Improving water quality with cover crops and fertilizer management during transition to no-till production

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Detroit
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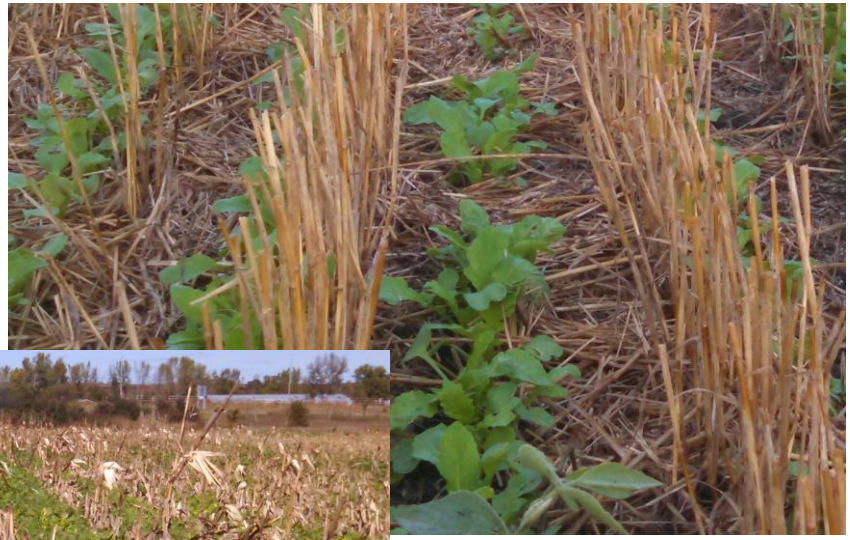
A toxic algal bloom caused a three-day ban on water usage for a half-million residents in SE Michigan and Toledo.
Experts say it's a 'wake-up call.'
TAINTED

Cheney Lake,
Kansas

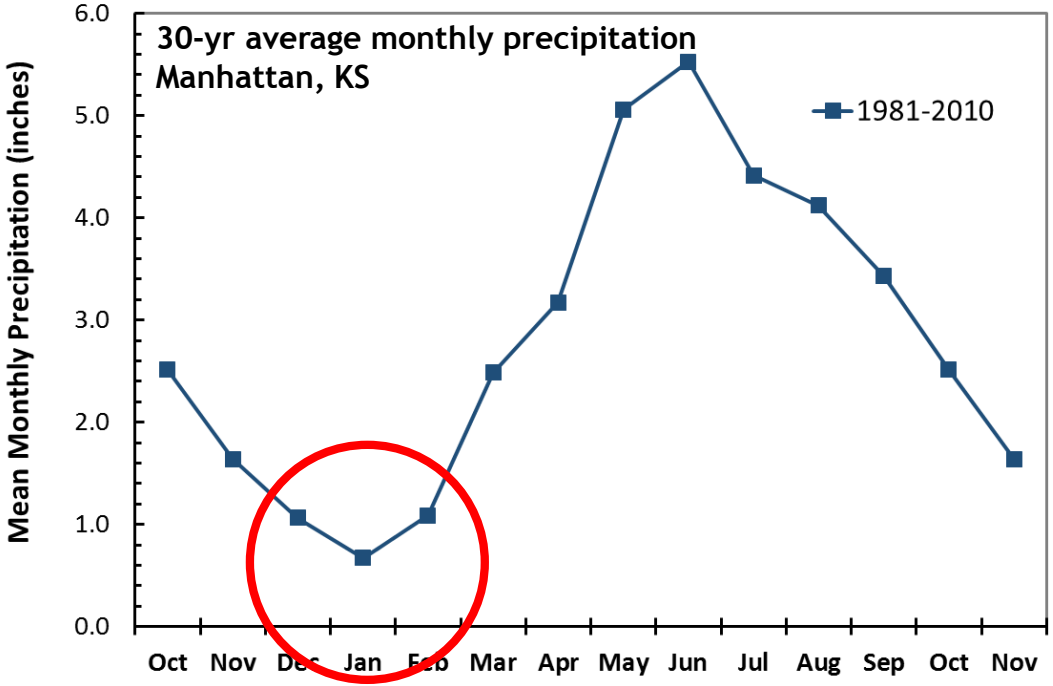
Milford Reservoir,
Kansas

Application method can influence P loss

Cropping system can influence P loss



The time, or season, of application can influence P loss

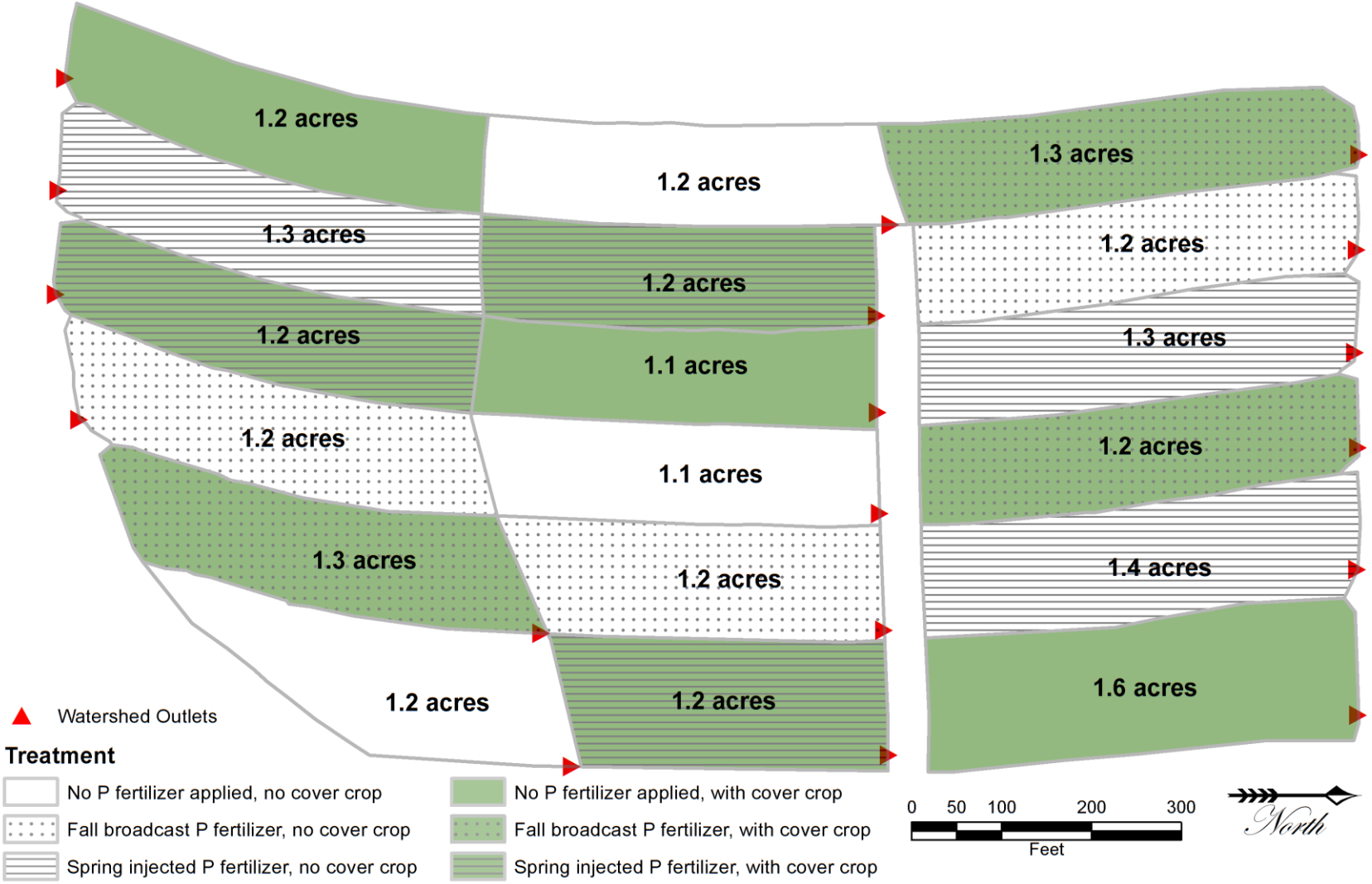


How will cover crops affect sediment and P loss?

- How much does fertilizer placement affect P loss? (when at the right time)
- Will cover crops reduce P loss in no-till?
- Will cover crops reduce P loss from surface-broadcast fertilizer?

Data from 2016 and 2017

- no-till corn-soybean rotation
- P treatments
  - 0 lb P_2O_5/ac
  - 55 lb P_2O_5 fall broadcast
  - 55 lb P_2O_5 2x2 at planting
- Cover crop
  - no cover crop
  - winter wheat cover (2016)
  - triticale & rapeseed (2017)


1.2 acres
1.2 acres
1.3 acres
1.3 acres
1.2 acres
1.2 acres
1.2 acres
1.1 acres
1.2 acres
1.1 acres
1.3 acres
1.2 acres
1.2 acres
1.2 acres
1.2 acres
1.3 acres
1.4 acres
1.6 acres
Watershed Outlets
Treatment
No P fertilizer applied, no cover crop
Fall broadcast P fertilizer, no cover crop
Spring injected P fertilizer, no cover crop
No P fertilizer applied, with cover crop
Fall broadcast P fertilizer, with cover crop
Spring injected P fertilizer, with cover crop
0 50 100 200 300
Feet
North

Data from 2016: Soybean

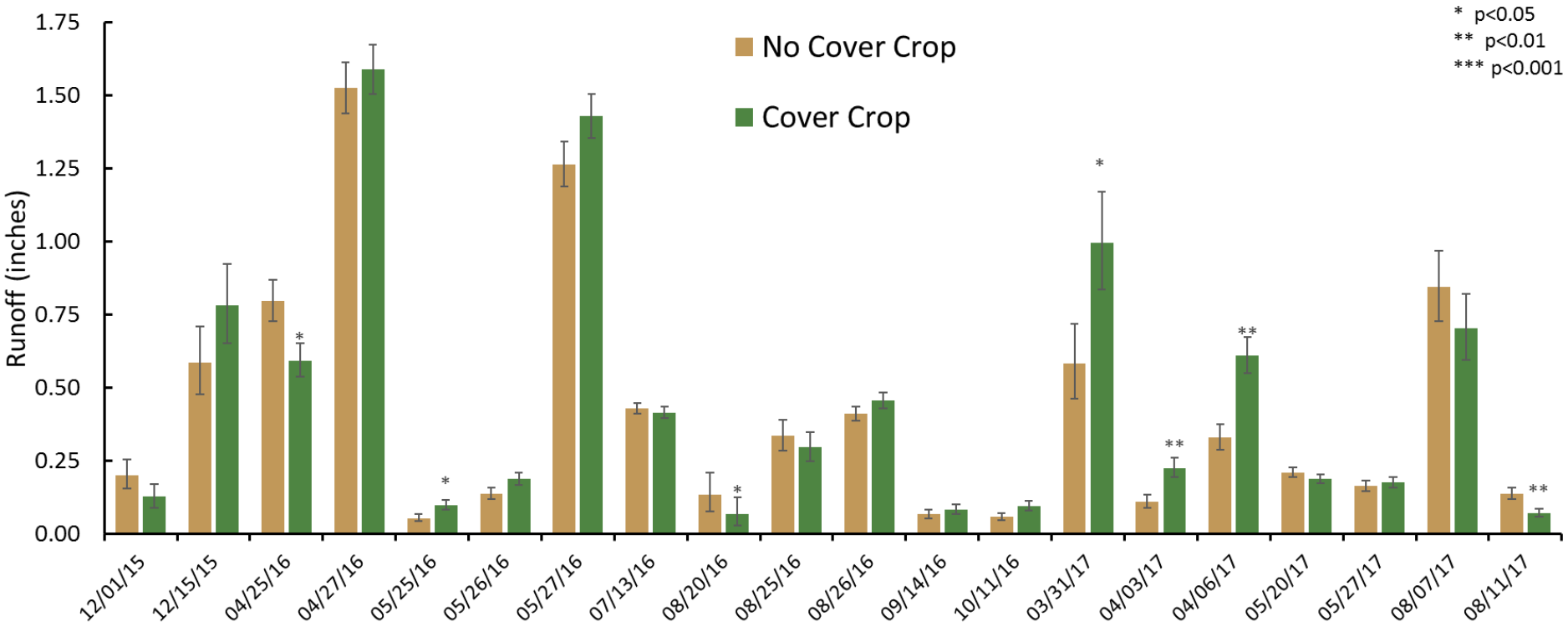
Environmental measures

- Runoff
- Sediment
- Total P
- Dissolved P

Agronomic and economic measures

- Yield
- Costs
- Net returns

Cover crop effects on runoff



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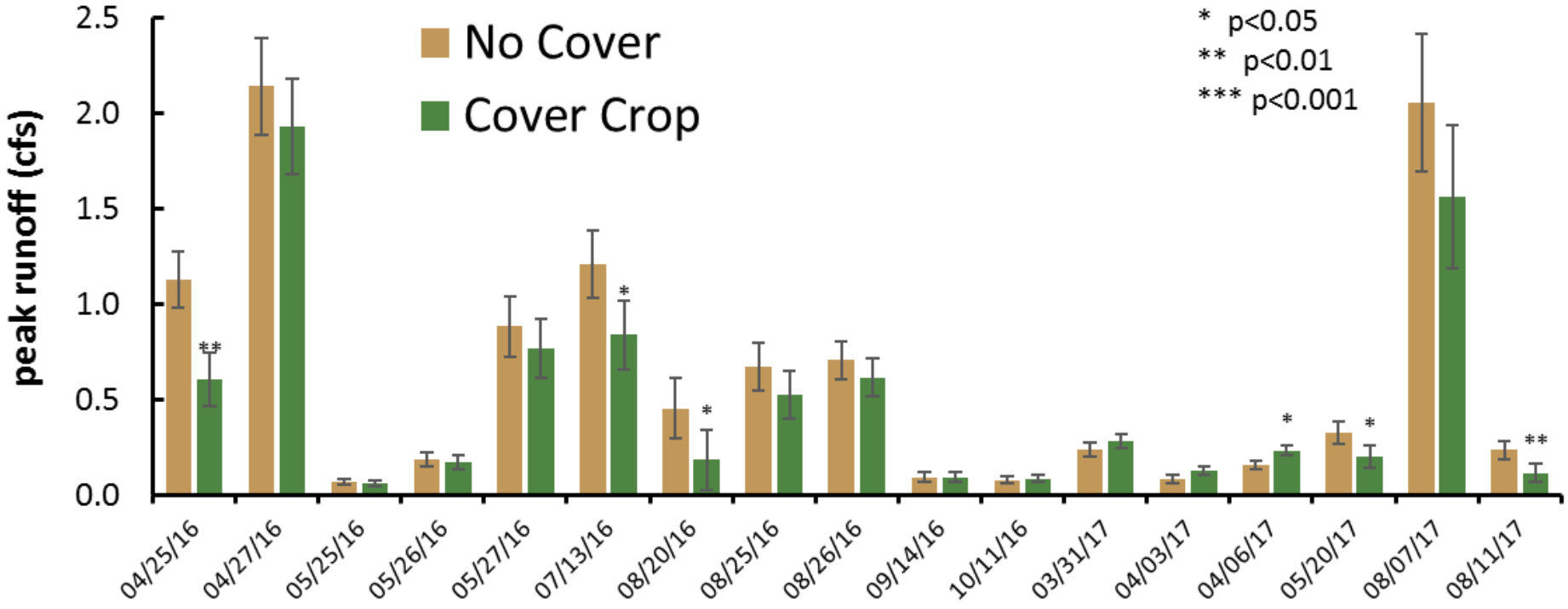

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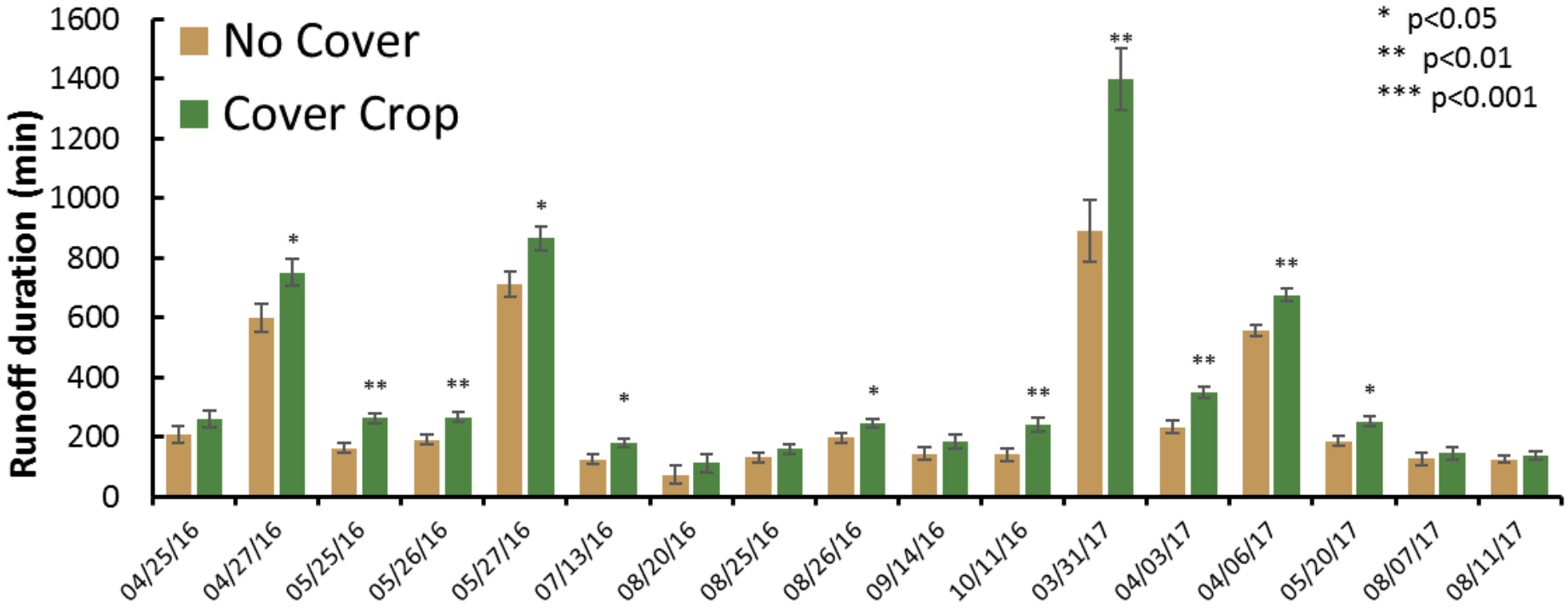

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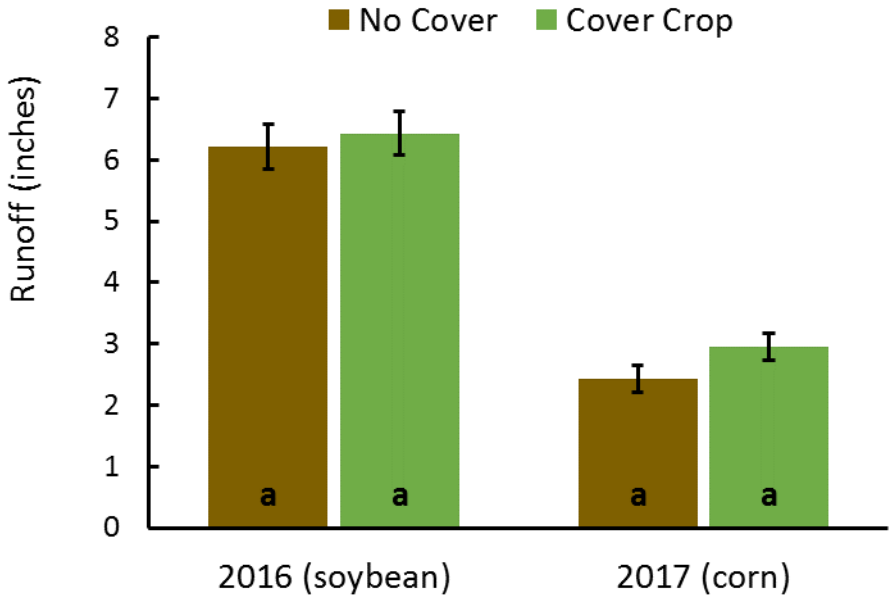
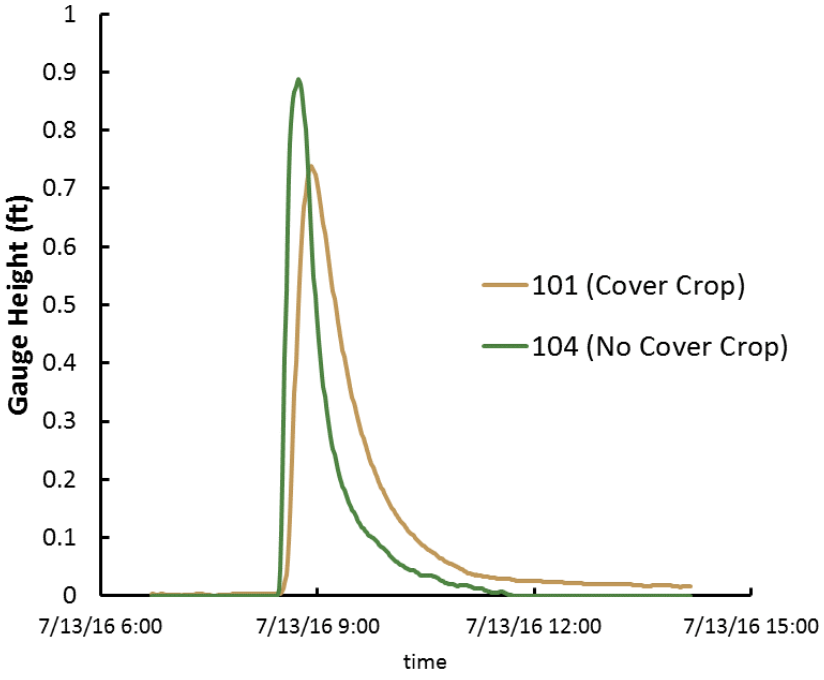
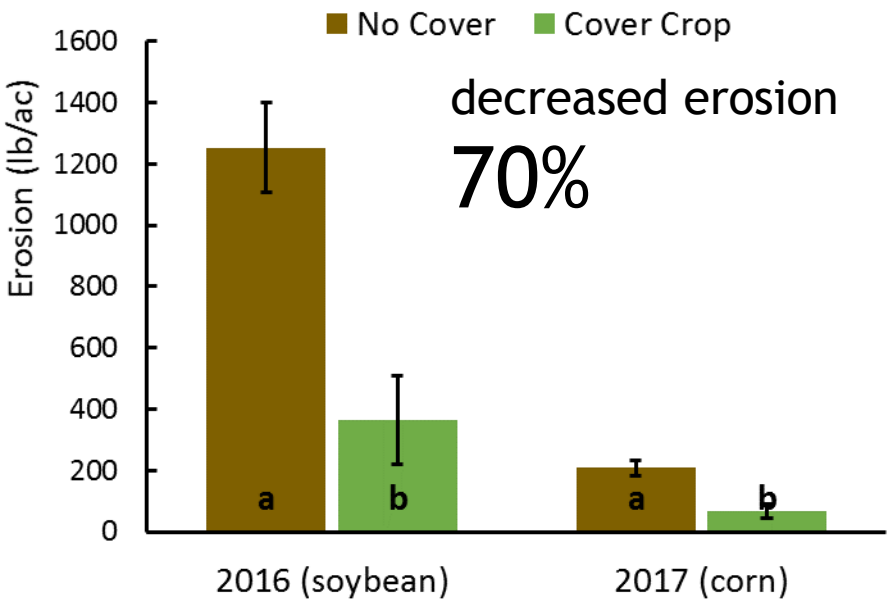
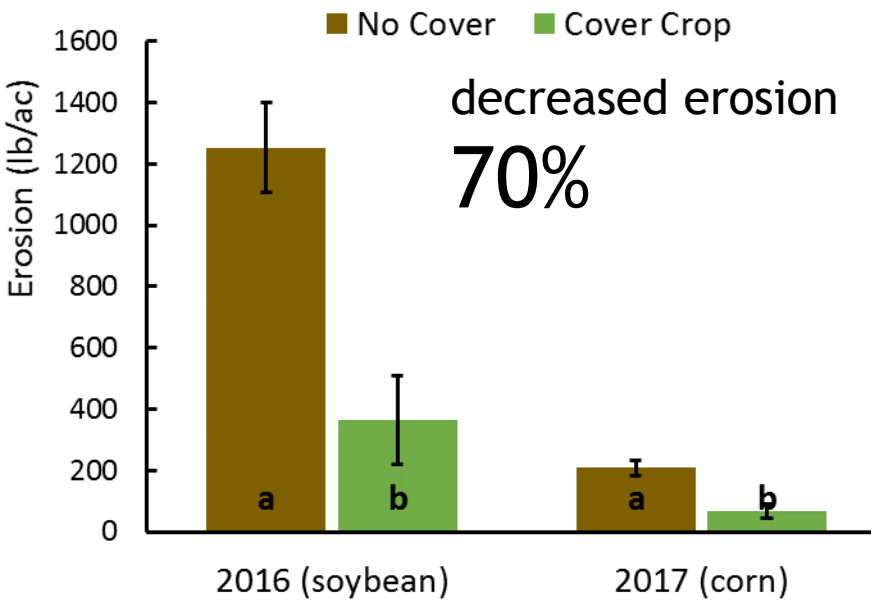


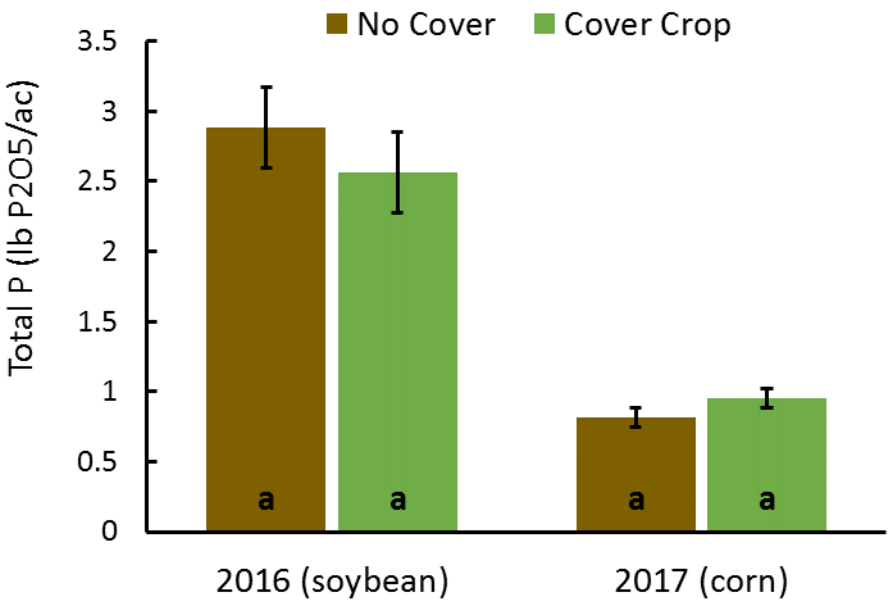


Cover crop effects on sediment & P loss

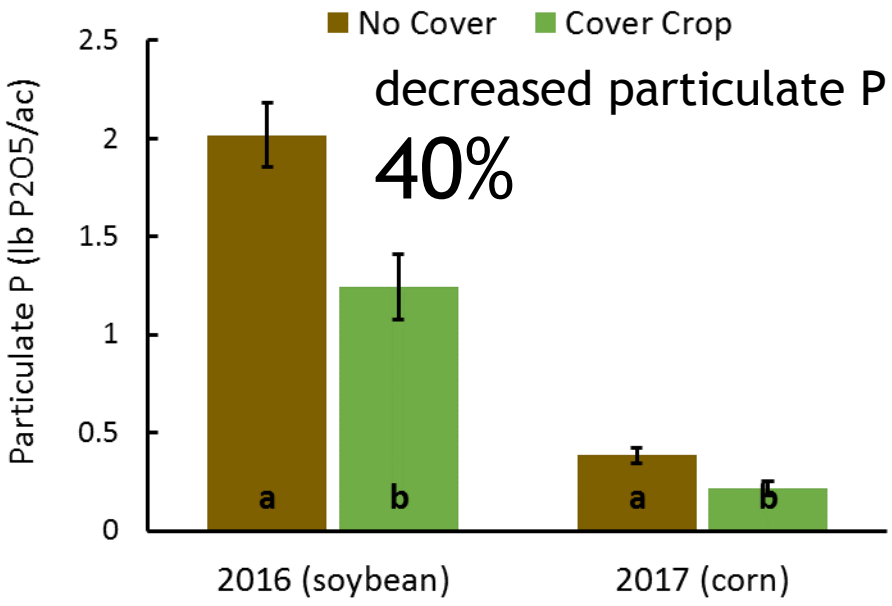


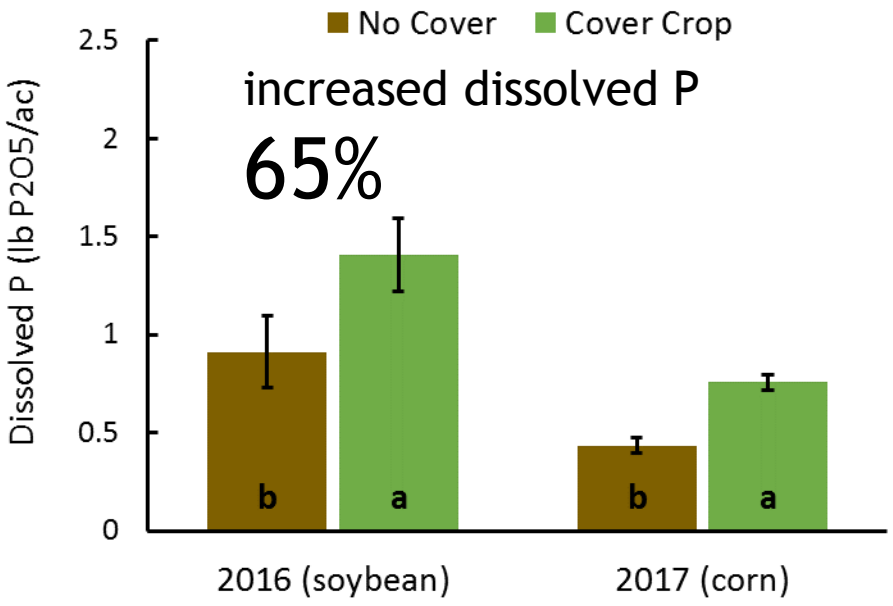
Cover crop effects on sediment & P loss



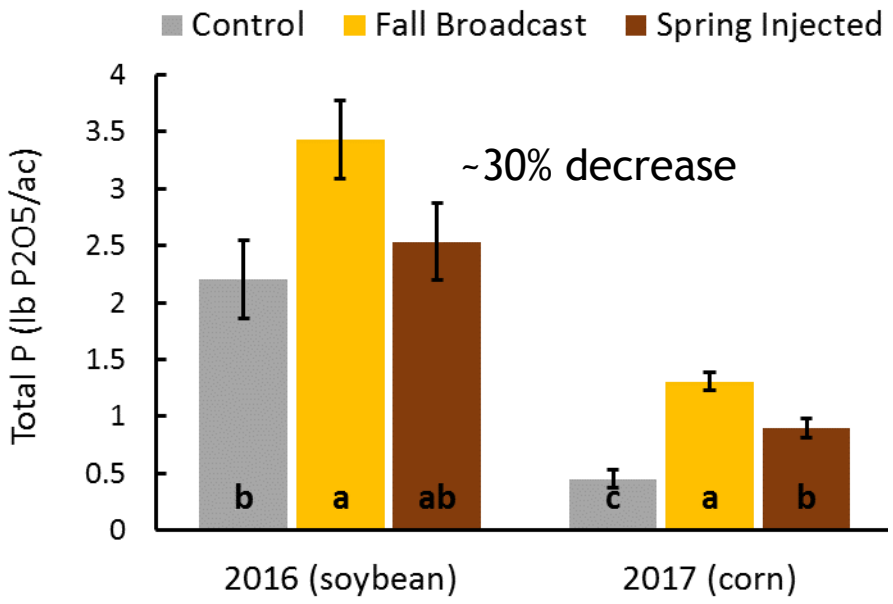


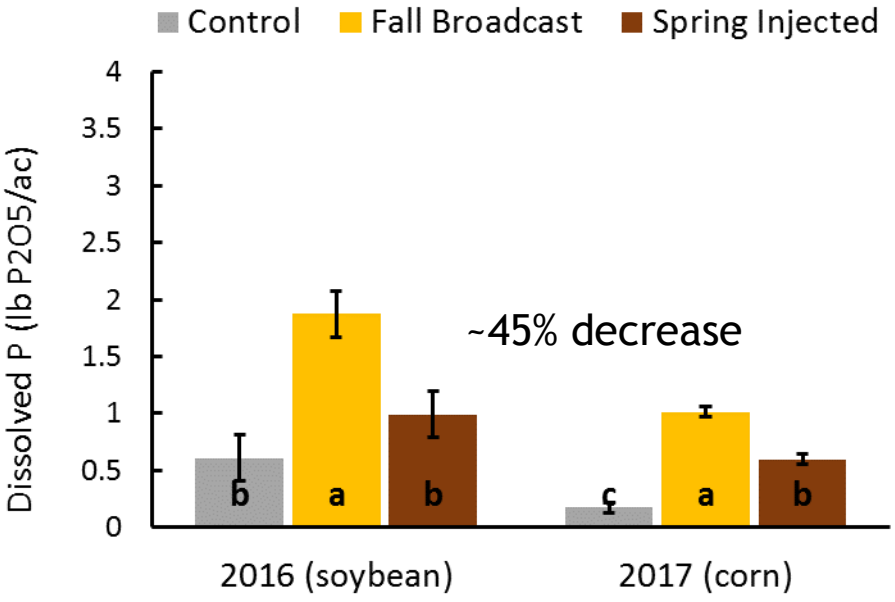
Cover crop effects on form of P loss



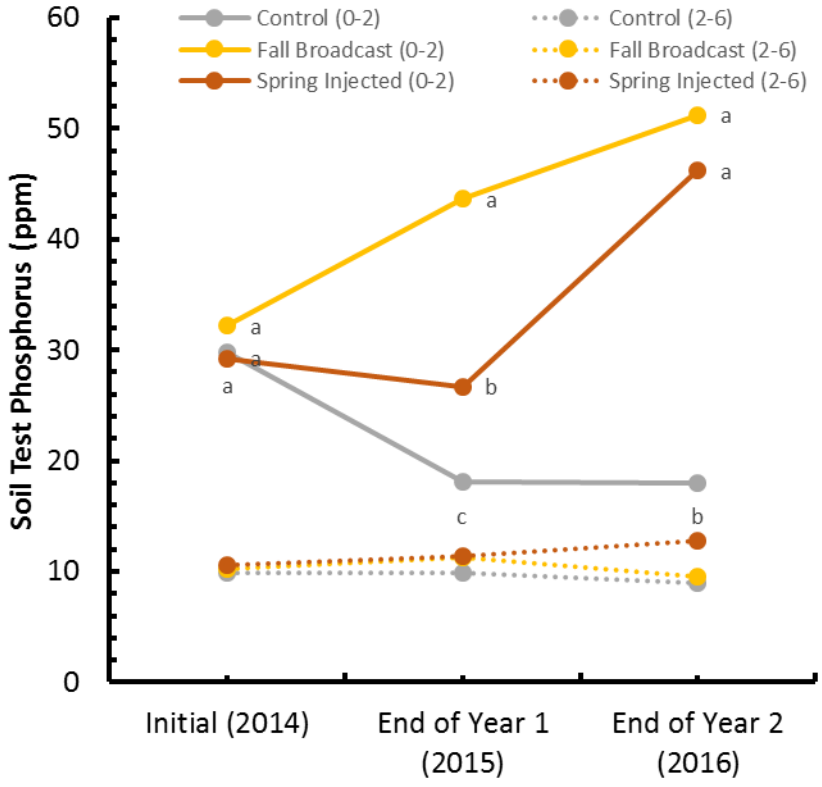


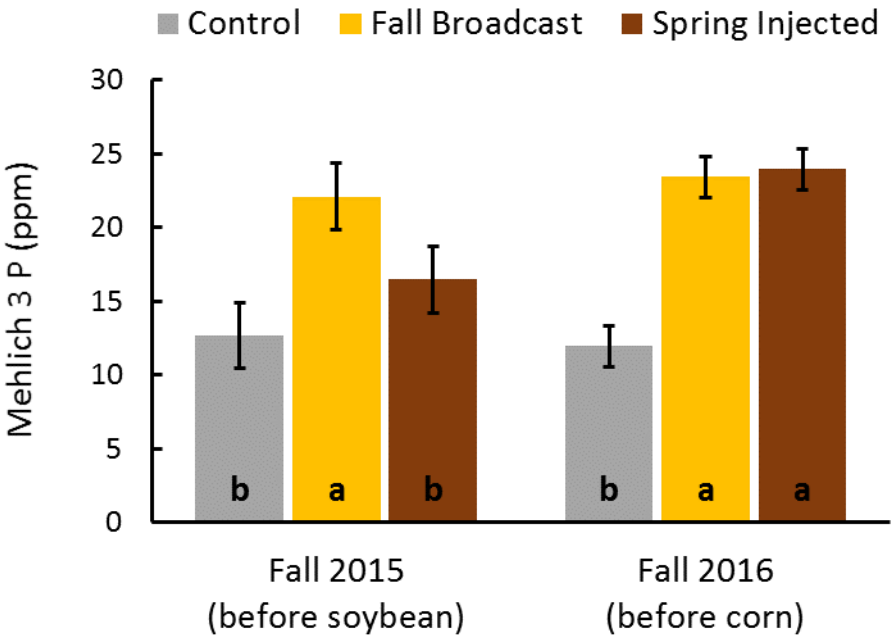
Fertilizer management effects on P loss





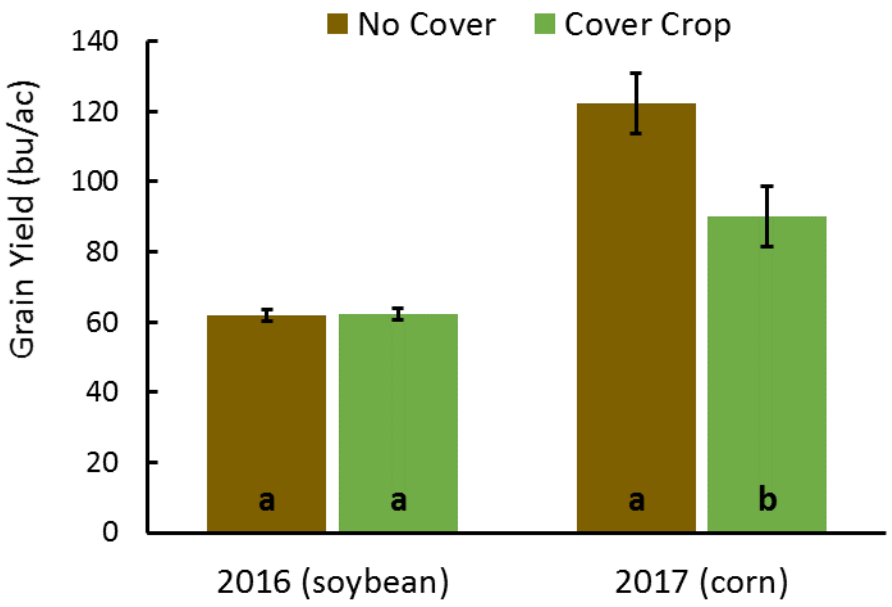
Fertilizer management effects on soil test P

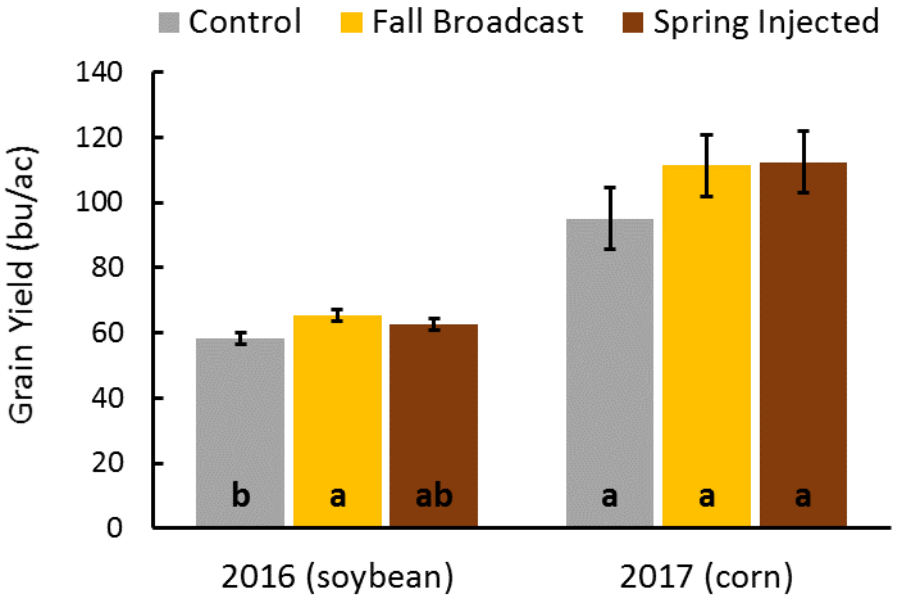




0-6 inch Mehlich 3 P
(weighted average of 0-2 and 2-6 inch samples)

Cover crop and P fertilizer effects on grain yield





Summary of 2016 and 2017 Data

- Cover crop
  - decreased sediment loss
  - increased dissolved P loss
  - no effect on total P loss
- Subsurface P fertilizer placement
  - decreased dissolved P loss
  - decreased total P loss

Still collecting data…
…need 2018, & 2019 data

Thank you to our funding sources

Research Fund

Kansas State University
Department of Agronomy

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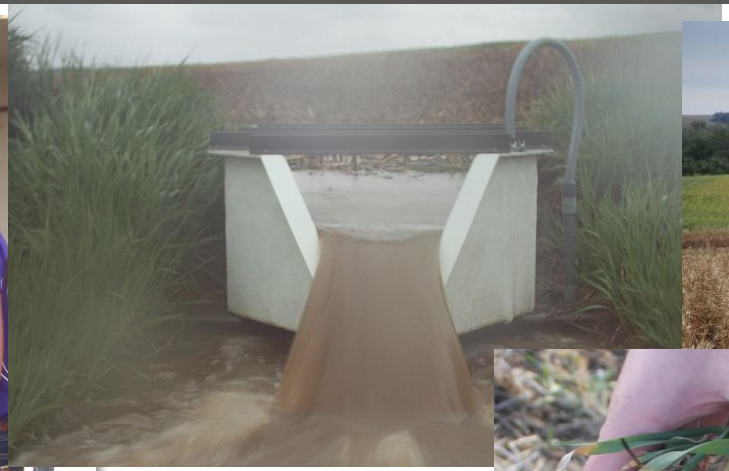
Natural Resources Conservation Service

Kansas Soybean Commission

Kansas Corn Commission

K-State Research and Extension

Questions?