



Producer-Led Watershed
Protection Grant Program

2019 SOIL AND WATER CONSERVATION BENEFITS REPORT

**Dodge County Farmers for
Healthy Soil Healthy Water**

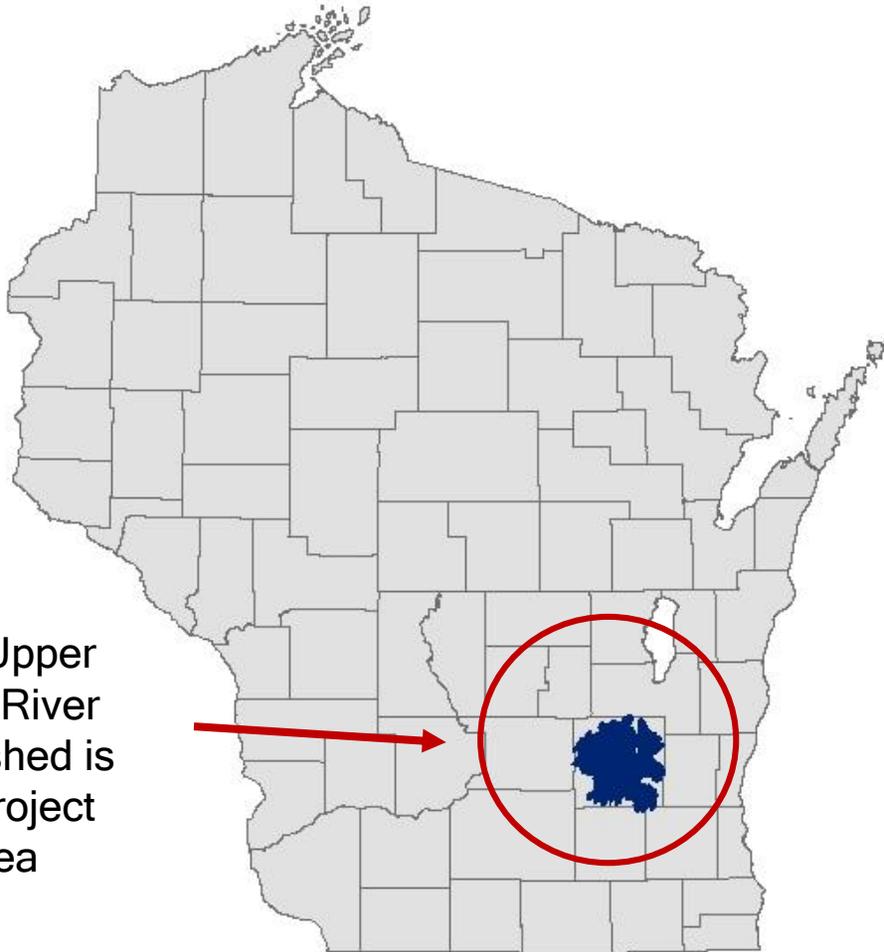


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Dodge County Farmers for Healthy Soil Healthy Water

Established in 2017, Dodge County Farmers for HSHW is committed to **improving their community's soil and water resources through conservation and education**, with a strong emphasis on practices including Cover Crops, Reduced Tillage, and Residue Management.



The Upper Rock River watershed is the project area

Dodge County Farmers for HSHW held 6 educational events in 2019 including their annual Winter Soil Health Expo which attracted over 130 attendees, 59 of whom were farmers coming to learn about soil health practices.

This group has been working closely with UW Discovery Farms Nitrogen Use Efficiency Program to fine tune nitrogen management and begin to understand how cover crops impact soil N and corn yield on four different farms in the county.

Innovation: Farmers are experimenting with planting corn in 60" row spacing and planting cover crops in between to provide soil cover after corn harvest.

In 2019, their Cover Crop Incentive Program grew from 17 to 42 participants.

SOIL & WATER QUALITY MODELING

Farmer-led groups are demonstrating and promoting conservation practices and rotations that can help reduce soil erosion and improve soil quality.

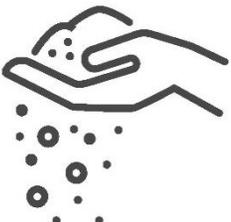
Reducing the amount of soil lost from farm fields and improving the ability of soils to function is connected to water quality. The degree of benefits that we see from each of these farmer-led groups' conservation projects is dependent upon the unique climate conditions, soil types, and farming practices used in the particular watersheds where they farm.

- Using SnapPlus nutrient management planning software, potential soil quality benefits were estimated for solely cropland practices implement by the Dodge County Farmers HSHW.
- These practices include primarily cover crops and reduced tillage.
- Crop rotations with varying levels of conservation integration were modeled to estimate the potential phosphorus and sediment reductions, and soil organic matter building potential that can occur from adopting different practices.
- Rotations were selected that **best reflect the practices used by farmers in this watershed area,**
- These estimations do not consider other conservation practices that may be present in a field such as a grassed waterway, water and sediment control basin, or buffers.

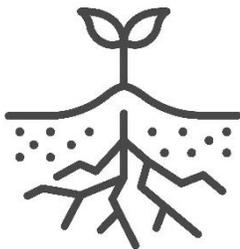


ESTIMATING SOIL & WATER QUALITY BENEFITS | Model Inputs

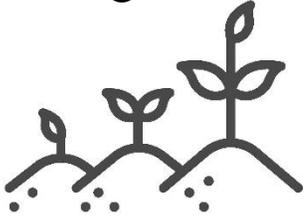
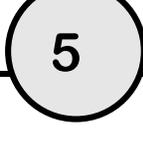
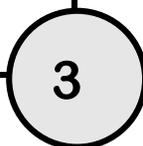
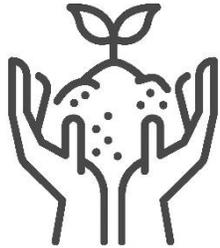
Dominant soil types of watershed + corresponding organic matter percentages (NRCS Web Soil Survey)



County average yields



Average plant and harvest dates of crops for Wisconsin (NASS)



The lower quartile, median and upper quartile soil test P levels for the appropriate county as provided by DATCP soil laboratory results summaries.

Farm operation type representative of watershed and conservation crop rotation scenarios

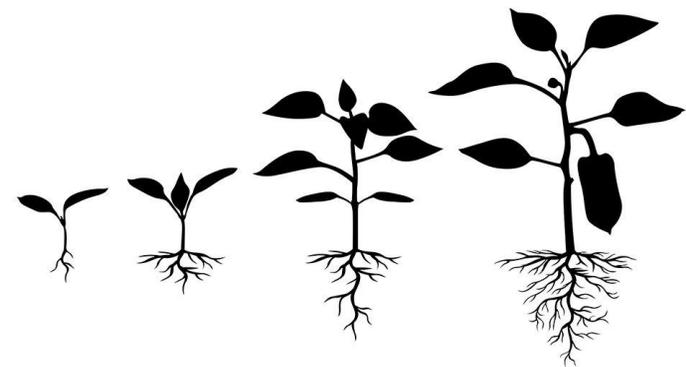


GENERALLY SPEAKING...

- + Greater **risk of soil erosion on fields** in conventional grain rotations
- + Greater **risk of phosphorus loss from fields** in conventional grain rotations
- + Higher Soil Conditioning Index (**soil building potential**, in simple terms) in Intermediate and Conservation Rotations
- + Conservation practices can **minimize variability in soil erosion** across A (0-2%), B (2-6%), and C (6-12%) slopes on farm fields
- + Conservation practices can **minimize variability in phosphorus loss** across farm fields with varying soil phosphorus concentrations.

Let's break it down →

Modeling Results: GRAIN OPERATIONS



CROP ROTATIONS: Grain

The majority of farm operations in this watershed project area are either dairy or cash grain operations. For each operation type, crop rotations for three different levels of conservation were identified for the purpose of modeling soil and water conservation benefits:

Conventional Rotation

Corn grain- Soybeans
Fall chisel, spring disk & field cultivation (2x);
No cover crops

Intermediate Rotation- Vertical Tillage (VT)

Corn grain- Soybeans
Fall vertical tillage; No cover crop

Intermediate Rotation- Strip Tillage (ST)

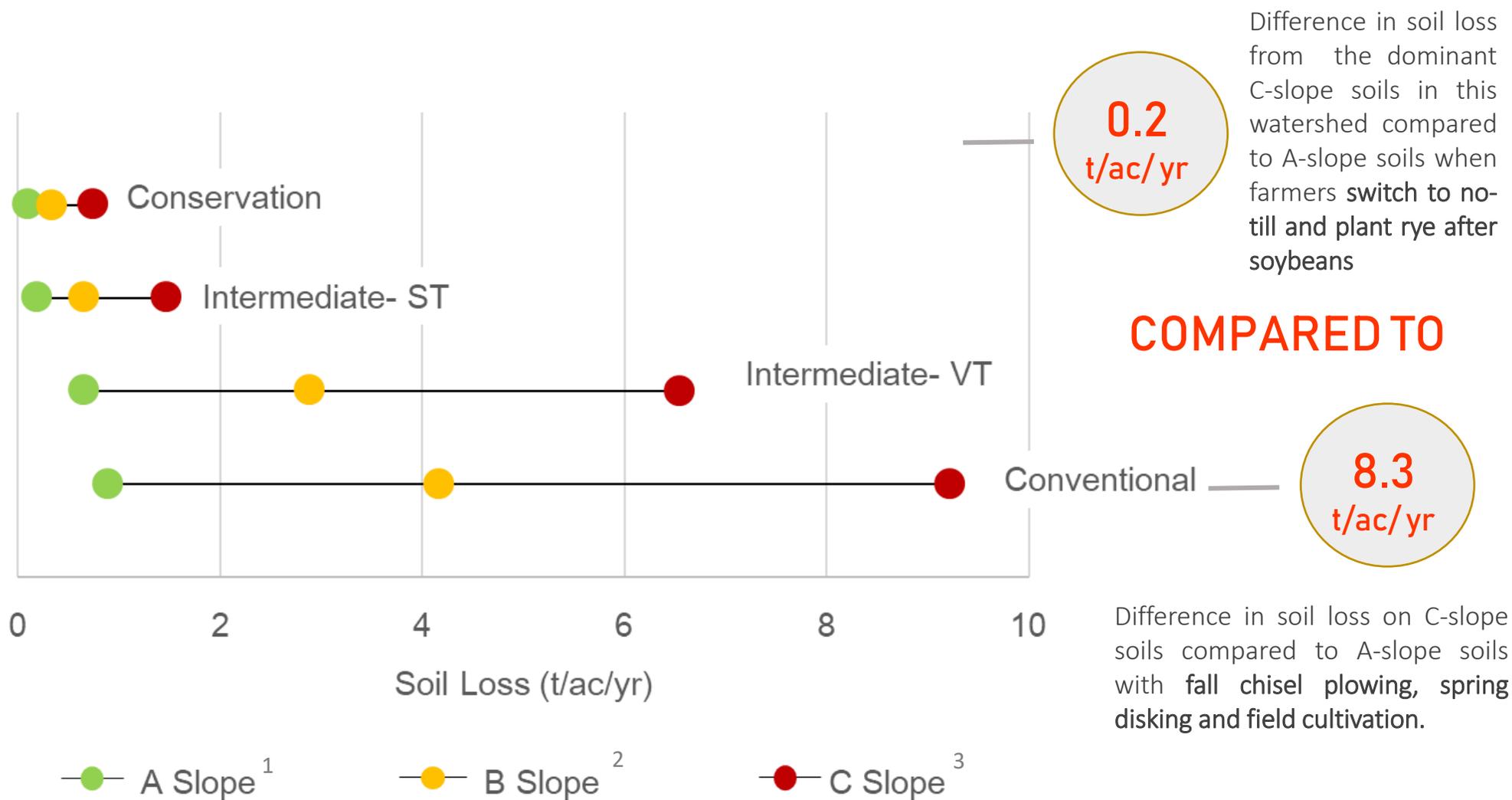
Corn grain- Soybeans
Spring strip tillage; No cover crop

Conservation Rotation

Corn grain- Soybeans
No-till; Rye cover crop drilled after soybeans,
Corn planted into living rye cover crop



Less variability in soil erosion across fields with different slopes when using conservation practices



Difference in soil loss from the dominant C-slope soils in this watershed compared to A-slope soils when farmers switch to no-till and plant rye after soybeans

Difference in soil loss on C-slope soils compared to A-slope soils with fall chisel plowing, spring disking and field cultivation.

Soil Loss in this publication refers to the amount of soil lost from a field in t/ac/year over a set rotation as calculated by RUSLE2¹. This value takes into account factors including field slope, soil type, climate, and ground cover.

1 'A slope' refers to the soil types in the this watershed with slope of 0-2%

2 'B slope' refers to the soil types in this watershed with slope of 2-6%

3 'C slope' refers to the soil types in this watershed with slope of 6-12%

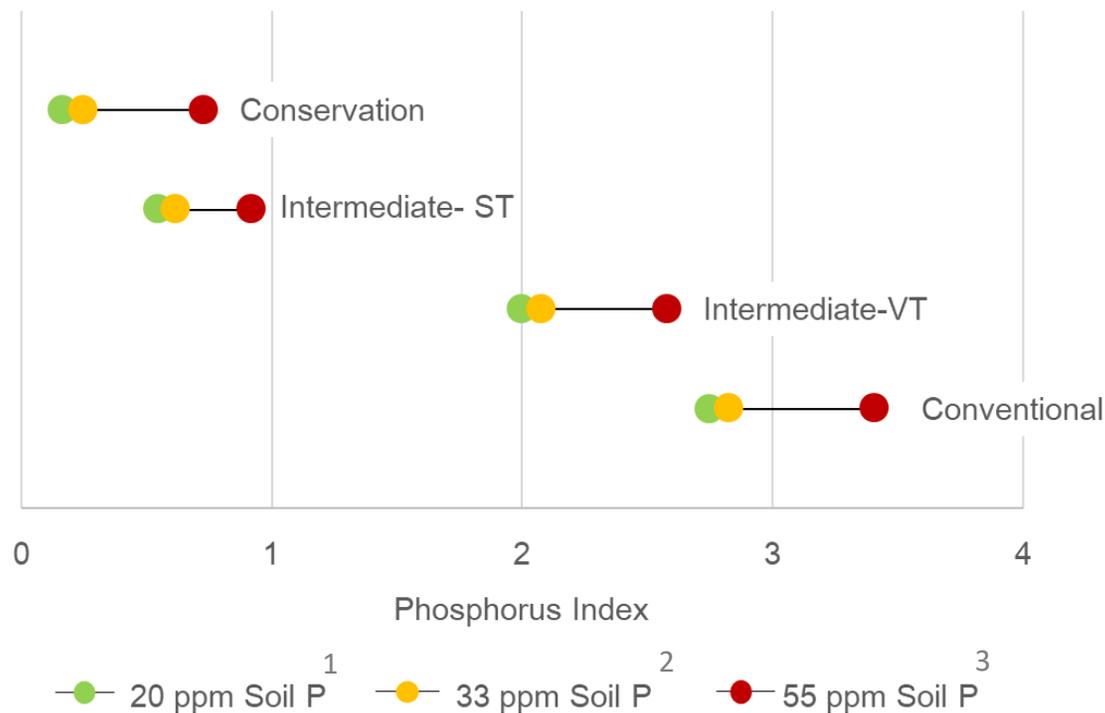
Higher phosphorus loss from fields in conventional rotations

0.8
lb/ac/yr

At a soil test level of 55 ppm P using a Vertical Till implement instead of conventional tillage to prep soil for planting can reduce phosphorus loading from 3.4 to 2.6 lb/ac/yr on soils in the Upper Rock River Watershed

1.9
lb/ac/yr

At the High P level, transitioning from Vertical Till to no-till and adding rye cover crops into the rotation crop can decrease phosphorus loading from 2.6 to 0.7



The Wisconsin Phosphorus Index (PI) estimates the average annual runoff P delivery to surface water from a farm field based on: manure application rate and timing, P fertilizer additions, soil test P, crop rotation and field operations.

1 Lower quartile of the Dodge County soil test P soil data summary

2 Median of the Dodge County soil test P soil data summary

3 Upper quartile of the Dodge County soil test P soil data summary



Modeling Results:
DAIRY
OPERATIONS



CROP ROTATIONS: Dairy

Conventional Rotation¹

Corn silage- Corn grain- Alfalfa Hay (3 years)
Fall chisel, disk, spring field cultivation (2x)
14,000 gallons/acre fall manure application,
Incorporated; No cover crop

Intermediate Rotation²

Corn silage- Corn grain- Alfalfa Hay (3 years)
Fall chisel, disk, spring field cultivation (2x)
14,000 gallons/acre fall manure application,
Low disturbance manure injection; Rye cover
crop after corn silage

Resilient Rotation³

Corn silage- Corn grain- Alfalfa Hay (3 years)
No till
14,000 gallons/acre fall manure application,
Low disturbance manure injection; Rye cover
crop after corn silage

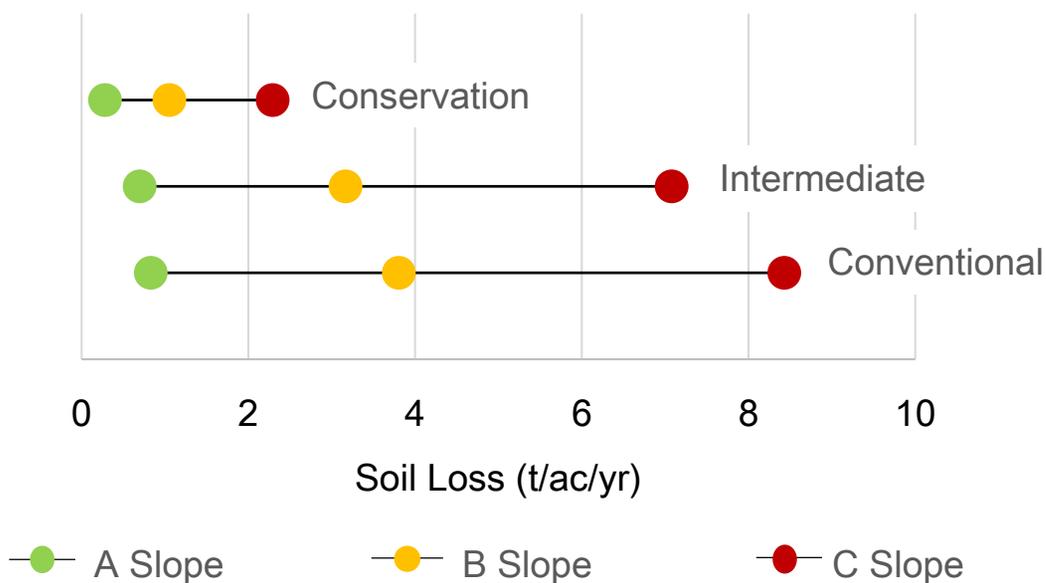
1. Conventional rotations are characterized by management that has been generally practiced and accepted in an area in recent decades, with no to low levels of conservation practice integration.

2. Intermediate rotations represent the integration of 1-2 conservation practices that result in either less disturbance or greater residue or living ground cover.

3. Conservation rotations are characterized by integrating cash crops, cover crop and other management practices that afford low or minimal soil disturbance and increase residue or living ground cover throughout the length of the rotation.



Less variability in soil erosion across fields with different slopes when using conservation practices in Dairy Operations.



When dairy farmers:

- + Practice no-till
- + Plant rye after corn silage
- + Use Low-Disturbance Manure application technology

2.0
t/ac/yr

is the range in soil loss between the dominant C-slope soils and A- slope soils in the Upper Rock River Watershed

COMPARED TO

When dairy farmers:

- + Use conventional tillage
- + Incorporate all manure using tillage
- + Don't use cover crops

7.6
t/ac/yr

is the range in soil loss between the dominant C-slope soils and A- slope soils in the Upper Rock River Watershed

Higher risk of **phosphorus loss from fields** in dairy rotations using conventional tillage, no cover crops

On dairy operations, manure is an important part of the system. Some fields may receive more frequent or higher volume manure applications than others on a regular basis, leading to a variability in soil test P levels across the farm.

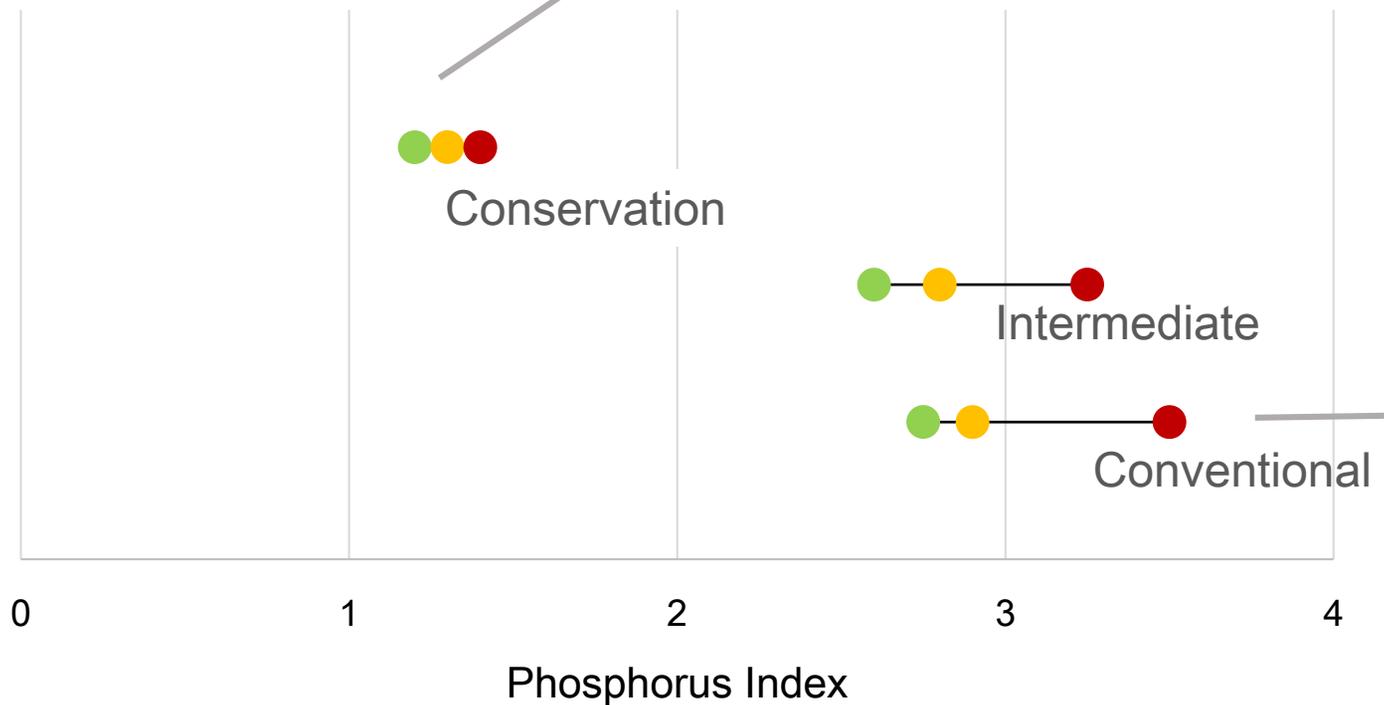
Conservation practices can not only lower risk of P losses from the field, but also reduce the *variability* in phosphorus losses across fields with different soil phosphorus concentrations.



Conservation Dairy Rotations: Lower PI and Less P Loss Variability Across Soil Test P Levels

Conservation Rotation:

- + Lower PI across all soil test levels than intermediate and conventional rotations
- + Range of **0.1 lb/ac/yr** potential phosphorus loading to waterways between 55 ppm P and to 20 ppm P



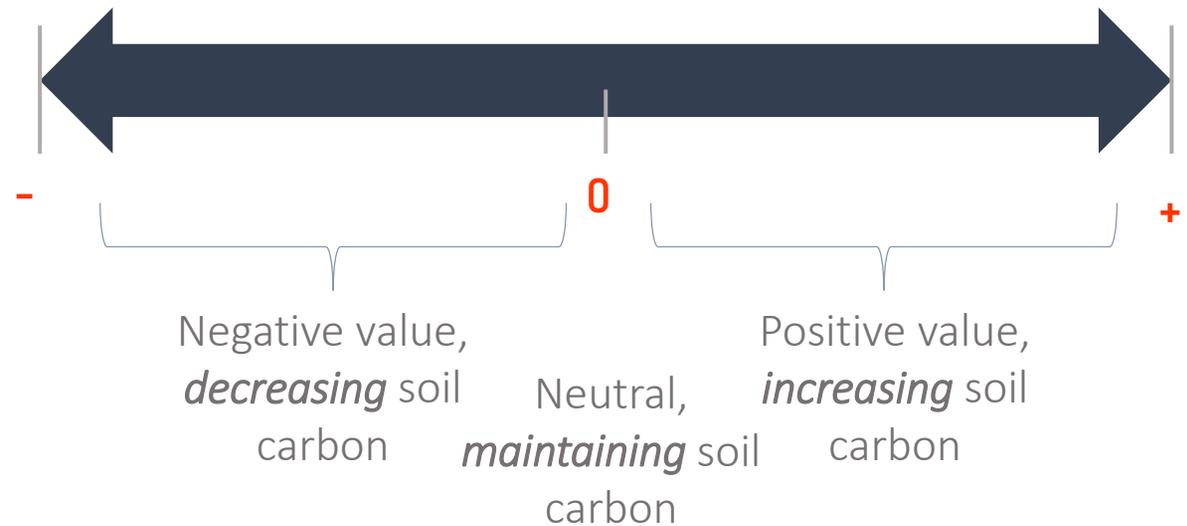
Conventional Rotation:

- + Higher average PI than Conservation Scenarios across all soil test levels
- + Range of **0.75 lb/ac/yr** potential phosphorus loading to waterways between 55 ppm P and to 20 ppm P

● 20 ppm Soil P ● 33 ppm Soil P ● 55 ppm Soil P



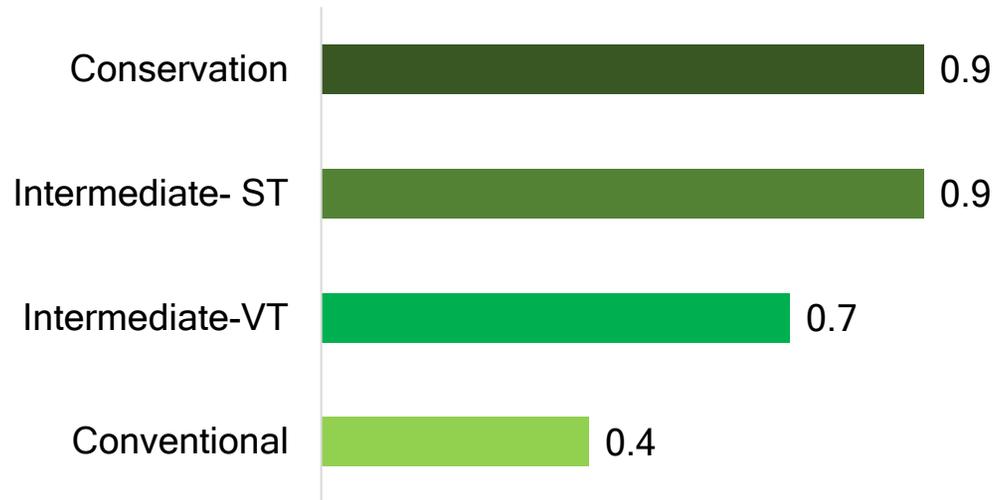
A higher Soil Conditioning Index means farming practices are encouraging **the building of soil organic matter**



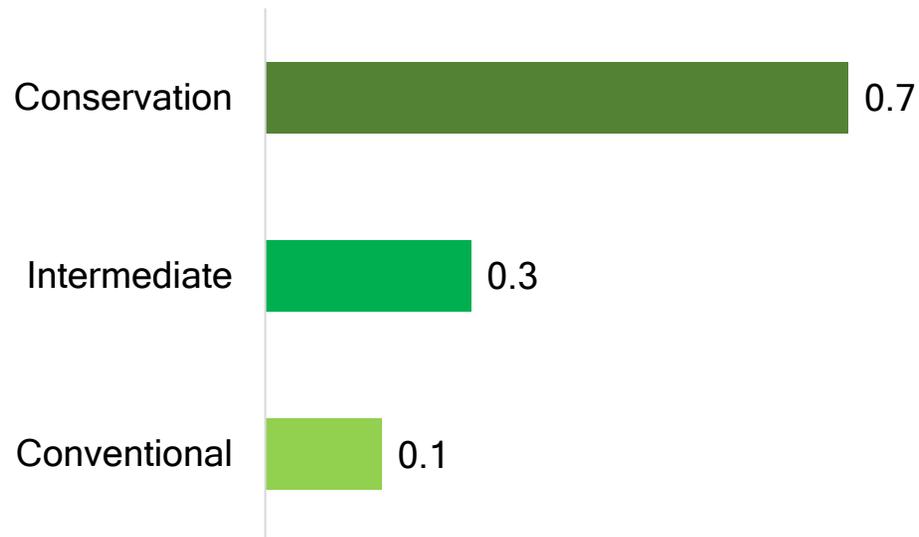
The SCI predicts whether field soil is **gaining or losing carbon**. Values indicate direction of soil carbon building based off management practices like tillage. It does not reflect the actual quantity of carbon stored in the soil and a **value near zero doesn't necessarily indicate good management** if soil carbon levels have already degraded and they are being maintained at a low level.



Soil Conditioning Index: GRAIN



Soil Conditioning Index: DAIRY



+ Reducing tillage,
+ Increasing surface residues left on the field

+ Integrating cover crops into a rotation

will often raise the SCI

DODGE COUNTY
FARMERS FOR HEALTHY
SOIL HEALTHY WATER
CONSERVATION
PROGRESS

Conservation
Dashboard

27,031
acres

Covered by participating farms in 2019 representing ~ 7% of the 392,600 acres* in watershed area

* Total acreage includes non- farming land uses

2,779
acres

Of cover crops planted across 43 farms through the group's cost-share incentive program, a 94% increase in ground cover

552

Attendees at 2019 educational events including a Soil Health Expo, Cover Crop Showcase, and Combine Cleaning Clinic

575

Farmers, landowners, and educators reached through their mailing lists and outreach channels



DODGE COUNTY
FARMERS FOR
HEALTHY SOIL
HEALTHY WATER
CONSERVATION
PROGRESS

Potential
Sediment +
Nutrient
Reductions

Conservation efforts can reduce sediment and phosphorus from reaching waterways.

If we apply the reductions we've modeled for the different scenarios on the 27,000 acres of cropland covered by the participating farmers in the project area, we can get an idea of potential impacts to water quality.



27,000 acres of farmland managed under a **cash grain system** could experience the following reductions* when switching from **Conventional Tillage** to:

**Vertical
Tillage**



29,700
Tons
Sediment

21,600
Pounds of
P

**Strip
Tillage**



83,700
Tons
Sediment

62,100
Pounds of
P

**No-till
and
planting
green**



91,800
Tons
Sediment

70,200
Pounds of
P



*Estimates based on numbers averaged across rotation years, all dominant soil types in watershed, slope classes and soil test P values. Actual reductions will vary based on practice particulars and placement on landscape

27,000 acres of farmland managed under a **dairy system** could experience the following reductions* when switching from **Conventional management** to:

**LDMI + Rye
cover crop
after corn
silage
harvest**



14,310
Tons
Sediment

6,750
Pounds of
P

**No-till, LDMI,
+ planting
corn green
into rye cover
crop**



64,530
Tons
Sediment

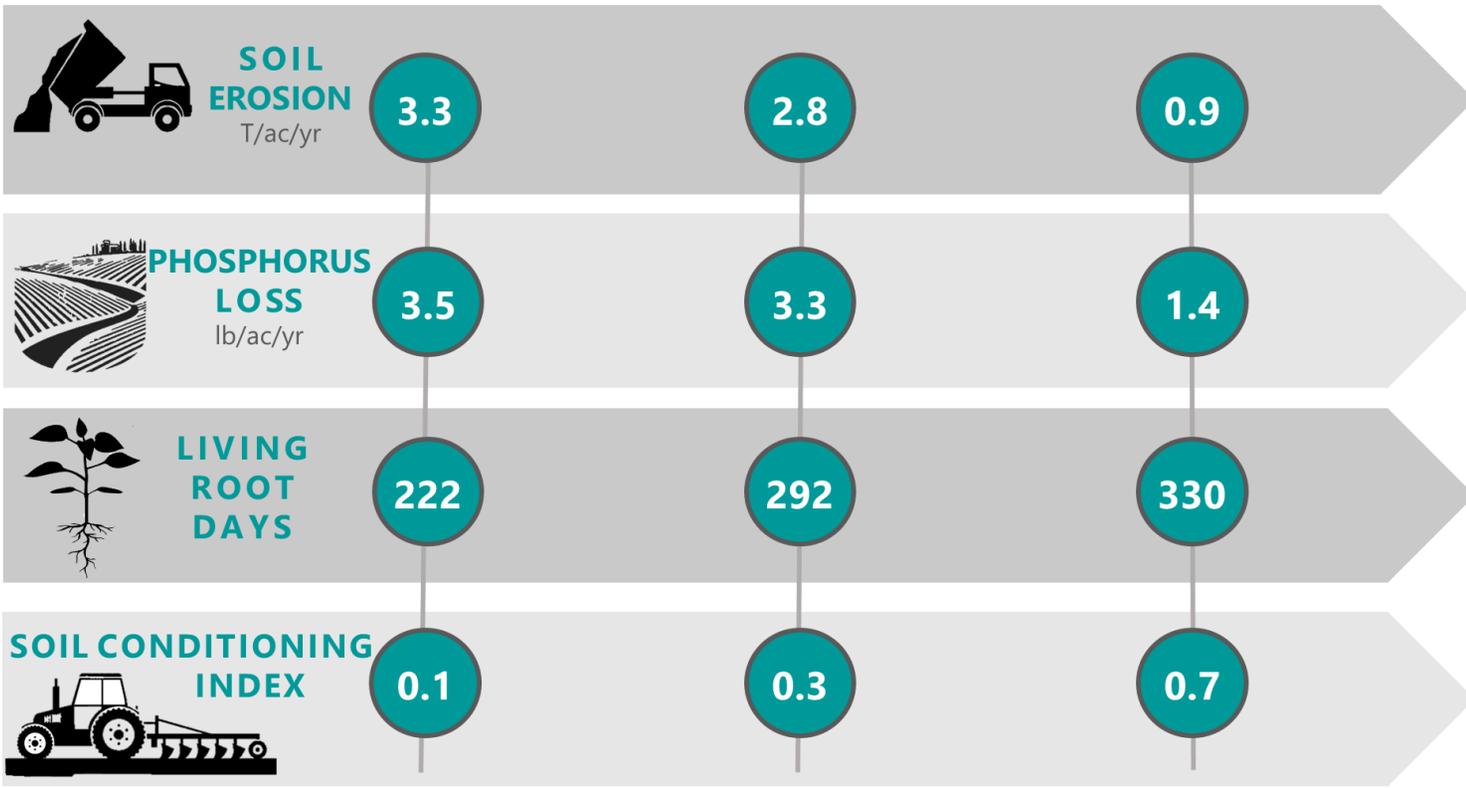
56,430
Pounds of
P



*Estimates based on numbers averaged across rotation years, all dominant soil types in watershed, slope classes and soil test P values. Actual reductions will vary based on practice particulars and placement on landscape

SOIL & WATER CONSERVATION IMPACT

Dodge County Farmers for Healthy Soil Healthy Water | Dairy Operations



Less soil loss = better productivity. **Soil loss** of 1 t/ac/year is the equivalent of **5 dump truck loads** of soil from one 35-acre field

Lower P Loss can mean better water quality. **Keeping soil on the field helps keep phosphorus out of waterways.**

More Living root days = better soil health. **Living roots keep soil in place and fuel soil biology and nutrient cycling.**

Higher SCI= Greater soil building. It can take years to increase **soil organic matter levels by 1%**. Farming practices that limit disturbance can help.

CONVENTIONAL INTERMEDIATE CONSERVATION

Crop Rotation: Corn silage- Corn grain- Alfalfa hay (3 yrs)
 Fall chisel, Disk, Field cultivation
 Fall manure application incorporated with tillage*
 No cover crops

Crop Rotation: Corn silage- Corn grain- Alfalfa hay (3 yrs)
 Fall chisel, Disk, Field cultivation
 Low disturbance manure injection
 Rye cover crop after corn silage

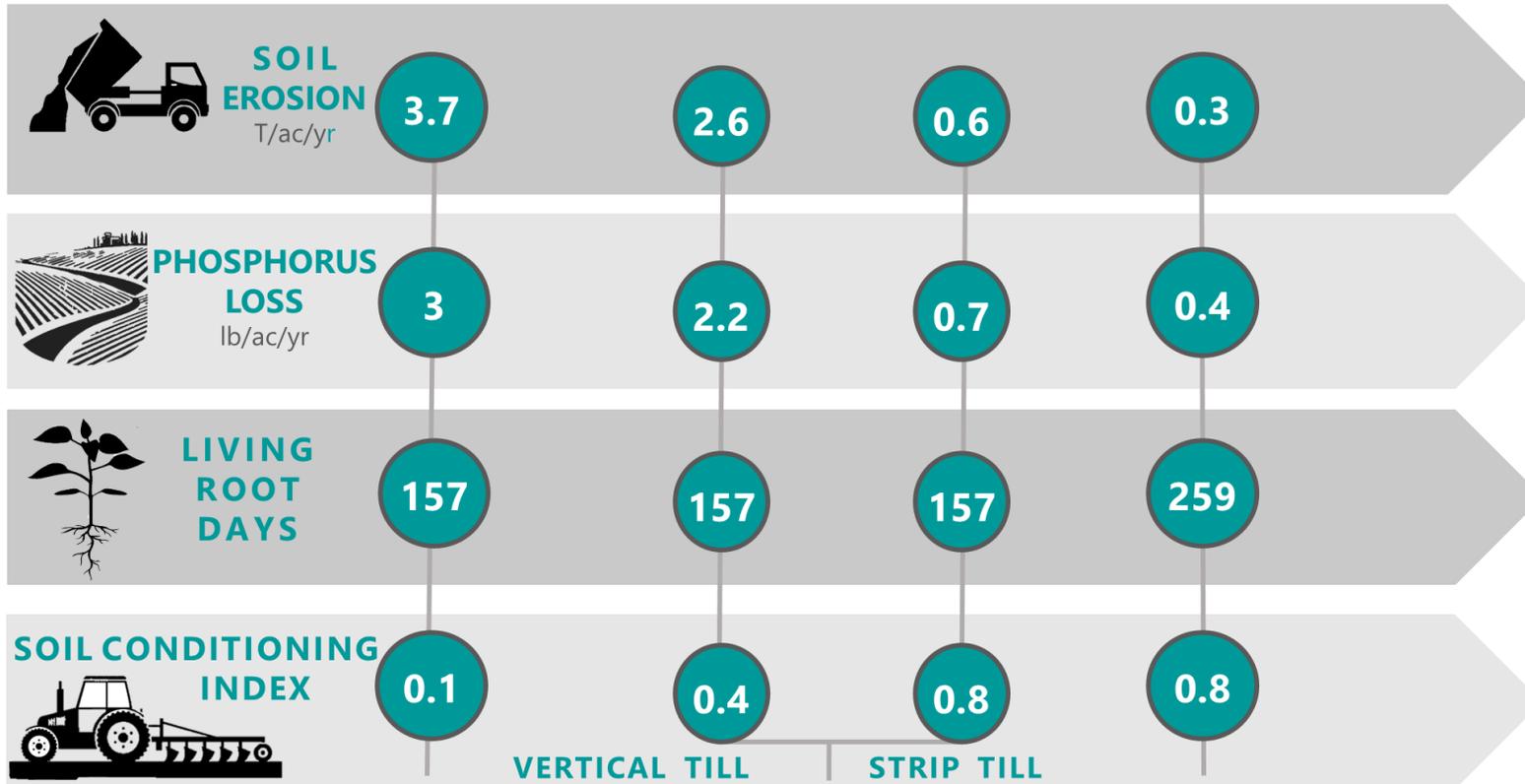
Crop Rotation: Corn silage- Corn grain- Alfalfa hay (3 yrs)
 No- till
 Low disturbance manure injection
 Rye cover crop after corn silage



* All manure application rates modeled at 14,000 gal/acre

SOIL & WATER CONSERVATION IMPACT

Dodge County Farmers for Healthy Soil Healthy Water | Grain Operations



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Crop Rotation: Corn grain- Soybeans
 Fall Vertical Till | Strip Till
 No cover crops

Crop Rotation: Corn grain- Soybeans
 No till
 Rye cover crop after soybeans, Corn planted into living rye



Looking ahead, the Dodge County Farmers for Healthy Soil Healthy Water are committed to learning more about soil health and will continue to educate on the 5 principles of soil health:

- + Minimize disturbance
- + Increase species diversity
- + Maintain a living root in the ground
- + Increase ground cover
- + Incorporate animals onto the land

They also plan to further develop their localized NUE program, with goals to involve more farmers in the studies.

If you have questions regarding this report, contact Dana Christel, Conservation Specialist:

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