Monitoring and Local Partnerships

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Topics to be covered

• New partner edge-of-field monitoring program

• Self-guided/group assessments that producers can perform
In 2018, Discovery Farms added 3 new project areas where partners assisted in monitoring efforts.
Priority categories

- Soil loss and erosion control
- Cover crops impacts on water quality
- Soil health impacts on water quality
- Impact of developing manure techniques on water quality
  - Treated or processed manure, including emerging technologies
  - Low disturbance incorporation, especially into living cover
  - Irrigation of manure or processed wastewater
Partner participation provides multiple benefits:

Discovery Farms can now provide statewide monitoring that is not limited by staffed offices.
Partner participation provides multiple benefits:

Enhanced participation of local partners with sample collection, site maintenance, data interpretation and organizing events
Antigo Flat Producer Group – evaluate the impact of potato and other crop production in low pH, high phosphorus soils
Kewaunee NRCS Demonstration Farms – cover crops in notill systems and potentially low disturbance manure injection and/or concentrated flow channel stabilization
Lake Redstone Producer Group – community sharing manure applications to cover cropped fields
Self-guided/group assessments that producers can perform
Nitrogen Use Efficiency assessments are valuable tools for individual farmers and regional clusters of farms

- complement to nutrient recs and management plans
- assessment of how much and how N is being applied- and if this can be improved
- indicator of potential nitrate leaching to groundwater
DF state averages and benchmarks come are based on data collected from nine regions in WI.
Step-by-step publications for performing your own Nitrogen Use Efficiency assessment
Discovery Farms Tile Project in WI and MN (2018-2020)

- Provide tools for farmers and advisors to diagnose and treat fields with high nutrient losses through tile drains
- Determine if intensively monitored tile sites can be complemented by lower intensity monitoring
- Understand the link between soil health and tile drainage
Three levels of monitoring

- 4 Intensive
- 9 Intermediate
- 11 Basic
Build upon tile nitrate information provided by Purdue and develop WI/MN self assessment tools

<table>
<thead>
<tr>
<th>NO$_3$-N Concentration (ppm)</th>
<th>Interpretation</th>
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<tbody>
<tr>
<td>≤ 5</td>
<td>Native grassland, CRP land, alfalfa, managed pastures</td>
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| 5 – 10                      | Row crop production on a mineral soil without N fertilizer  
                              | Row crop production with N applied at 45 lbs./acre below the economically optimum N rate†  
                              | Row crop production with successful winter crop to “trap” N |
| 10 - 20                     | Row crop production with N applied at optimum N rate  
                              | Soybeans |
| ≥ 20                        | Row crop production where:  
                              | • N applied exceeds crop need  
                              | • N applied not synchronized with crop need  
                              | • Environmental conditions limit crop production and N fertilizer use efficiency  
                              | • Environmental conditions favor greater than normal mineralization of soil organic matter |

Source: Interpreting Nitrate Concentration in Tile Drainage Water, Purdue Extension, Purdue University
Soil health initiative as part of the Nitrogen Use Efficiency and tile drainage monitoring projects
Soil health project

Testing soil health metrics
  Chemical
  Biological
  Physical

~300 site samples
  ~250 from NUE
  48 from tile project

Looking for links between soil health, productivity and water quality
Soil health project

All Sites: ~290
Routine pH, P, K, Organic Matter
POxC, POxN, PMC, PMN

All 2018 Sites: ~75
Dry Fractionation
Water Stable Aggregates

“Case Study” Sites: 9
Infiltration
Water Holding Capacity
Bulk Density
Measuring soil health
April 2019

Soil health is a framework used to evaluate how well a soil is functioning. As displayed in the ven diagram on the right, soil health combines the chemical, physical and biological properties of a soil system. UW Discovery Farms is evaluating biological and physical aspects of soil health. UW Discovery Farms’ soil health work spans both the Nitrogen Use Efficiency and Tile Monitoring projects. This handout shares results from three years of biological soil health measurements and one year of soil physical measurements.

Biological measurements identify which soil properties and management factors influence soil carbon and nitrogen cycling

218 soil samples were collected in the growing seasons of 2015, 2016 and 2017 and tested in the laboratory for biological activity, soil carbon (C), and nitrogen (N) pools. These tests included potentially mineralizable nitrogen (PMN), potentially mineralizable carbon (PMC), permanganate oxidizable carbon (POXC) and total carbon (TC). In addition, short and long-term field history information was gathered through farmer interviews and surveys.

Total carbon is influenced by soil texture

Percentage of total carbon (TC) in 216 soil samples was measured and data were put through a regression tree analysis. Twenty-seven variables were included in this analysis including soil properties, sample timing and management practices. Average TC was 2.1%. TC was most influenced by soil texture. Finer textured soils including silty clay loam or clay loams had an average TC of 3.7% whereas coarser textured soils had an average TC of 2.0%.

Figure 1. Regression tree of total carbon percentage of 216 soil samples collected from 2015-2017

Labile nitrogen pools are influenced by crop rotation

Regression tree analysis of potentially mineralizable nitrogen (PMN) from our dataset showed the most influential factor we analyzed was crop rotation. Rotations with higher biomass such as continuous corn or including alfalfa in the rotation demonstrated higher PMN values (top number in squares).

Figure 2. Regression tree of PMN (mg N kg⁻¹) of 218 soil samples collected from 2015-2017

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University of Wisconsin-Madison
Other self assessment guides

Field Walkover Guide
A practical on-farm conservation tool

Inside:
✓ On-farm lessons learned
✓ Finding vulnerable areas
✓ Ways to adapt tillage
✓ The waterway option
✓ Checking non-tillled areas
PLUS: FIELD MANAGEMENT DECISION TREES

Spring 2016

Tile Drainage in Wisconsin

Inside:
✓ Why use a drainage system?
✓ Locating tile drains
✓ Tips for inspecting
✓ Installing/modifying
✓ Managing to prevent nutrient loss
PLUS: TILE DRAINAGE QUICK REFERENCE GUIDE

Producers, consultants and agency personnel must understand tile drainage systems and how to properly locate and maintain them to sustain agricultural productivity and protect water quality.

By Matt Rusk, Eric Cooley, John Panoska, Joe Pagen and Aaron Pape
Action items...

Build off and enhance information in our databases
- Partner edge-of-field monitoring
- Nitrogen Use Efficiency
- Soil health assessments
- Tile drainage water evaluation

Browse our other project studies and publications. Our staff are always available to answer questions or provide more information.