Producer-Led Watershed
Protection Grant Program

SOIL AND WATER CONSERVATION 2019 BENEFITS REPORT

Buffalo-Trempealeau Farmer Network

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The Buffalo-Trempealeau Farmer Network was created in early 2016 to encourage farmers to evaluate their farms for opportunities to reduce nutrient loss and increase long term sustainability. Group members explore nutrient application rates, timing and methods, and alternative practices and farming systems.

For example, farmers in this group have been experimenting with interseeding cover crops into soybeans. More recently, the group has partnered with conservation organization Pheasants Forever to work together on projects that link precision agriculture technology with conservation practices as a way to improve profitability on a per acre basis

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 Horse Creek Council.

→ These practices include primarily cover crops and reduced tillage.

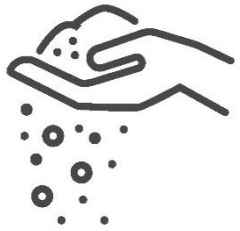
→ Crop rotations with varying levels of conservation integration were modeled to estimate the potential phosphorus and sediment reductions, and soil organic matter building potential that can occur from adopting different practices.

→ Rotations were selected that **best reflect the practices used by farmers in this watershed area,**

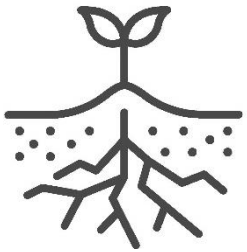
→ These estimations do not consider other conservation practices that may be present in a field such as a grassed waterway, water and sediment control basin, or buffers.

ESTIMATING SOIL & WATER QUALITY BENEFITS | Model Inputs

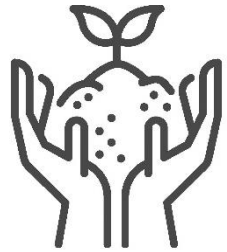
Dominant soil types of watershed + corresponding organic matter percentages (NRCS Web Soil Survey)



County average yields

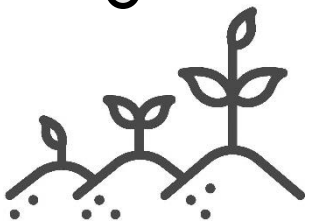


Average plant and harvest dates of crops for Wisconsin (NASS)



1 2 3 4 5

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 loss** in conventional grain and dairy systems compared to those incorporating no-till and cover crops.
+ Greater **risk of phosphorus loss from fields** in conventional rotations, especially in continuous corn silage systems.
+ Higher Soil Conditioning Index (**soil building potential**, in simple terms) in Intermediate and Conservation Rotations
+ Conservation practices can **minimize variability in soil loss** across slopes on farm fields

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 (3 yrs)- Soybeans (1 yr)
Fall chisel, spring disk & field cultivation;
No cover crops

Intermediate Rotation

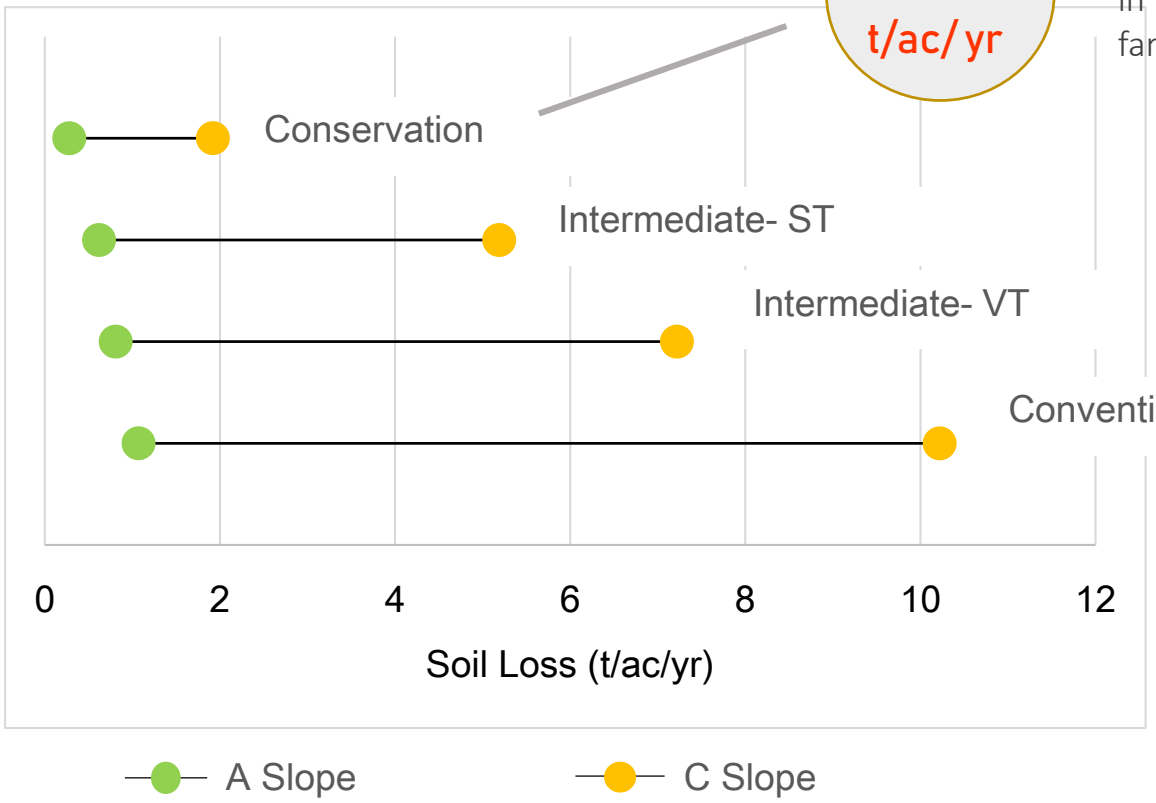
Corn grain (3 yrs)- Soybeans (1 yr)
Fall vertical tillage; No cover crop

Conservation Rotation

Corn grain (3 yrs)- Soybeans (1 yr)
No-till; Rye cover crop after corn

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

Less variability = Greater resilience to extreme rainfall events.



1.6 t/ac/yr

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 corn.**

COMPARED TO

9.2 t/ac/yr

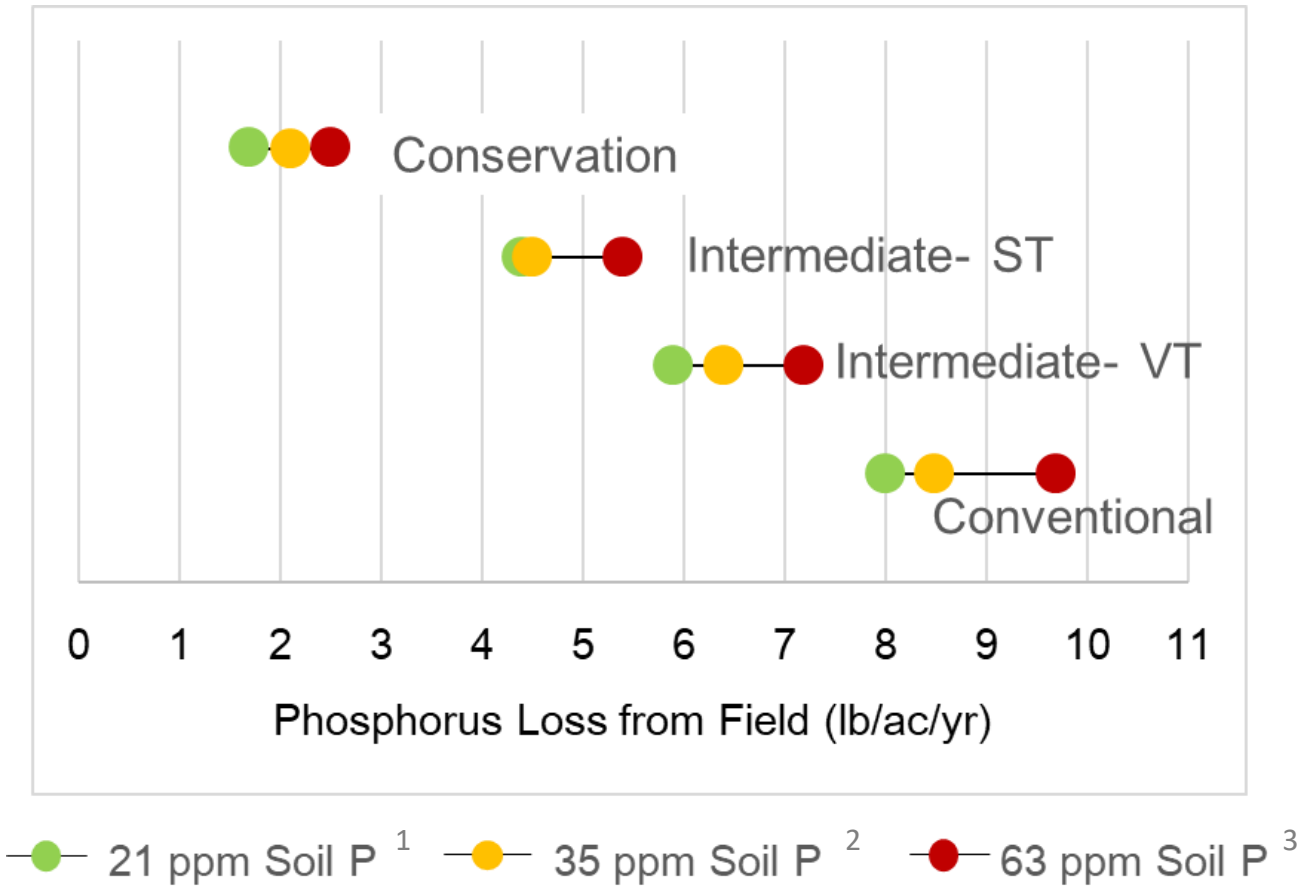
Difference in soil loss on C-slope soils compared to A-slope soils with **fall chisel plowing, spring disking and field cultivation.**

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 RUSLE2[1]. This value takes into account factors including field slope, soil type, climate, and ground cover.

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

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

Cover crops and no-till help reduce the amount of phosphorus being lost from farm fields.



The Wisconsin Phosphorus Index (PI) estimates the average annual runoff P 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 Trempealeau County soil test P soil data summary
2 Median of the Trempealeau County soil test P soil data summary
3 Upper quartile of the Trempealeau County soil test P soil data summary

Reducing P losses in Corn-Soybean Rotations…

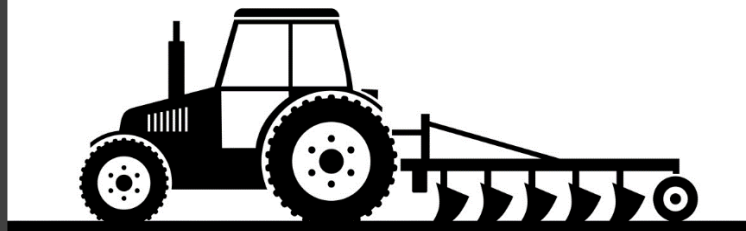
2.5
lb/ac/ yr

At a soil test level of 63 ppm P, planting the corn crop **using a vertical tillage implement** instead of relying on conventional tillage to prep soil for planting may reduce phosphorus loss by 2.5lb/ac/yr.

4.7
lb/ac/ yr

Planting corn and soybean crops using no-till and **planting a rye cover crop after corn** can reduce P losses by another 4.7 lb/ac/yr.

Modeling Results:
DAIRY
OPERATIONS



CROP ROTATIONS: Dairy

Conventional Rotation[1]

Continuous corn silage
Fall chisel, disk, field cultivation
15,000 gallons/acre manure application incorporated with tillage; No cover crop

Intermediate Rotation[2]

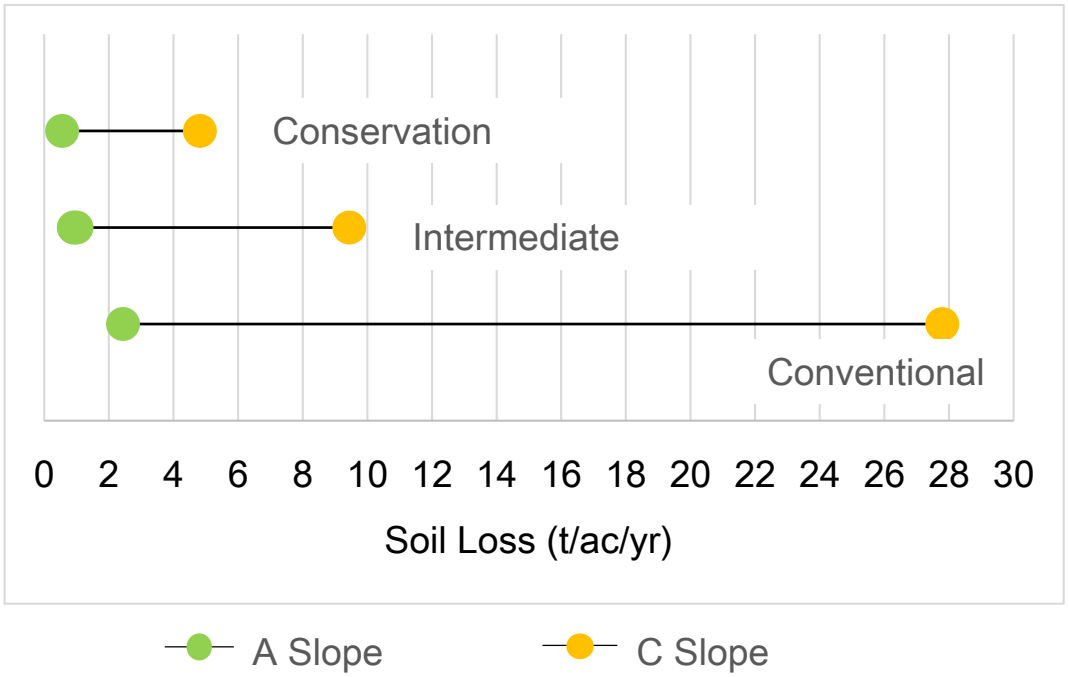
Corn silage (2 yrs)- Alfalfa Hay (3 years)
Fall vertical tillage
15,000 gallons/acre manure application, Low disturbance manure injection in spring
Rye cover crop after corn silage years

Conservation Rotation[3]

Corn silage (2 yrs)- Alfalfa Hay (3 years)
No-till
15,000 gallons/acre manure application, Low disturbance manure injection in spring
Rye cover crop after corn silage years

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

4.3 t/ac/yr

is the range in soil loss between the C-slope soils and A- slope soils of this watershed

COMPARED TO

When dairy farmers:

+ Plant continuous corn silage
+ Use conventional tillage
+ Incorporate all manure using tillage
+ Don't use cover crops

25.3 t/ac/yr

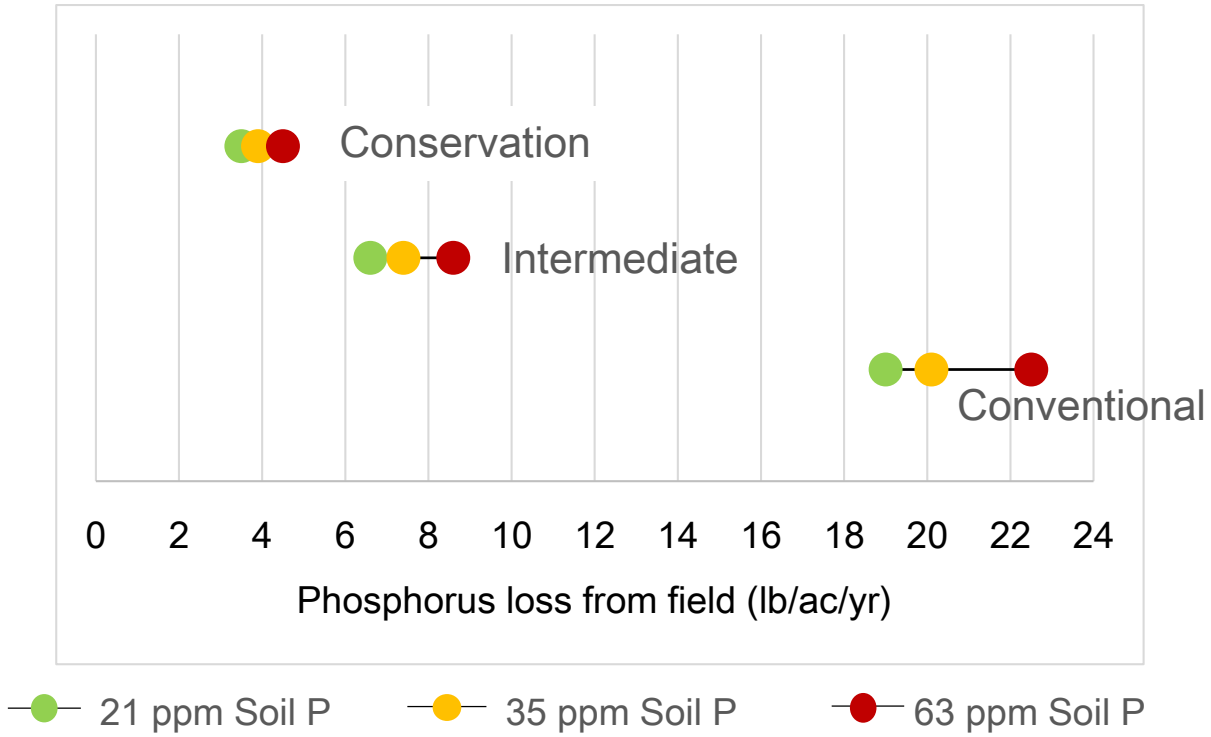
is the range in soil loss between the dominant C-slope soils and A-slope soils

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 phosphorus loss from fields with lower soil test P levels and increased conservation practices in rotation.



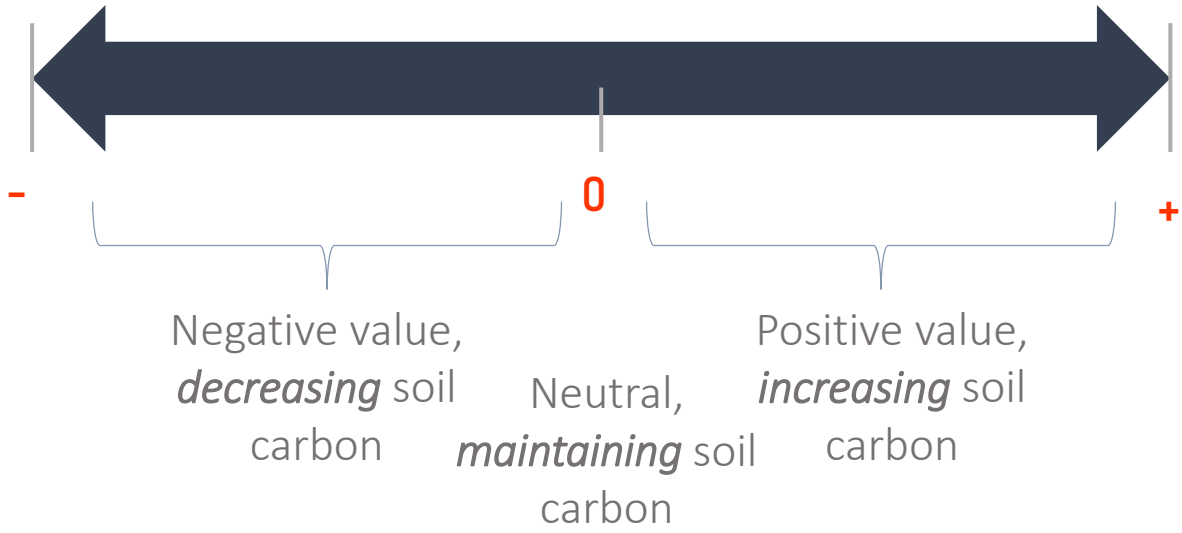
13.9 lb/ac/yr

At a soil test level of 63 ppm P the following enhancements can reduce P loss from fields by 13.9 lbs/ac/yr in this watershed: adding hay into a corn silage rotation, using vertical tillage instead of using conventional tillage and low-disturbance manure application technology, and planting a rye cover crop after corn silage.

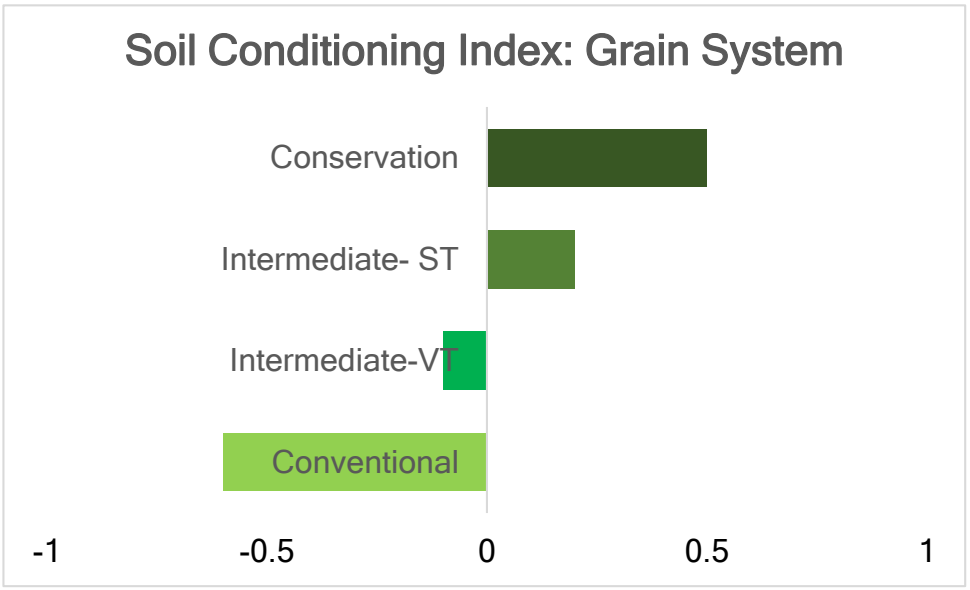
4.1 lb/ac/yr

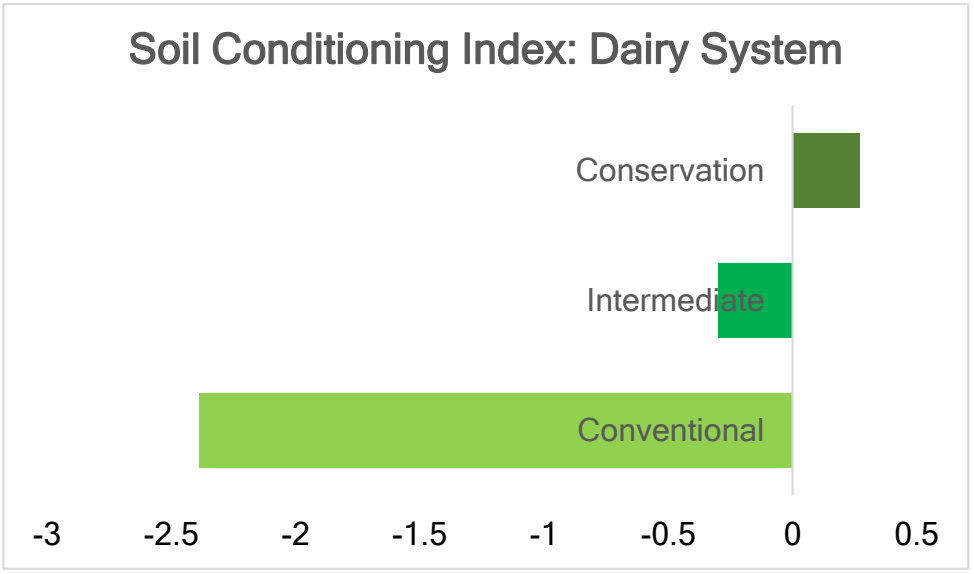
Making the previous adjustments in addition to switching to no-till instead of vertical or conventional tillage can reduce P losses by an additional 4.1 lb/ac/yr.

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.





+ Reducing tillage,
+ Increasing surface residues left on the field
+ Integrating cover crops into a rotation

will often raise the SCI

BUFFALO-TREMPEALEAU FARMER NETWORK

Conservation Dashboard

400 acres — NEW acres managed using no-till throughout the watershed project area

3,000 acres — Of cover crops planted facilitated through the Network's education and outreach efforts

46 acres — Pollinator habitat planted on farms.

100 acres — NEW acres included under a nutrient management plan

BUFFALO TREMPEALEAU FARMER NETWORK

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 approximately 10,000 acres of cropland covered by the participating farmers in the project area, we can get an idea of potential impacts to water quality.

BUFFALO TREMPEALEAU
FARMER NETWORK

Potential Sediment + Nutrient Reductions

10,000 acres of farmland managed under a **cash grain system** could experience the following reductions* when switching from **Conventional Tillage** to:

Vertical Tillage →	29,975 Tons Sediment	24,615 Pounds of P
Strip Tillage →	50,318 Tons Sediment	43,077 Pounds of P
No-till + rye after corn →	83,025 Tons Sediment	71,538 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

BUFFALO-TREMPEALEAU FARMER NETWORK

Potential Sediment + Nutrient Reductions

10,000 acres of farmland managed under a **dairy system** could experience the following reductions* when switching from **Continuous corn silage and regularly chisel plowing and disking fields:**

Vertical till, Rye cover crop after corn silage, LDMI →

- 116,000 Tons Sediment
- 90,000 Pounds of P

No-till, Rye cover crop after corn silage, LDMI →

- 144,858 Tons Sediment
- 114,000 Pounds of P

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

Looking ahead, the Buffalo-Trempealeau Farmer Network continues to connect with other farmers in their community through outreach, education, and demonstration field days.

They continue to trial cover crop establishment techniques and working with precision agriculture and conservation concepts.

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

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