

Adapting Precision Technologies to Soil Health Management

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Soil Health Management

- Systems based approach to managing the chemical, physical, and biological soil characteristics that impact productivity and offsite environmental impacts

Soil health Indicators

◉ Chemical

- > pH
- > Nitrogen
- > Macro Nutrients
- > Micro Nutrients
- > Clay Type

◉ Biological

- > Organic Matter
- > Microbial Activity

◉ Physical

- > Depth
 - > Texture
 - > Structure
 - > Landscape Position
-
- > Macrobial Activity
 - > Microbial Diversity

Framework for Soil Health Assessment

- ◉ We have framework for nutrients,
 - > A great deal of precision Ag efforts have focused on this
- ◉ Framework exists for physical characteristics
 - > Soil survey Crop Productivity index
 - > Iowa corn suitability rating
 - > Not available in all states due to lack of validation
 - > Mapping unit scale is often too large

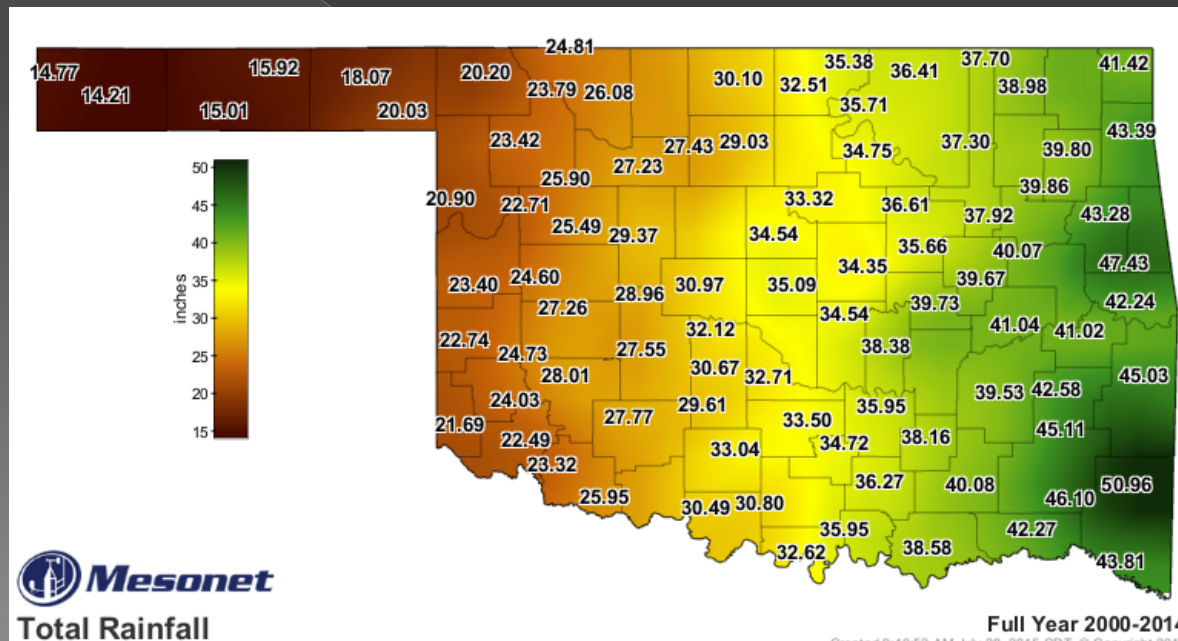
Framework for Soil health Assessment

● Biological Indicators

- These need a great deal of work
- There are volumes of data, but little or no data relating biological indicators to productivity or environmental impacts
- Data available is not robust enough for state wide applications
- We are left with a “more is better” approach with no threshold for management.

Organic matter is a great example

- It is often said that higher organic matter equals higher yields
- How did the organic matter get there in the first place?



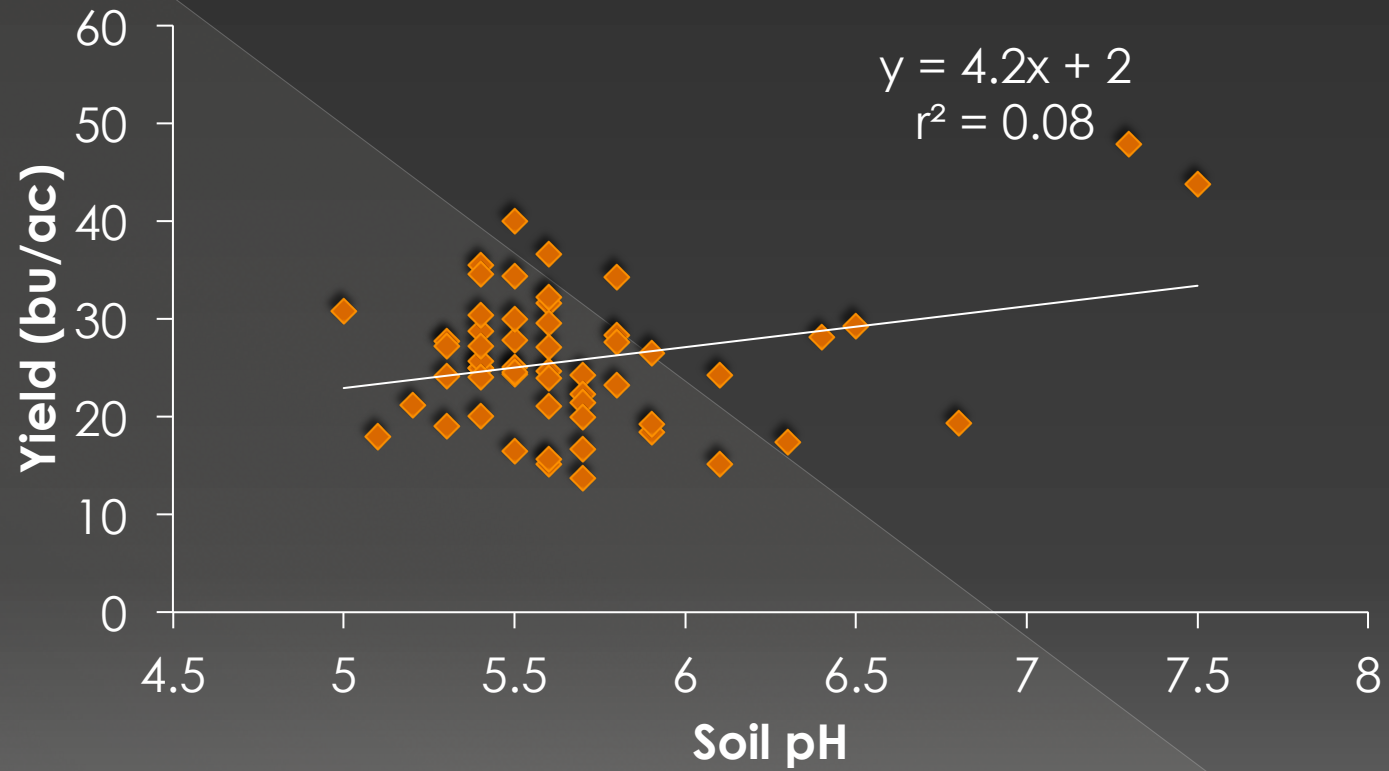
Role of precision ag technologies

- Identify soils with poor “health”
 - > Productivity
 - > Environmental impacts
 - > Identify limitations
- Identify variable response to soil health promoting practices
 - > Utilize strip trials to identify soil conditions where cover crops and/or no-till provide response

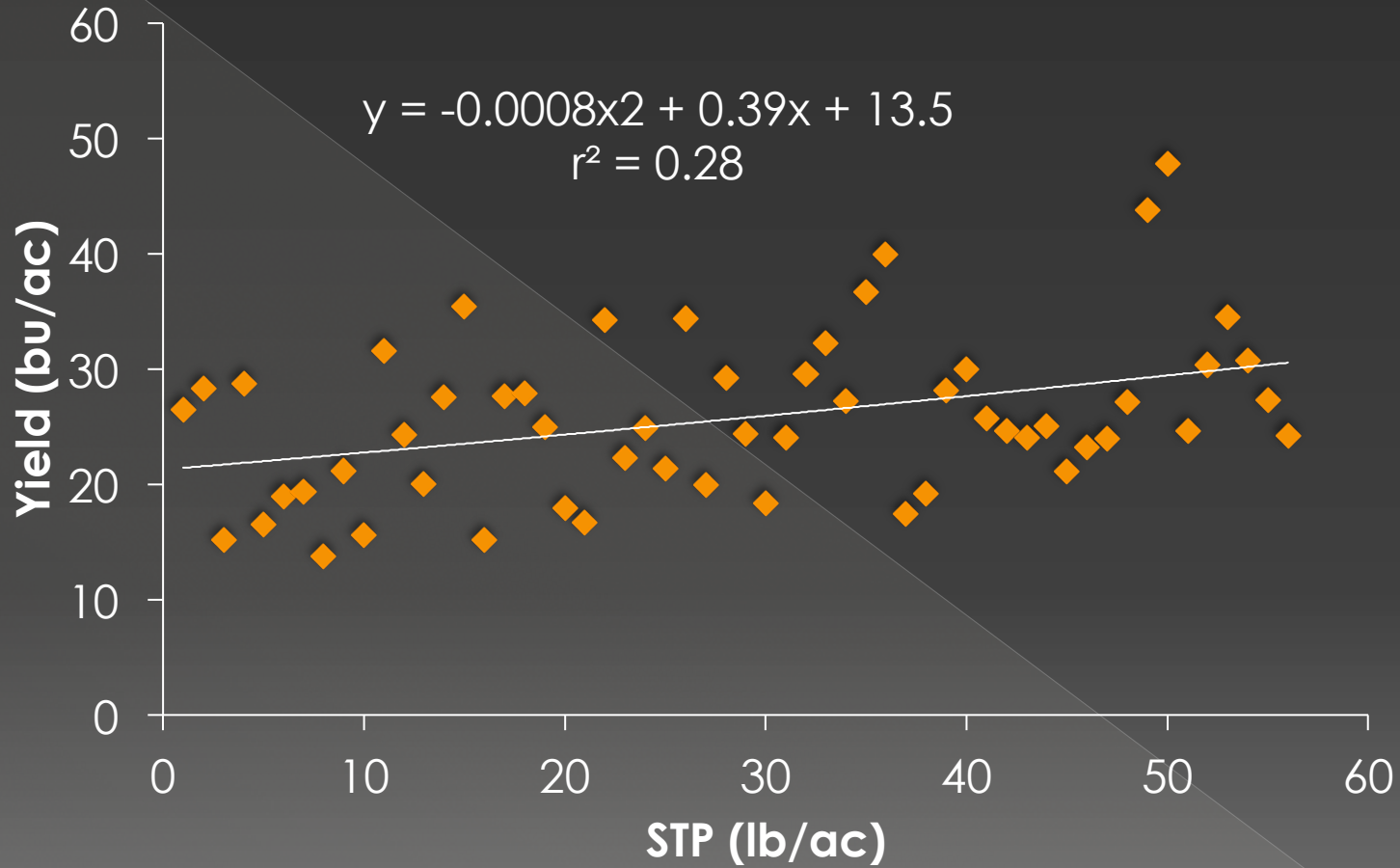
Complexity of Soil Productivity

- ◉ There are many factors that influence soil productivity
- ◉ It is a very complex **system**
- ◉ Precision Ag technologies must be used to manage the system

pH vs Yield



P vs Yield

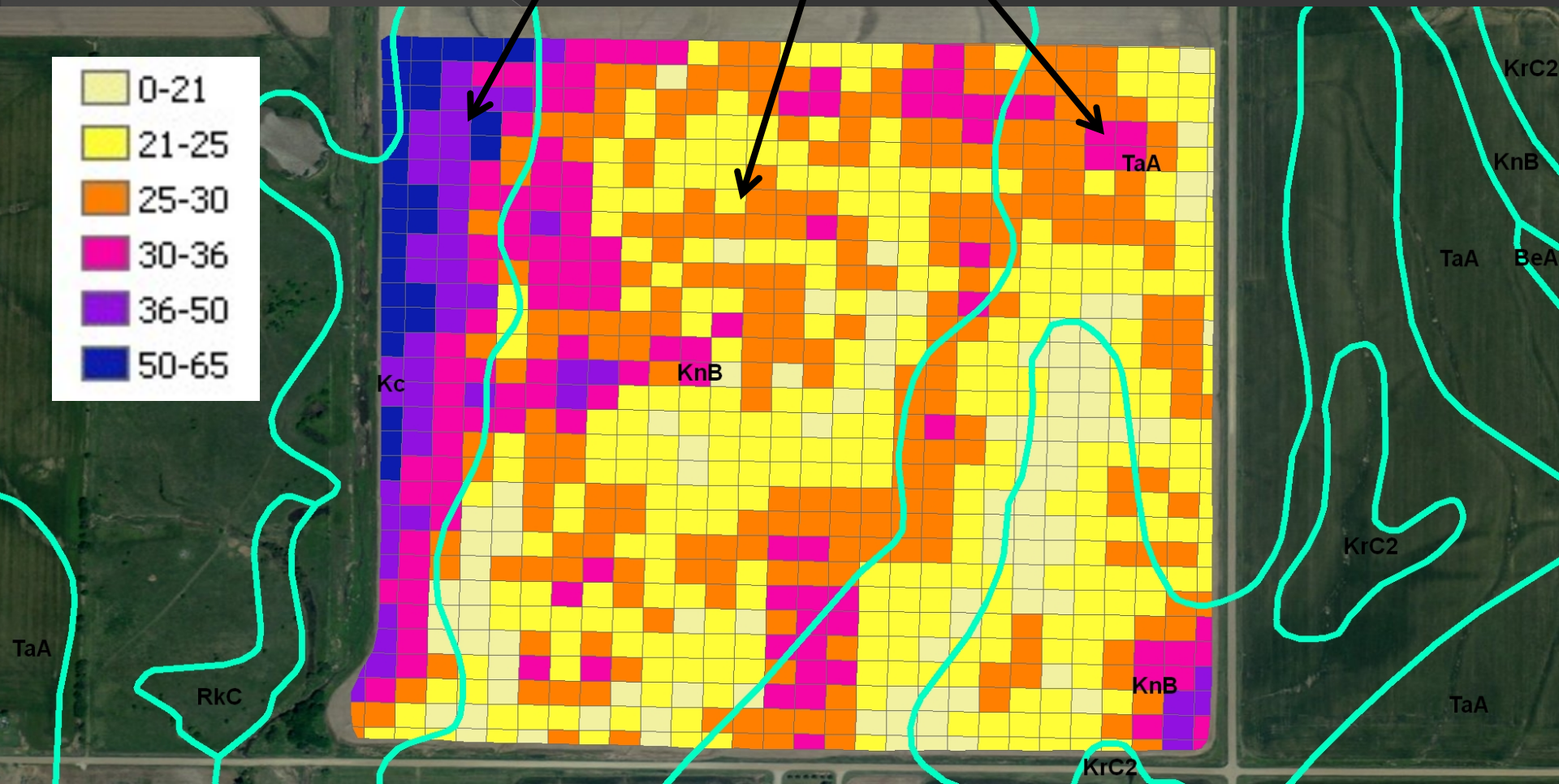


Soil Map, Ponca City

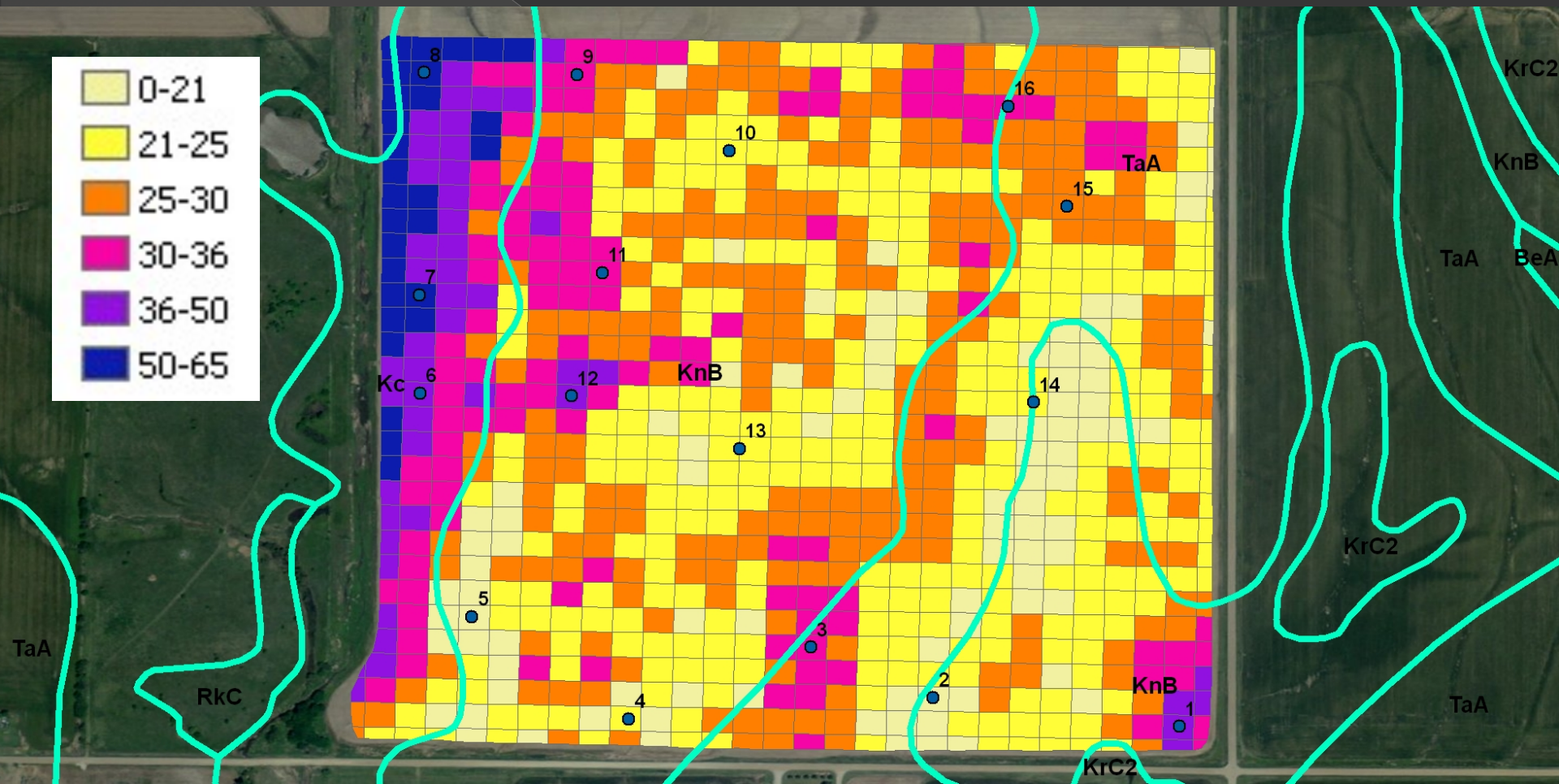
○ A little bit!

Port Silt loam is a beautiful Alluvial soil

The Tabler and Kirkland aren't bad but they're not Port

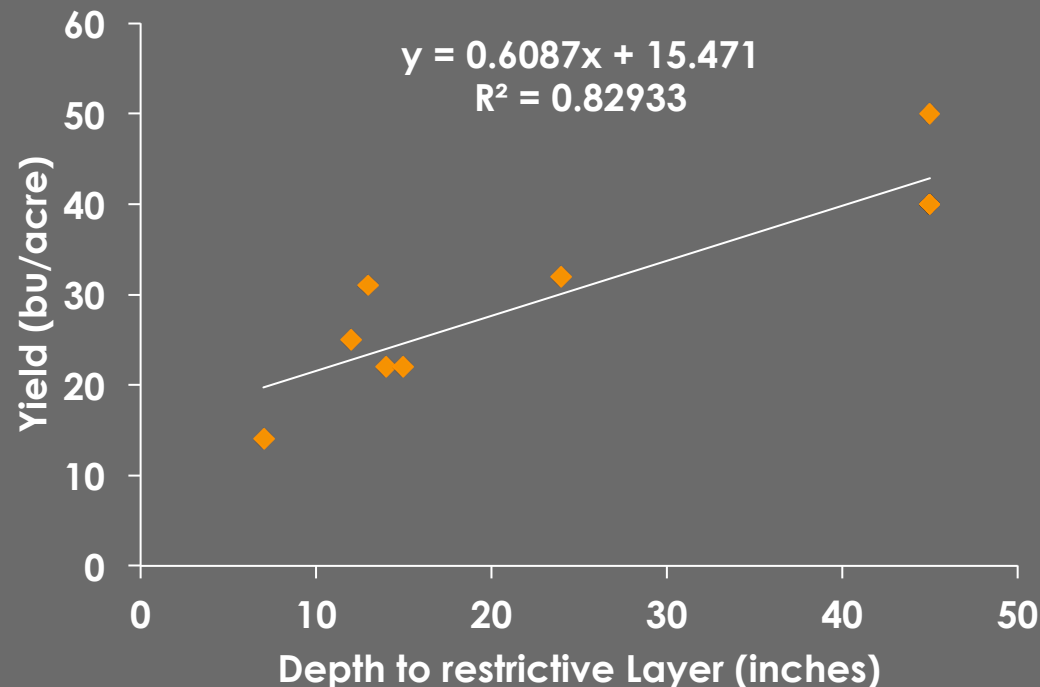


Deep Core Soil Samples

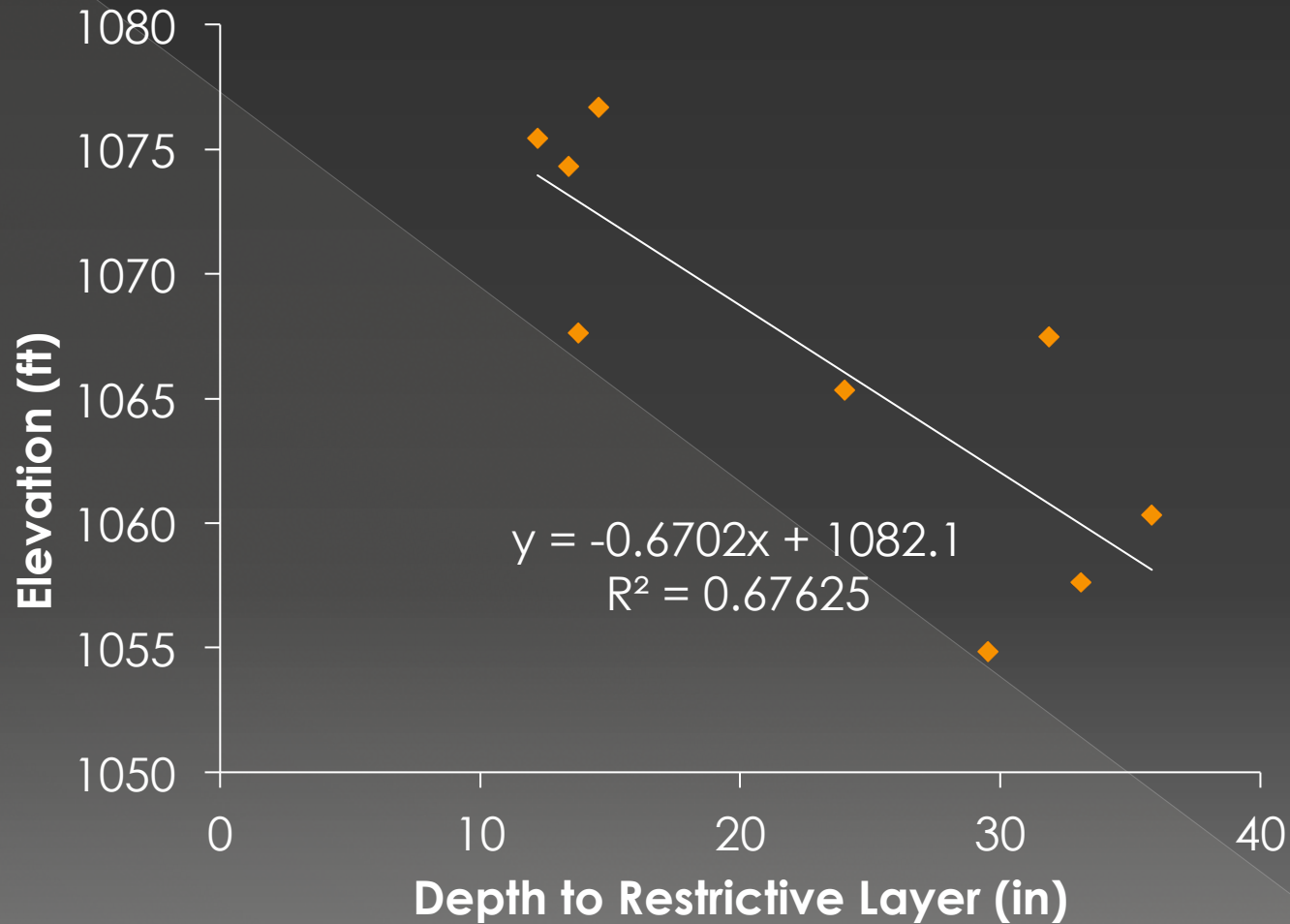


Relationship Between Limiting Layer and Yield

- Yield was generally well related to the depth of restrictive layer and water holding capacity of the soil

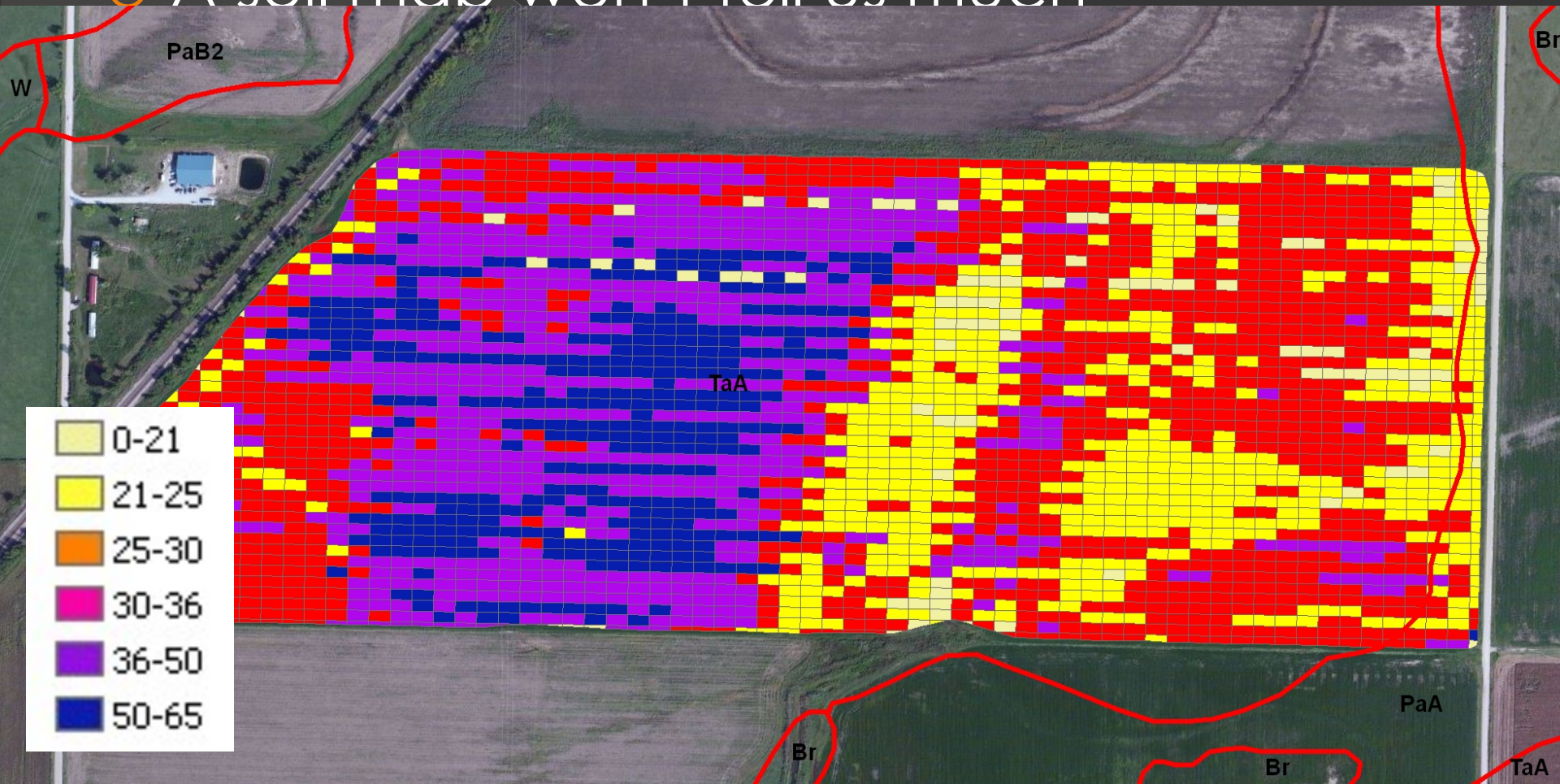


Elevation vs Depth to Restrictive Layer



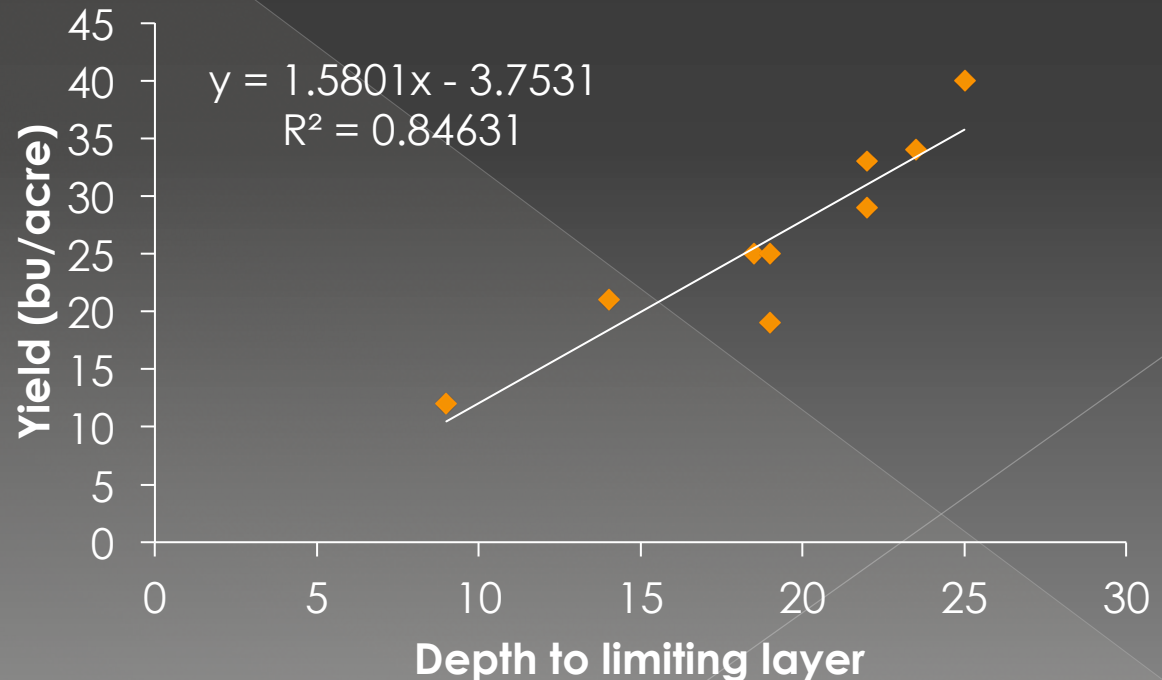
Some mapping units are very
Heterogeneous (Taloka Silt Loam,
Ottawa Co.)

○ A soil map won't tell us much



Relationship Between Limiting Layer and Yield (Ottawa Co)

- Limiting layer is defined as the layer with a clay content above 35%, containing Redoximorphic features (drainage problem)



Healthy soils “can” make more Grain

110 bushel sorghum in 2013



140 bushel sorghum in 2013



Summary

- Not all soils are created equal
- We don't lime all soils
- Why should we impose the same soil health promoting practices to all soils
 - > We need to learn what factors influence success and impose soil health practices accordingly

Questions

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