Minimizing Phosphorus Loss with 4R Stewardship & Cover Crops

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Phosphorus is essential to crop production

Phosphorus addition to soil increases crop growth and yield…

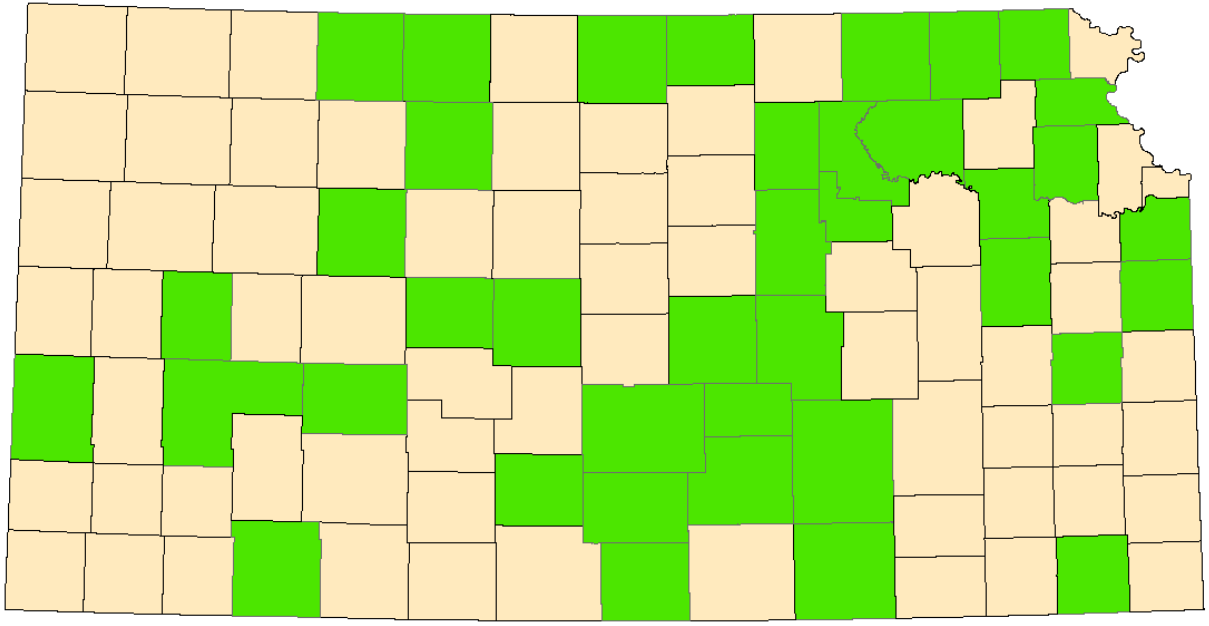
P deficient corn (photo courtesy Tom Morris)

…phosphorus addition to water also results in increased growth.

Centralia Lake, KS (photo courtesy Kevin Price, 2012)

Kansas Counties with Harmful Algal Blooms Confirmed in Public Lakes from 2010 to 2017

(68 lakes and reservoirs in 39 counties)



A photo shows the water at Milford Reservoir on June 22, the same day KDHE issued a "warning" for the lake. Warnings were also issued more recently for a variety of lakes. **Michael Pearce** - The Wichita Eagle

LOCAL

Warning issued for three Kansas lakes because of harmful algae

July 20, 2017

BY KATHERINE BURGESS
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JULY 20, 2017 04:31 PM

A public health warning has been issued for three lakes, in addition to watches for five lakes due to harmful algae blooms.

If a lake is under a public health warning for blue-green algae, boating and fishing may still be safe, according to the Kansas Department of Health and Environment. However, direct contact with water through activities like wading or swimming is strongly discouraged for people, pets and livestock. The lakes currently under a watch or warning status are:

Warning

Marion County Lake, Marion County

Milford Reservoir (Zones A and C), Geary, Dickinson and Clay counties. Residents can check the zones of the Milford Reservoir online.

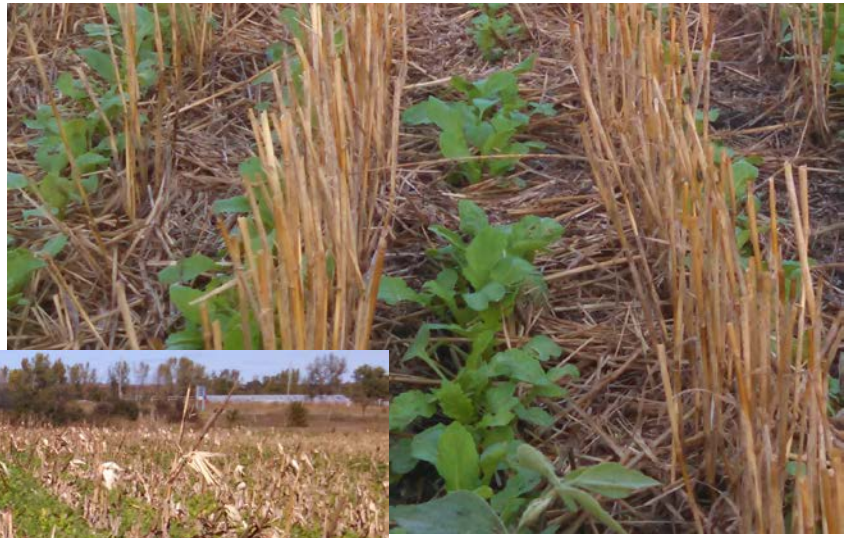
Wolf Pond, Barton County

Agriculture can benefit from minimizing P loss to surface water

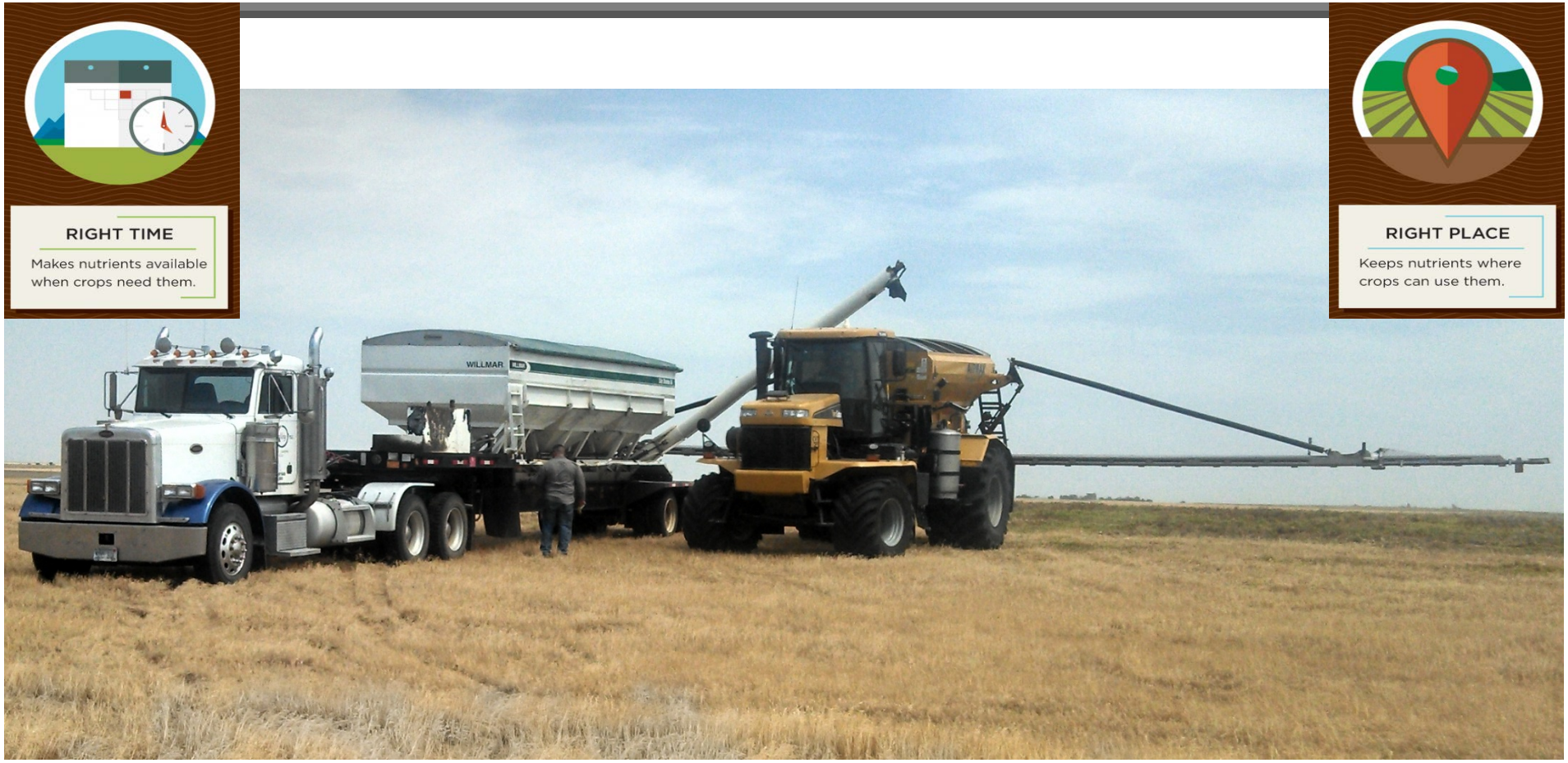
- Keeps valuable nutrients in fields
- Reduces potential for off-site impacts (like algal blooms)
- Keeps producers in control of nutrients
  - reduces regulatory pressures

We need to identify and encourage practices that maintain high yields while minimizing P loss

How do cover crops affect water quality?

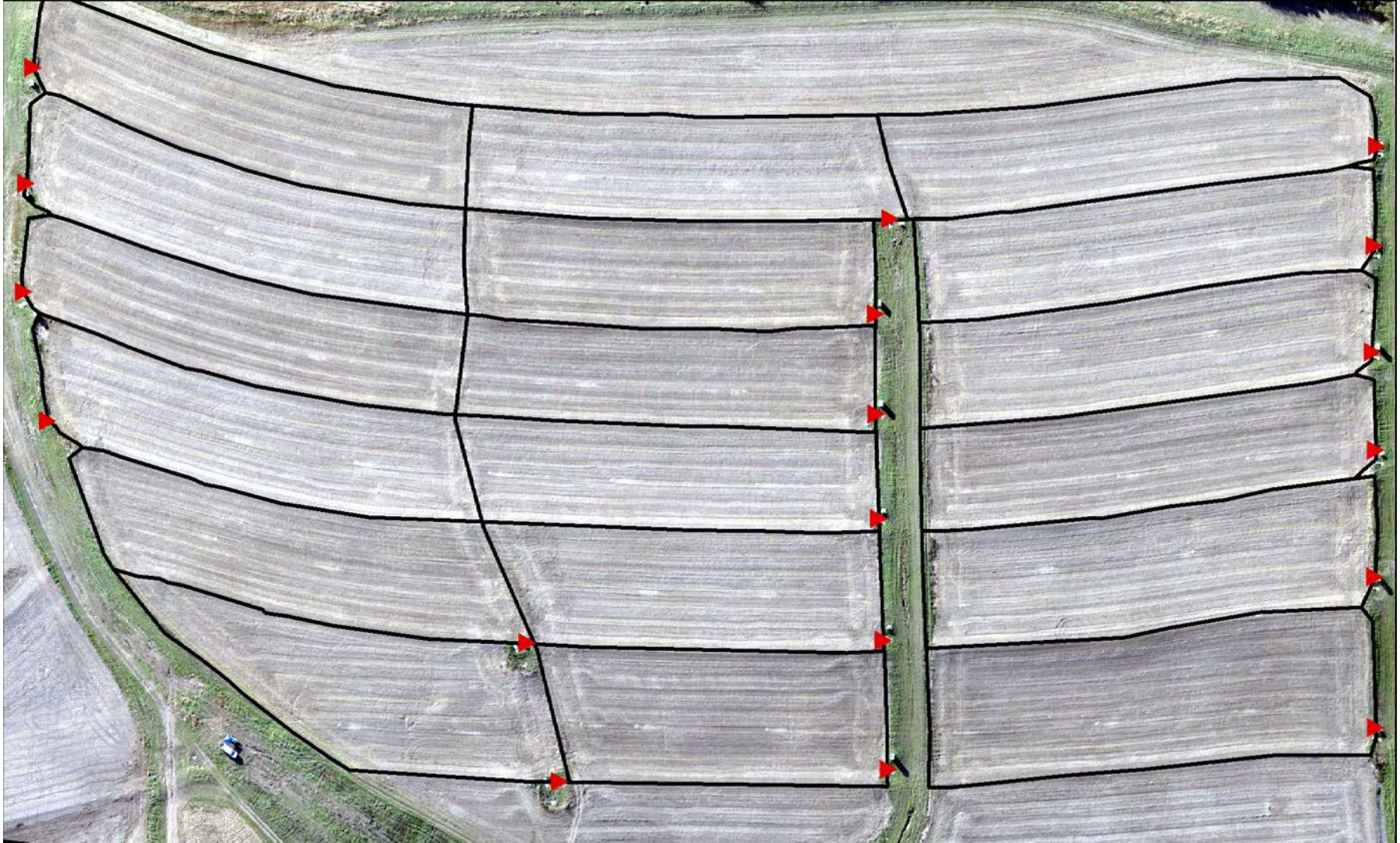


Application method and timing can influence P loss



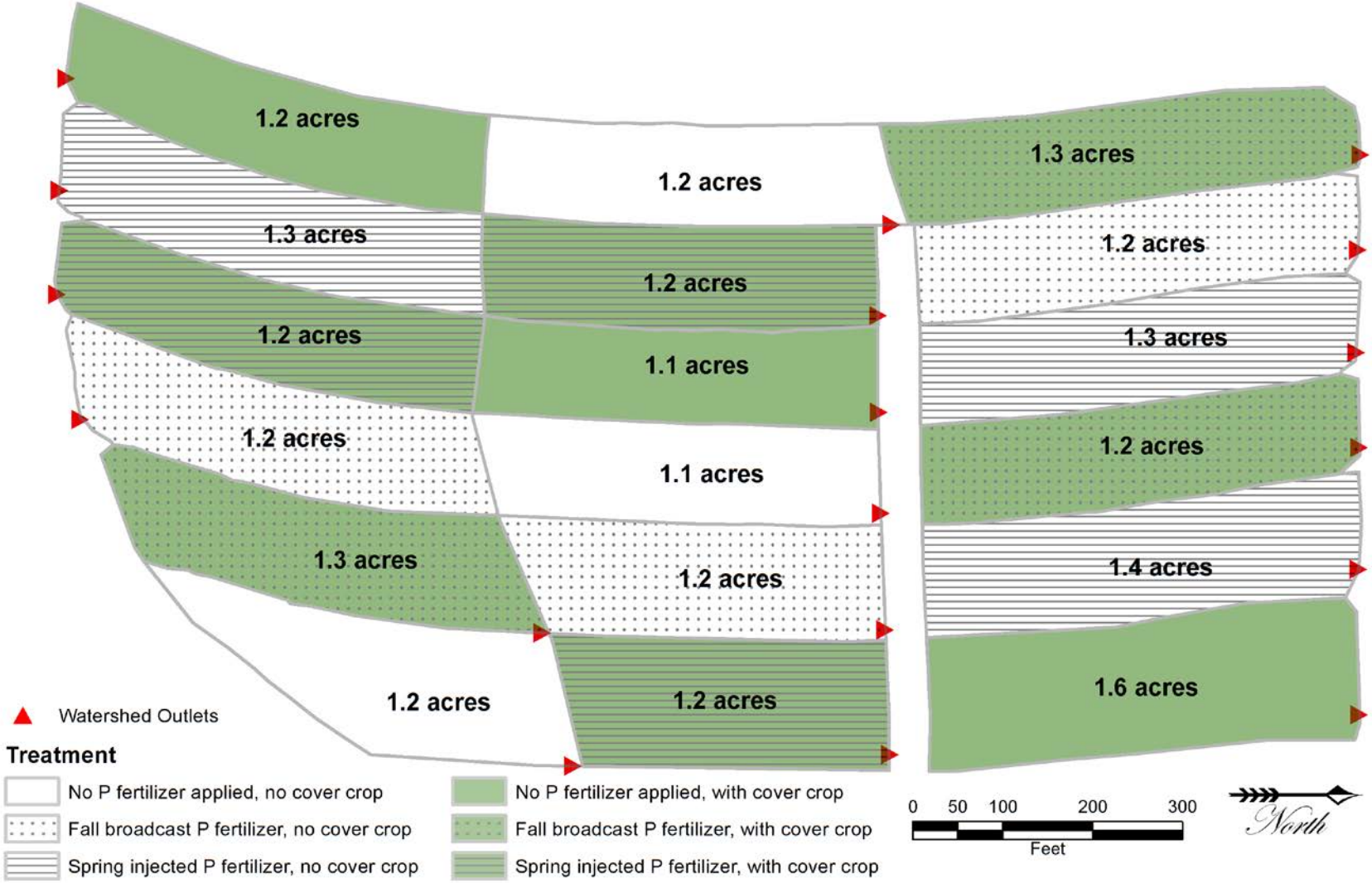
How will cover crops affect sediment and P loss?

- 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?
- How do these changes affect nutrient loss throughout the cropping cycle?



Data from 2016 (Soybean) and 2017 (Corn)

- 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)

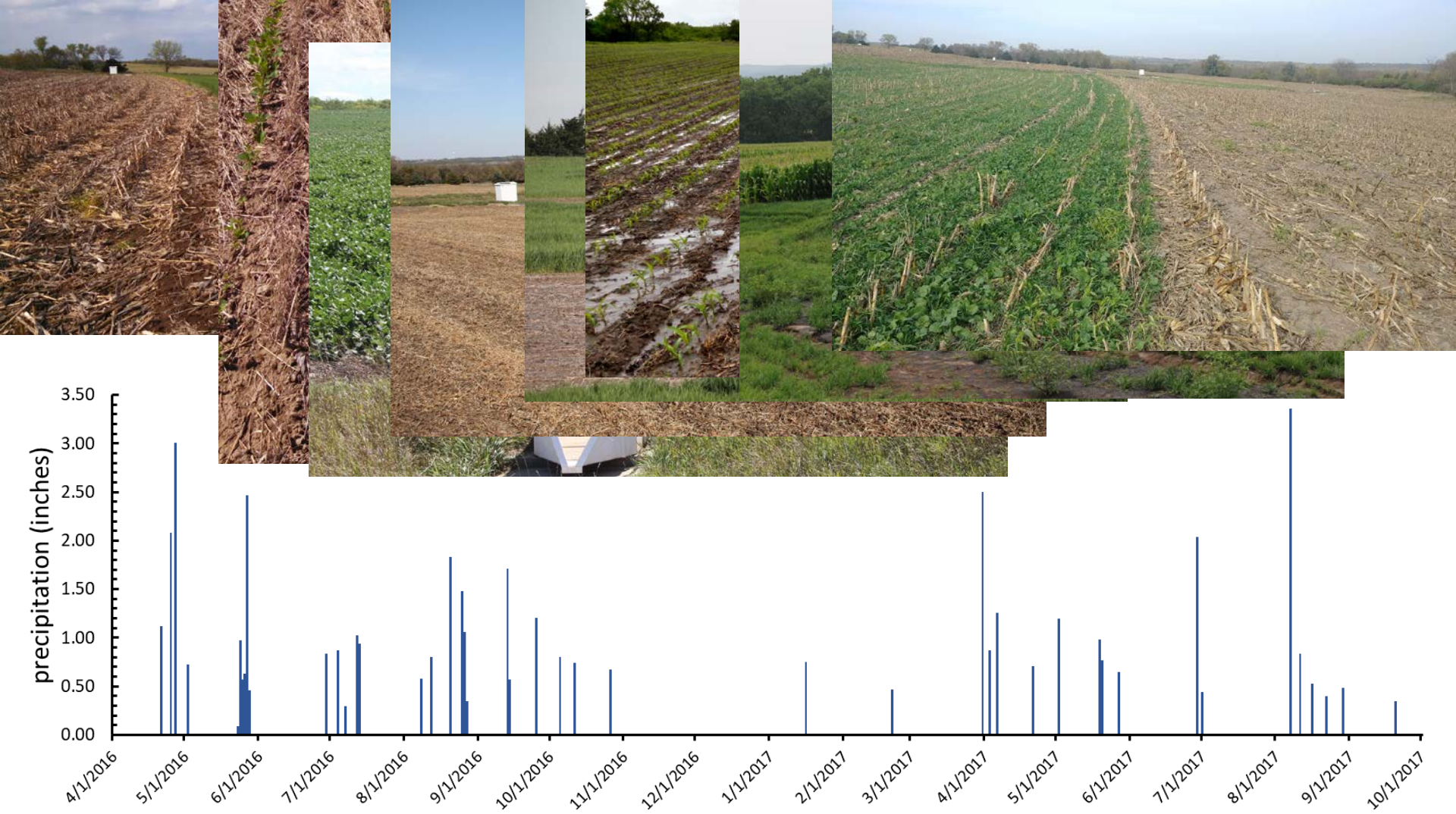

1.2 acres
1.2 acres
1.3 acres
1.3 acres
1.2 acres
1.2 acres
1.2 acres
1.1 acres
1.2 acres
1.1 acres
1.3 acres
1.2 acres
1.2 acres
1.2 acres
1.2 acres
1.3 acres
1.4 acres
1.6 acres
Watershed Outlets
Treatment
No P fertilizer applied, no cover crop
Fall broadcast P fertilizer, no cover crop
Spring injected 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

Environmental measures

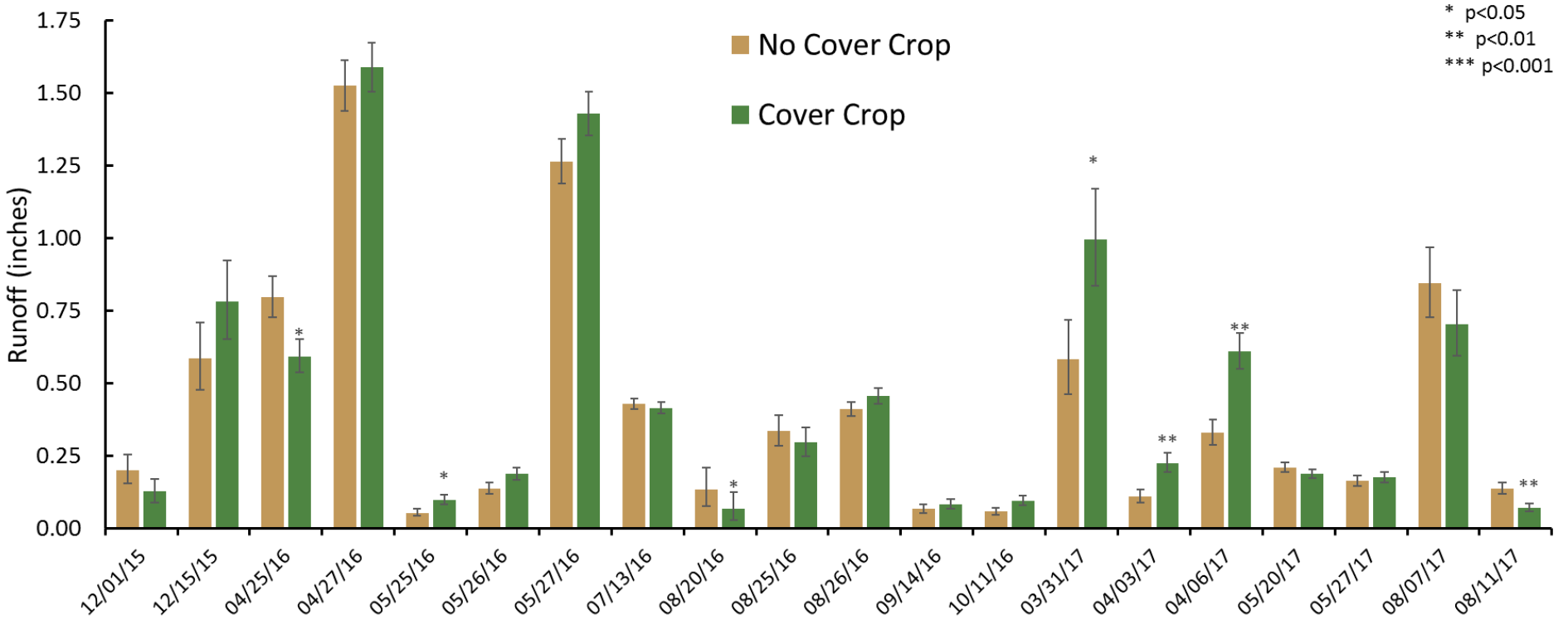
- Runoff
- Sediment
- Total P
- Dissolved P

Agronomic and economic measures

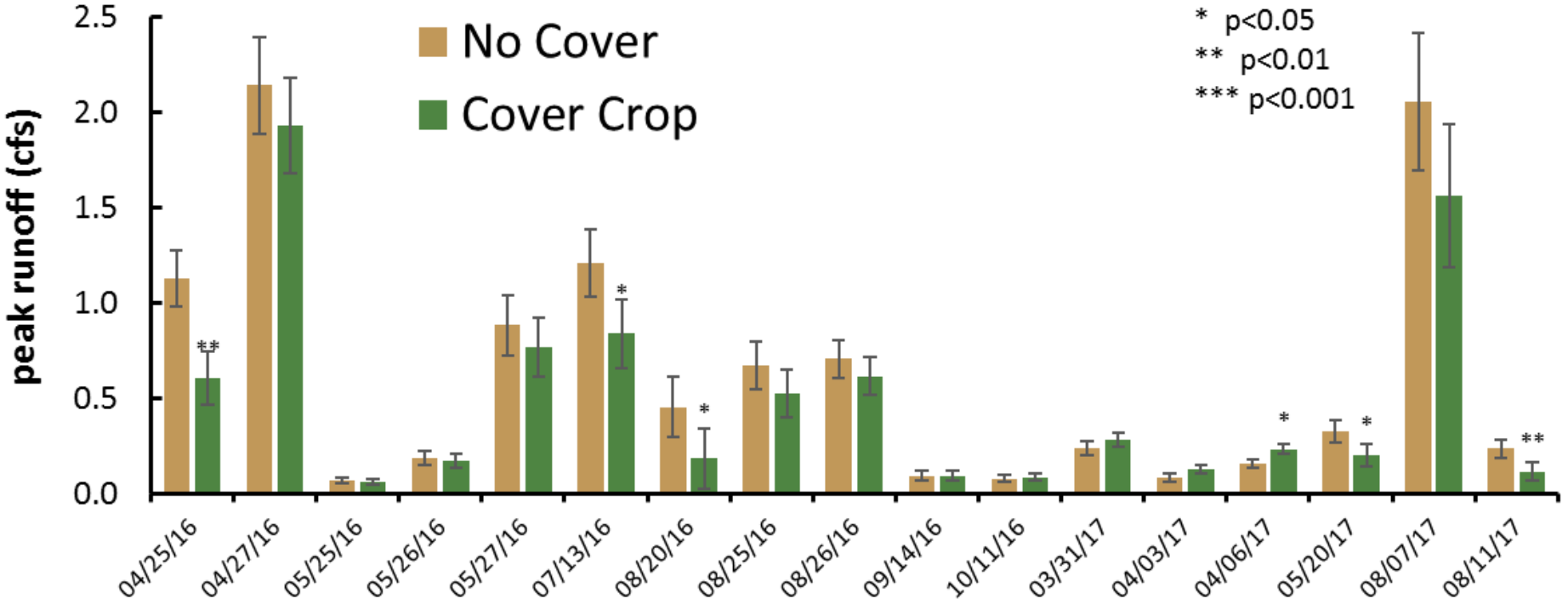
- Yield
- Nutrient uptake and removal
- Costs
- Net returns


precipitation (inches)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
4/1/2016
5/1/2016
6/1/2016
7/1/2016
8/1/2016
9/1/2016
10/1/2016
11/1/2016
12/1/2016
1/1/2017
2/1/2017
3/1/2017
4/1/2017
5/1/2017
6/1/2017
7/1/2017
8/1/2017
9/1/2017
10/1/2017

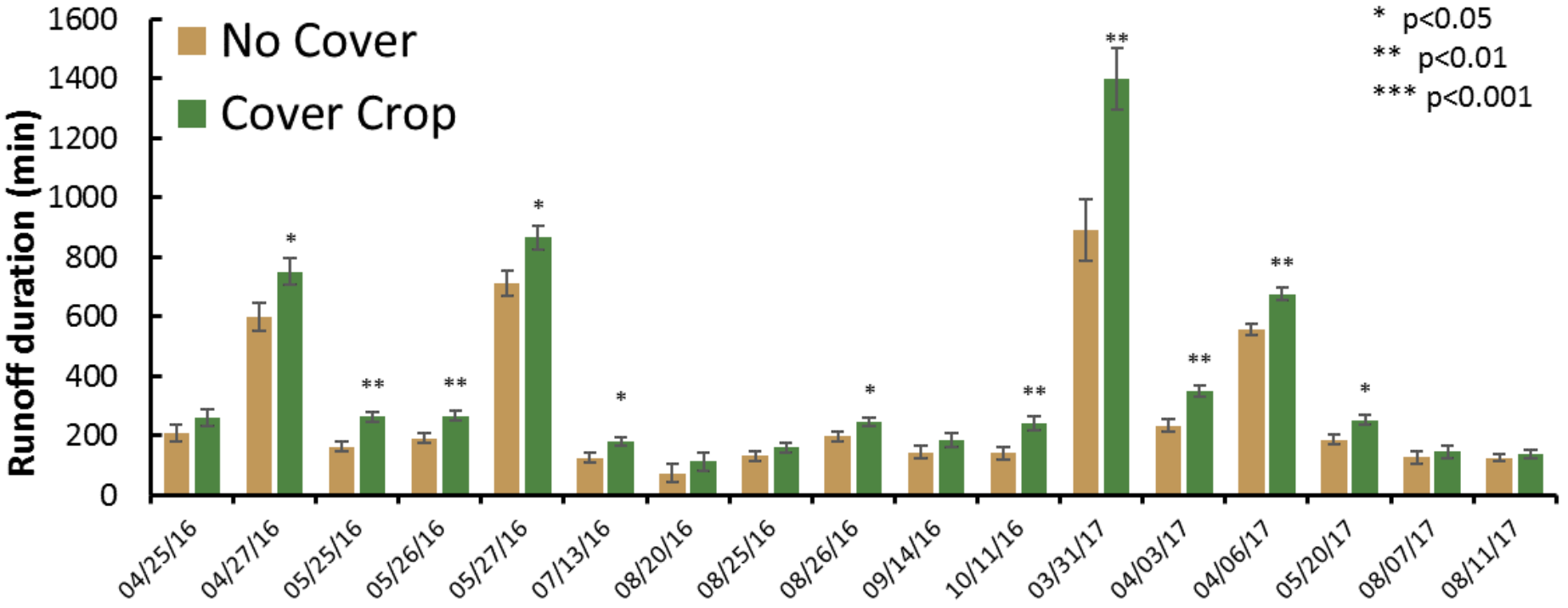
Cover crop effects on runoff



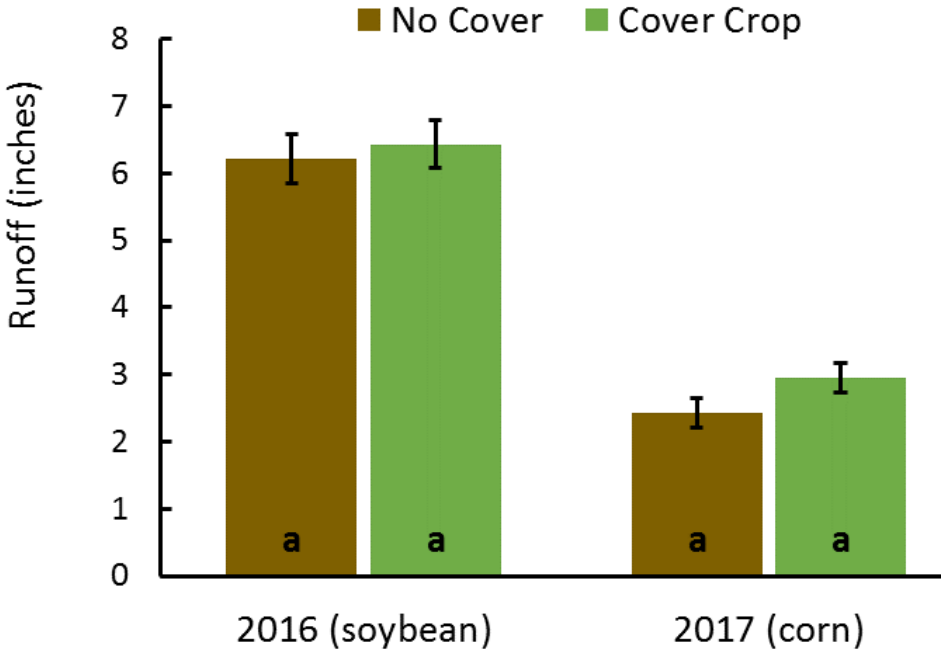
Cover crop effects on runoff

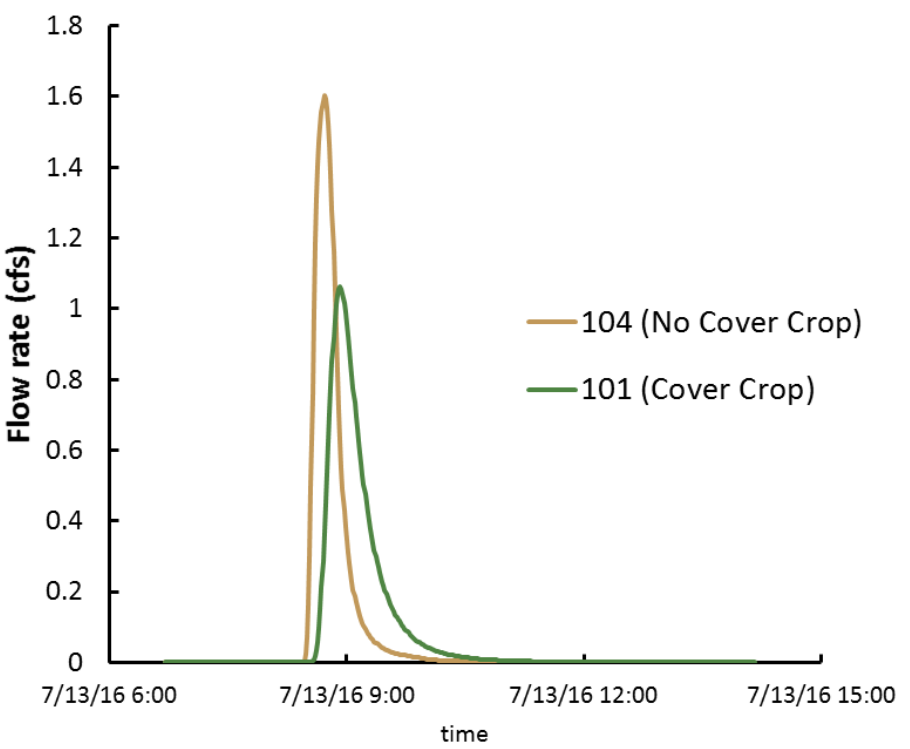


Cover crop effects on runoff

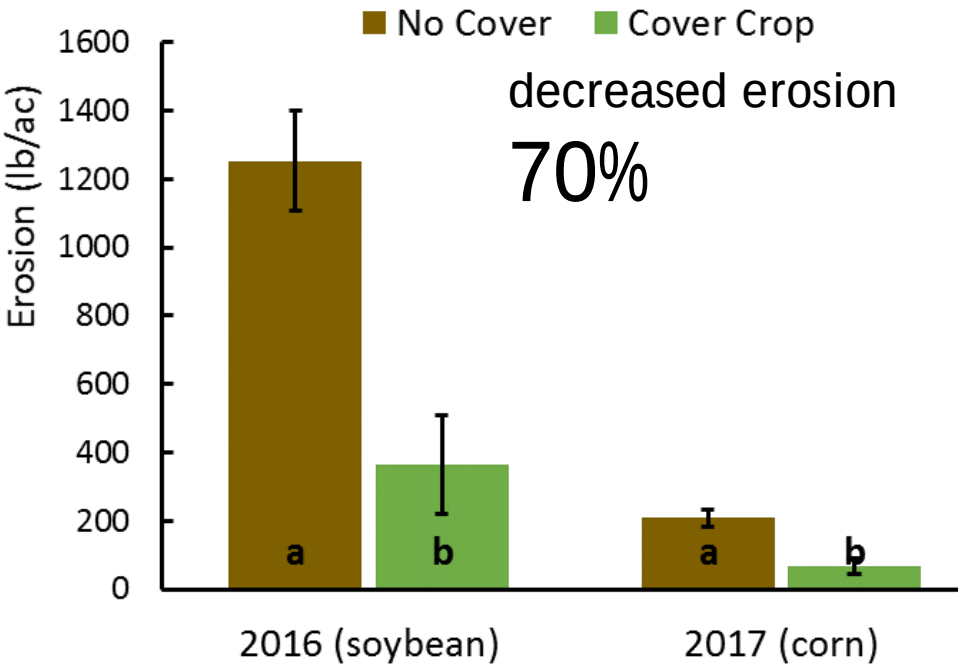


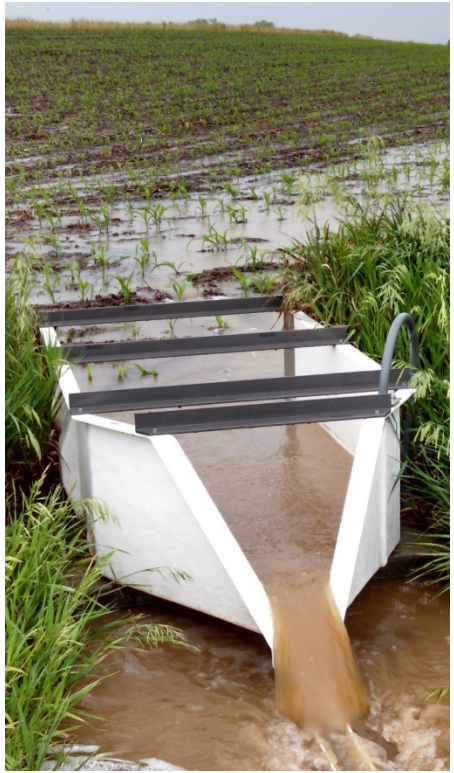
Cover crop effects on runoff

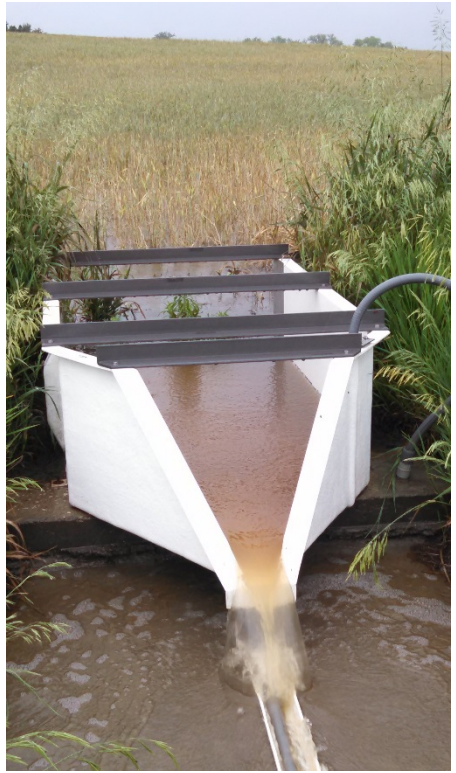




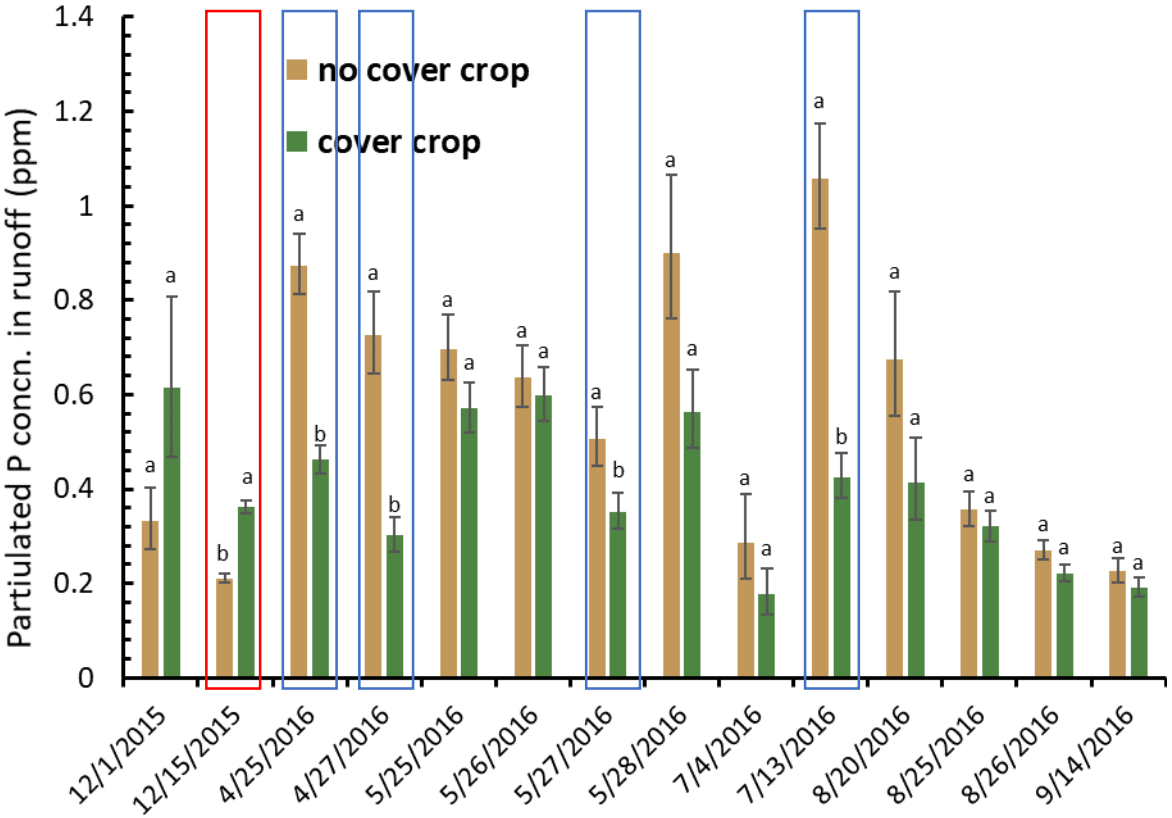
Cover crop effects on sediment & P loss

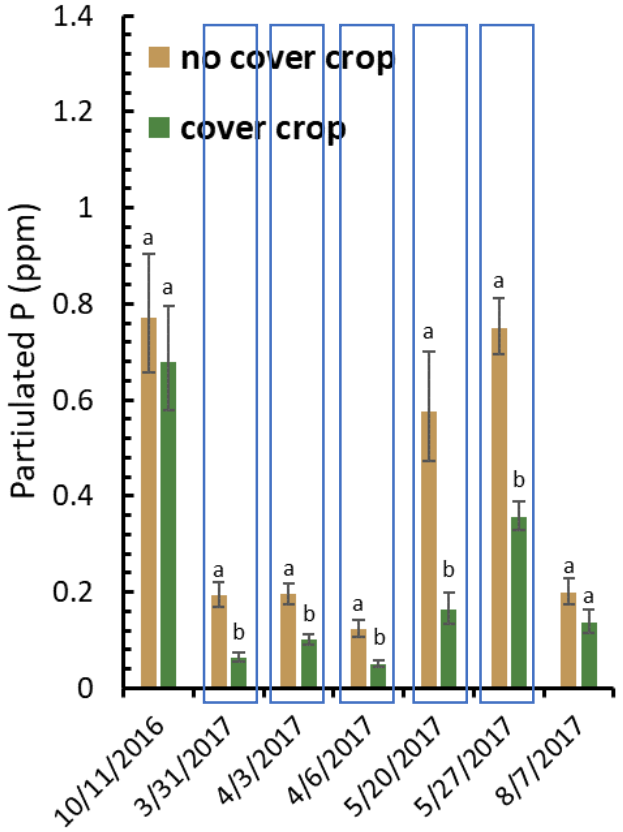




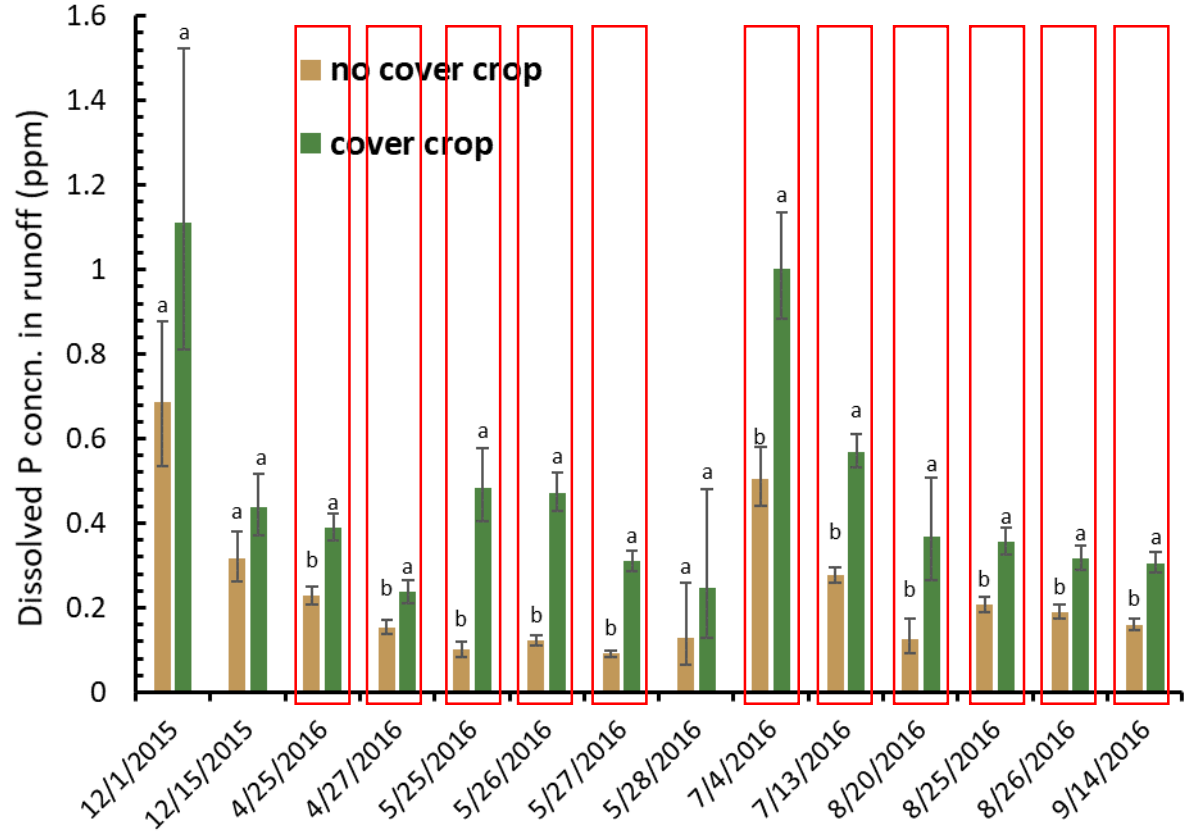


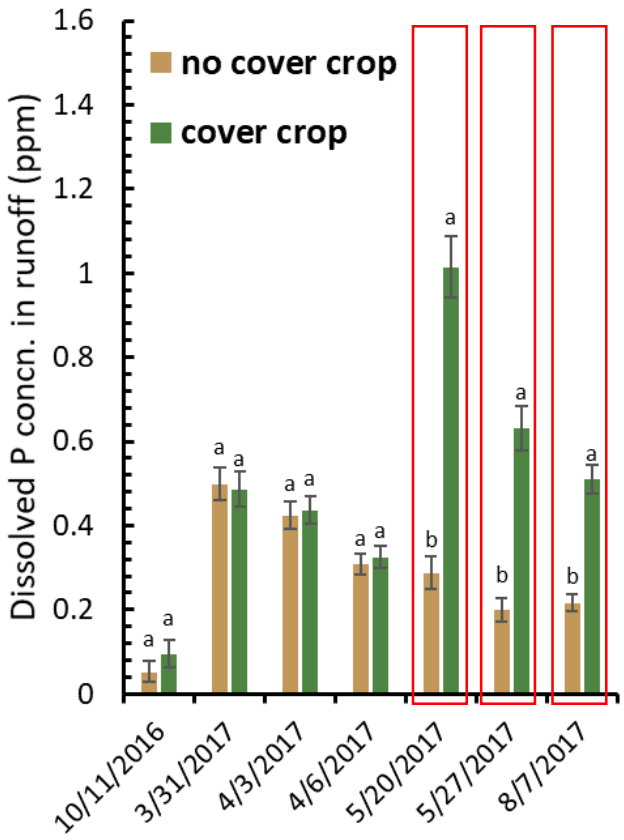
Cover crop decreases particulate P



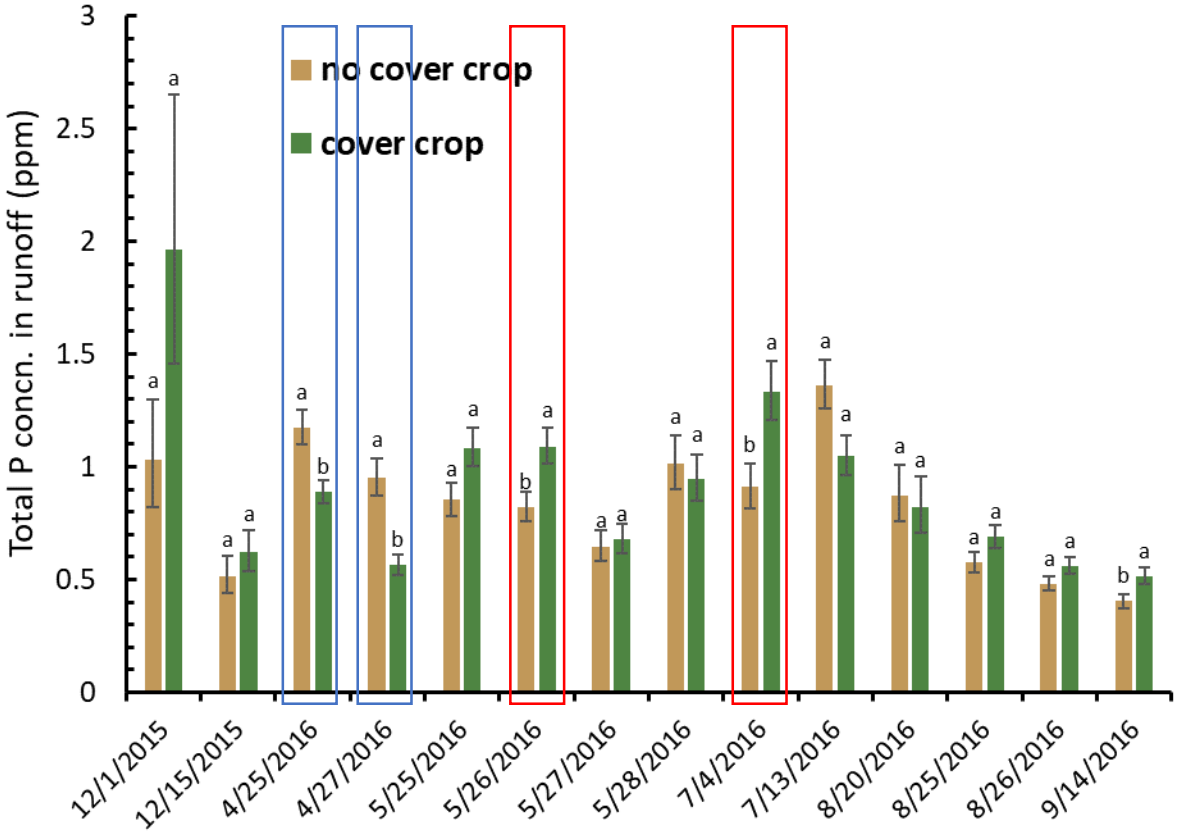


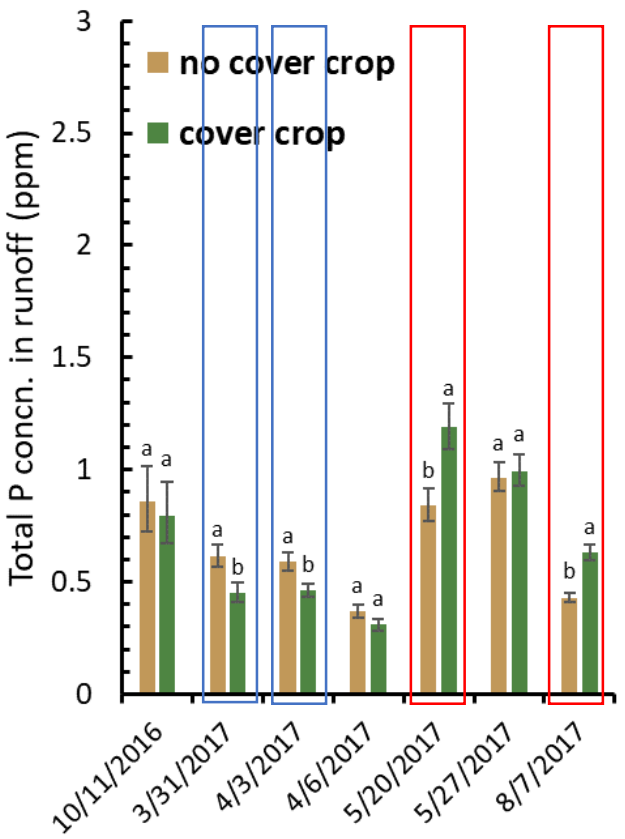
Cover crop increases dissolved P



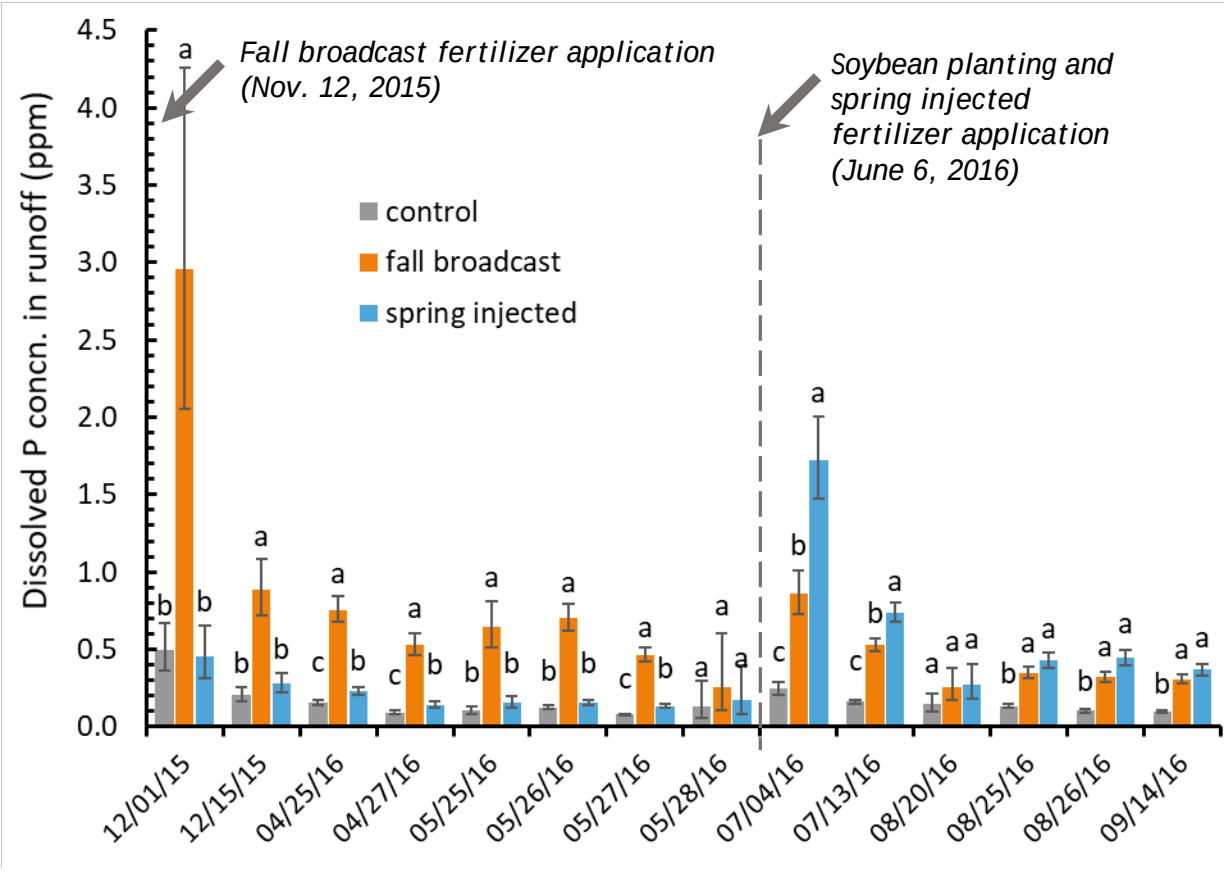


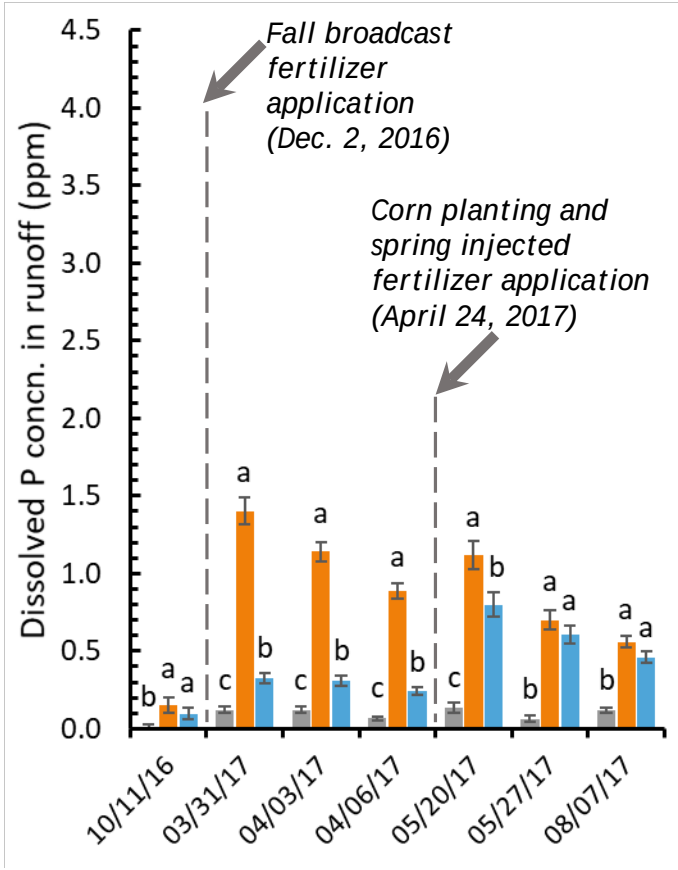
Variable effects on Total P



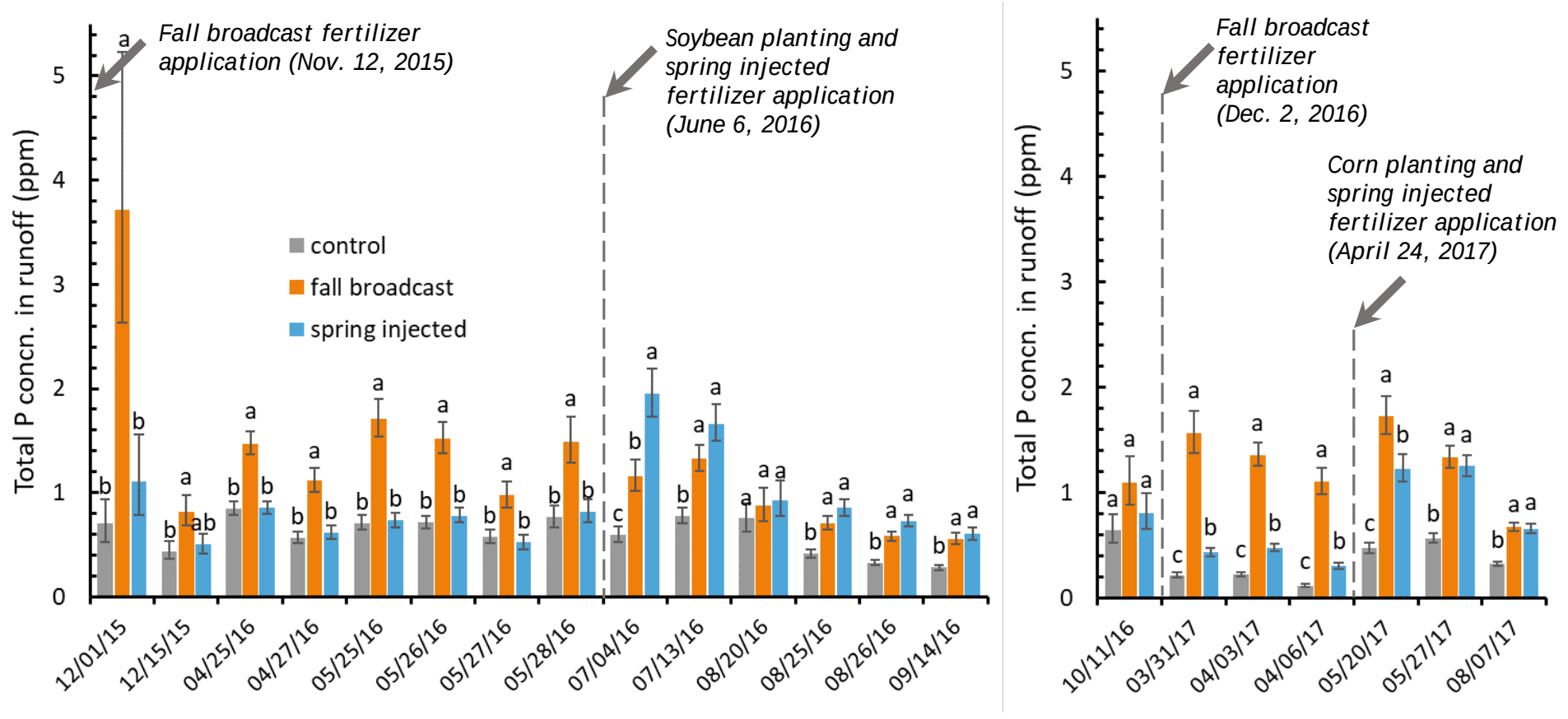


Sub-surface placement decreases dissolved P





Sub-surface placement decreases total P



Summary

- Cover crop
  - Decreased the runoff intensity
  - Decreased sediment and particulate P
  - Increased dissolved P
  - Variable effect on total P
- Sub-surface P fertilizer placement
  - Decreased dissolved P (prior to application)
  - Decreased total P (prior to application)

Still collecting data…
… 2018 & 2019 still to come

Thank you to our funding sources

Research Fund

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USDA NRCS

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Natural Resources Conservation Service

Kansas Corn Commission

K-State Research and Extension

Questions?