



Phosphorus management and cover crop impacts on water quality and environmental efficiency in no-till soybean

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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
BLOOM**



**Cheney Lake,
Kansas**



**Milford Reservoir,
Kansas**

Application method can influence P loss



RIGHT PLACE

Keeps nutrients where crops can use them.

Cropping system can influence P loss

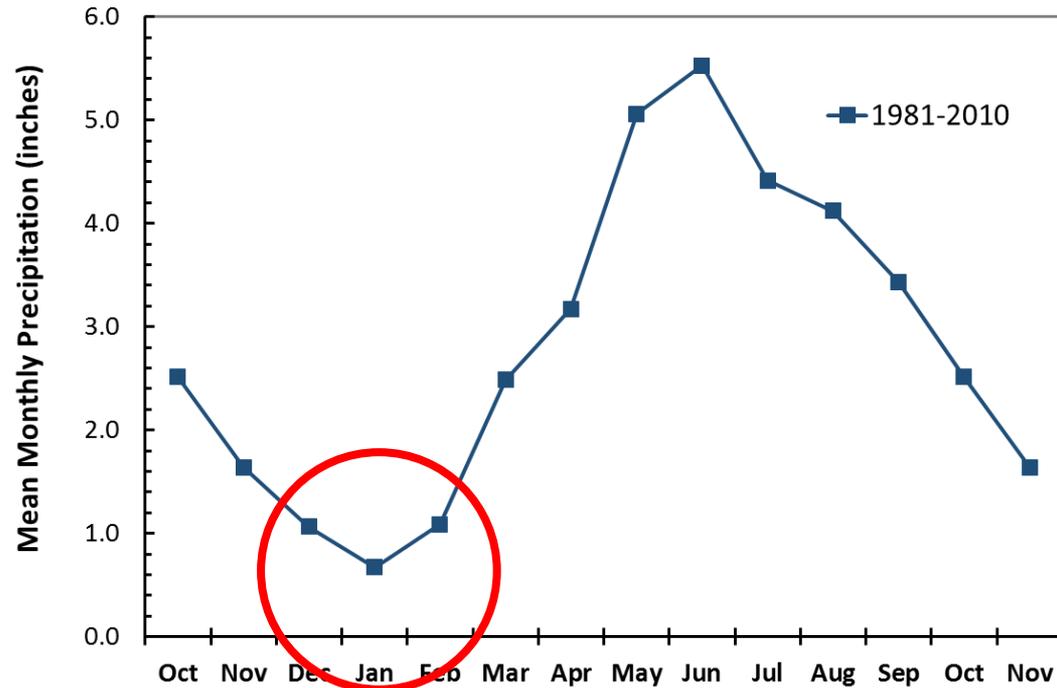




RIGHT TIME

Makes nutrients available when crops need them.

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?
- How do these changes affect...
 - Nutrient cycling?
 - Yield?
 - Net returns?











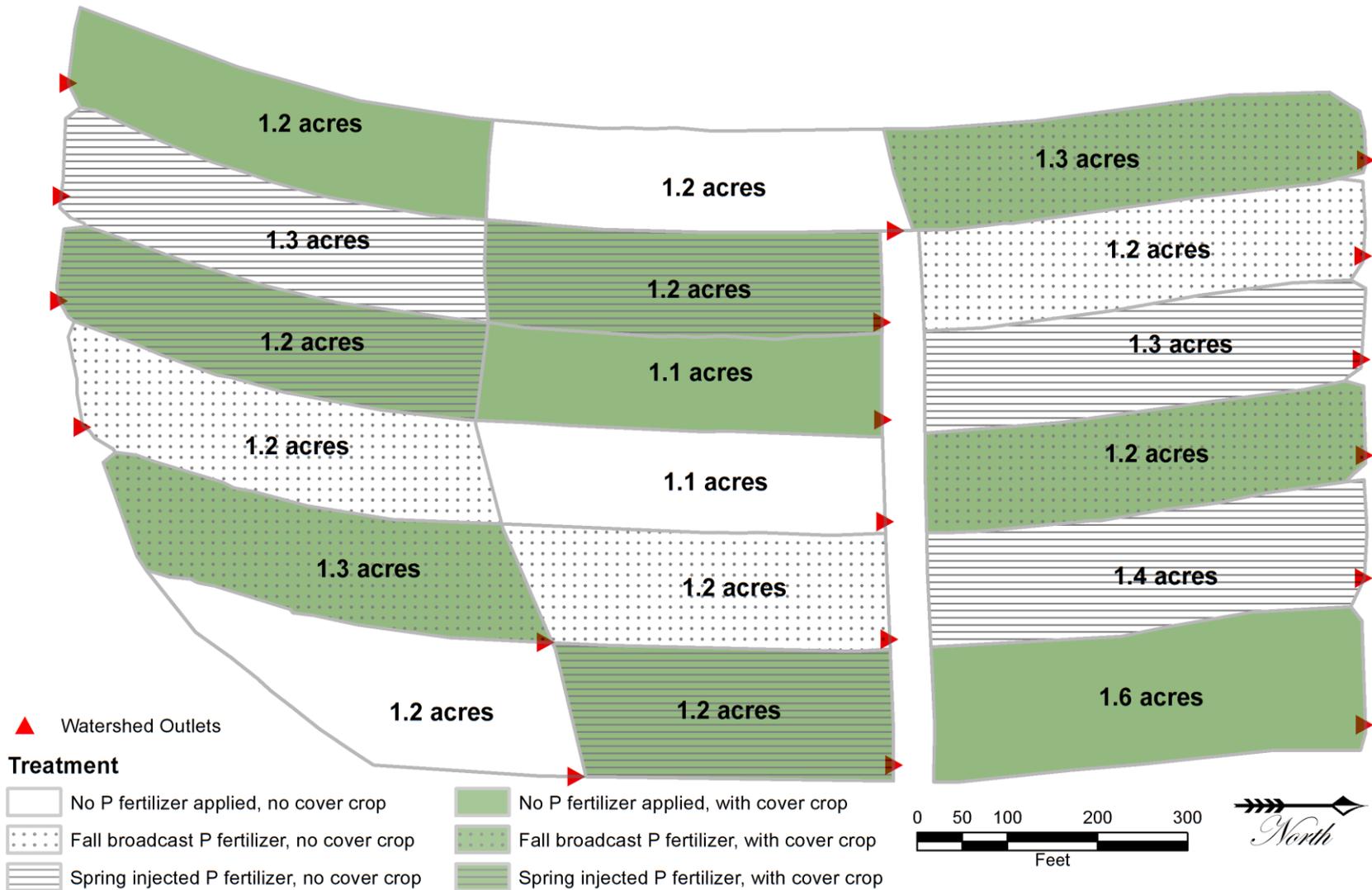




Data from 2016 (Year 2 of 5)

- no-till soybean following no-till corn
- 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





Data from 2016: Soybean

Environmental measures

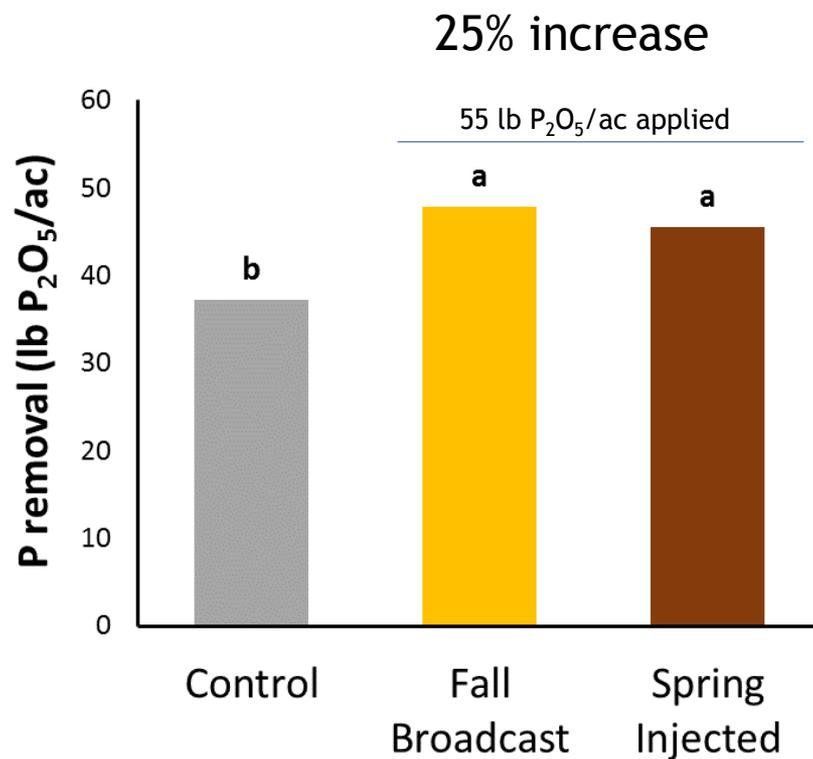
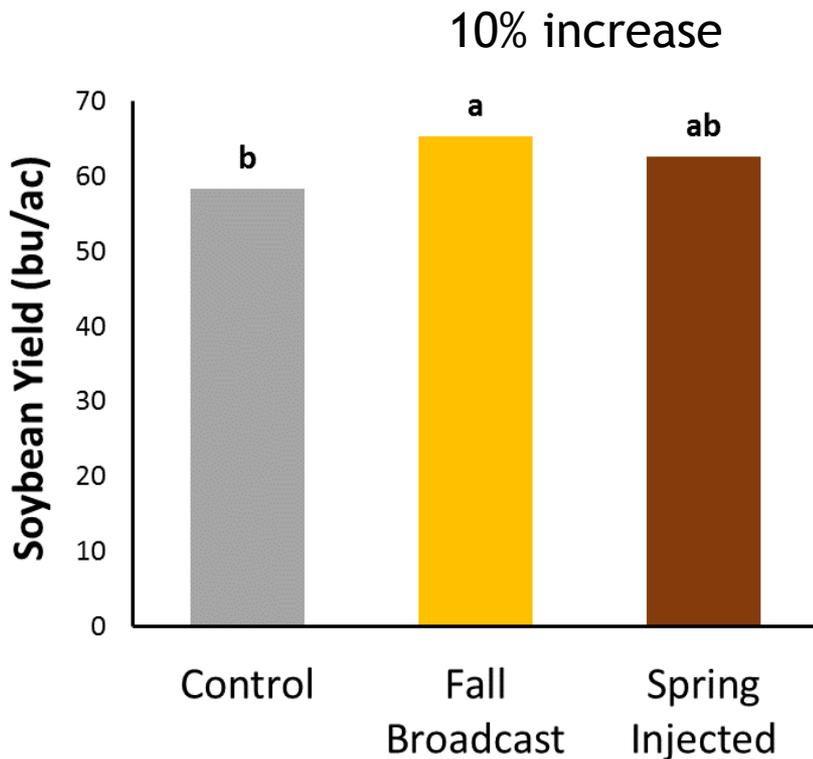
- Runoff
- Sediment
- Total P
- Dissolved P

Agronomic and economic measures

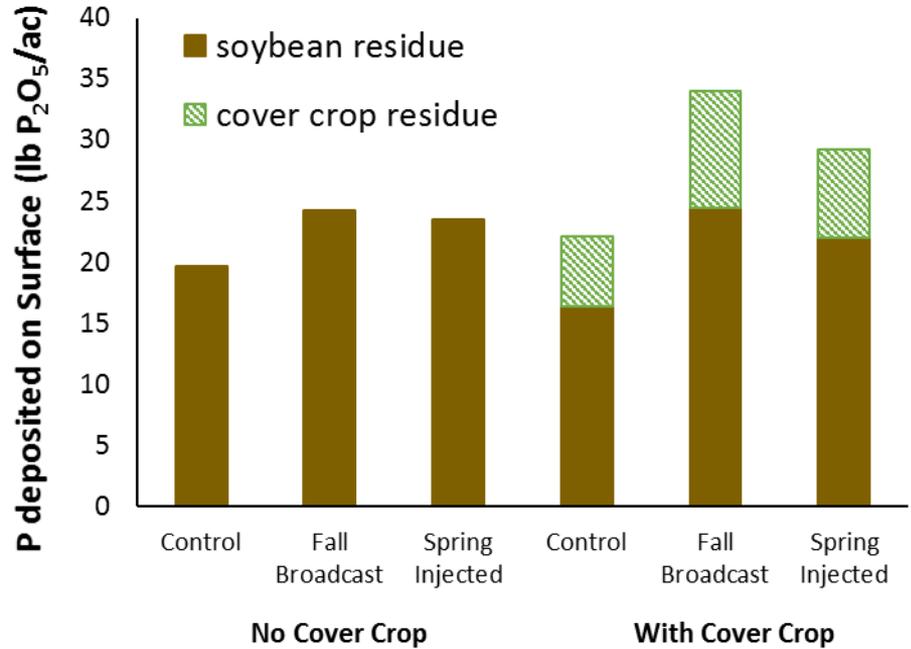
- Yield
- Costs
- Net returns



P fertilizer increased yield

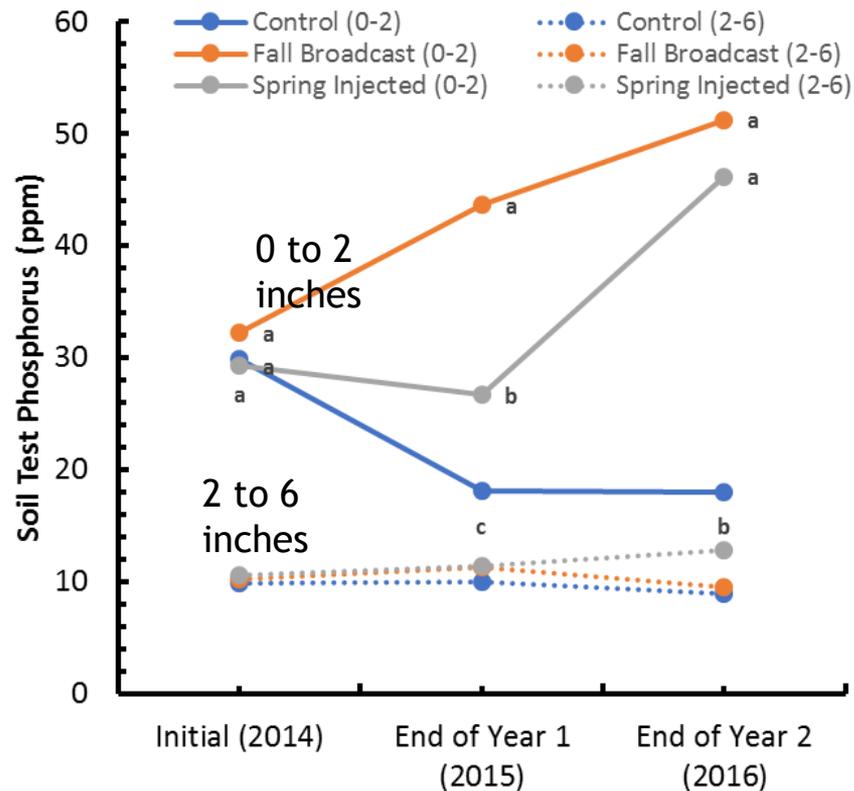


Residue deposits P on the surface

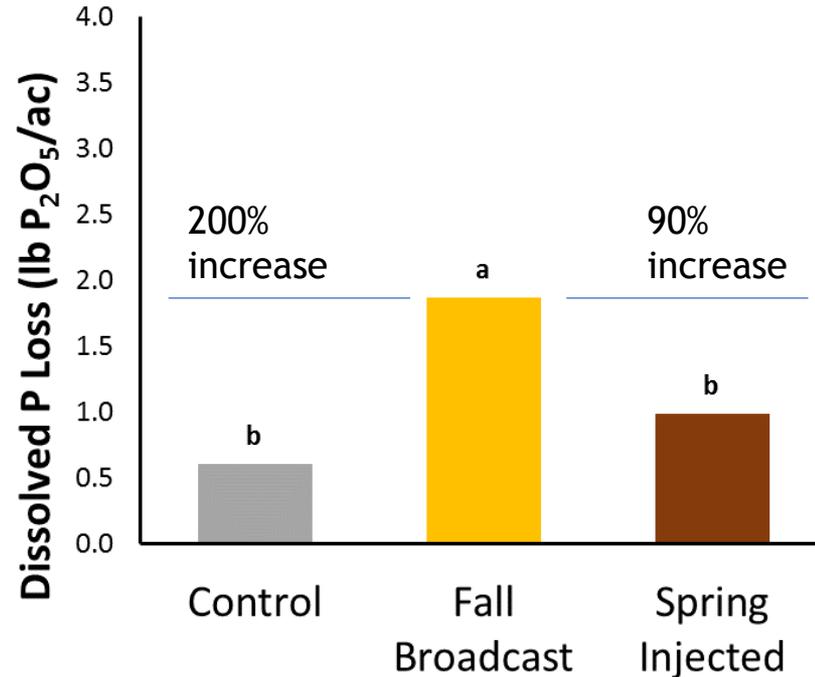
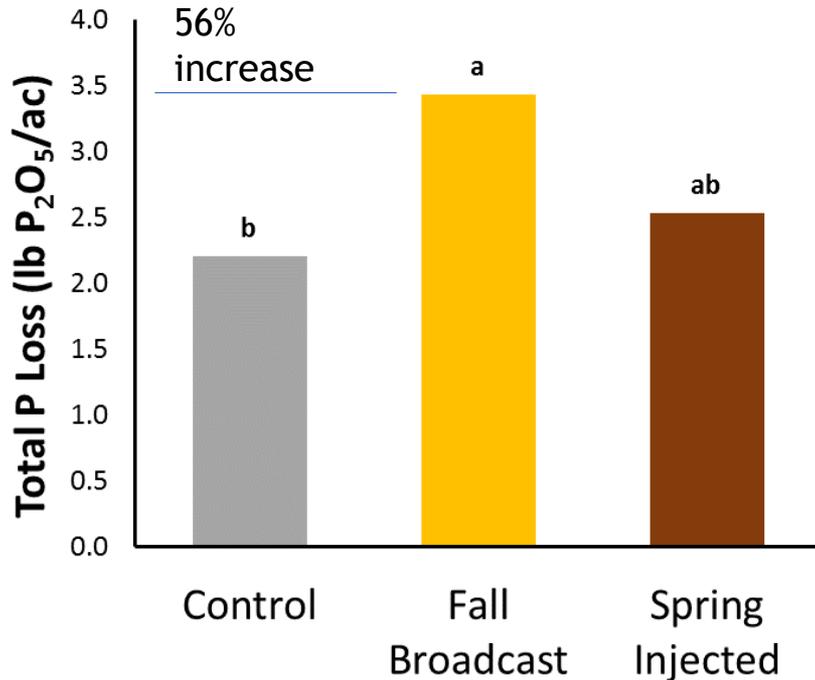


Residue deposits P on the surface

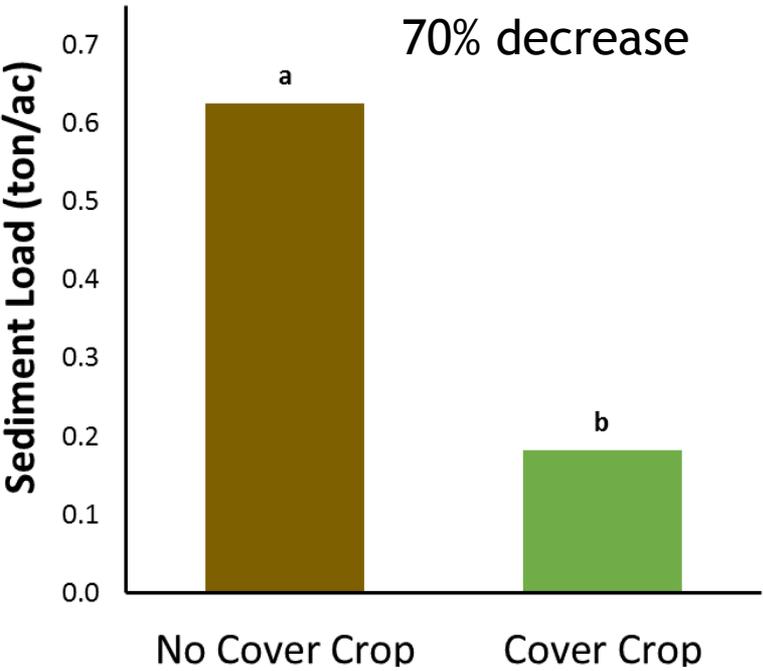
Completed 2 yr of a 5-yr study



Broadcast P fertilizer increased P loss

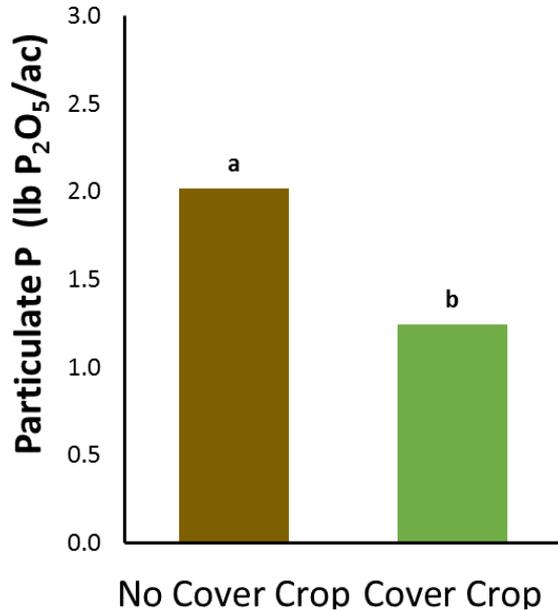


Cover crops reduced sediment loss

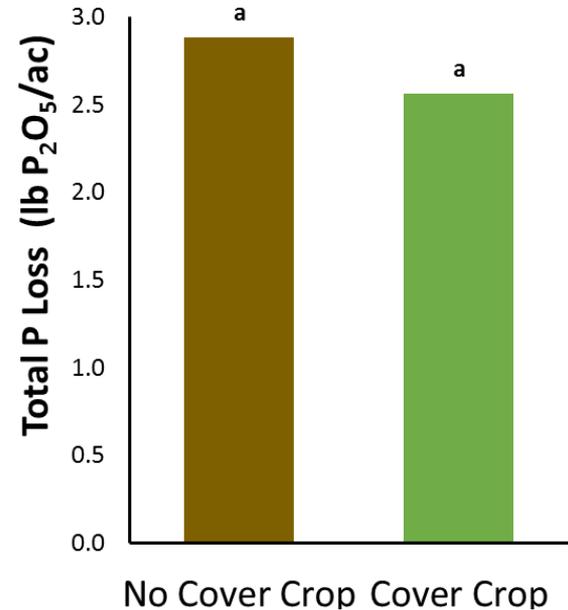
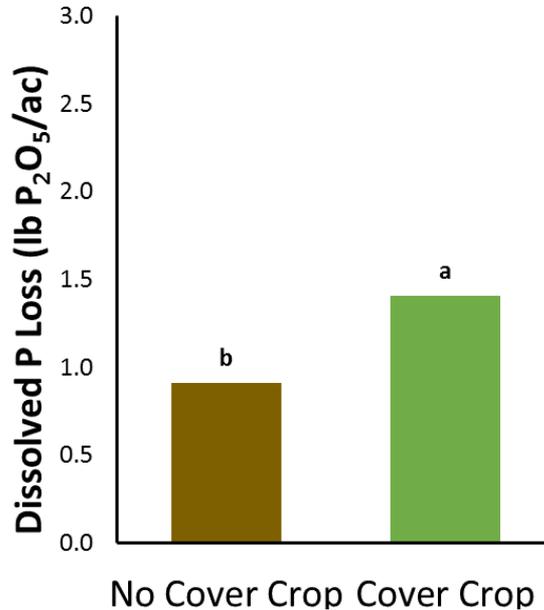


Cover Crop decreased particulate P loss... ...but increased dissolved P loss

38% decrease



54% increase



Environmental Efficiency

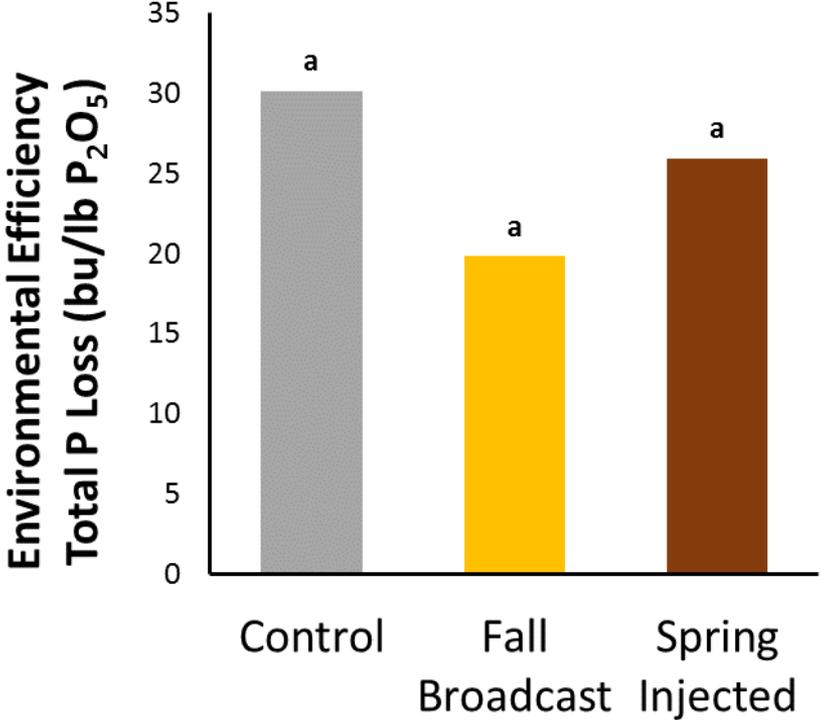
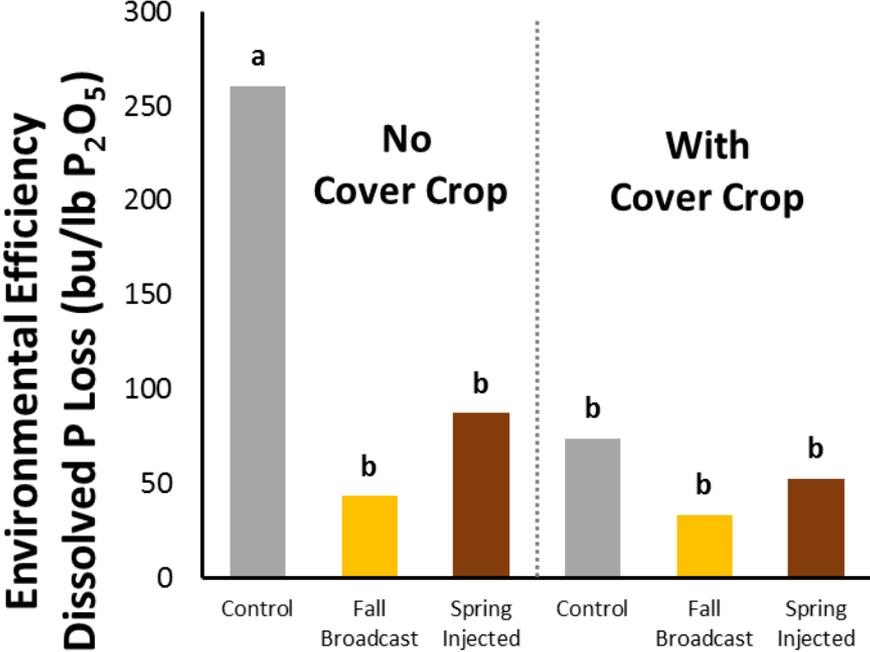
Defined as a productivity:loss ratio for each pollutant

- bu grain/lb P_2O_5
 - total P
 - dissolved P
 - particulate P
- bu grain/ton sediment

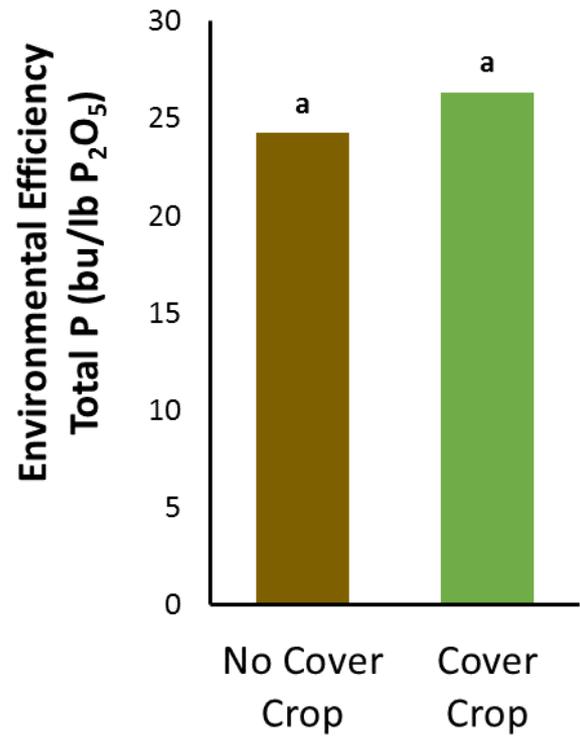
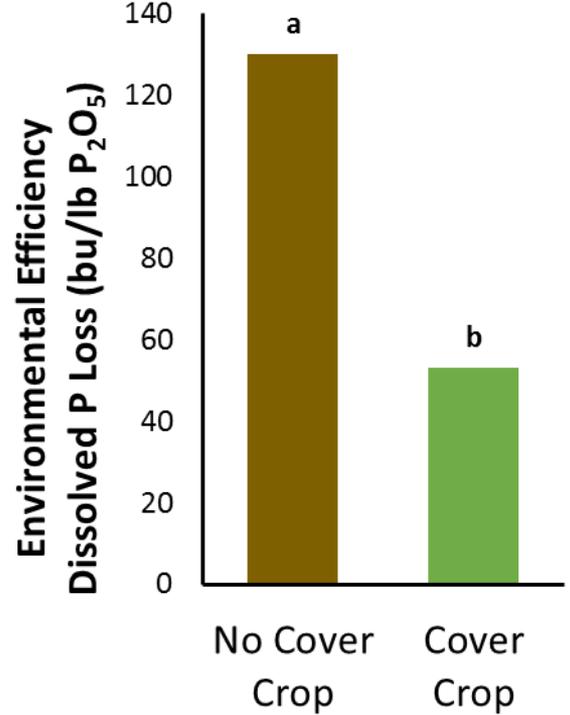
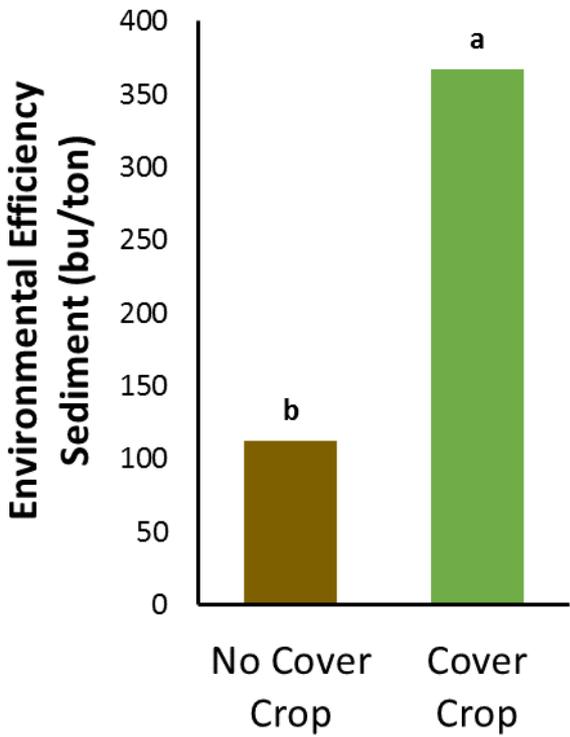
******* *Higher numbers indicate a more efficient system*



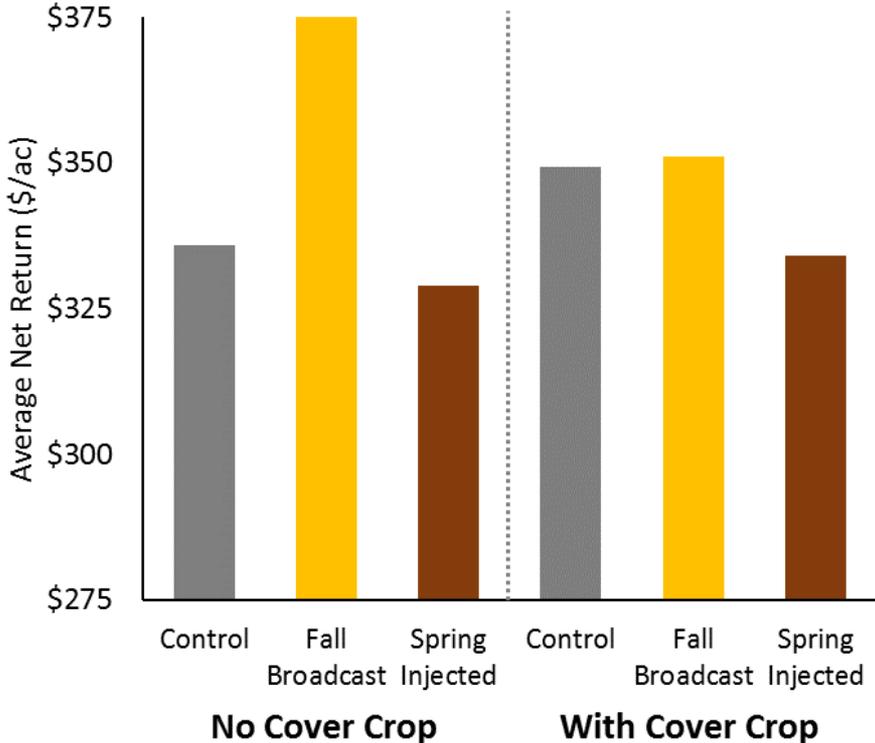
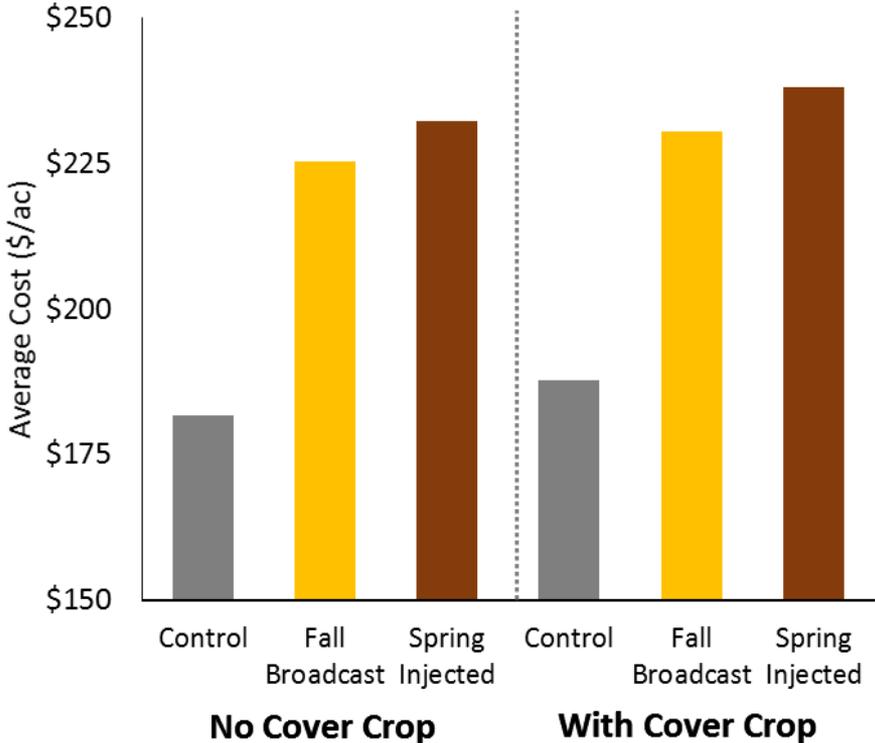
Fertilizer management effects on environmental efficiency



Cover crop effects on environmental efficiency



System impacts on costs and returns



Summary of 2016 Data

- Fall Broadcast fertilizer had greatest dissolved P and total P losses.
- Cover crop increased dissolved P loss
- Fall Broadcast fertilizer also tended to have highest yield
- Environmental Efficiency
 - Systems about equal for total P
 - No cover/no P fert. was greatest for DP
 - Cover crop was greatest for sediment
- Fall Broadcast fertilizer had greatest Net Return



*Still collecting data...
...need 2017, 2018, & 2019 data*

Thank you to our funding sources



Research
Fund

KANSAS STATE
UNIVERSITY

Department of Agronomy



United States Department of Agriculture
Natural Resources Conservation Service



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Questions?

