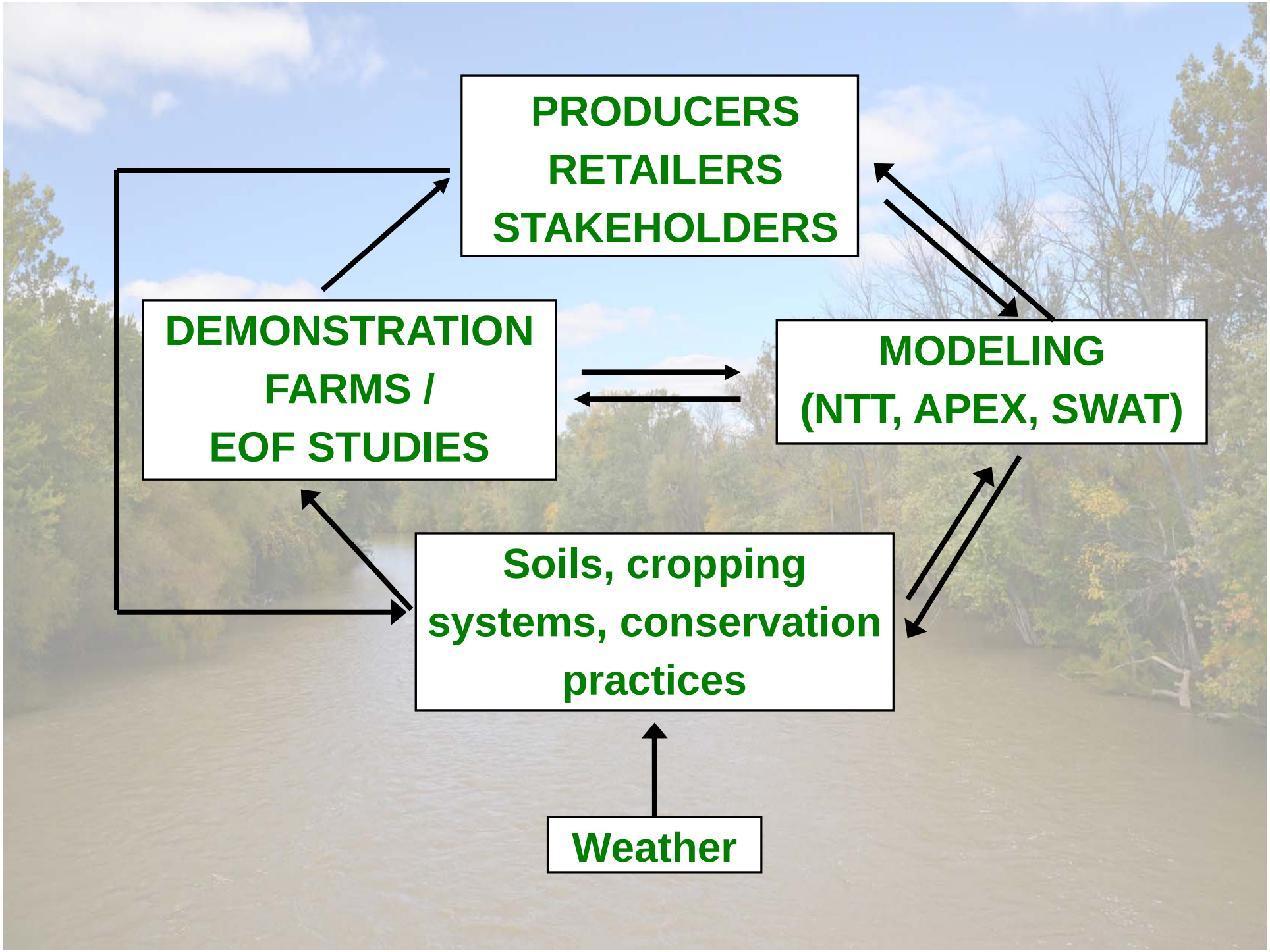
## No. 69-3A75-13-216

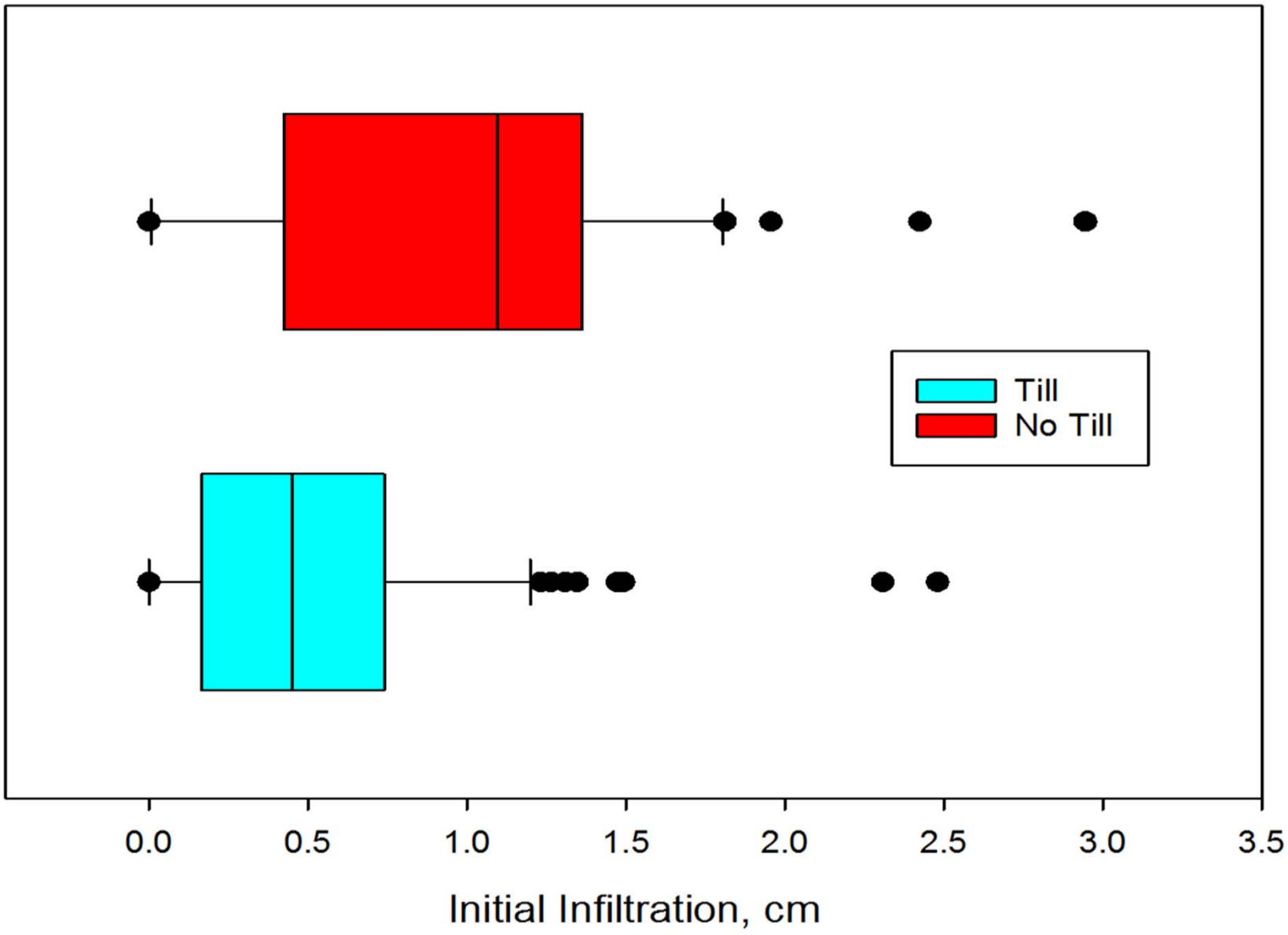
# CIG project objectives

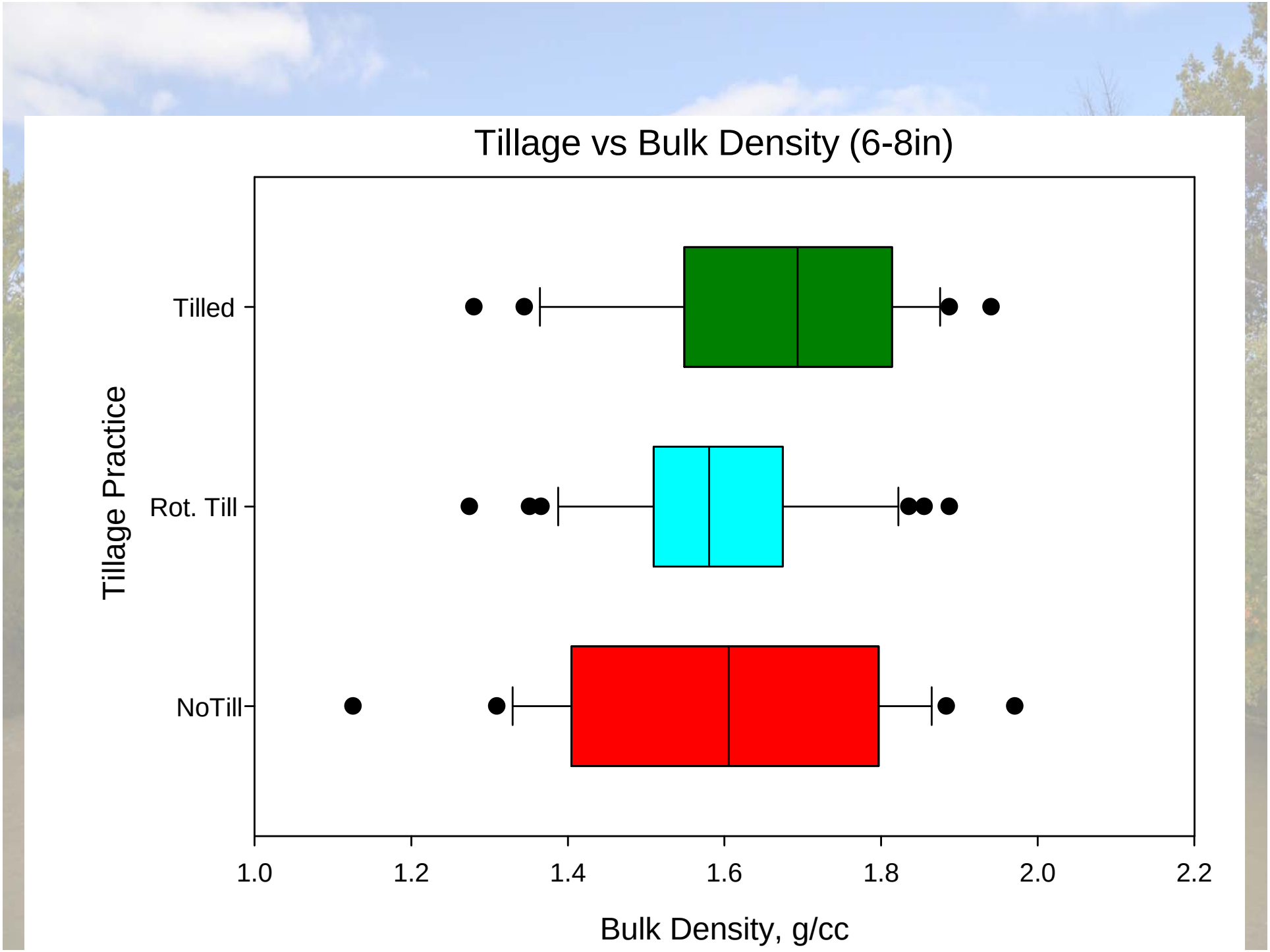
1) EOF studies/field samplings: environmental effects of BMPs.
2) APEX and SWAT calibration and verification
3) Nutrient Tracking Tool (NTT) calibration and verification.
4) Extension and outreach

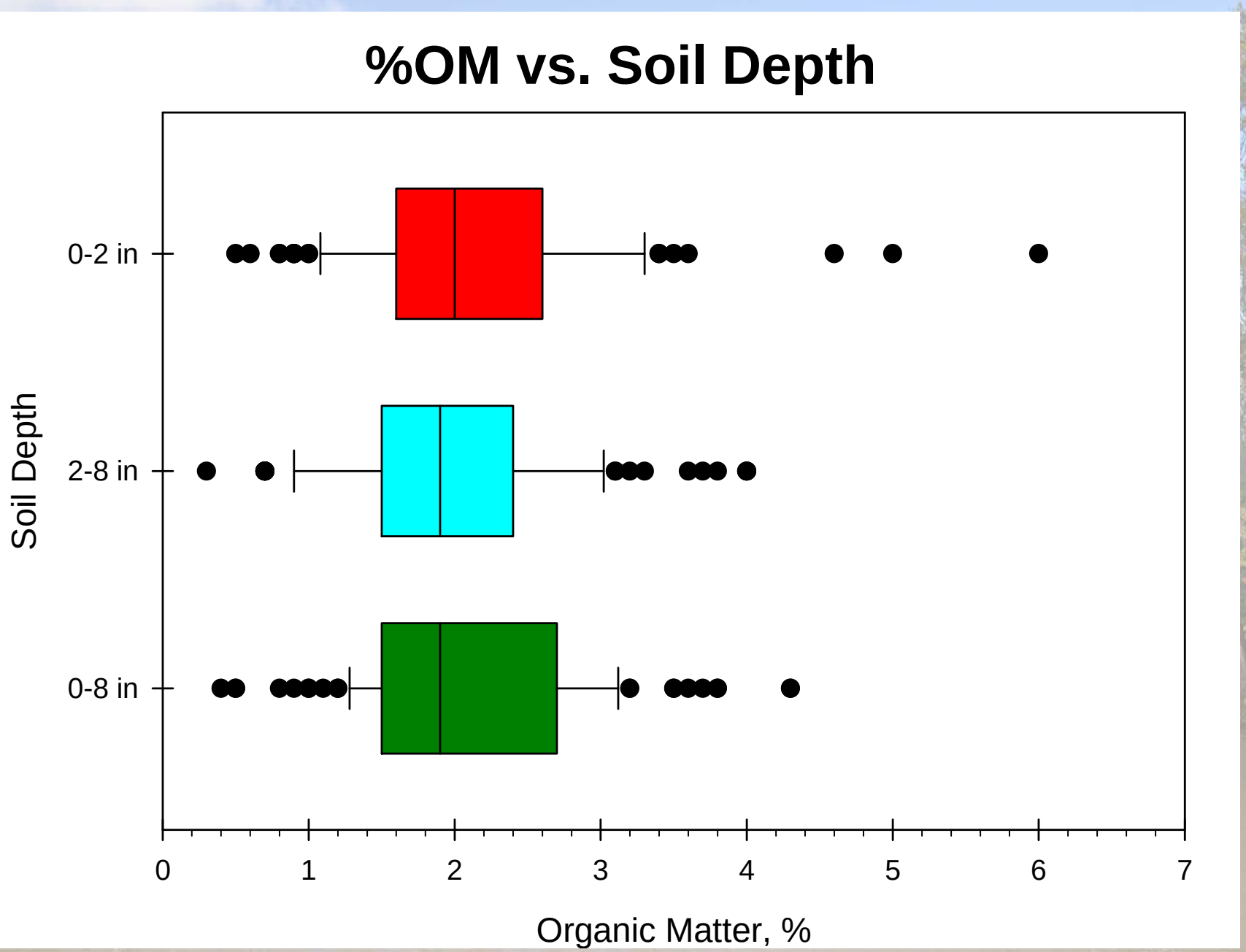

PRODUCERS
RETAILERS
STAKEHOLDERS
DEMONSTRATION
FARMS /
EOF STUDIES
MODELING
(NTT, APEX, SWAT)
Soils, cropping
systems, conservation
practices
Weather

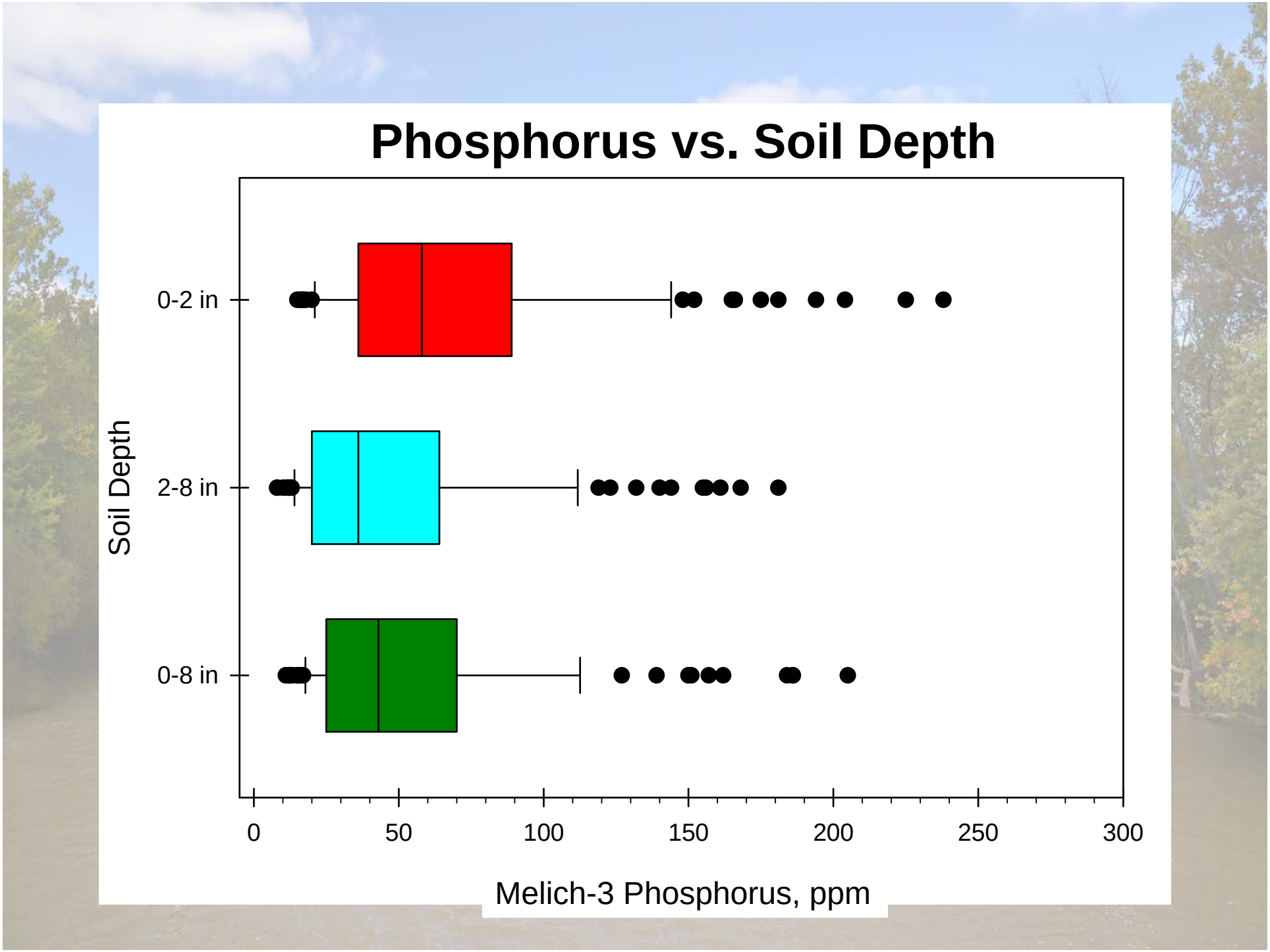

Field Data
Tillage, Soil, and Infiltration tests

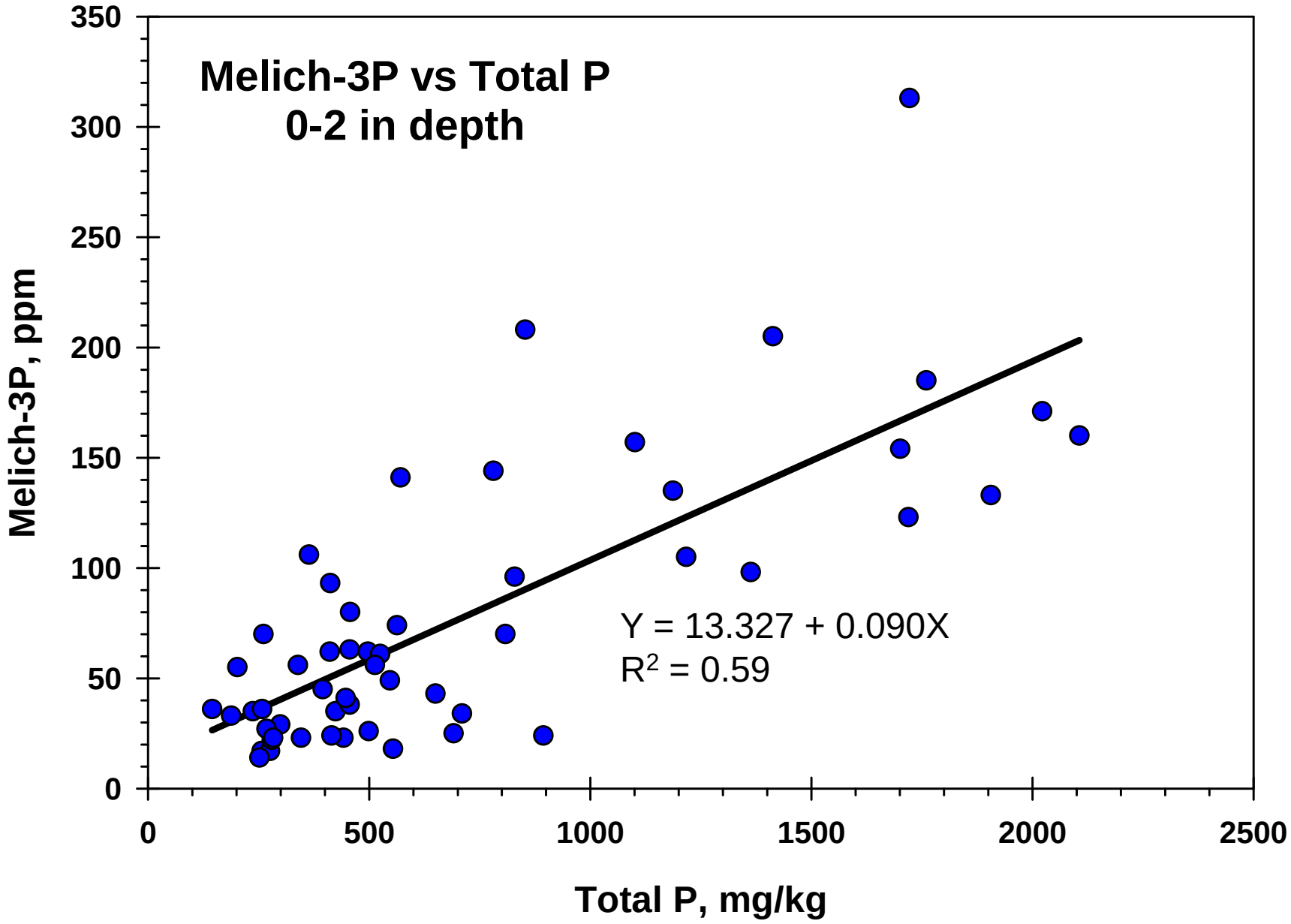
# Tillage vs Initial Infiltration

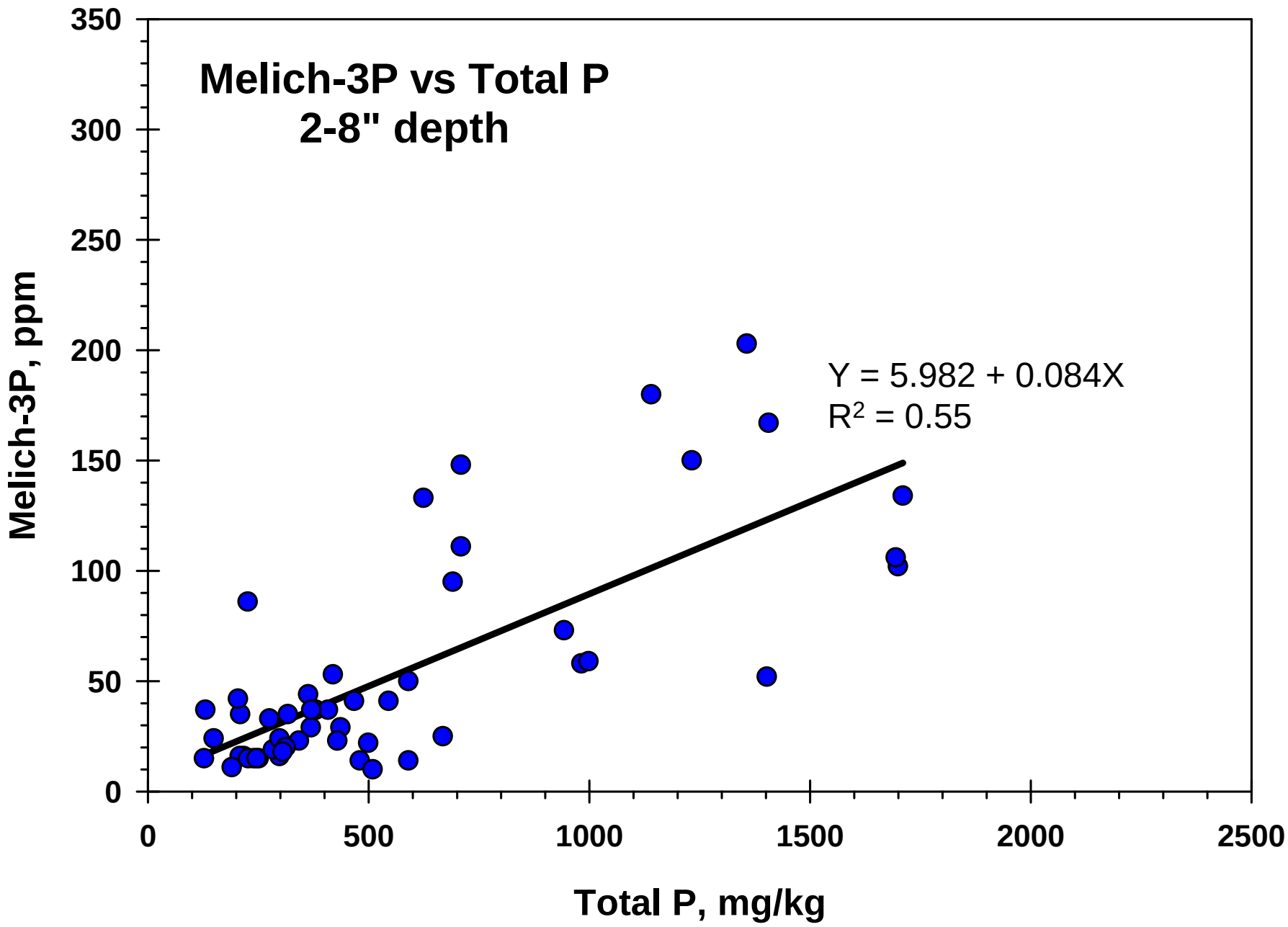



Tillage vs Bulk Density (6-8in)
Tillage Practice
Tilled
Rot. Till
NoTill
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Bulk Density, g/cc


%OM vs. Soil Depth
Soil Depth
0-2 in
2-8 in
0-8 in
0
1
2
3
4
5
6
7
Organic Matter, %


Phosphorus vs. Soil Depth
Soil Depth
0-2 in
2-8 in
0-8 in
0
50
100
150
200
250
300
Melich-3 Phosphorus, ppm


Melich-3P vs Total P
0-2 in depth
Melich-3P, ppm
Total P, mg/kg
Y = 13.327 + 0.090X
R2 = 0.59
0
50
100
150
200
250
300
350
0
500
1000
1500
2000
2500

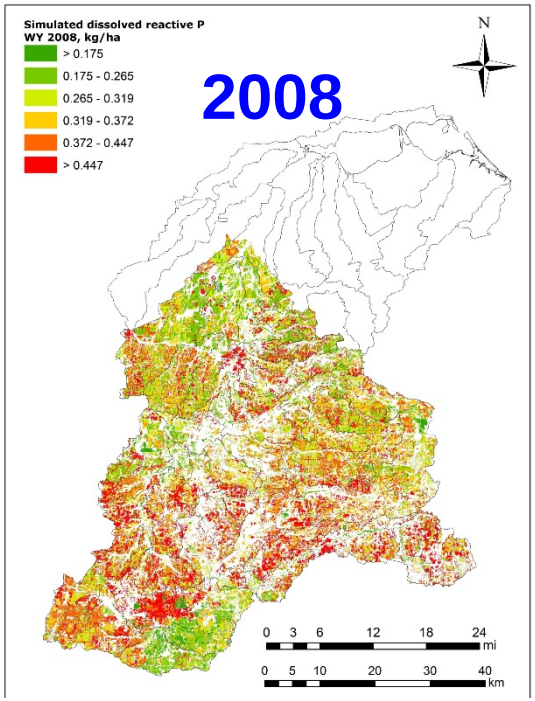

Melich-3P vs Total P
2-8" depth
Y = 5.982 + 0.084X
R2 = 0.55
Melich-3P, ppm
Total P, mg/kg
0
50
100
150
200
250
300
350
0
500
1000
1500
2000
2500

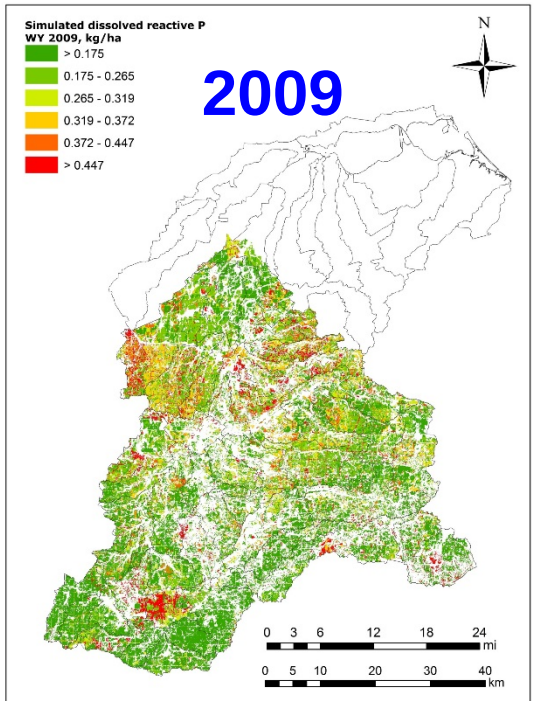
# SUMMARY

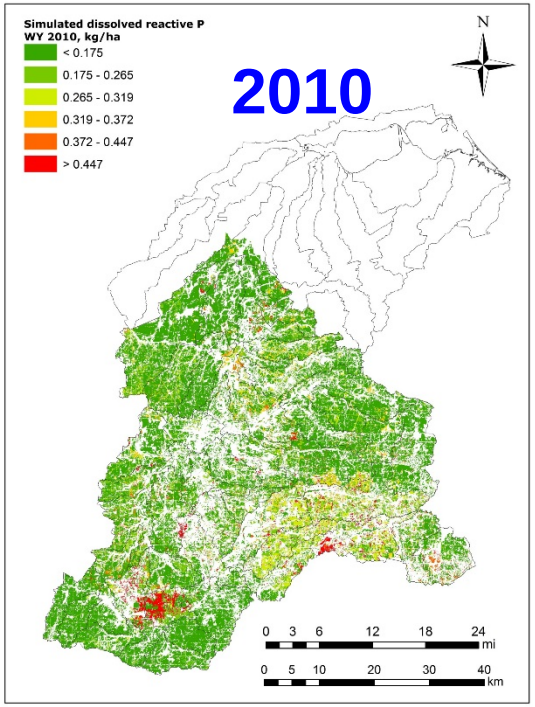
- Higher initial infiltration in no-till vs. tilled.
- Lower bulk density in no-till vs. tilled.
- Median OM is about 2% with some fields less than 1% and as high as 6%.
- Higher available soil phosphorus at the top 0-2 inches (~55ppm) than at the lower 2-8 cm (37 ppm): soil stratification.
- The soil available P (M3) is less than 10% of the total soil P.

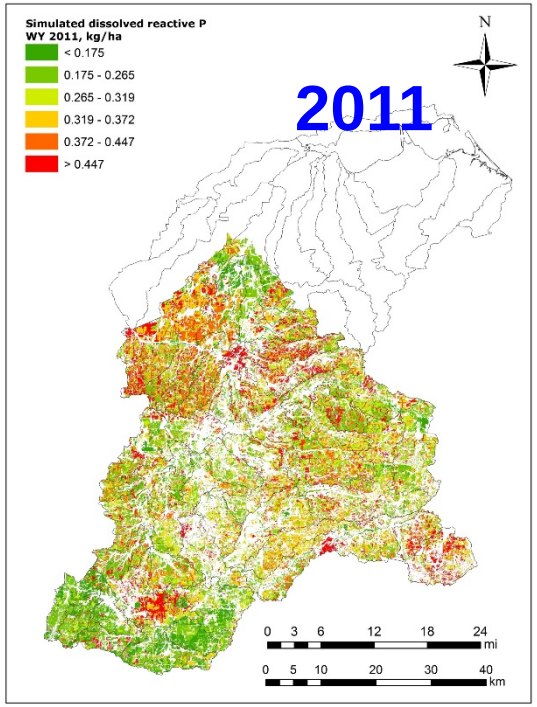

SWAT Modeling

# Simulated annual dissolved P exports

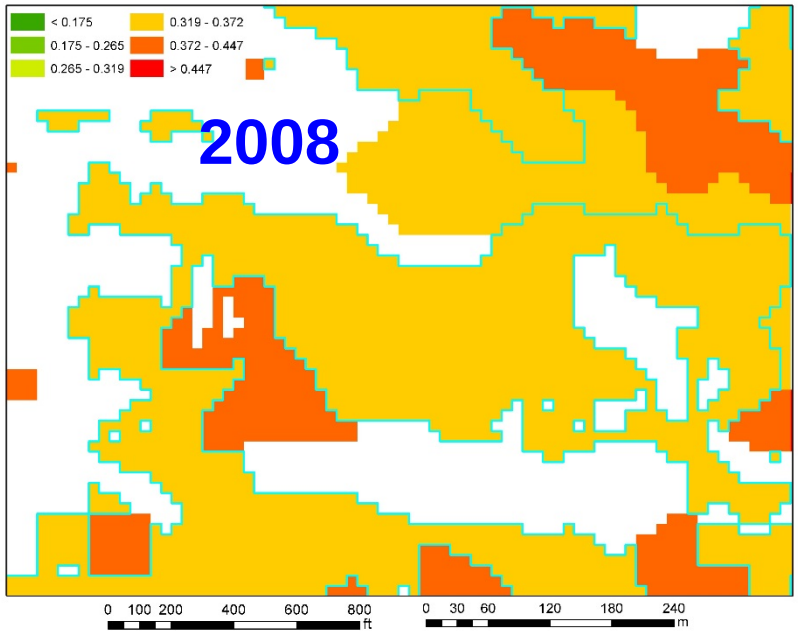


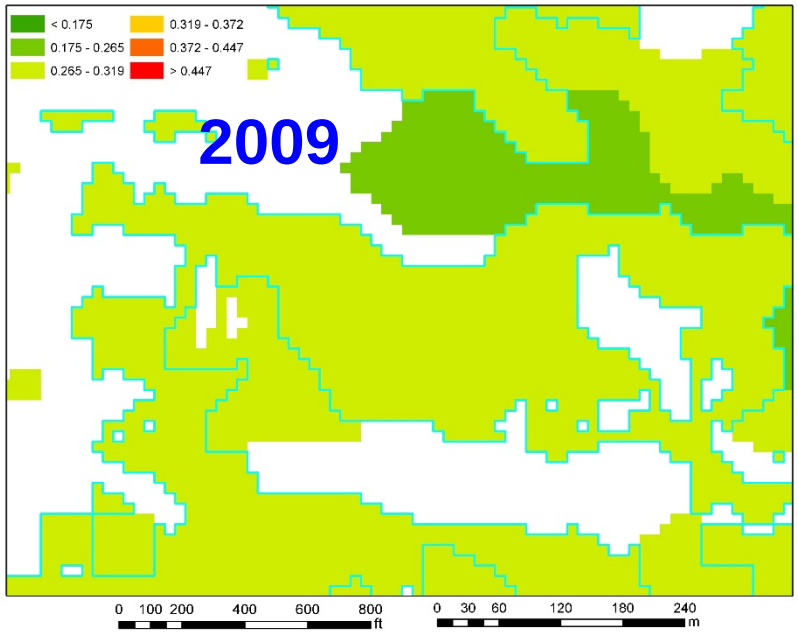



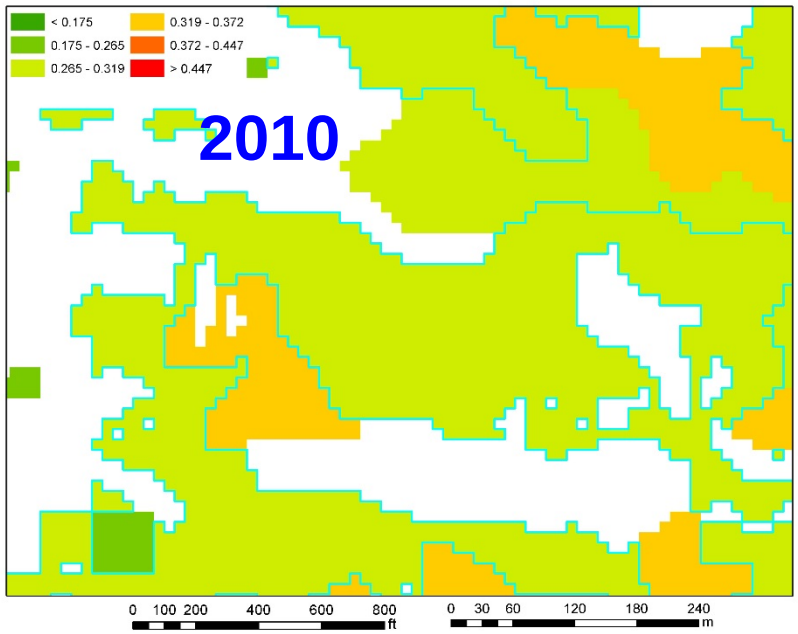



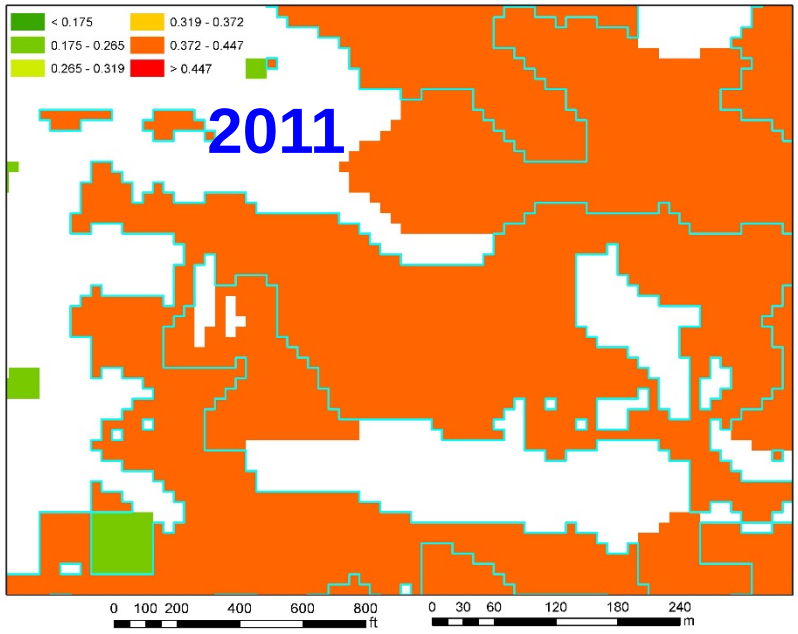



# Simulated annual dissolved P exports, kg/ha

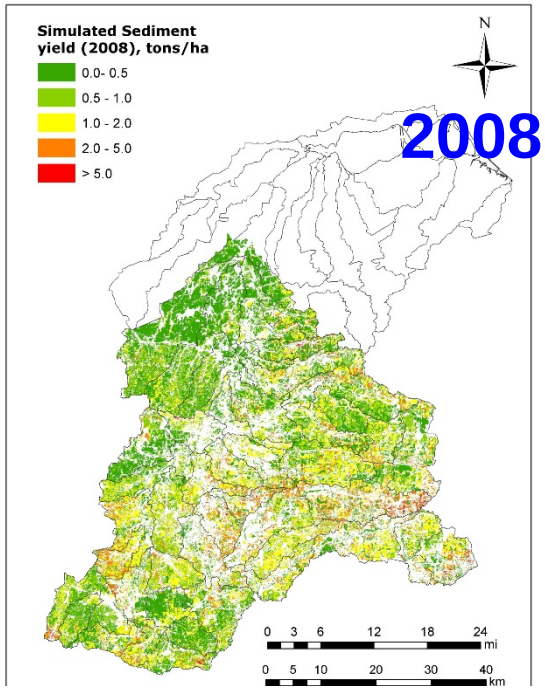


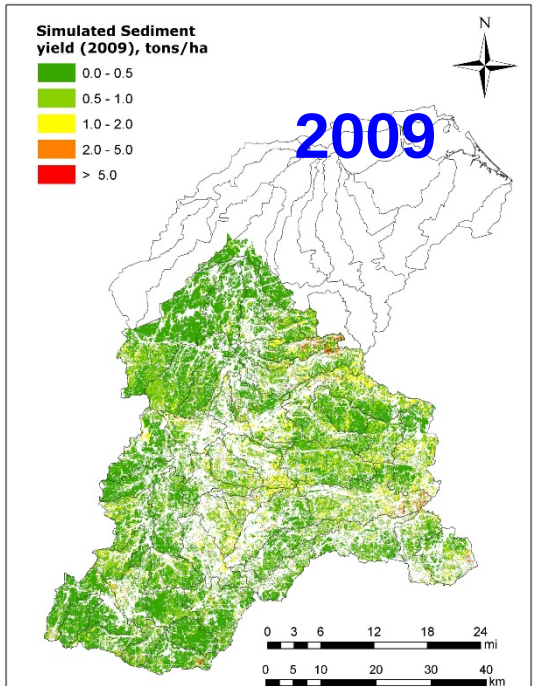



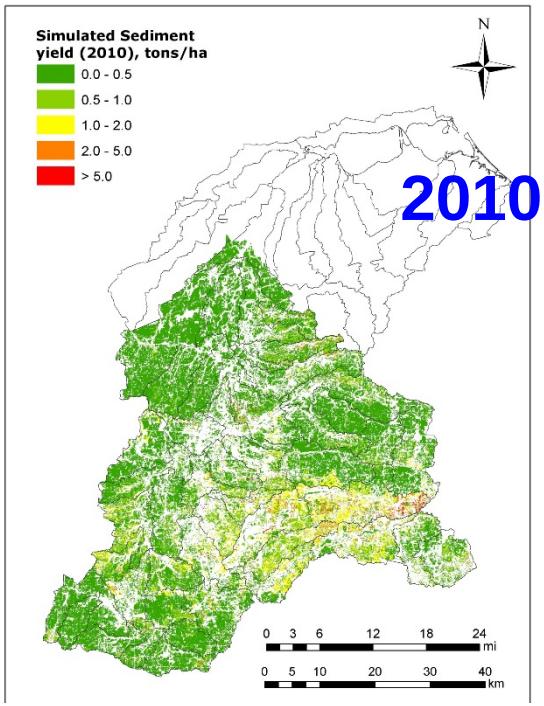



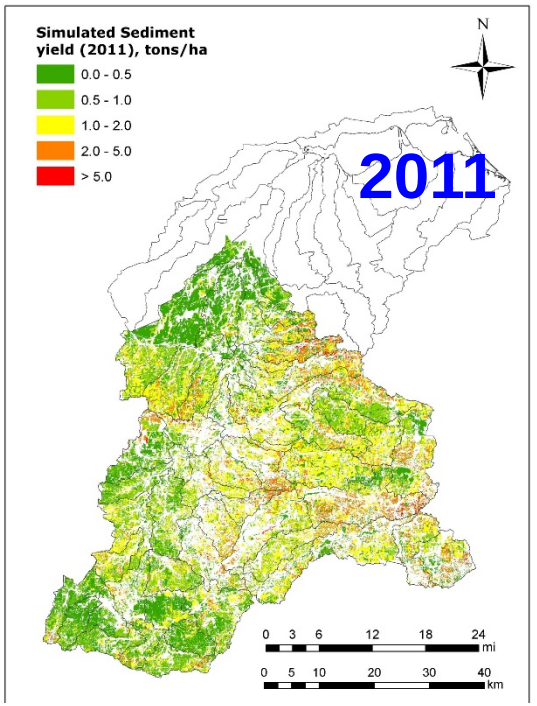



# Simulated annual sediment yield



# SUMMARY

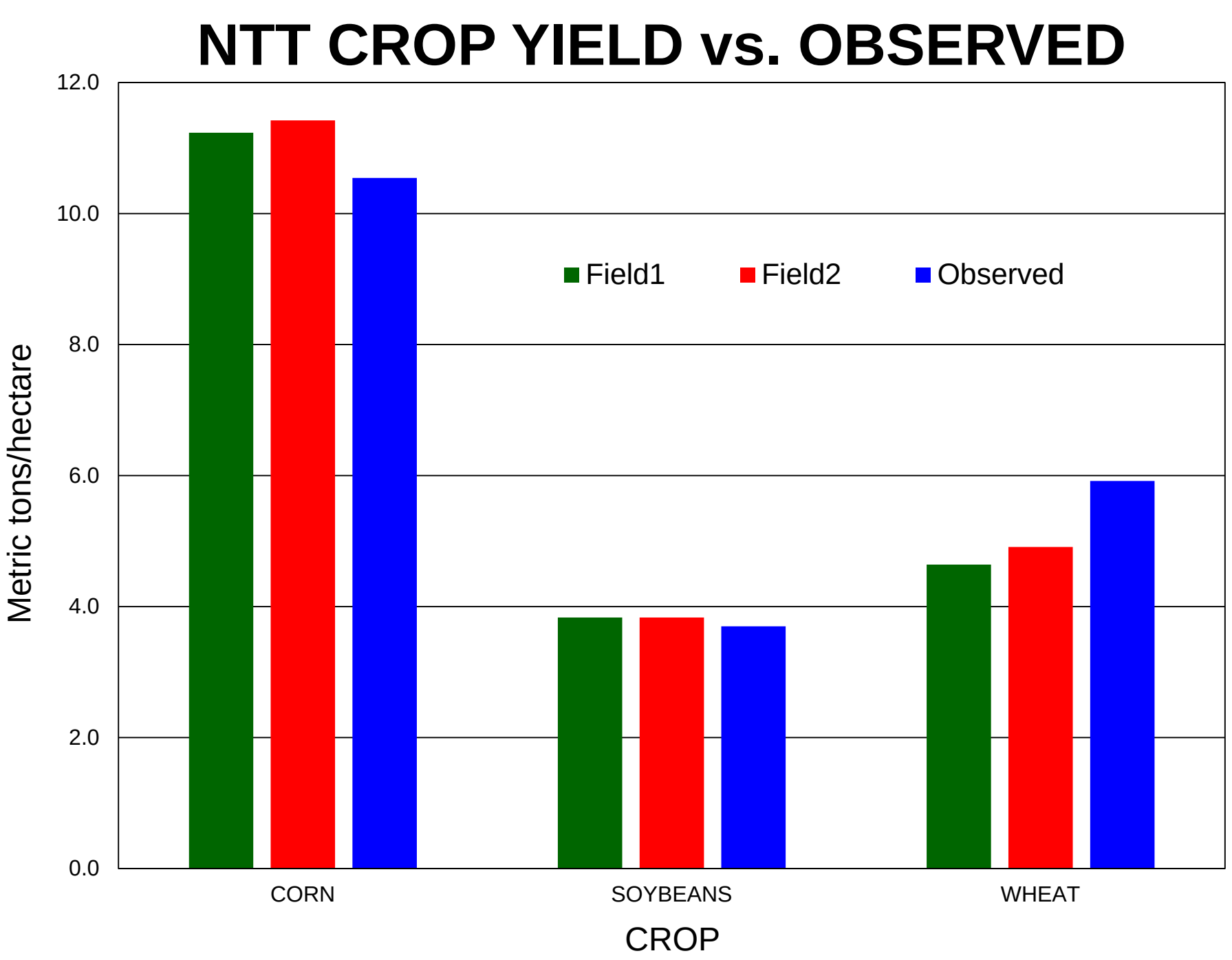
**Critical areas are changing with time and space.**

**Traditional concept of CSA may not be applicable to NW OH (tile drain connectivity)**

**Targeting CSAs may not be enough to attain load reduction goals.**

**Watershed-wide implementation of “cultural” (e.g. 4R) BMPs rather than structural might be more appropriate in reducing loading exports.**


THE Nutrient Tracking Tool (NTT)


NTT CROP YIELD vs. OBSERVED
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Metric tons/hectare
Field1
Field2
Observed
CORN
SOYBEANS
WHEAT
CROP

# Total field exports, kg/ha

| | Total P | Total N |
|---|---|---|
| FIELD1(30 yrs) | 0.86 | 12.6 |
| Observed(2015) | 0.74 | 22.4 |
| | | |
| FIELD2 (30yrs) | 0.92 | 15.8 |
| Observed(2015) | 1.09 | 15.4 |

# Tile drain exports, kg/ha

| | Dis P | Total N |
|---|---|---|
| Field1(30 yrs) | 0.22 | 8.14 |
| Observed(2015) | 0.19 | 22.33 |
| | | |
| Field2 (30 yrs) | 0.22 | 10.18 |
| Observed(2015) | 0.19 | 12.90 |

# SUMMARY

- NTT is a web-based APEX model
- “User-friendly” and accessible to anyone with internet connection
- Uses field data: soil test, BD, etc.
- Calculate nutrient and sediment exports, crop yield
- Powerful tool to compare different practices at field level


EXTENSION

# NEXT STEPS/ONGOING

- Continue to verify the NTT with EOF data.
- Compare OM vs. Bulk Density vs. Infiltration
- Pilot study in Erie and Huron County: pay for performance program using NTT

# Take Home

- 40% P reduction?
- Widespread BMP adoption is necessary
- Each field is unique from each other!
- Actual implementation: “the devil is in the details”
- Field by field basis of implementation.
- APEX/NTT is a potential tool to guide implementation.


THANKS!!!
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