

A close-up photograph of two green wheat stalks. The stalks are in the foreground, slightly out of focus, showing the developing grain heads. The background is a soft, out-of-focus green field. The text is overlaid on the top half of the image.

Healthy Soils – Healthy Water: The Role of Soil Health in Securing Water Resources

G.F. Sassenrath¹, V.J. Alarcon²,
S. Kulesza¹,

¹Kansas State University and

²Univ. Diego Portales

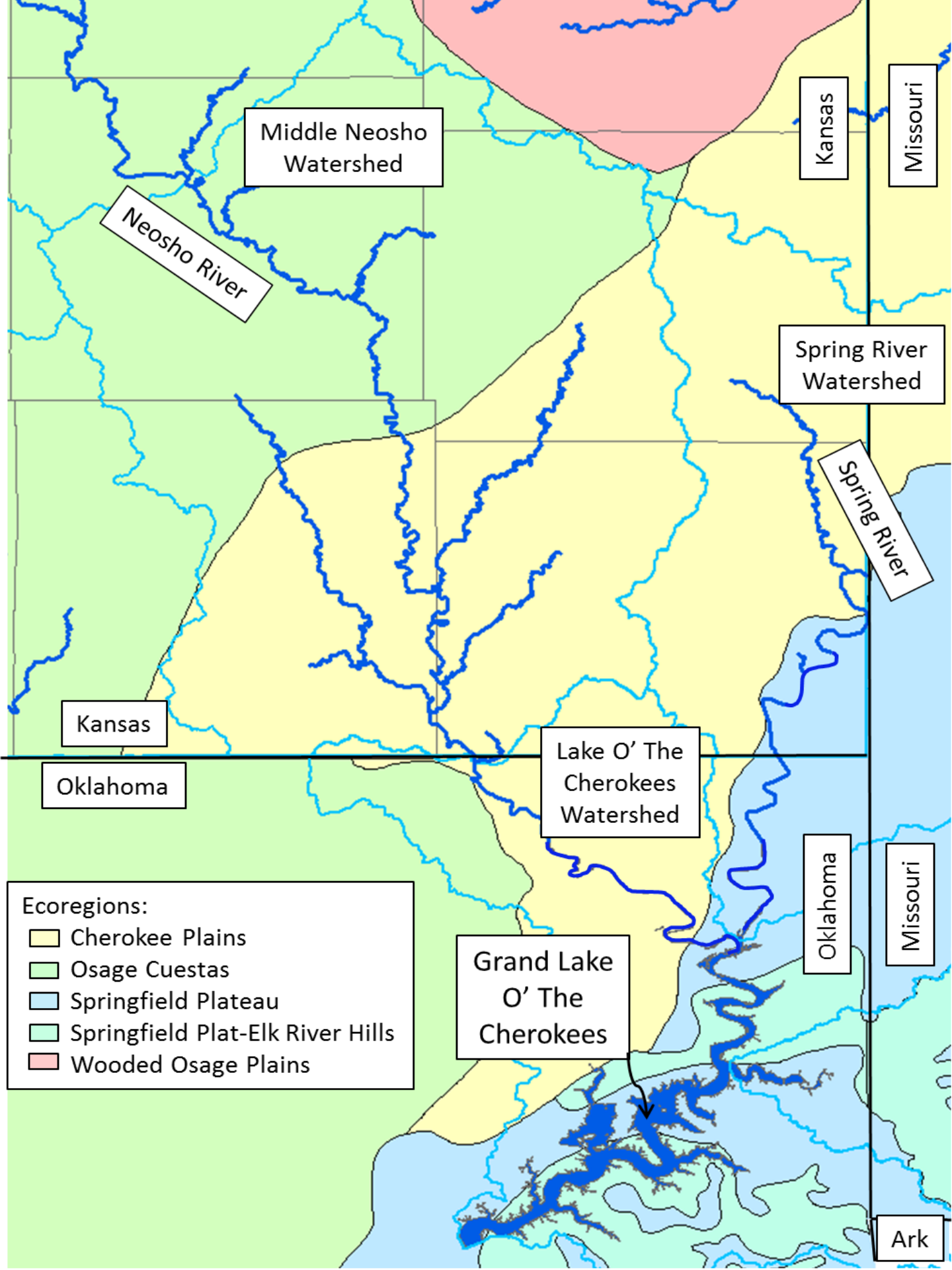
Soil Health: the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. NRCS

Functions of healthy soils:

- Sustain life
 - Habitat of plants, animals and soil microorganisms
 - Stability and support
- Nutrient cycling
- Filtering and Buffering
- Water relations

Characteristics of healthy soils:

- Microbial activity
- Organic matter
- Soil structure



The Middle Neosho and Spring
River Watersheds:

Critical watershed draining the
southeast area of Kansas into the
Grand Lake Watershed.

Transfer point of Kansas
agricultural activities to Oklahoma
water, producing potential trans-
boundary negative environmental
impacts between the states.

Crop production: rotation of corn/winter wheat/soybeans



Animal production: cow/calf on pasture



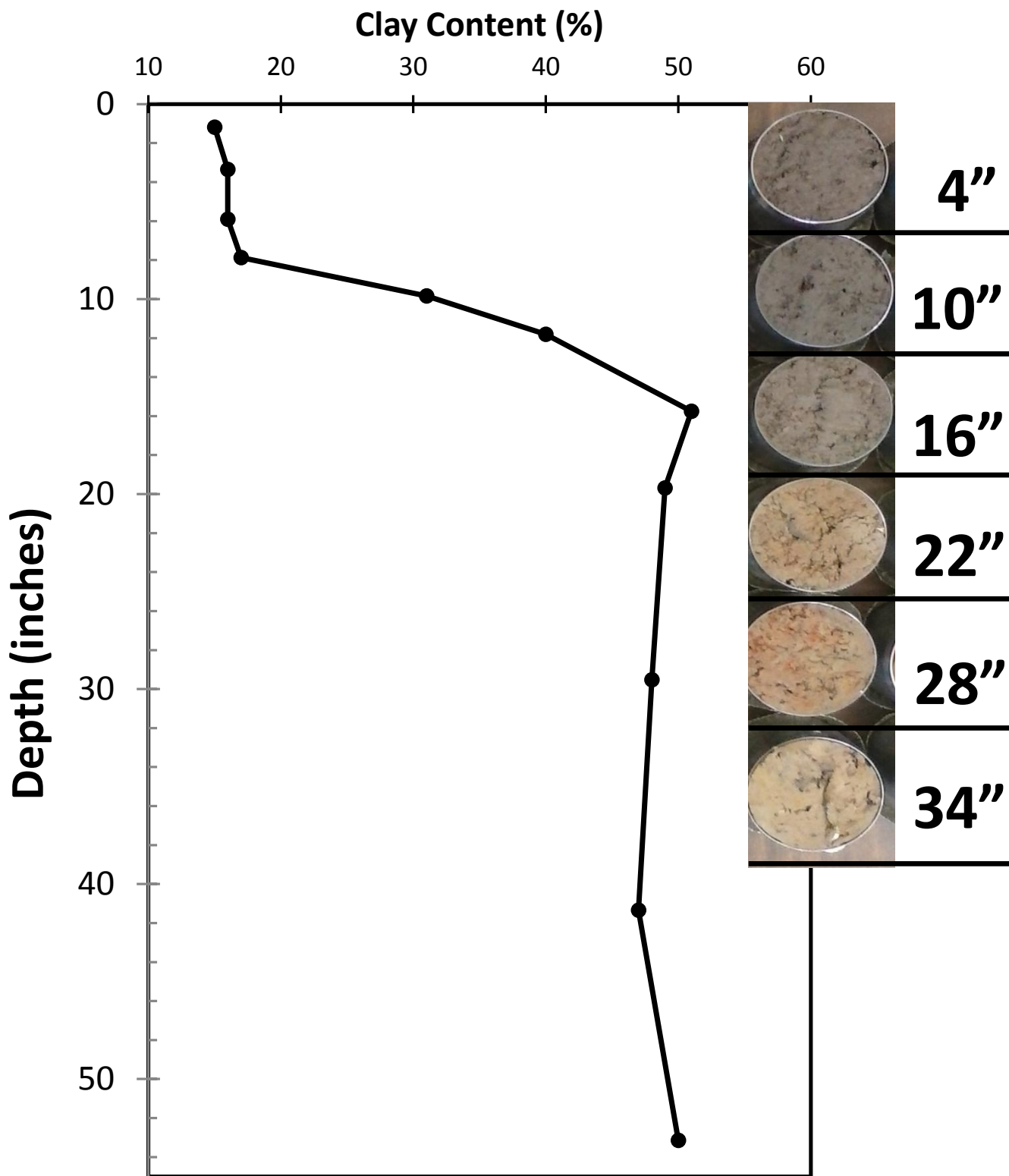
Poultry litter fertilizer imported from AR and MO



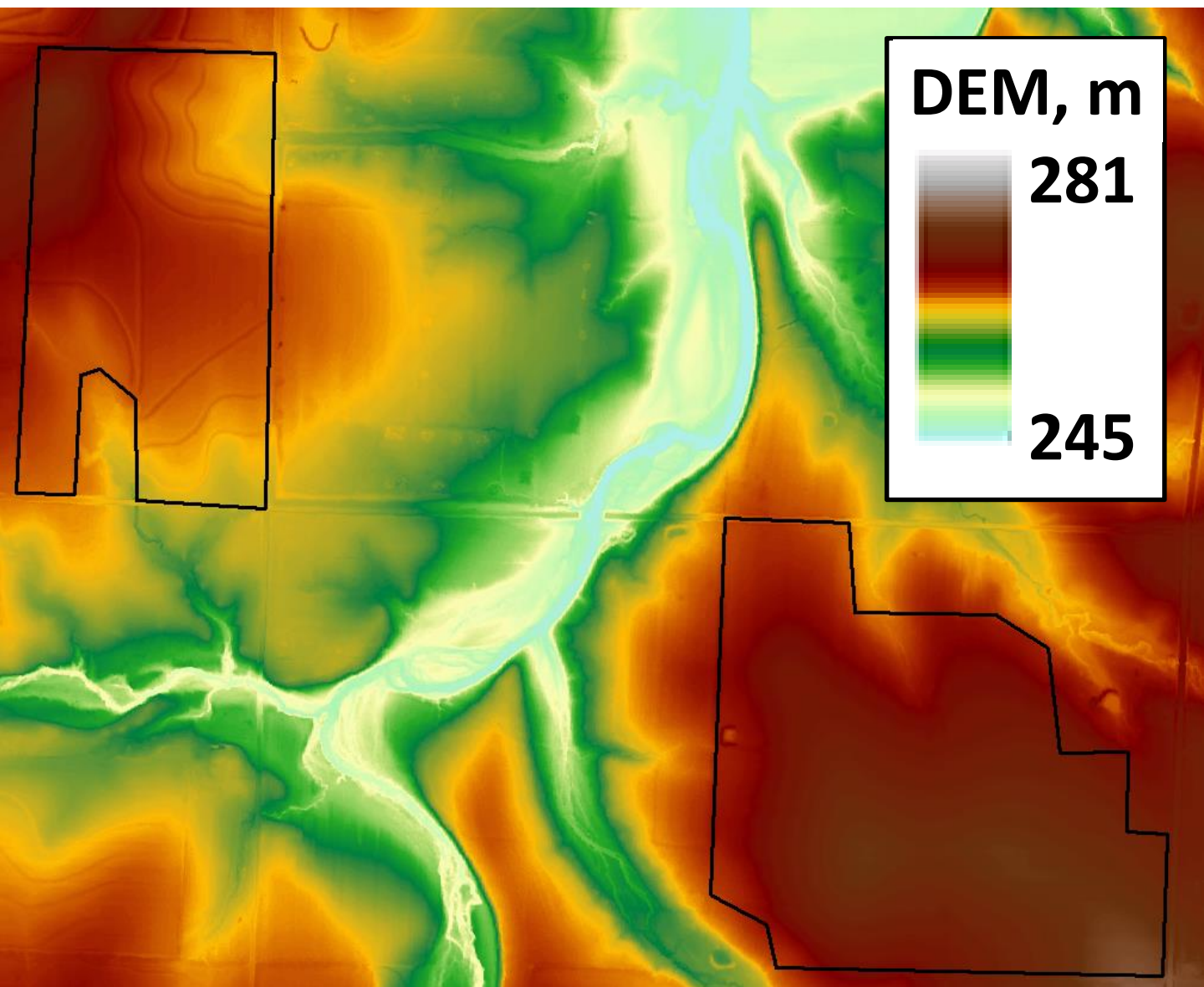
A photograph of a dry, cracked field. The foreground shows deep, irregular cracks in the dry, brownish soil. The field extends to a flat horizon under a clear sky. In the distance, a line of bare trees and a small building are visible. Yellow text is overlaid on the upper right portion of the image.

0.6% slope

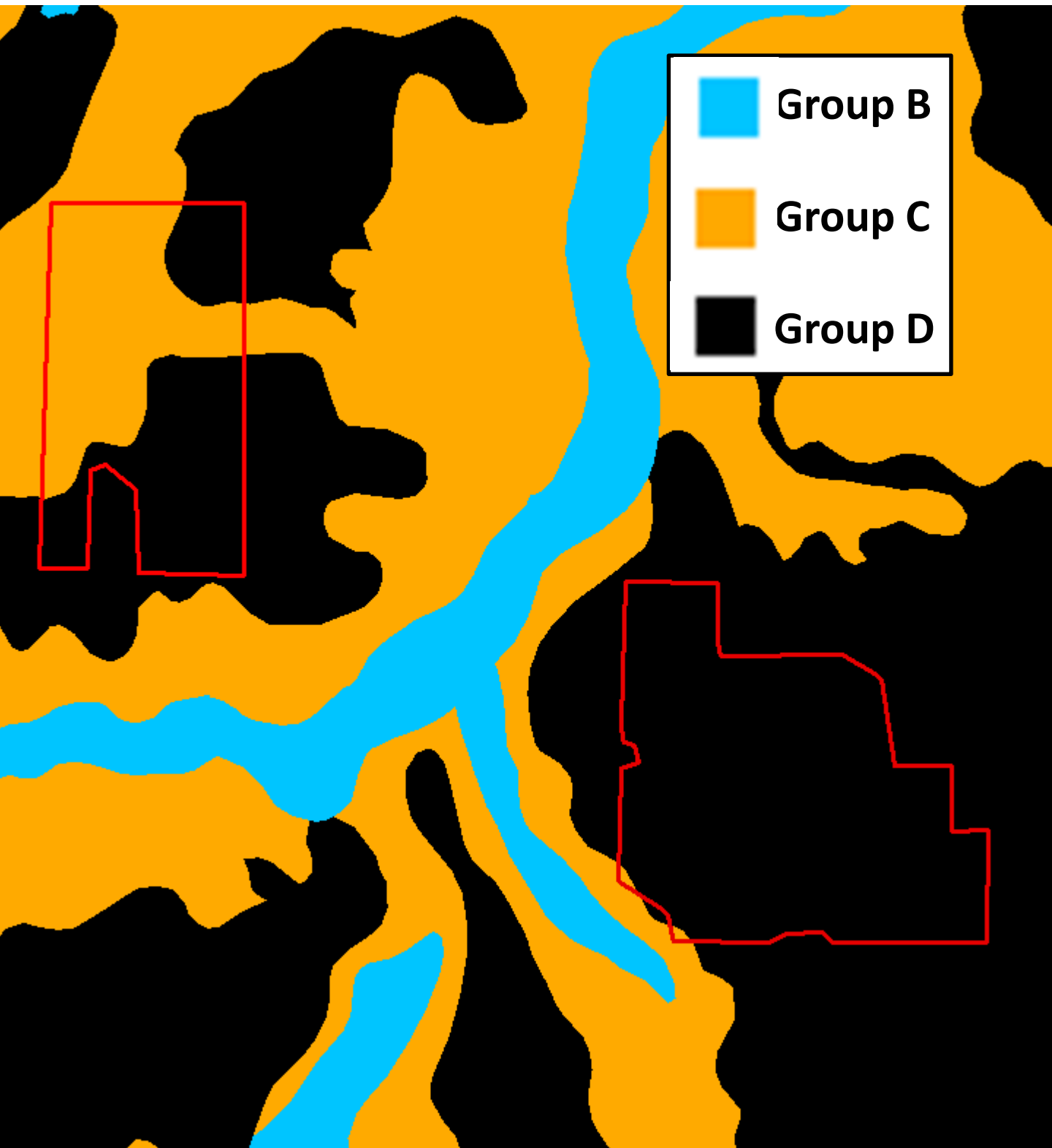
**➤ 1100 mm rain/year
(45" rain/year)**



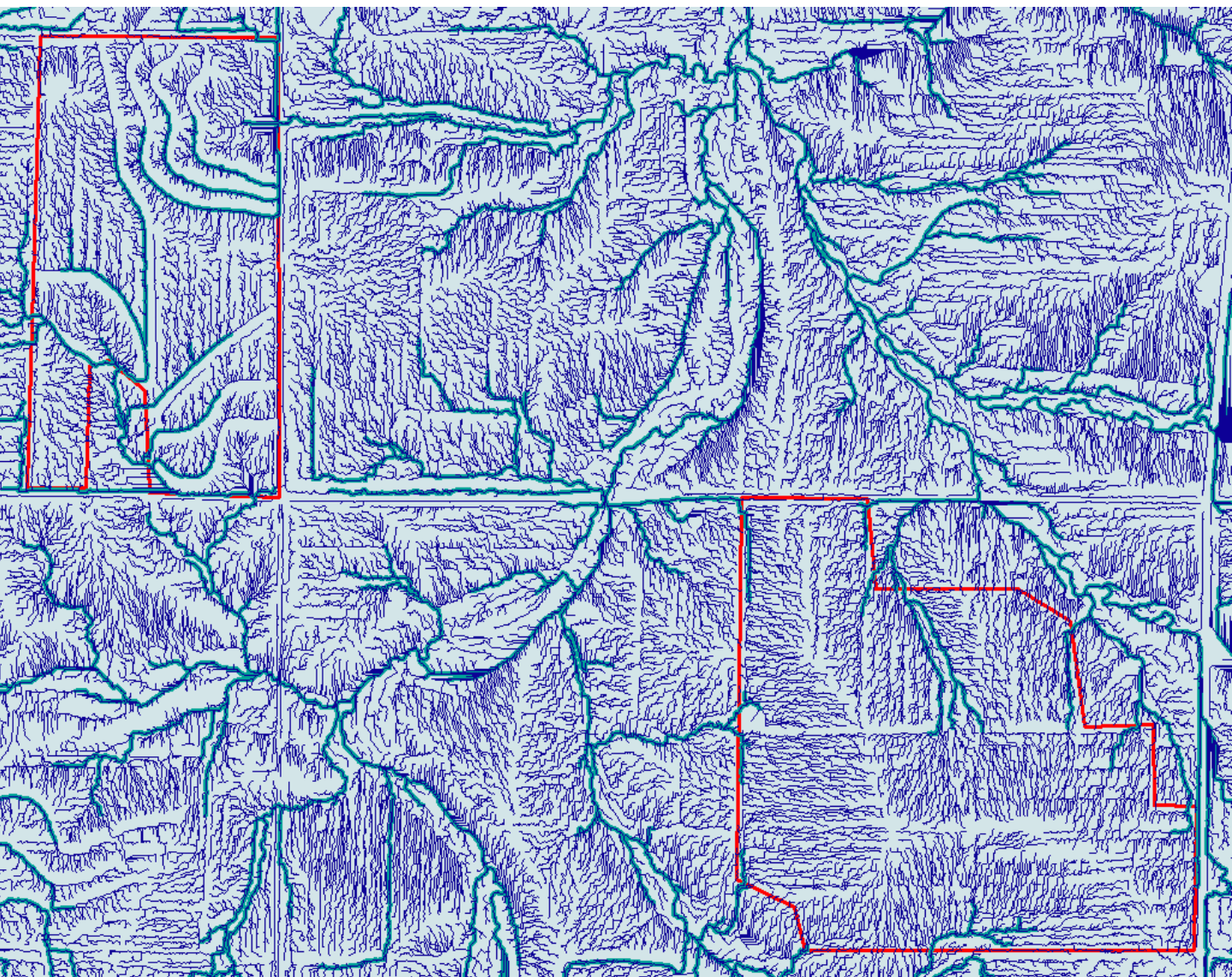
Buckley et al., 2010, Effect of tillage on the hydrology of a claypan soil in Kansas. SSSAJ, 74:2109-2119



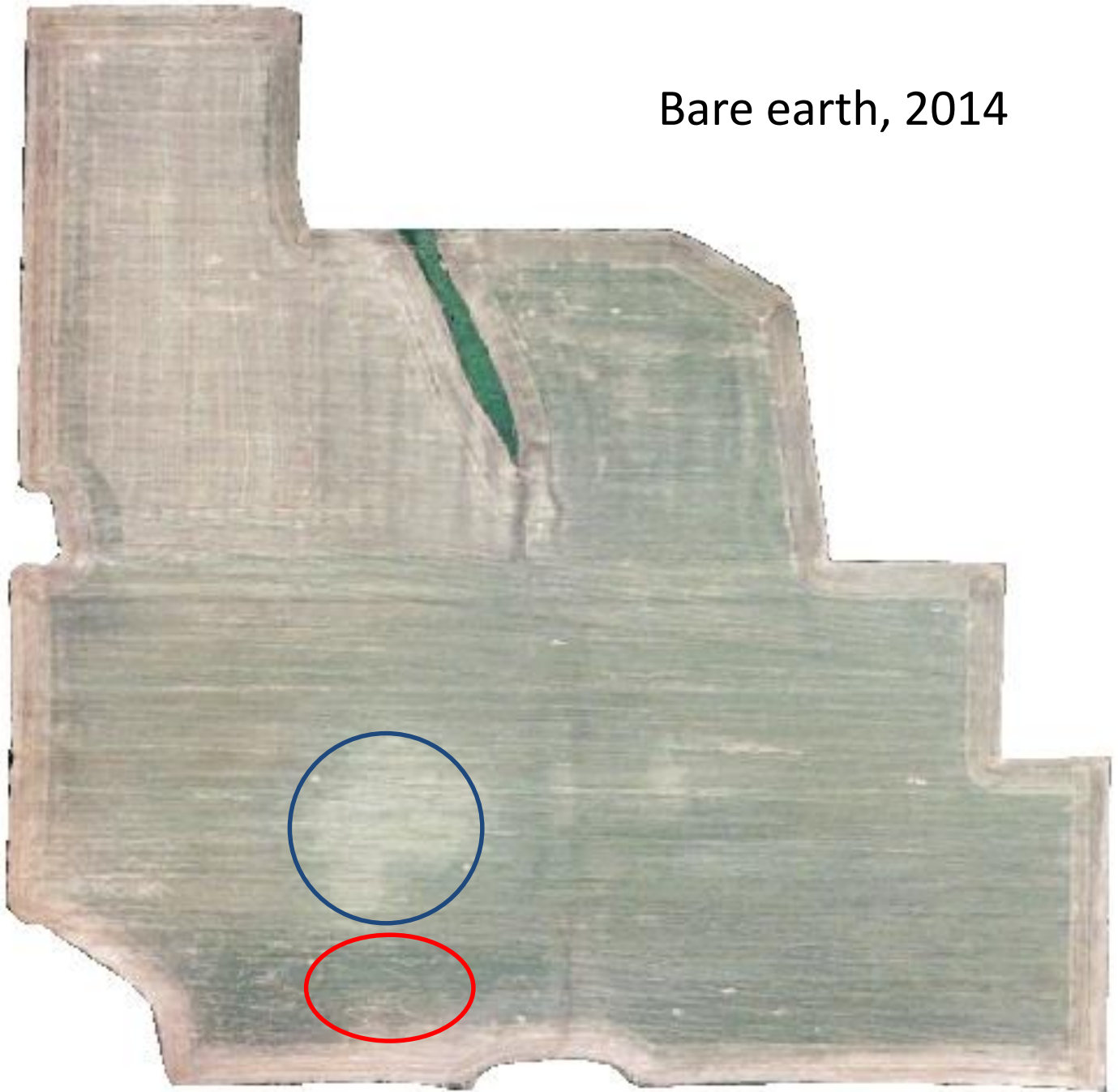
Soil Hydrologic Classification



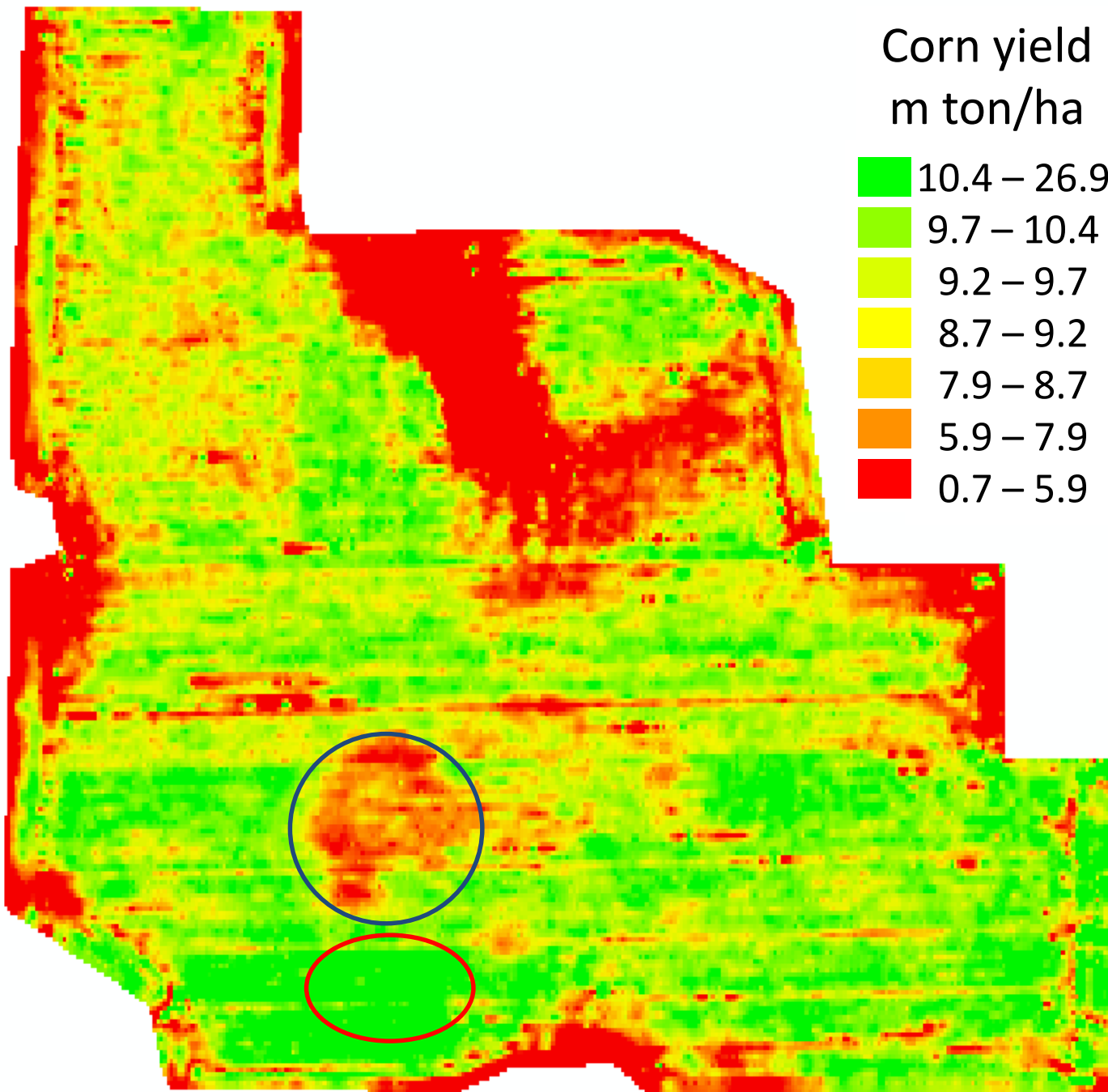
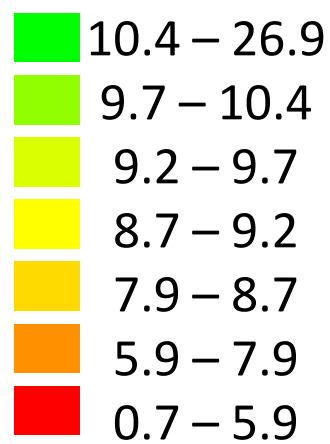


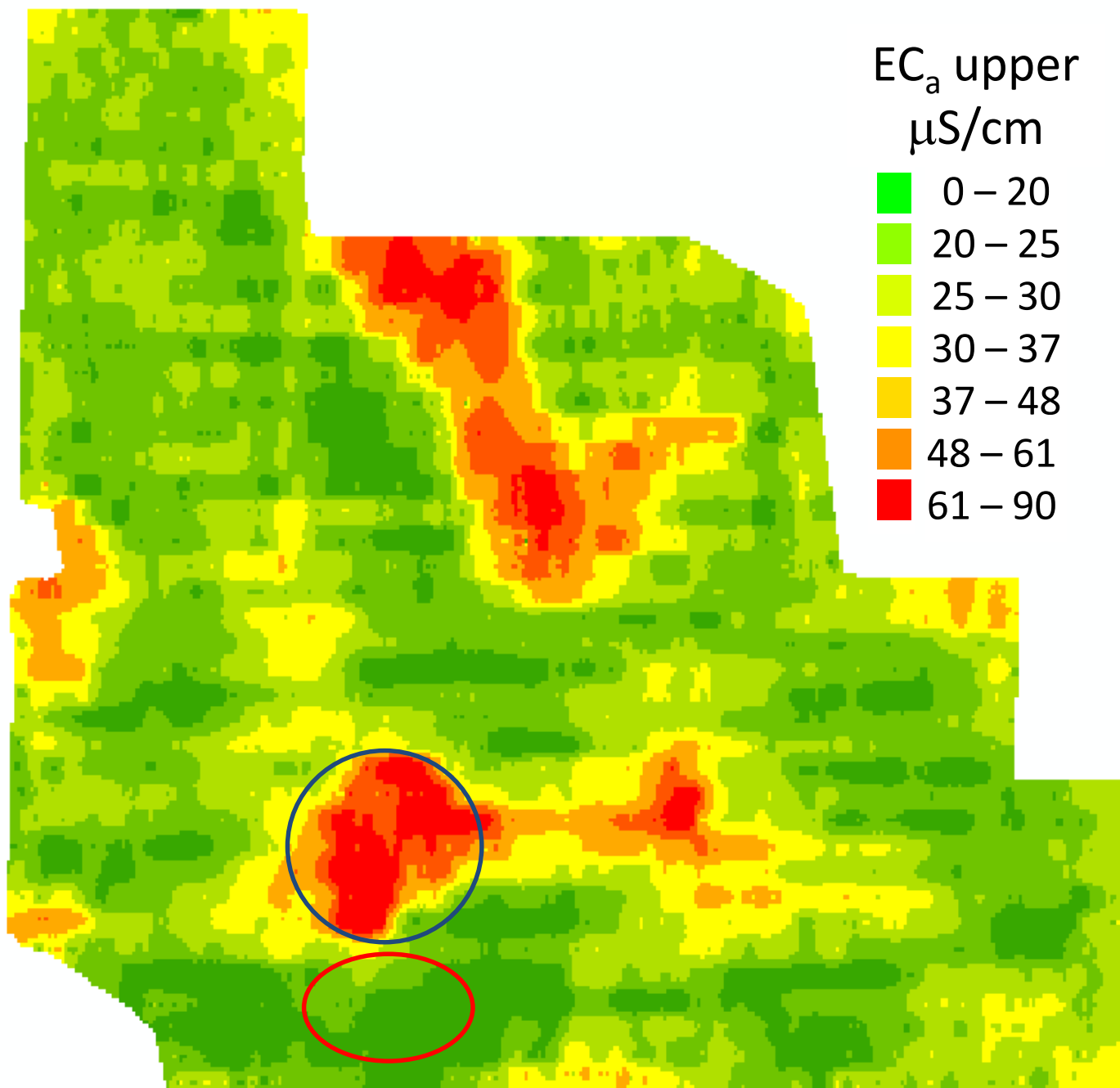


Bare earth, 2014



Corn yield
m ton/ha







2014

Corn Yield,
t/ha

1.3-4.4



4.4-5.6



5.6-6.3



6.3-7.5



7.5-8.5



8.5-9.7



9.7-10.7



10.7-11.6



11.6-12.6



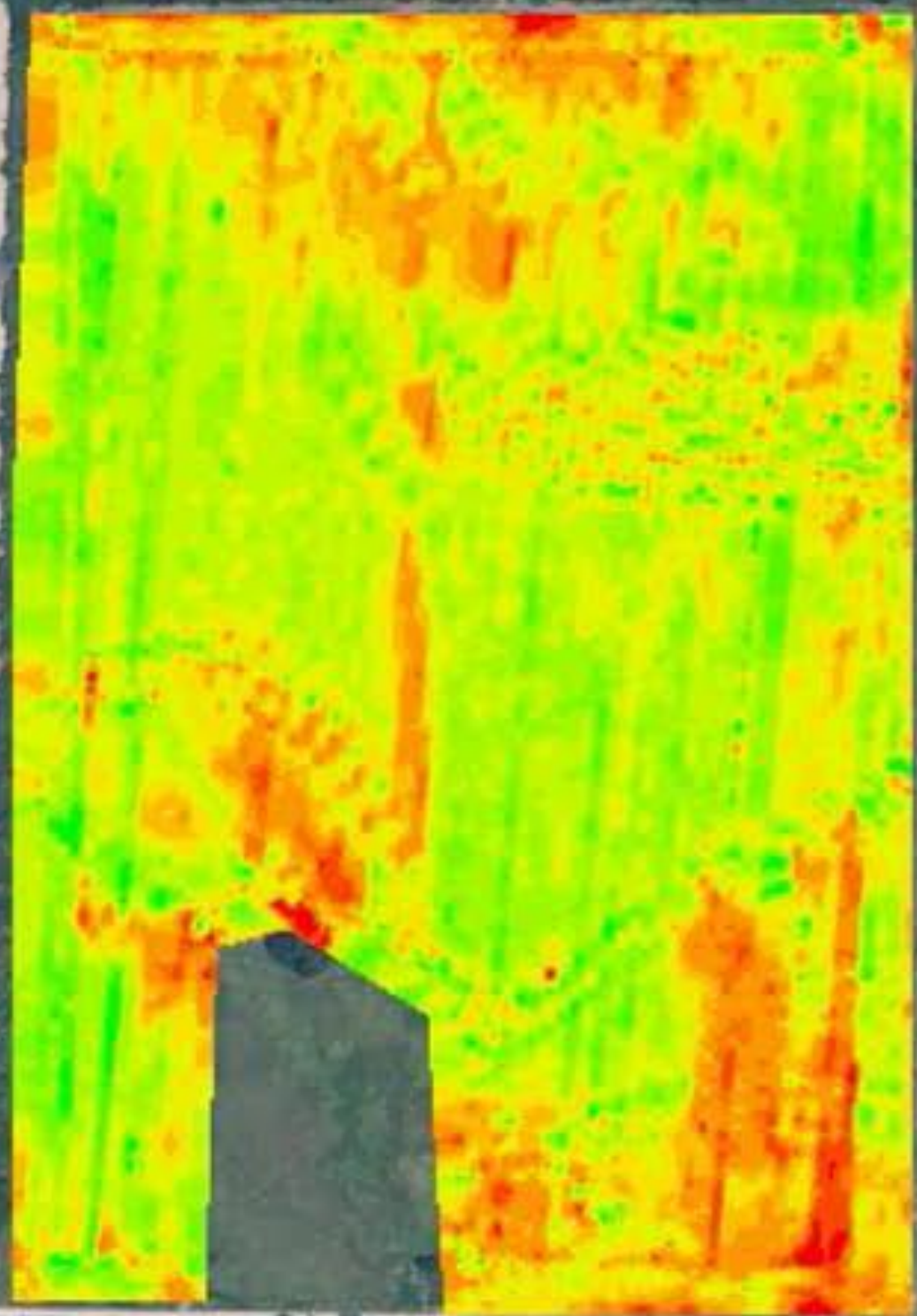
12.6-13.5



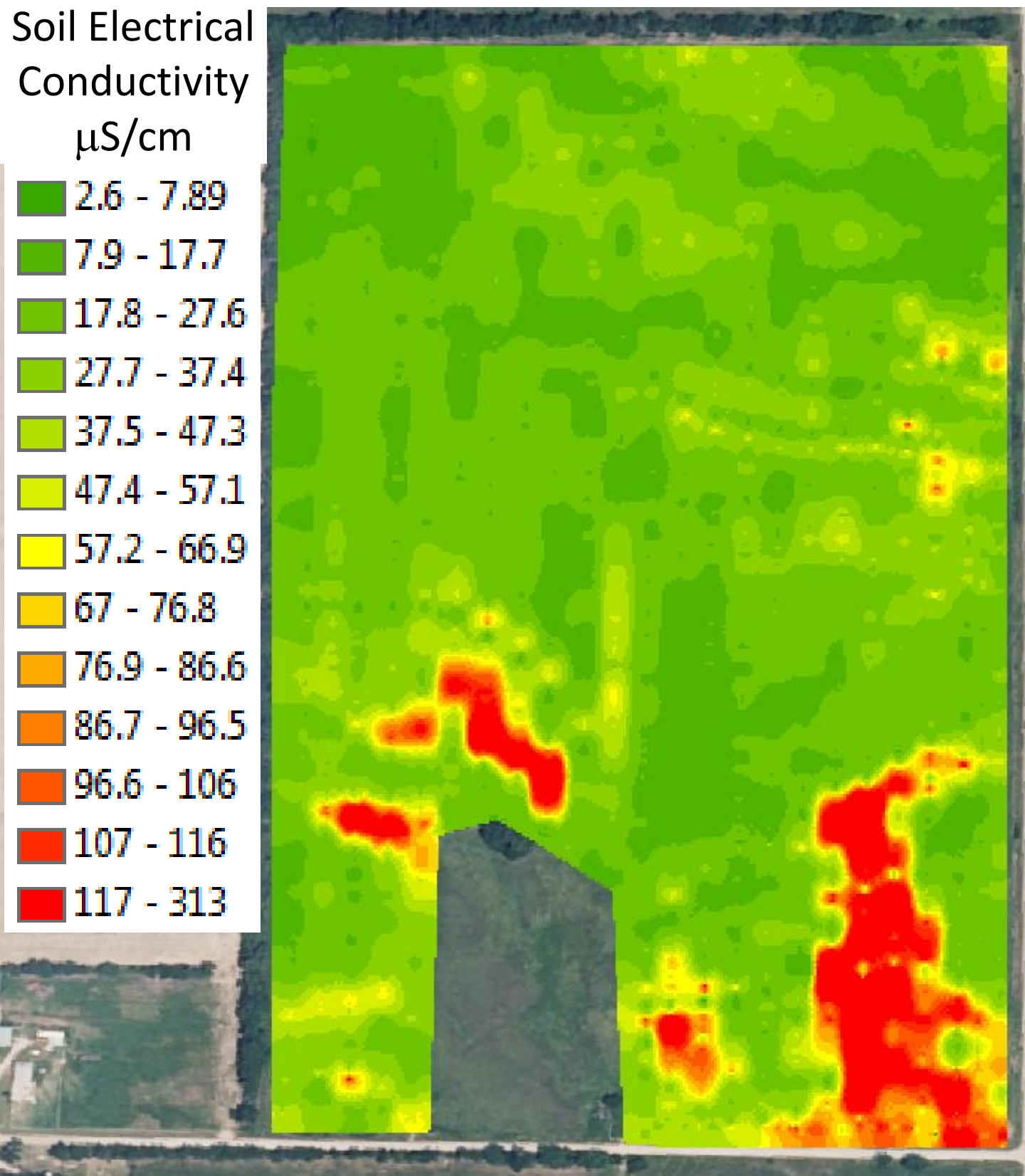
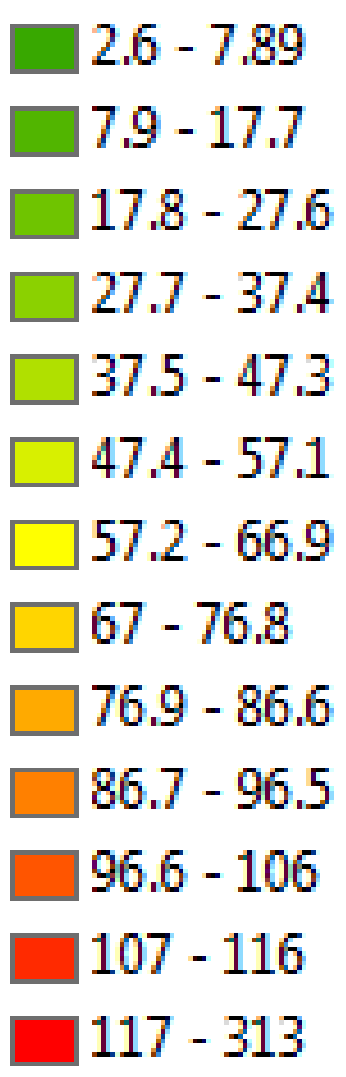
13.5-14.7

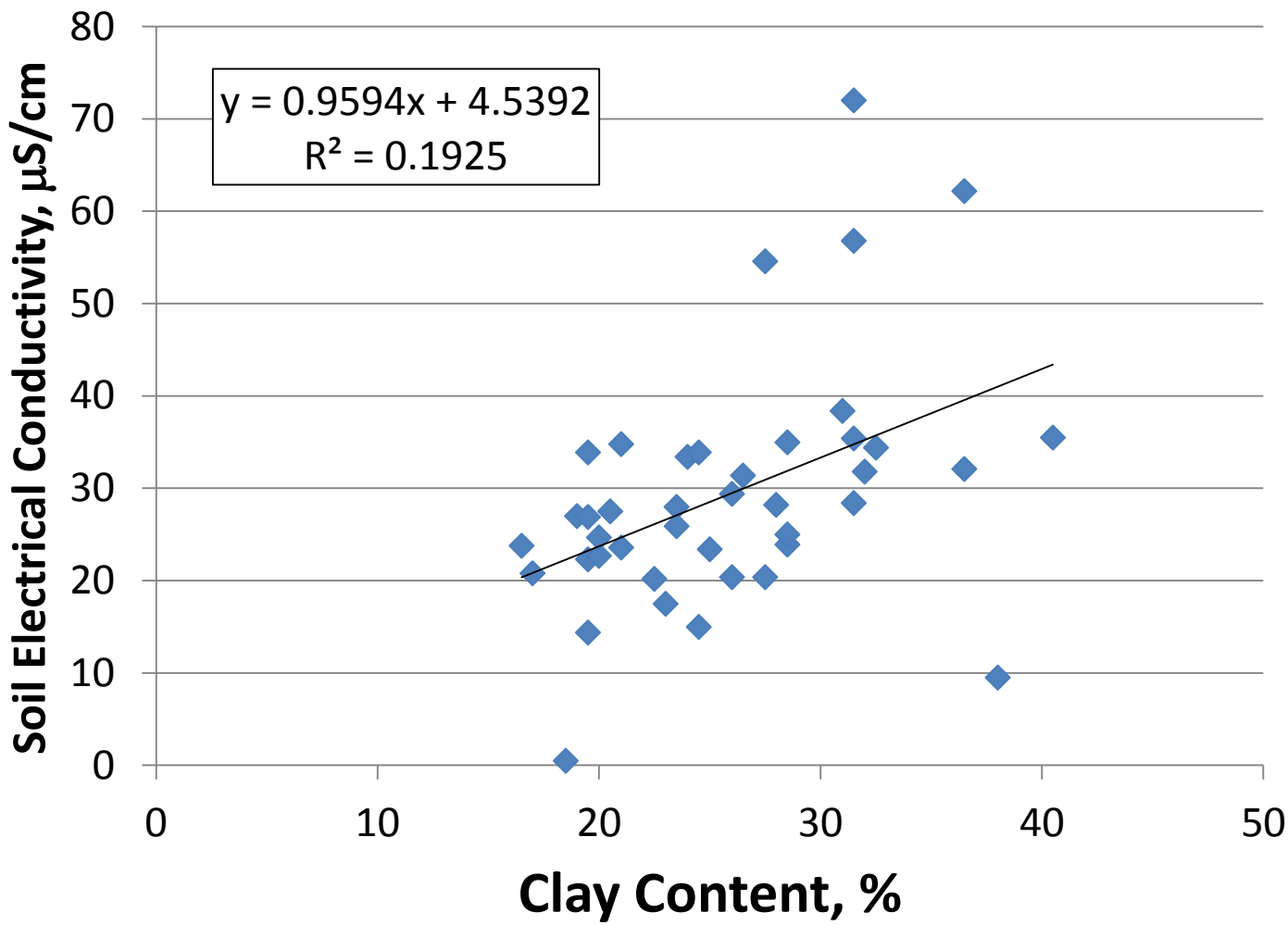


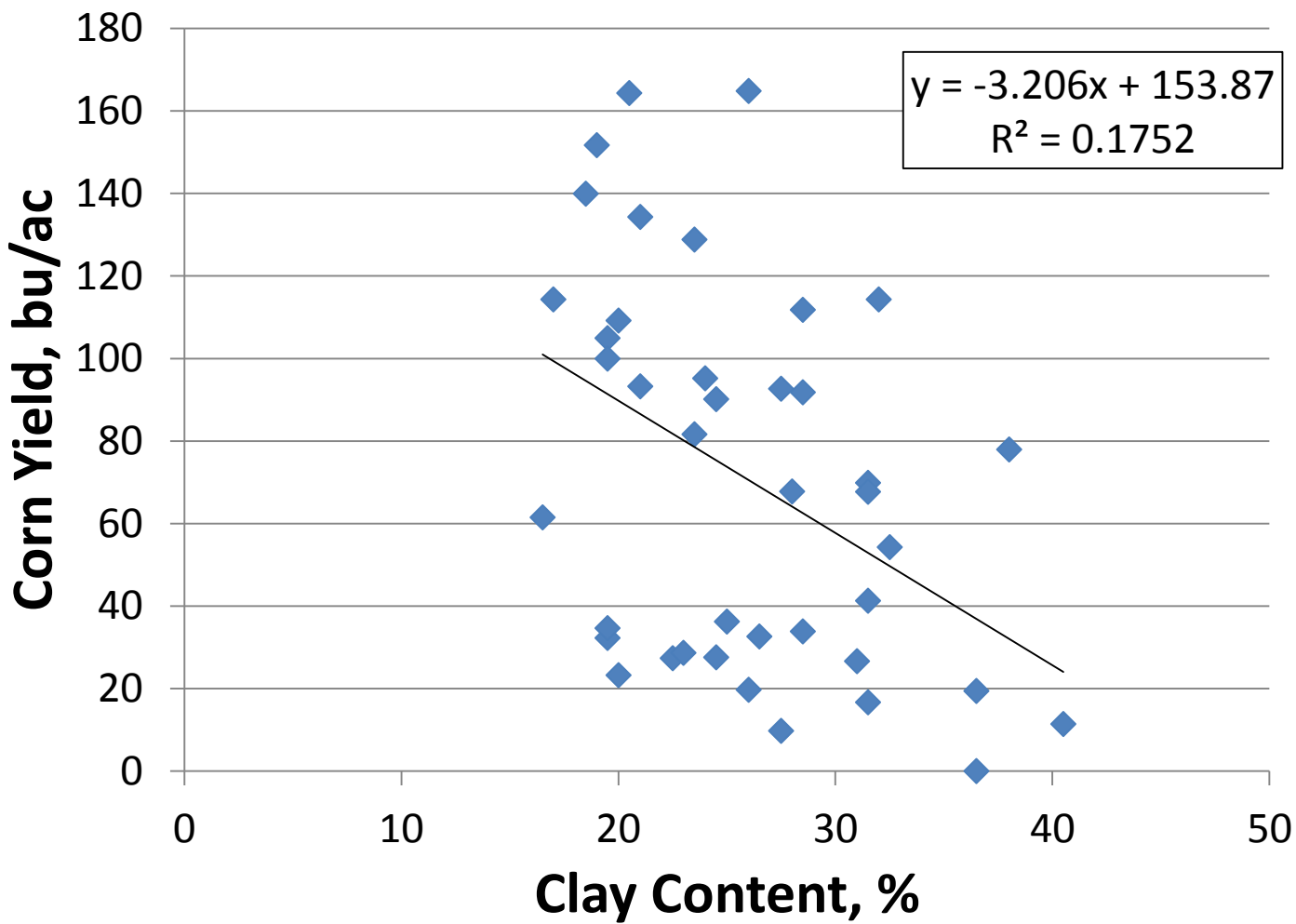
14.7-22.0



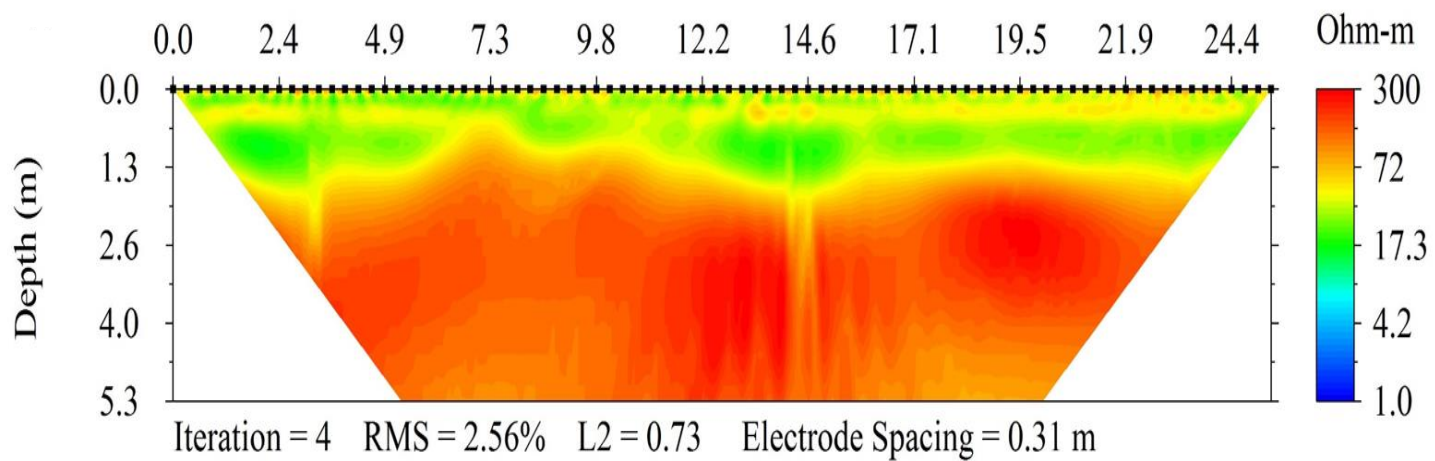
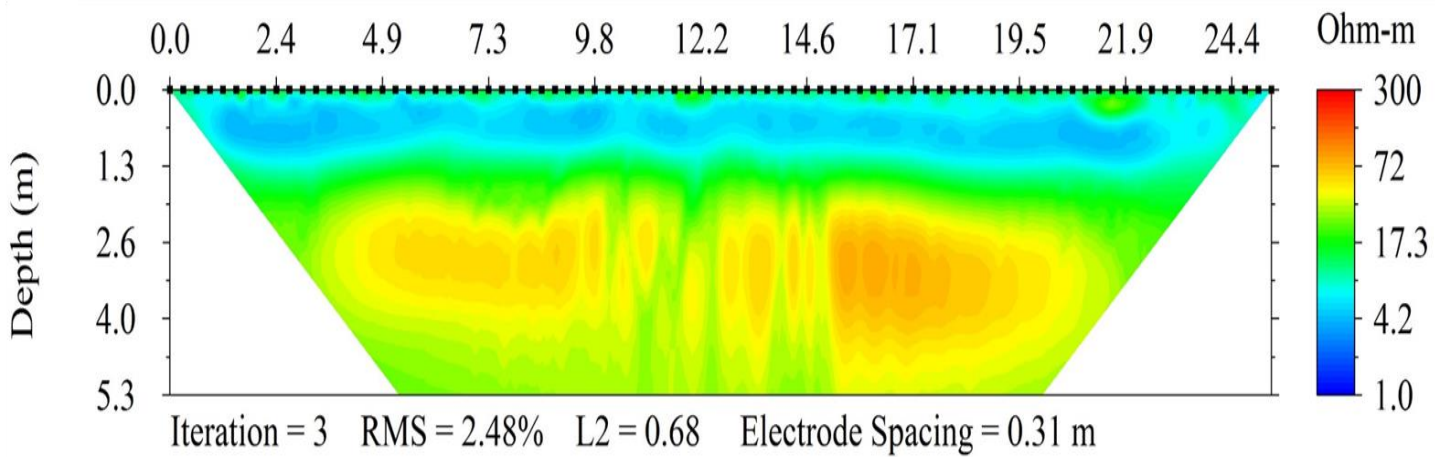
Soil Electrical
Conductivity
 $\mu\text{S}/\text{cm}$

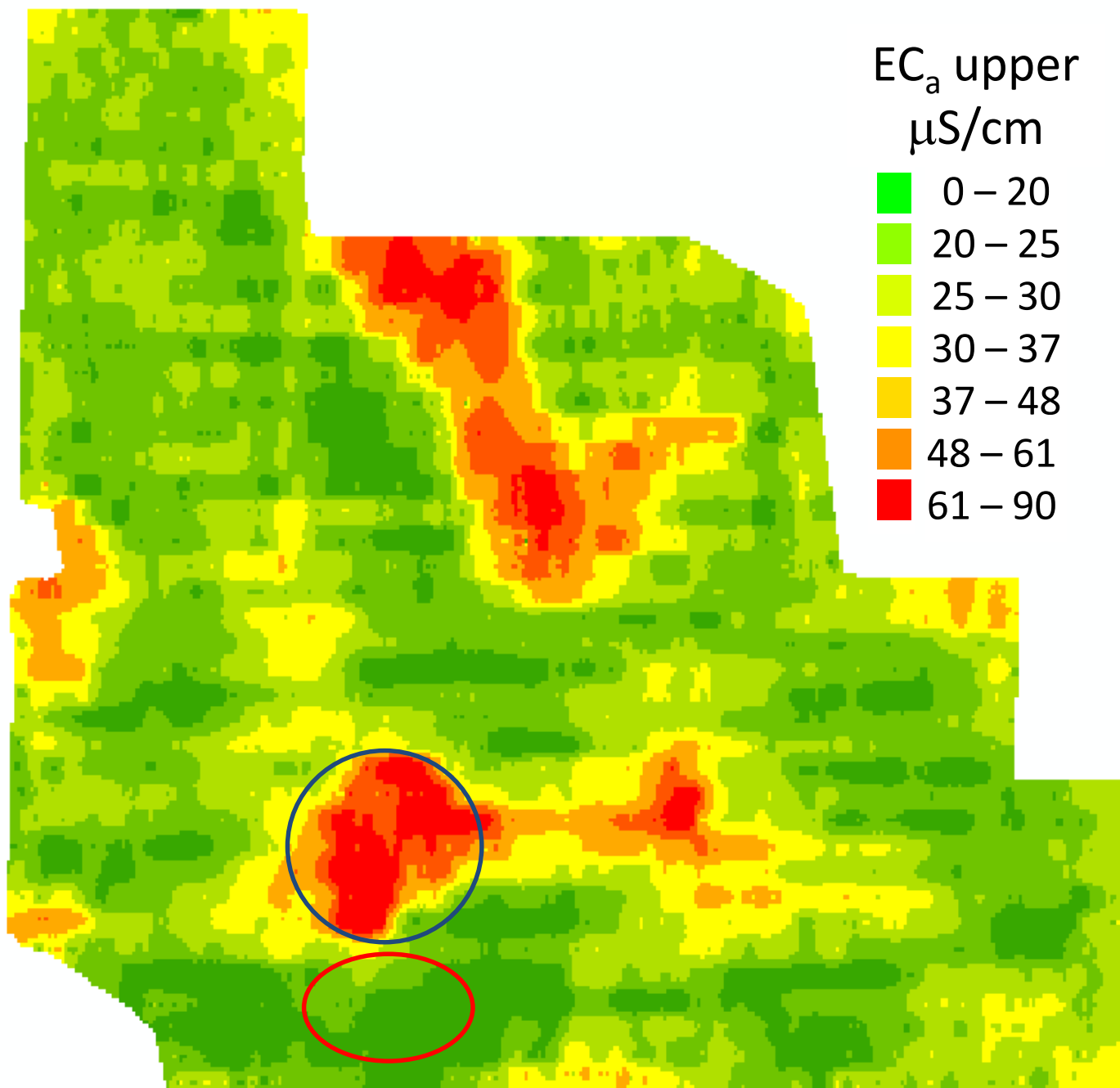




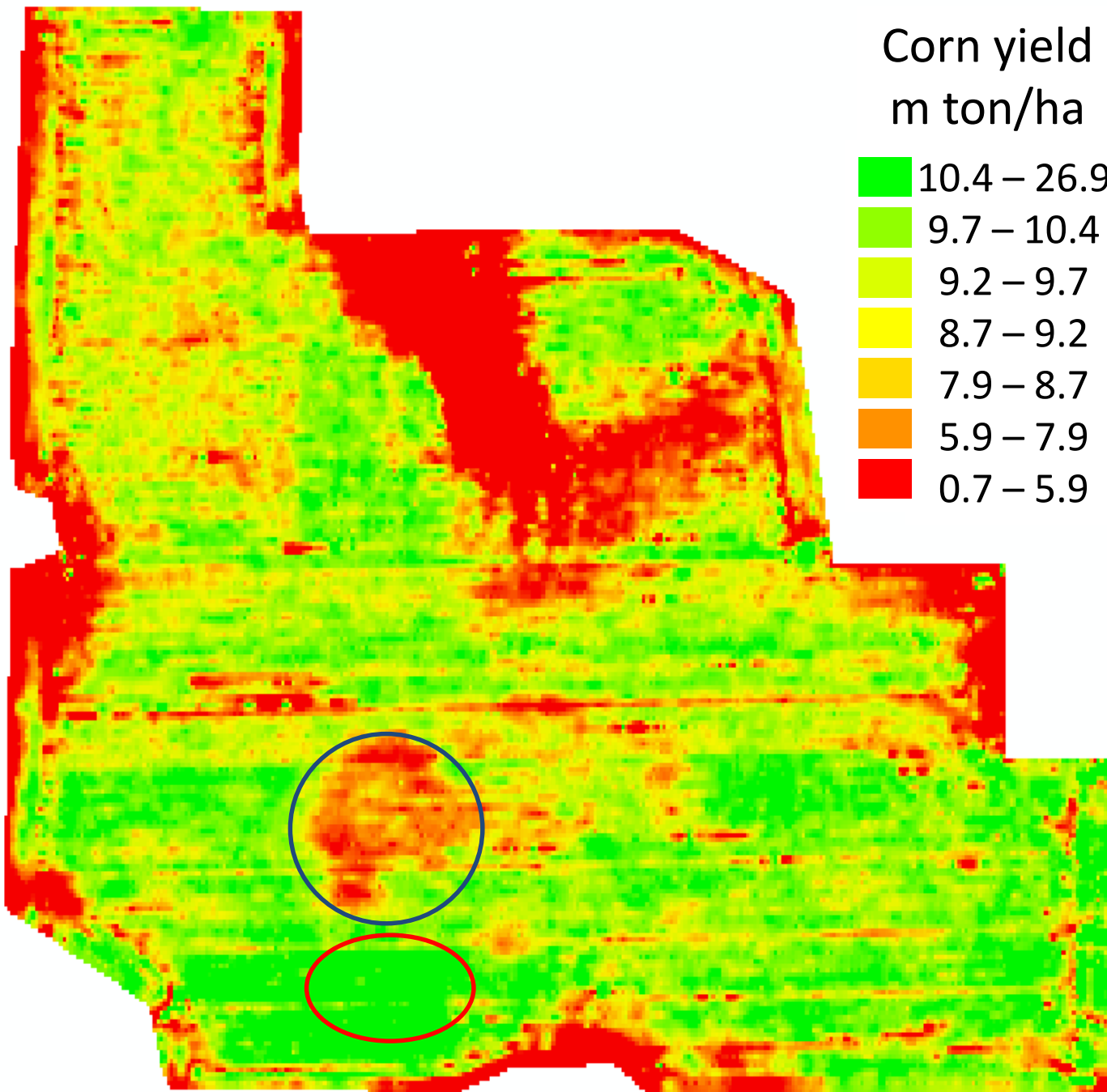
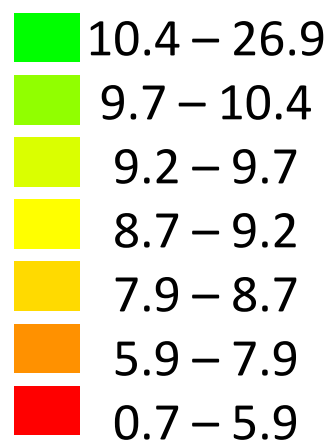




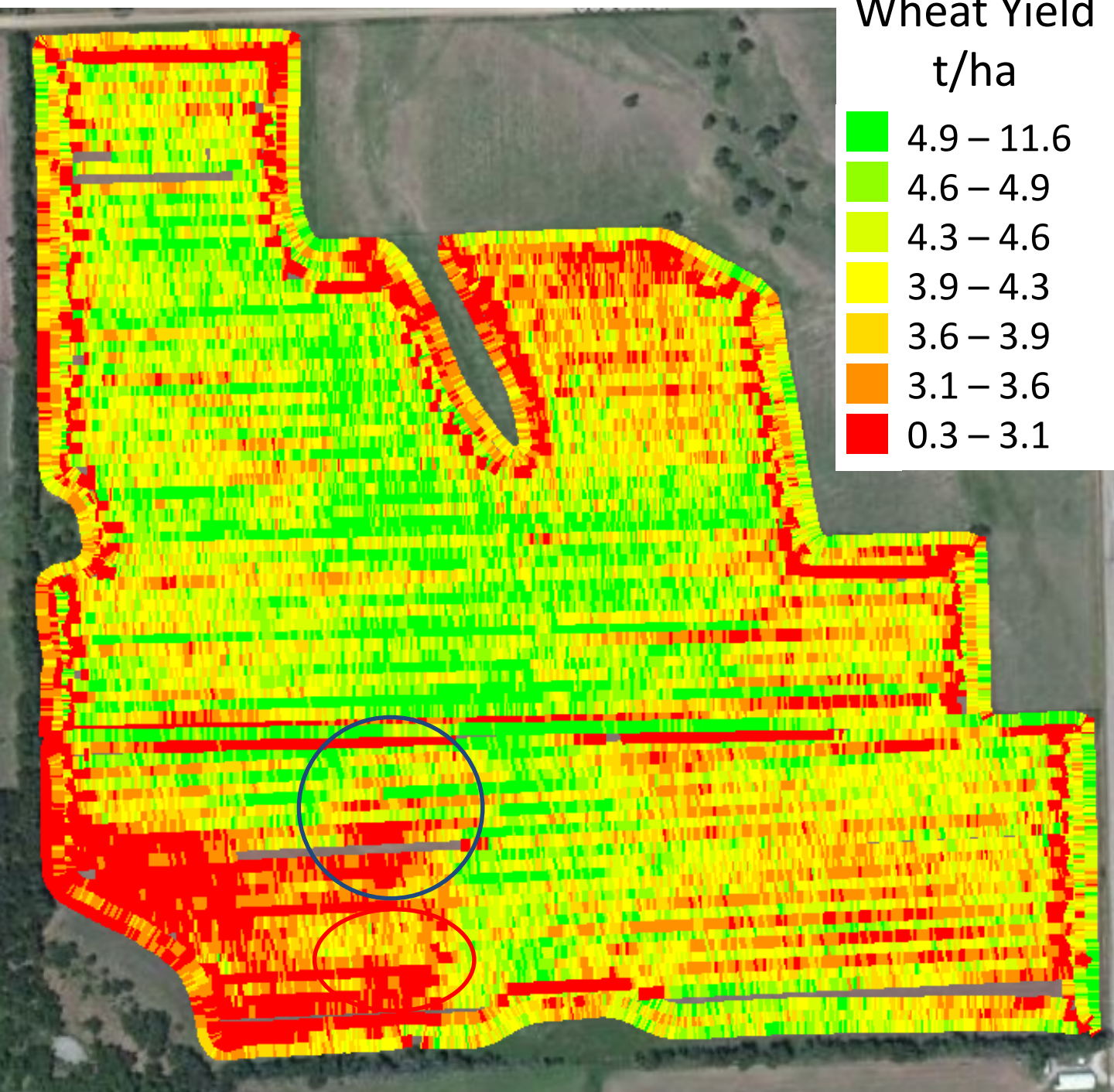
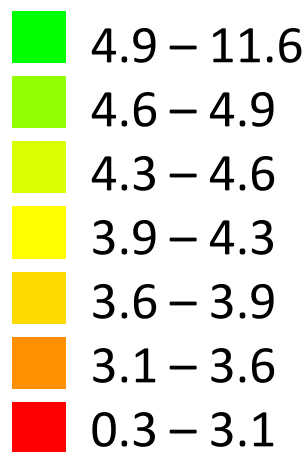




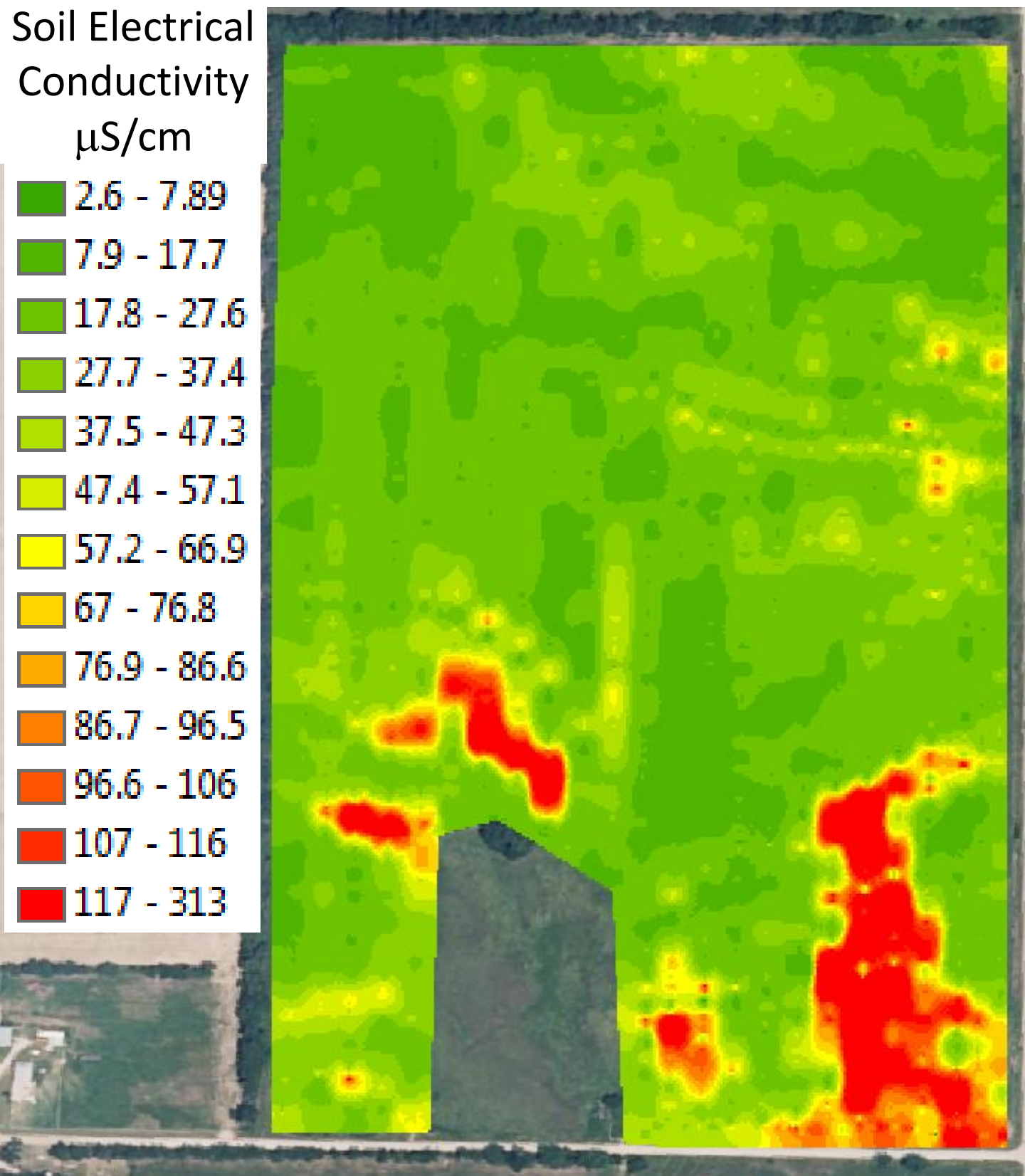
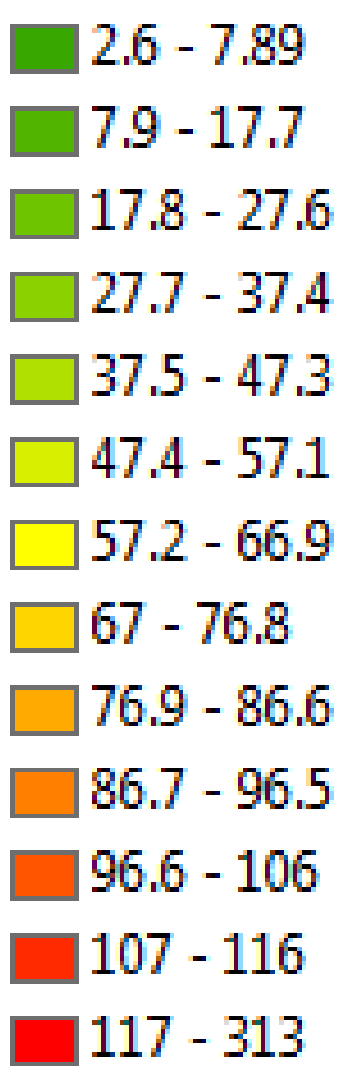
Corn yield
m ton/ha



Wheat Yield t/ha



Soil Electrical
Conductivity
 $\mu\text{S}/\text{cm}$



2014

Corn Yield,
t/ha

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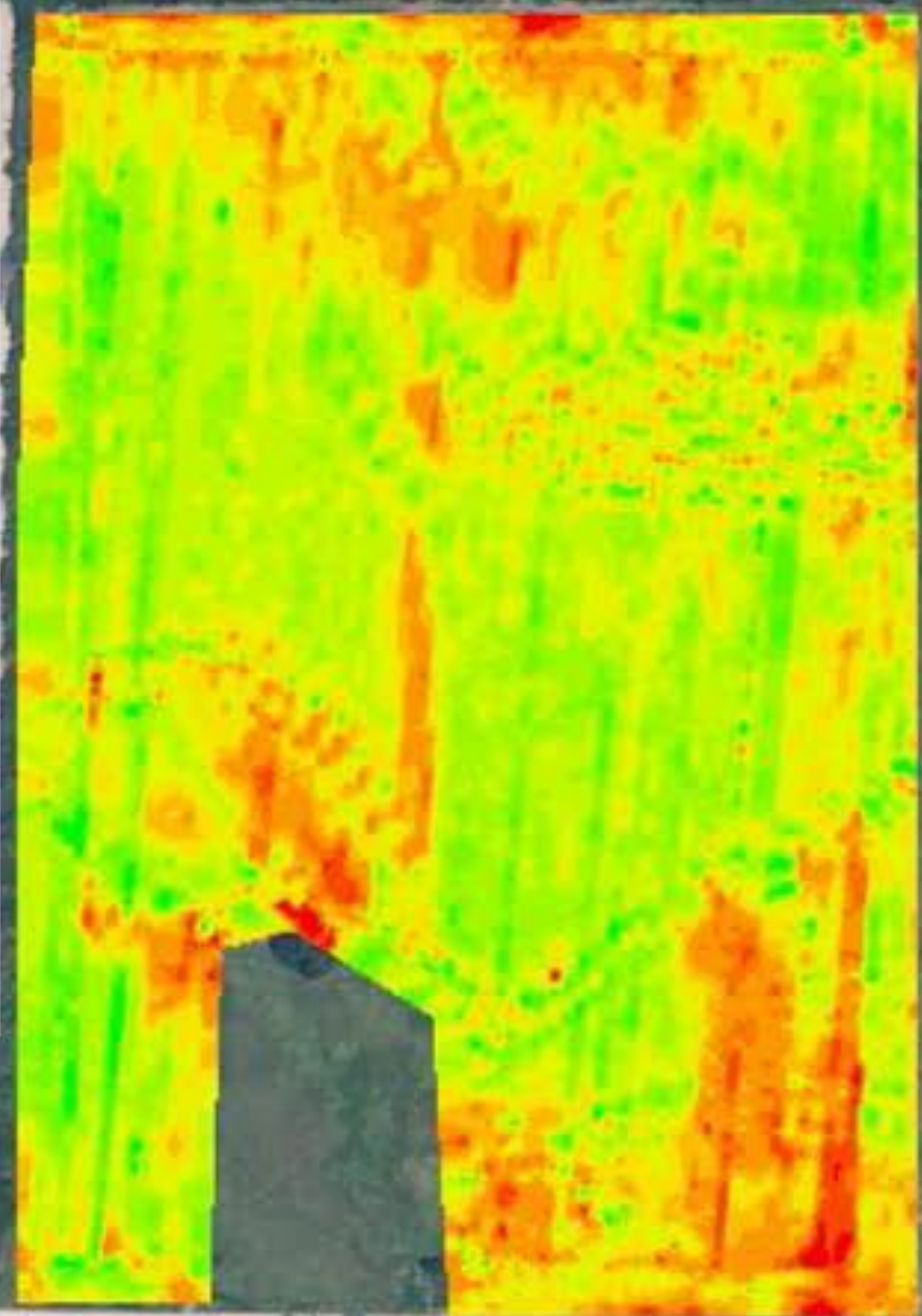
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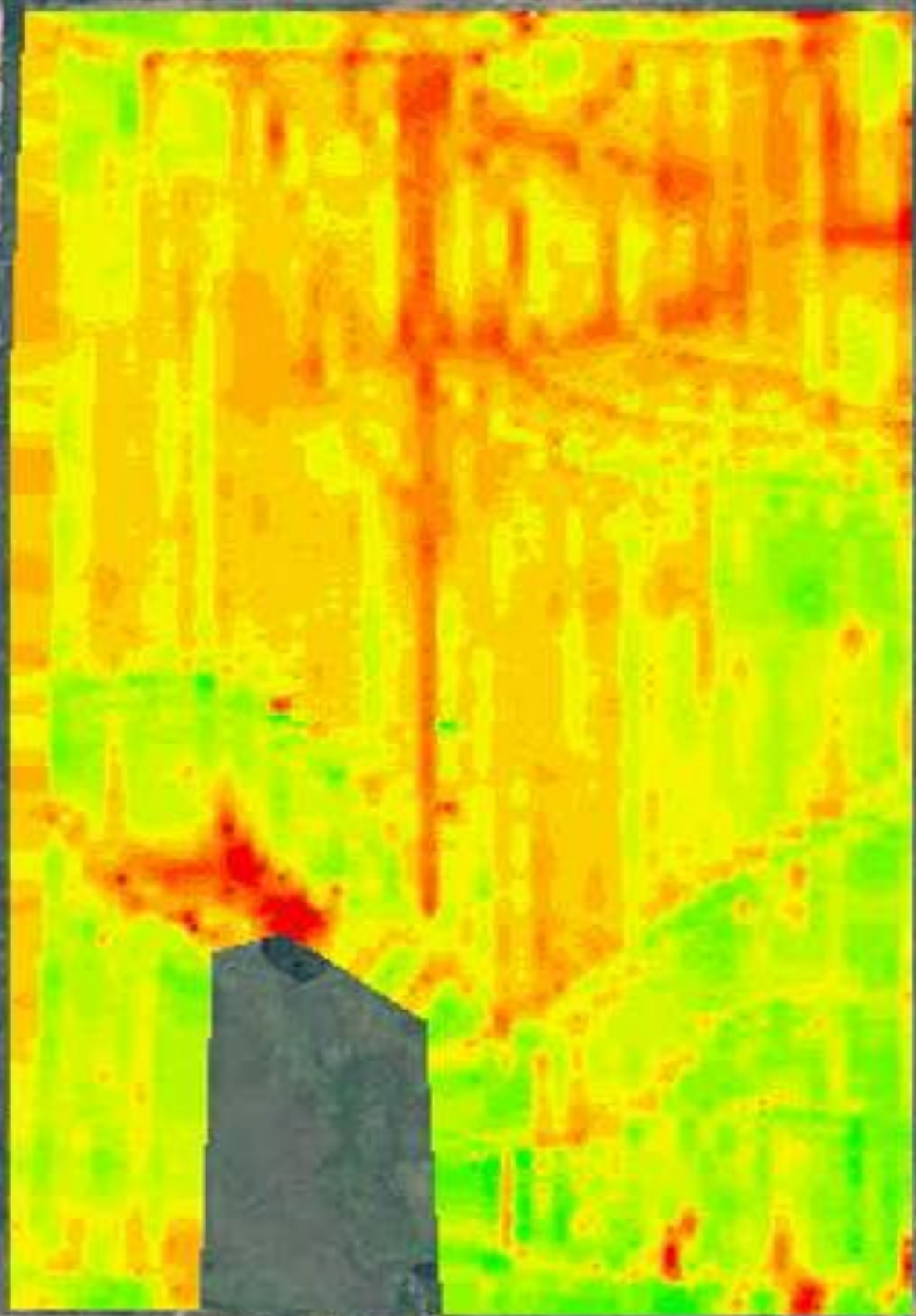
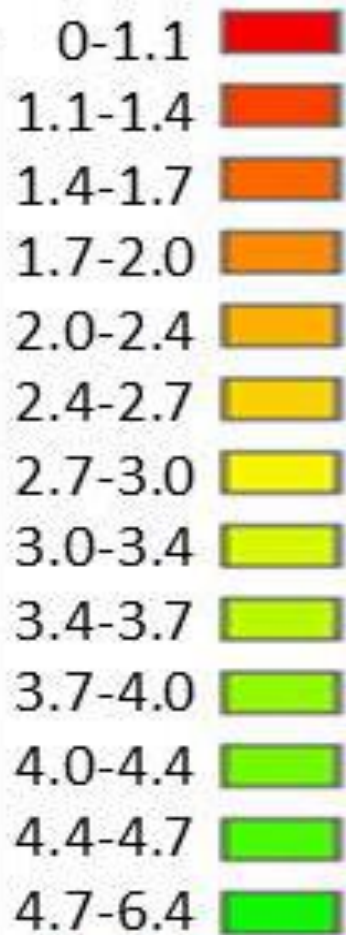


14.7-22.0

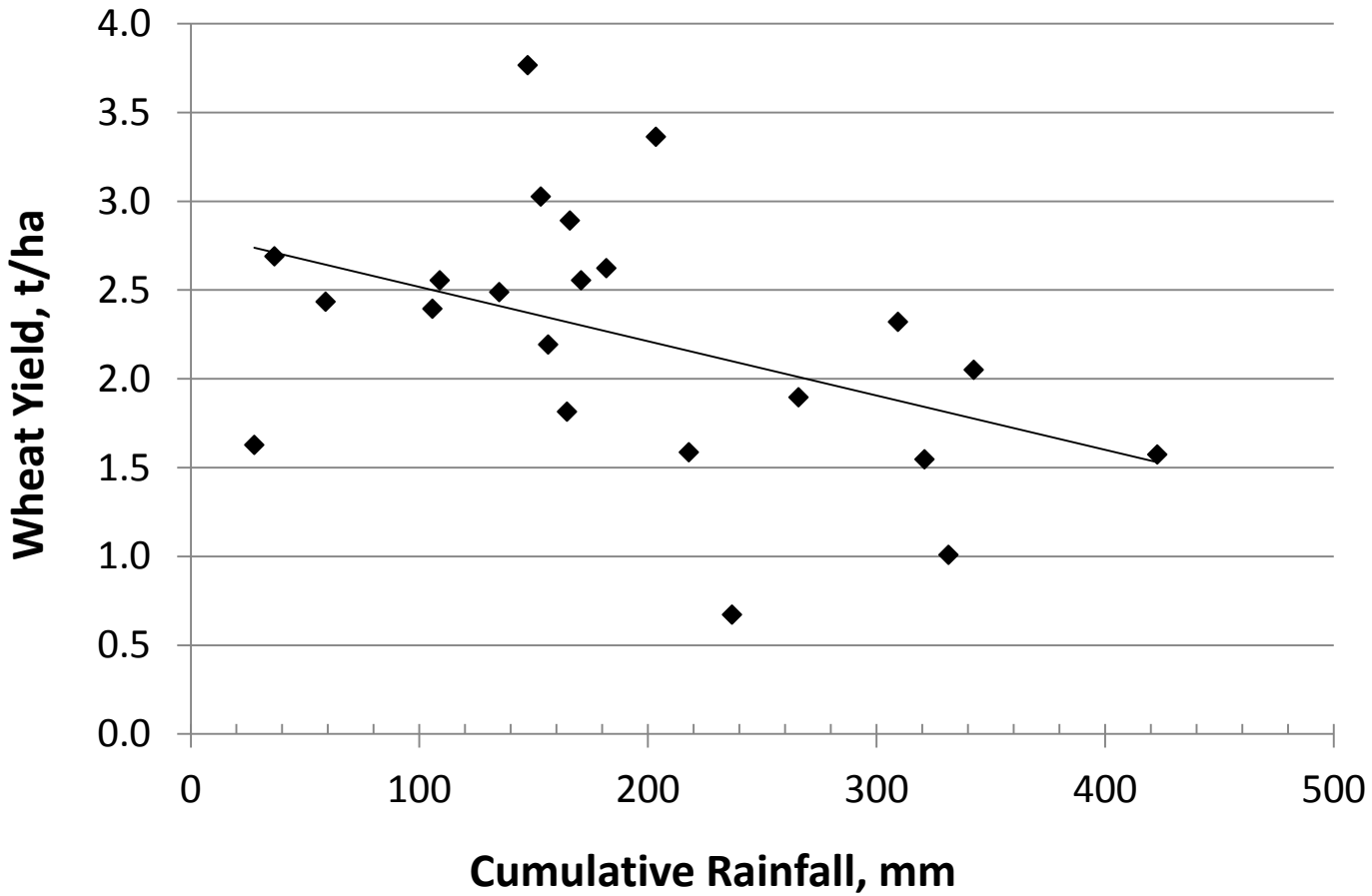


2015

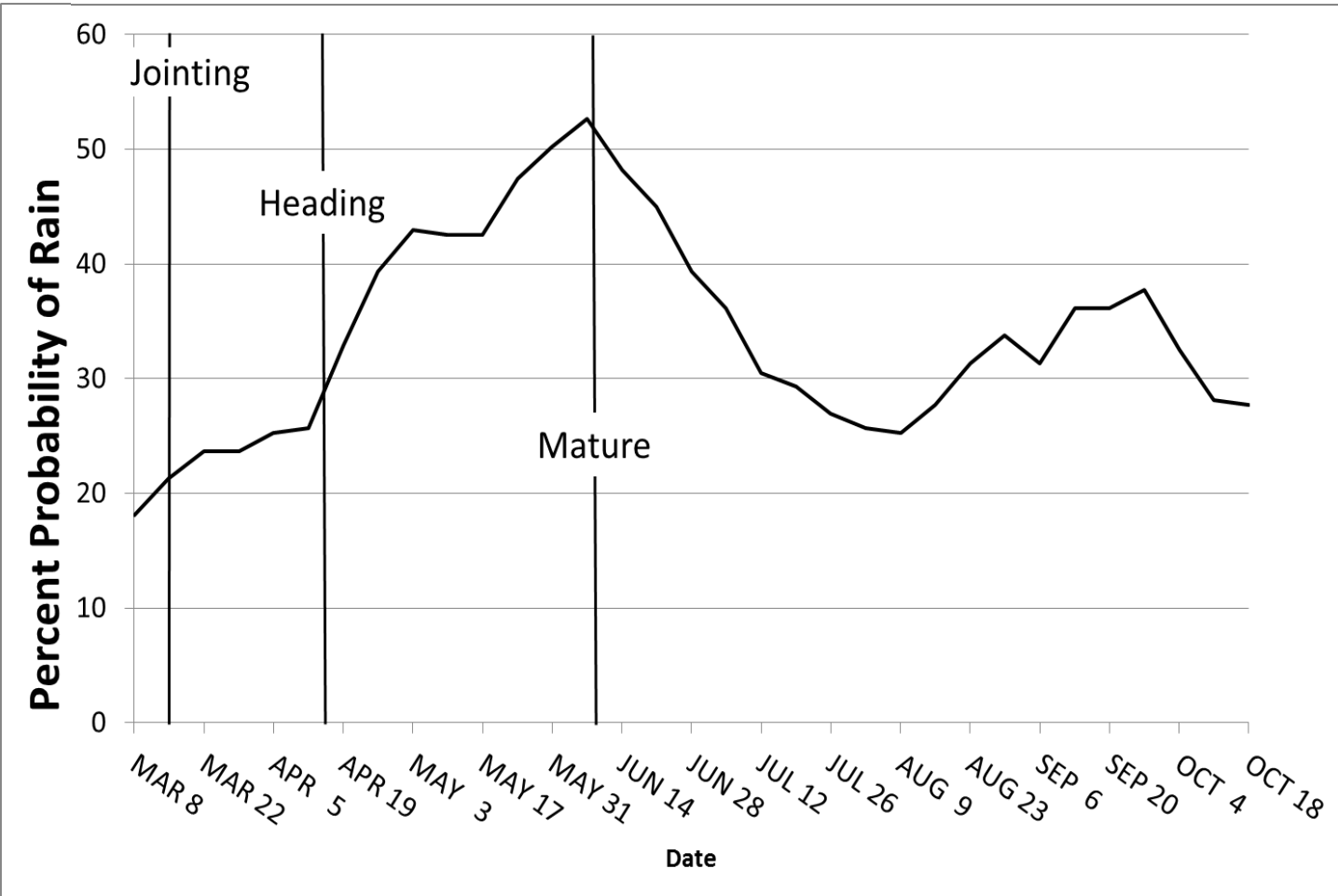
Wheat Yield,
t/ha



Wheat Yield Response to Spring Rain



Wheat Growth Stages



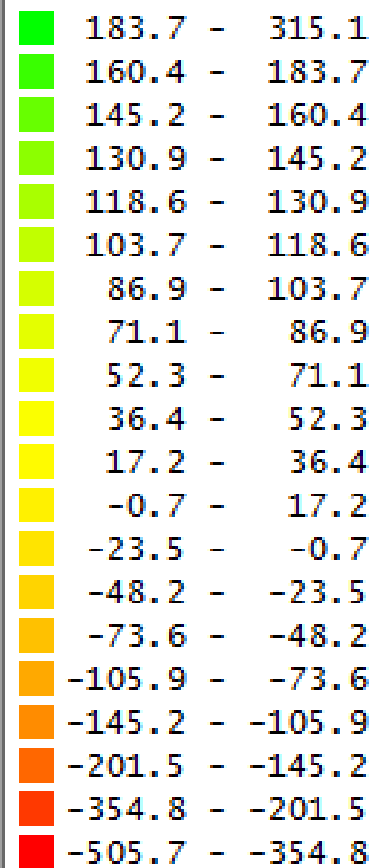
Challenges:

- Multiple crops – tight rotation
- Different crop responses to soil characteristics and water
- Compromised soils from historical erosion

How can we improve soil health?



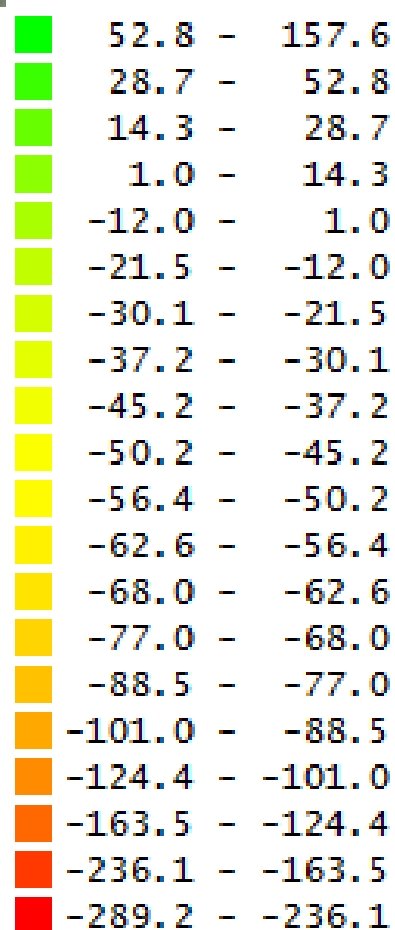
2014 Corn \$/ac



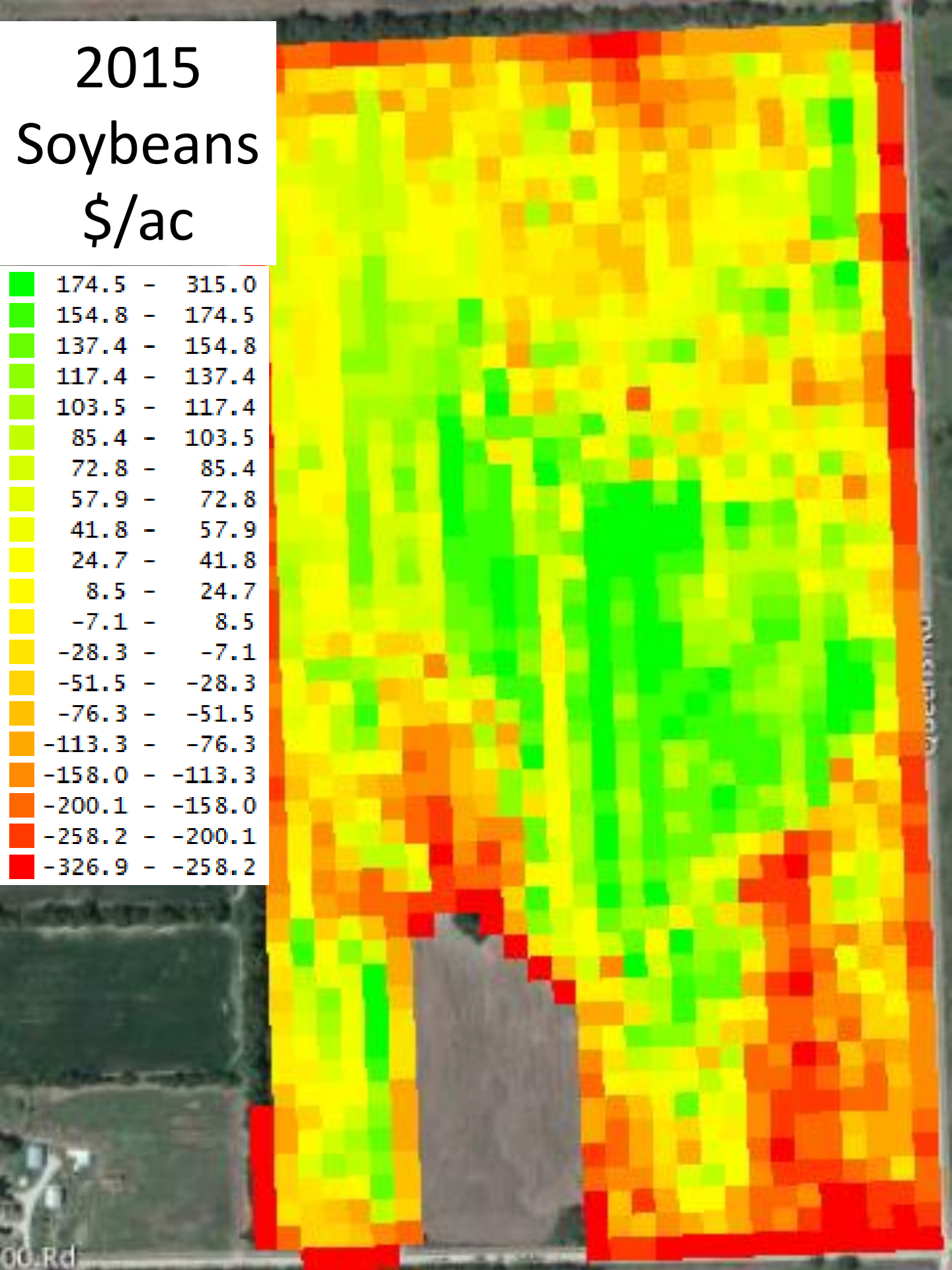
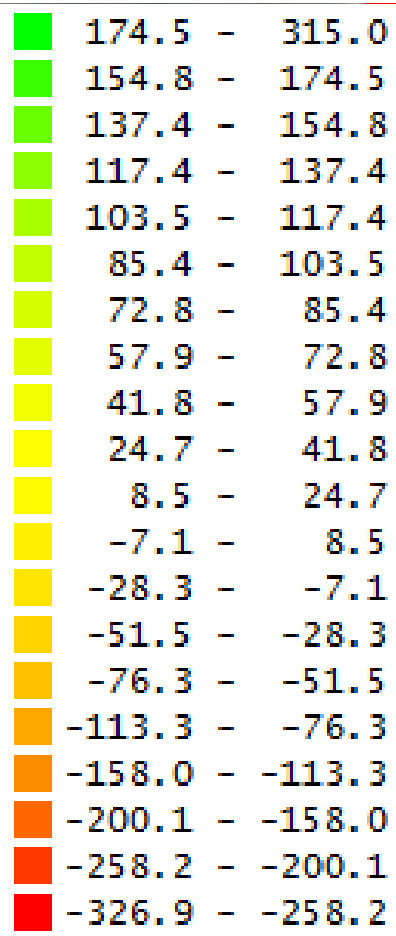
Queens Rd

000 Rd

2015 Wheat \$/ac



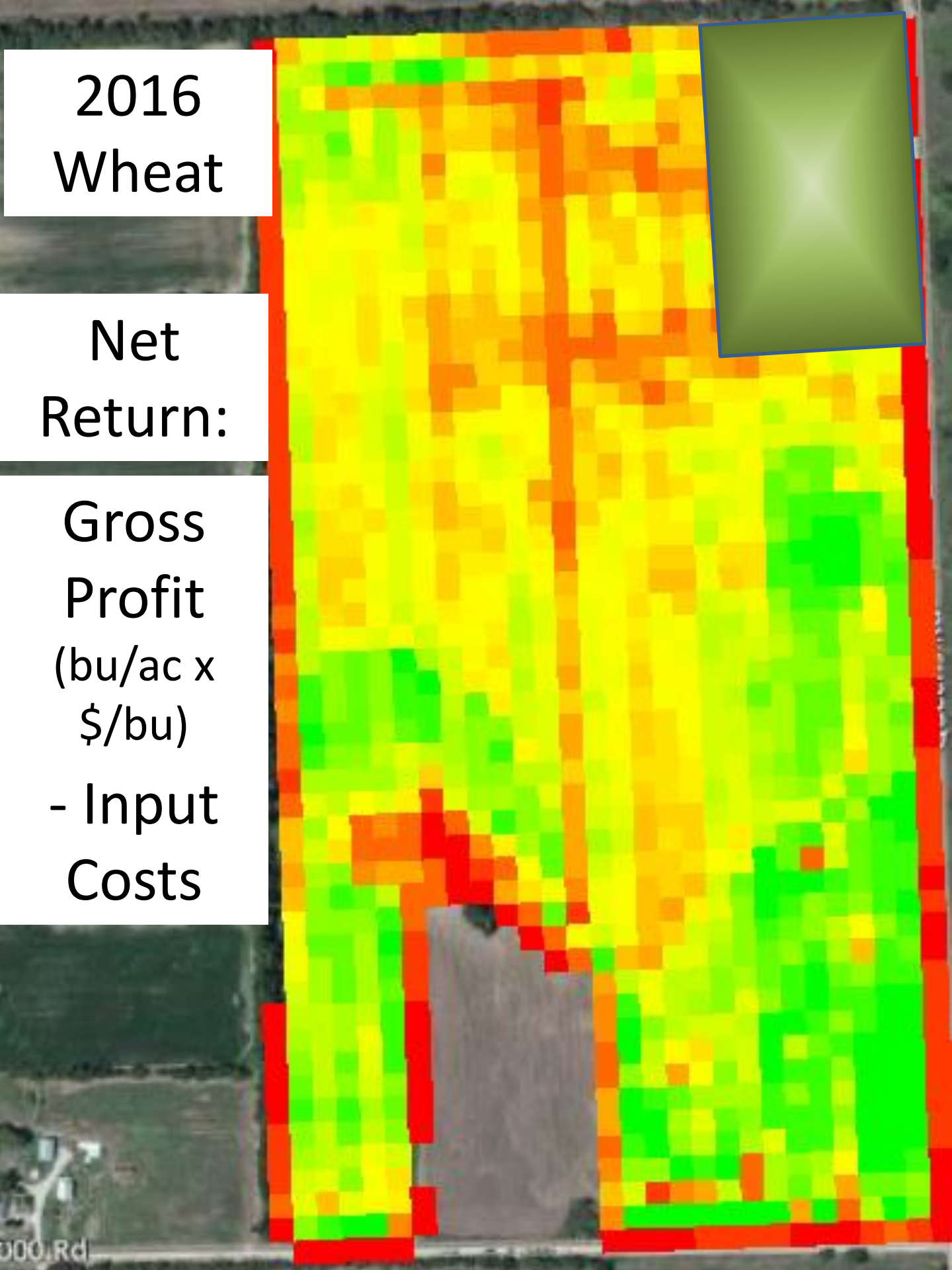
2015 Soybeans \$/ac



2016
Wheat

Net
Return:

Gross
Profit
(bu/ac x
\$/bu)
- Input
Costs



2017
Beans

00.Rd

Queens

2017
Beans

00.Rd

Queensland

2017
Beans

00.Rd

Queens

Conclusions:

- Poor soil health compromises the productive capacity
- Poor soil health compromises the environment by contributing to sediment and nutrient losses
- Conservation systems that focus “on the field” target the primary problem of poor soil health and improve the productive capacity of the soils, net return of production, and water resources
- Conservation systems need to be spatially and temporally dynamic to integrate with farming practices

Conclusions:

- Causes of erosion are not clear – may have more to do with underlying soil characteristics rather than topographic position
- Claypan does not appear to be as ubiquitous as first reported
- Wheat takes advantage of different soil characteristics than corn and soybeans
- Soils are a critical component of the water cycle. Conservation practices that improve soil health will improve water resources.

Opportunities:

- Identify and educate
- Build rooting structure
- Improve soil biology
- Integrate crop and animal production





Thank you

Questions?