

Minimizing Phosphorus Loss with 4R Stewardship and Cover Crops

Exploring management options for reducing P loss

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Project dates: Fall 2014 – Winter 2019

Project Number: 4RN-26

Collaborators: Co-Project Investigators: Kraig Roozeboom (cropping systems), Peter Tomlinson (extension), Gerard Kluitenberg (soil physics), and Jeff Williams (economics). Graduate students: David Abel, Elliott Carver. Undergraduate students: Gus Lamb, Egypt Edwards, Erin Bush, Brett Bullinger, Tyler Royal, Tessa Zee, Connor Kijowski, Tara Wilson



Research Fund

PROJECT GOALS

SOURCE	Broadcast P applications with DAP; injected P applications with Ammonium Polyphosphate
RATE	P versus no P application; rate is the same for different time and place combinations
TIME	Spring (injected) versus Fall (broadcast) application of P fertilizer
PLACE	Broadcast versus injected P placement

Each P application method and timing treatment occurs with and without the establishment of a fall cover crop in a corn-soybean crop rotation.

PROJECT RESULTS

Broadcast P applications have a higher risk of loss. Dissolved P loss in surface runoff is higher with broadcast P application.

RATE	Lower P loss from zero P application compared to broadcast, fall-applied P. During most runoff events spring injection of P had losses equal to no P application.
SOURCE	Fall broadcast P application had higher dissolved P loss than spring injected P or no P application (Figure 1).
TIME	
PLACE	
4R	The use of cover crops decreased erosion, and therefore total P loss across P application treatments at most runoff events through the season in 2015. However, results in 2016 show cover crops had less impact on total P loss because of lower overall erosion in 2016.

MORE PROJECT RESULTS ▼

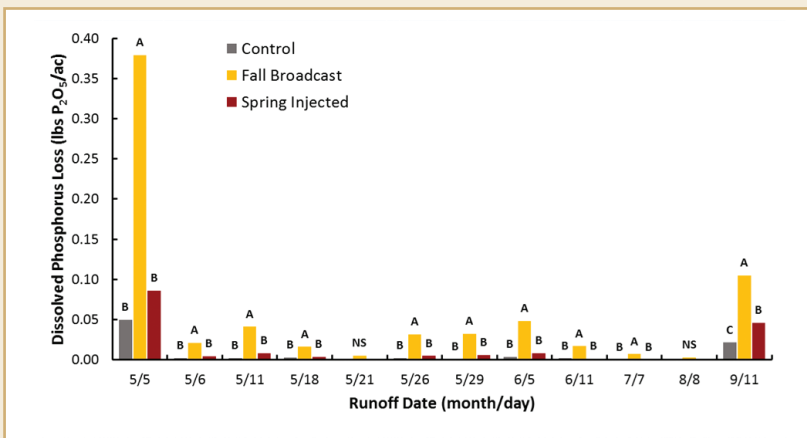


Figure 1. Sub-surface application of fertilizer decreased dissolved P loss by 70%.



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MEET NATHAN

Nathan's interest in 4R research stems from his desire to help producers maximize agronomic, economic, and environmental sustainability of their production systems.

Nathan grew up in northeastern Kansas, spending summers on his grandparent's dairy in northern Utah. During his teenage years, they had 30-acre hobby farm with cow-calf, forage, and fresh horticultural crop production (primarily sweet corn and strawberries). After graduate school in North Carolina and a post-doctoral job in Idaho, he and his wife moved back home to Kansas. They have four children and enjoy gardening, hiking, and camping as a family. In his leisure time, he enjoys woodworking and fly-fishing.

PUBLISHED REPORTS

- Abel, D.S. 2016. Cover crop effects on soil moisture and water quality. M.S. thesis. Kansas State Univ. Manhattan, KS.
- Patrignani, A., E.L. Bush, L. Feng, G.J. Kluitenberg, N.O. Nelson, and T.E. Ochsner. 2016. Improving soil moisture monitoring networks by implementing lab and field sensor calibration protocols. ASA-CSSA-SSSA International Annual Meeting. Nov. 6-9, 2016. Phoenix, AZ.
- Abel, D., N.O. Nelson, K. Roozeboom, P. Tomlinson, and G. Kluitenberg. 2016. Cover Crop and Fertilizer Management Impacts on Water Quality. ASA-CSSA-SSSA International Annual Meeting. Nov. 6-9, 2016. Phoenix, AZ.
- Abel, D., N.O. Nelson, K. Roozeboom, G. Kluitenberg, P. Tomlinson, J. Williams, and P. Barnes. 2015. Cover Crop and Fertilizer Management to Improve Water Quality. ASA-CSSA-SSSA International Annual Meeting. Nov. 15-18, 2015. Minneapolis, MN.
- Bush, E.L., G.J. Kluitenberg, and N.O. Nelson. 2015. Laboratory Calibration of a Water Content Reflectometer. ASA-CSSA-SSSA International Annual Meeting. Nov. 15-18, 2015. Minneapolis, MN.

WHAT DO WE DO NEXT?

- Continue data collection and analysis for remaining seasons of the project, including the examination of yield and economic differences.
- Investigation of cover crop and fertilizer management effects on long-term P cycling and soil health. Investigate cover crop management (species, termination, etc.) on P loss.