A “MANAGE”ed Approach for 4R Nutrient Stewardship on Drained Land

Synthesize currently available water quality research and update the MANAGE database to evaluate the 4Rs on drained land

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Collaborators: Daren Harmel, USDA Agricultural Research Service

4R Research Fund

PROJECT GOALS

SOURCE	Data was available to evaluate the use of N fertilizers versus N fertilizers treated with inhibitors and P fertilizers versus manure sources of P for difference in nutrient losses in drained lands.
RATE	Evaluate available research results for the effects of application rate on N and P loss in drainage.
TIME	Evaluate available research results for the effects of application timing on N and P loss in drainage.
PLACE	Data was available to examine the loss of P in drained systems when it is banded versus incorporated.

PROJECT RESULTS

Adherence to 4Rs strategies is vital regardless of the nutrient source, and accurate implementation of the 4Rs approach will require site-specific knowledge.

SOURCE	Use of organic nitrogen and phosphorus sources could boost corn yields with potentially no increase in dissolved nutrient loads compared to inorganic fertilizer.
RATE	Increased N rates increased yield and loss to drainage
TIME	No significant differences for N timing and application methods.
PLACE	
OTHER	Across the literature, less than 2% of applied P was lost in drainage in a given site year

MORE PROJECT RESULTS ▼

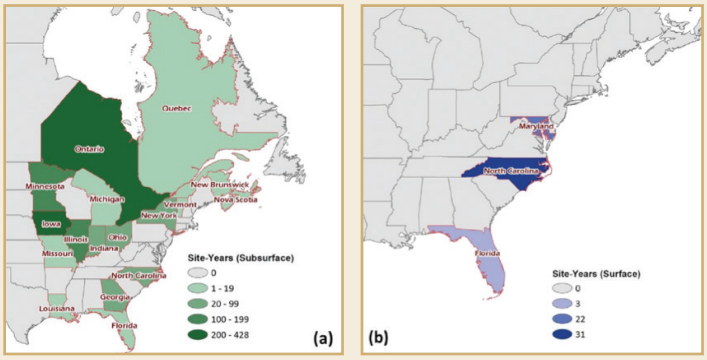

Figure 1. MANAGE Drain Load subsurface (a) vs. surface drainage site-years (b).

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MEET LAURA

“I enjoy my work because I feel agriculture and water are two very important issues. Figuring out how farmers can produce ample food while maintaining good environmental quality is a great challenge and a great opportunity!”

During her spare time Laura enjoys reading fiction books, playing violin, and working out, joking that “I love to run on trails next to streams. Checking for indicators of stream health helps keep my mind off my burning legs!” Laura also welcomed a baby girl in December 2016.

PUBLISHED REPORTS

4R Water Quality Impacts: An Assessment and Synthesis of Forty Years of Drainage Nitrogen Loss (L.E. Christianson and R.D. Harmel, J. Environ. Qual. 44:1852-1860 (2015))

The MANAGE Drain Load database: Review and compilation of more than fifty years of North American drainage nutrient studies (L. E. Christianson, R.D. Harmel. Agricultural Water Management 159 (2015) 277-289)

Assessment and Synthesis of 50 Years of Published Drainage Phosphorus Losses (L.E. Christianson, R.D. Harmel, D. Smith. M.R. Williams, and K. King, J. Environ. Qual. 2015)

Expansion of the MANAGE database with forest and drainage studies (D.R. Harmel, L.E. Christinason, M.W. McBroom, D.R. Smith and K.D. Higgs. JAWRA 2016: vol. 52 no. 5:1275-1279)

WHAT DO WE DO NEXT?

- Need for research studies with more intensive year-round discharge analysis
- Improved monitoring in newly drained areas, ditch drained areas, and surface intakes
- More long-term studies to dilute out the variation across geographies