Farmers for Sustainable Food

PENINSULA PRIDE FARMS

Peninsula Pride Farms Sustainability Project Four-Year Progress Report (2020-23)

July 2024

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1 EXECUTIVE SUMMARY

Farmers for Sustainable Food and Peninsula Pride Farms have worked together since 2020 to create a baseline set of information for seven core sustainability metrics from a widely accepted industry leader in the space, Field to Market: The Alliance for Sustainable Agriculture®. Additionally, PPF was interested in how their farmer members were impacting local water resources and worked with FSF and Houston Engineering, Inc., to identify how current and future in-field best management practices are influencing changes to local water resources. Local water resources were presented in the annual update in 2022 report. This can be found on the Farmers for Sustainable Food website, https://farmersforsustainablefood.com/.

Farmer Participation:

- ***Door and Kewaunee Counites in Wisconsin***
- ***11 farms that manage over 34,000 acres are evaluating on-farm sustainability metrics***
- ***Combined dairy cattle headcount of over 40,000***

Founded in 2016, Peninsula Pride Farms is a group of farmers and businesses focused on improving the environment and ensuring sustainable farming into the future. Part of this commitment led PPF to start an Innovation Project within Field to Market's Fieldprint Project Framework. Quantifying and measuring environmental metrics that are nationally recognized aligns with PPF's mission statement: "As farmers and caretakers of the environment, we are committed to protecting, nurturing and sustaining our precious soil, water and air. To foster environmental stewardship, we will promote practices with measurable outcomes that secure and enrich the future of our shared community."

This report summarizes four years year of data collection and analysis (2020-2023 crop years) involving 11 PPF farmers from Door and Kewaunee Counties in Wisconsin. These 11 farmers worked to obtain environmental information regarding their farming footprint on greenhouse gas emissions, water quality, soil erosion and energy efficiencies.

Tools used in the project to evaluate on-farm crop enterprise sustainability and local water quality included:

- On-farm sustainability – Field to Market's Fieldprint Platform®
- Local water resources – Prioritize, Target, and Measure Application (PTMApp), Minnesota Board of Water and Soil Resources.

Biodiversity	Energy Use	Greenhouse Gas	Land Use Efficiency	Soil Carbon	Soil Conservation	Water Quality

Key Project Purposes

1. Assess if current farming practices in conservation-conscious areas are having a positive impact on sustainability and water quality compared to the Fieldprint Platform's national indicators and state benchmarks.
2. Increase the use of sustainability measurement platforms by farmers to inform land and water management decisions, leading to increased adoption of conservation measures.
3. Identify area within the watershed to improve nutrient management to protect groundwater resources.

KEY FINDINGS AVERAGE OF FOUR-YEAR PERIOD

Conservation Practices

On average, farms use two or more conservation practices.

Water Quality

91% of reported acreage has mitigated the risk of excessive loss of nitrogen to subsurface

Soil Erosion

0.97 tons/acre/year compared to state benchmark* of 3.5 tons/acres/year for corn grain.

Energy Use

209,632 btu/ton for corn silage, 33% lower/better than national indicator.

Greenhouse Gas Emissions

97 lbs CO2e/ton

17% percent higher/worse than the corn silage state benchmark*

*Field to Market's state benchmark for Wisconsin.

KEY FINDINGS ANNUALIZED RATE OF CHANGE OF METRICS OVER FOUR YEARS

Conservation Practices

No change

Water Quality Score

Alfalfa:
No change

Corn Silage:
No change

Corn Grain:
No change

Soil Erosion

Alfalfa:
No change

Corn Silage:
No change

Corn Grain:
7% worsening

Energy Use

Alfalfa:
No Change

Corn Silage:
No change

Corn Grain:
No Change

Greenhouse Gas Emission

Alfalfa:
No Change

Corn Silage:
No change

Corn Grain:
8% worsening

*No change indicates a less than 5% change in either direction on an annualized basis. Because the dataset is only showing four years of data and sampled fields are 10% of total farmed area, the 5% cutoff was chosen to reduce overall statistical noise within the data.

Figure 1 shows that across the project, yields for alfalfa and corn silage have been rising. Corn grain has seen increases and decreases across the four years, but on average has remained unchanged. Likewise, field acres for alfalfa and corn silage have remained rather stable at 2,000 acres for alfalfa and 2,500 acres for corn silage. The water quality metric, soil conservation (soil loss) metric and greenhouse gas metric for all crops see some changes over the four-year period. It is important to note that some of the changes in the metric could be due to changes in what field is currently in the rotation for alfalfa, corn grain or corn silage. As fields transition from one crop to another, certain field characteristics (such as nutrient loss potential) move with the field because those are linked directly to field characteristics.

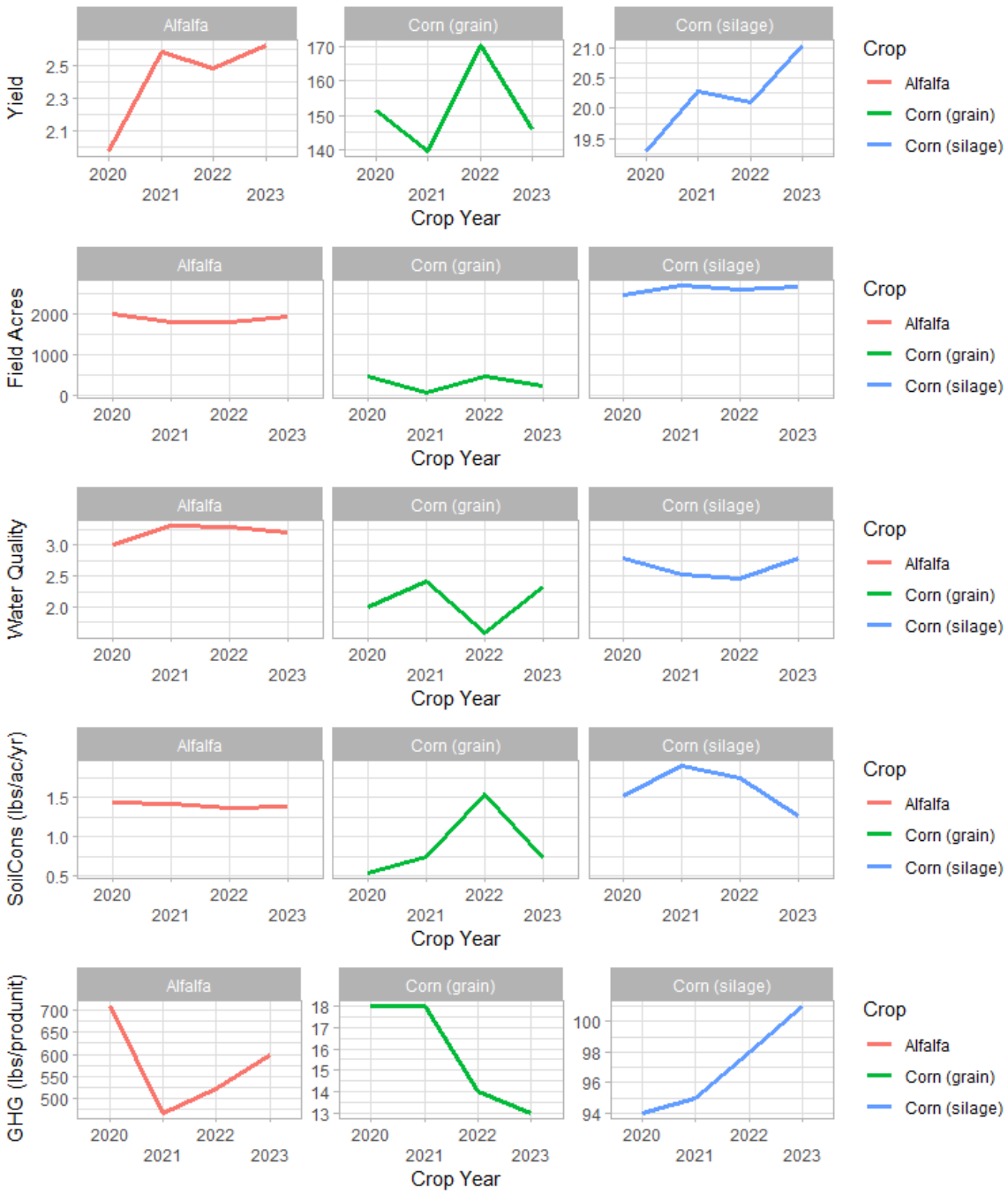

Figure 1: Four-year change of project metrics

For the greenhouse gas emissions section, a subsequent graphic was developed for how many field passes were performed, on average, for each crop. Though this does not explain all of the variation with the greenhouse gas scores, it can help provide context of management needs in that year.

Figure 2: Field passes for nutrient and chemical application on fields shows the average number of passes for inorganic, and organic fertilizers, and chemical passes (such as herbicides or insecticides) per crop and by year. Field passes impact many of the metric scores including greenhouse gas and energy use scores. The orange line shows the sum of the chemical, inorganic and organic passes per year.

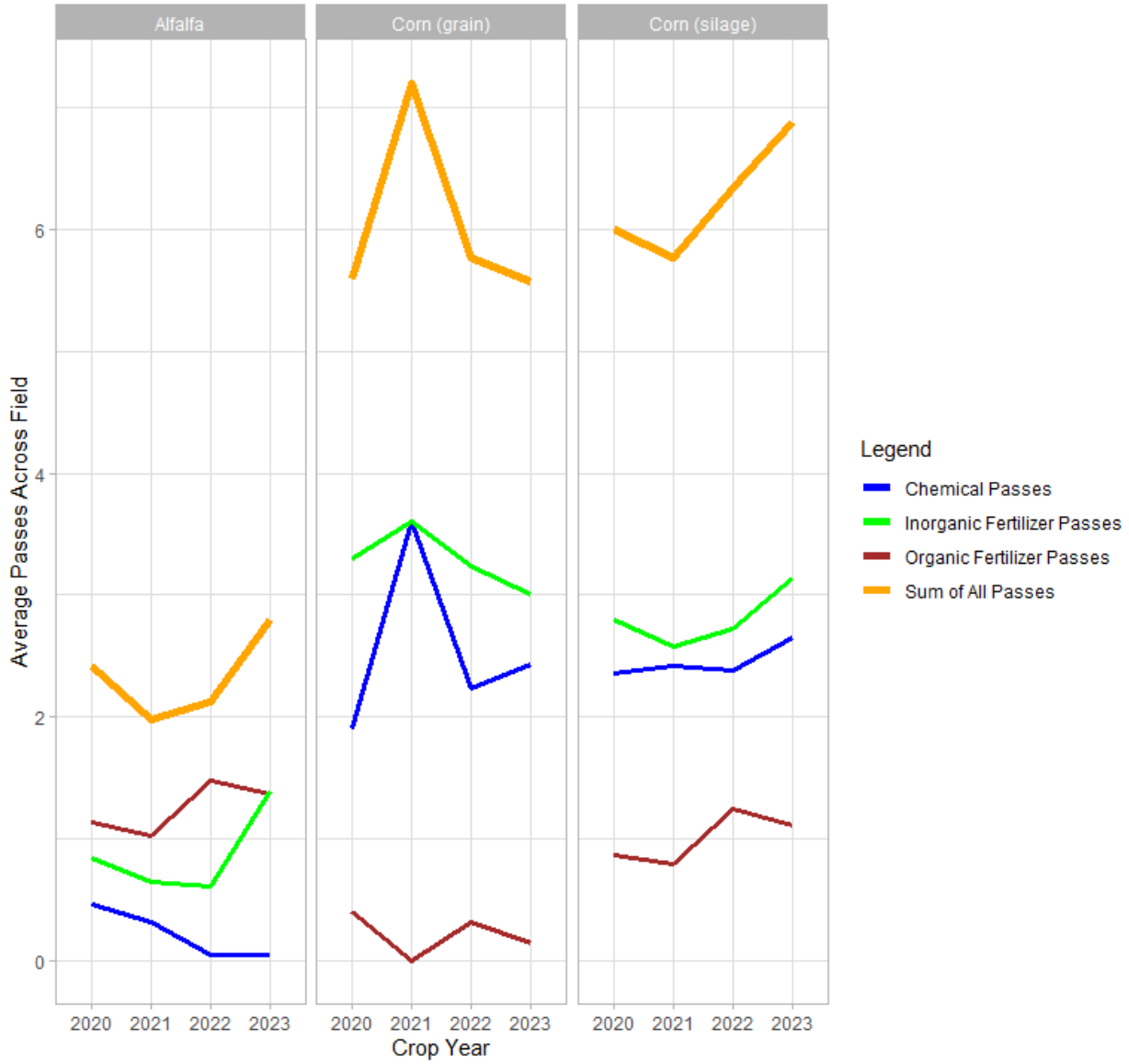

Figure 2: Field passes for nutrient and chemical application on fields

2 SUSTAINABILITY METRIC METHODOLOGY

An explanation of the Field to Market Fieldprint Platform metrics can be found on their website, https://fieldtomarket.org/ourprograms/sustainability-metrics. A breakdown of four metrics (energy use, soil erosion, greenhouse gas emissions, and water quality) highlighted throughout this report is provided in the Year 1 report which is available on the Farmers for Sustainable Food website.

2.1 PROJECT-BASED RESULT METHODOLOGY

All data within the report was obtained from Field to Market's downloadable data (comprehensive data output file), the 2020 National Indicators Report (Field to Market, 2021) and Field to Market's national and state benchmarks.

National indicators, retrieved from the National Indicators Report, and state and national benchmarks are reference points meant to provide context for Fieldprint results. These indicators and benchmarks were calculated based on USDA Survey and Census data for prior years and thus represent a historical point of reference but do not provide a starting point for measuring continuous improvement. Project benchmarks in this report are reported for a four-year growing period (2020-2023) and calculated with actual farmer data.

In instances where a project benchmark is broken down and discussed more granularly, the comprehensive data output file was used to obtain the breakouts. For instance, the water quality metric is broken out by water quality pathways to provide a deeper insight into water quality mitigation occurring as well as opportunities for improvement. All water quality breakout scores are weighted by field size to better reflect the total area of the project meeting or not meeting mitigation thresholds. Data is screened to ensure complete data is present before analysis is completed. Project benchmarks were created for alfalfa, corn silage and corn grain. Project benchmarks were weighted by field size or by production (bu/tons) where appropriate.

Total best management practices implemented within the project can be located within the comprehensive data output file. Best management practices (BMPs) are self-reported and are only as accurate as the data entered into the platform. For this report, all BMPs for the four years of the project were summed up by year to determine the total number of active BMPs during each growing season. To get the average active BMPs per field per year, the total BMP count (which includes all BMPs from the 'water conservation practices' column and the total number of fields actively using cover crops in the growing year) was divided by the total number of fields within the project during each growing season. If "no-tillage" and "reduced tillage" were both selected during data entry, only one was counted as to not double count practices.

3 PROJECT RESULTS (2020-2023 GROWING SEASONS)

As noted in the previous two sustainability reports (encompassing three years of crop data) for Peninsula Pride Farms, the Fieldprint Platform provides detailed information on a field-by-field basis which is available to each farmer. The platform also provides project-based averages for the individuals who participate at a project level. The project level benchmarks are provided to all farmers in the project, whereas individual field scores are only provided to the farmer who owns those fields.

Individual farmer reports are provided to all participants and compares each farmer to each other anonymously along with providing the breakdown of field scores, project benchmarks, state benchmarks and national indicators. These detailed reports allow the farmers to compare themselves with the project as a whole, and other larger datasets at the state and national level.

This Four-Year Progress Report provides a high-level overview of how the project is doing compared to state benchmarks and national indicators.

Table 1: PPF Fieldprint Platform project sustainability metrics for the four growing seasons of the project (2020-2023). Data from Fieldprint Platform comprehensive data output file.

Field-Level Fieldprint Platform Output			
Table 1 contains the PPF project benchmarks for corn grain, corn silage and alfalfa based on 11 farms for four years of the project.	**Corn Grain**	**Corn Silage**	**Alfalfa**
Soil Conservation*	..... ton/ac/yr		
	0.97	1.61	1.40
Energy Use**	... btu/bu ...	..... btu/ton	
	33,177	209,632	1,337,890
Greenhouse Gas**	lbs. CO_2e/bu	lbs. CO_2e/ton	
	15.9	97.4	570.2
Water Quality*	..... unitless		
	1.92	2.64	3.20
Biodiversity*	..... %		
	72.4	79.4	77.5
Land Use**	....ac/bu....	.....ac/ton.....	
	0.0064	0.05	0.42

*Weighted average by area (field sizes)

**Weighted average by production (yields)

State benchmarks and national indicators – The project partners and interested farmers can compare metrics to national indicators and state benchmarks to better understand how the project performs against national and state averages. Field to Market has published updated national indicator metrics for 2020 (FTM, 2021). State benchmarks are averages from data between 2008-2012. The comparisons are listed in Table 2.

Table 2: State Benchmarks and National Indicators vs project benchmarks by crop type

		Corn Grain	**Corn Silage**	**Alfalfa**
Soil Conservation	..... tons/ac/yr			
	Project	**0.97**	**1.61**	**1.40**
	State Benchmark	**3.5**	**N/A**	**N/A**
	National indicator	4.7	4.7	NA
Energy Use		..... btu/bu	..... btu/ton	

	Project	**33,177**	**209,633**	**1,337,870**
	State Benchmark	**25,291**	**242,976**	**N/A**
	National indicator	37,791	312,716	NA
Greenhouse Gas		lbs. CO_2e/bu	lbs. CO_2e/ton	
	Project	**15.9**	**97.0**	**570.2**
	State Benchmark	**9.3**	**83.2**	**N/A**
	National indicator	10.7	122.2	N/A
Land Use		…ac/bu…	……..ac/ton……	
	Project	**0.0064**	**0.050**	**0.42**
	State Benchmark	**0.0069**	**0.0582**	**N/A**
	National indicator	0.0058	0.0493	N/A

Table 2 shows that the PPF group is, on average, performing better against the state benchmarks and national indicators in soil conservation. The group is performing better than the state benchmark and national indicator for energy use in corn silage. For corn grain, the project participants are consuming 31% more energy per bushel of corn grain compared to the state benchmark but performing 12% better compared to the national indicator. The group is producing higher greenhouse gases when compared against the state benchmark and national indicator for corn grain.

In instances where there is an 'N/A' present, state benchmarks and/or national indicators cannot be created yet due to the lack of information from USDA on crops and or regions.

4 FIELDPRINT WATER QUALITY METRIC

Water quality is the priority resource concern in the region and project area due to areas of high nitrate in groundwater and proximity to Lake Michigan. Excess sediment, phosphorus and nitrogen can result in impairment to fish and wildlife habitat and drinking water. The Fieldprint Platform uses USDA's Stewardship Tool for Environmental Performance to assess how likely a field is to lose nutrients to waterways and subsurface water. Based on soil properties and local climate characteristics, STEP assigns a Field Sensitivity Score to each field that represents the potential for nutrient losses, either by runoff beyond the edge of the field (surface loss) or leaching below the rootzone (subsurface loss), for each of four loss pathways: surface P (Phosphorus), subsurface P, surface N (Nitrogen), and subsurface N. STEP then assigns mitigation points for management practices that impact nutrient loss (a Risk Mitigation Score (RMS)).

A score of 1 or above means a farmer has mitigated the risk of excessive nutrient loss to the environment for a pathway.

The final metric score for each nutrient loss pathway is a ratio of how effective management practices are at mitigating the risk of nutrient loss (RMS) to how sensitive the field

is to nutrient loss based (Field Sensitivity Score (FSS)). If the ratio is 1 or higher, the basic level of risk mitigation for excessive nutrient loss has been met. If the ratio is below 1, excessive nutrient loss is likely, and producers should discuss potential mitigation practices with their advisors.

Water Quality Score

unit of measure: Scored between 0 and 4.

numeric score across project years: 2.82 unitless

The water quality metric is comprised of four pathway mitigation processes: surface phosphorus pathway, subsurface phosphorus pathway, surface nitrogen pathway and subsurface nitrogen pathway. A larger value is preferred (maximum score of 4) as it shows that more pathways were mitigated (i.e., fewer nutrients were able to leave the field from the surface and/or subsurface). This score is representative of all crops grown.

Figure 3: Water quality score and explanation. PPF 2020 crop year water quality score.

The aggregated score for the PPF project is 2.82 out of 4 (weighted by field size and when all fields regardless of crop are aggregated together), suggesting that on average, each of the 11 farmers is mitigating between two and three pathways. This was an increase from the first three years, showing continued improvement in protecting water quality within the project area. This could be a result of continued adoption of best management practices, or reduction in fertilizer and chemical applications. A breakdown of each nutrient loss mitigation pathway is provided in Table 3. The water quality score, 2.80, differs from what is seen in Table 1 because the value represents the entire project, not a specific crop.

Table 3: Water quality loss pathway explanation.

	Loss Pathway	
	Phosphorus	**Nitrogen**
Surface Pathway Mitigation	**67% of project acres mitigated excessive risk of surface phosphorus losses.**	**94% of project acres mitigated excessive risk of surface nitrogen losses.**
Subsurface Pathway Mitigation	**40% of project acres mitigated excessive risk of subsurface phosphorus losses.**	**82% of project acres mitigated excessive risk of subsurface nitrogen losses.**

Table 3 outlines the different phosphorus and nitrogen loss pathways that are calculated with the Fieldprint Platform and the results from the project for the duration of the project.

Figure 4 outlines the different pathways that are mitigated within the PPF project. This figure provides a breakdown of Table 3 by year to show how mitigation pathway acres have changed over time. It is important to note that fields change from year to year, so the change in the water quality breakdown

where scores change does not necessarily mean that fields that were mitigating a pathway in one year are suddenly not mitigating pathways in the next year. It is possible that fields were not counted in the next year because they were growing a crop that was different from alfalfa, corn silage or corn grain.

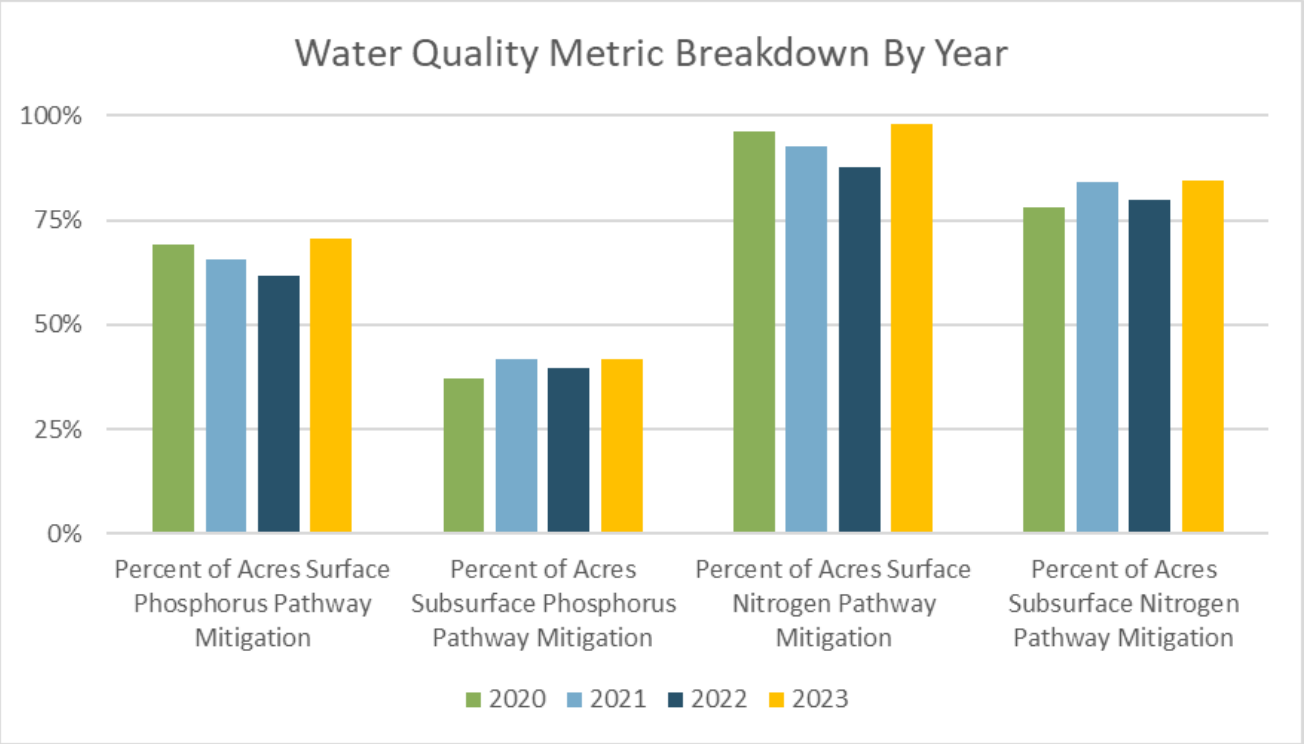

Figure 4: Water quality metric breakdown for the four-year project period. Pathway mitigation percentages show the percentage of acres within the project that have mitigated pathways.

ADOPTION OF CONSERVATION PRACTICES

The use of conservation practices greatly influences farm field water runoff and the soil and nutrients that it carries. Conservation practices are designed to reduce water runoff and loss of sediment, phosphorus and nitrogen by reducing water and wind erosion and precision application of crop fertilizers, including manure. Common conservation practices used by farmers in Peninsula Pride Farms are:

- No-till or reduced tillage
- Cover crops, including planting green
- Grassed waterways
- Farming on the contour
- Harvestable buffers
- Low-disturbance injection of manure
- Comprehensive nutrient management
- Drainage water management

On average, there are more than two conservation practices on each of the enrolled fields.

Farms using the Fieldprint Platform self-report conservation practices that are implemented on each field within the platform. Across the 11 farms, there was a range between 0 and 7 conservation practices on a given field, with an average of 2.7 BMPs per field. The top four practices used within the PPF project are reduced tillage, cover crop, no-till and grassed waterways.

5 PROJECT SPONSORS

This project was made possible by:

- Agropur
- Cargill
- Compeer Financial Fund for Rural America
- Dairy Farmers of Wisconsin
- Farmers for Sustainable Food
- GreenStone Farm Credit Services
- Houston Engineering, Inc.
- Innovation Center for U.S. Dairy
- National Fish and Wildlife Foundation Sustain Our Great Lakes Grant Program
- Natural Resources Conservation Service
- Nicolet National Bank
- Peninsula Pride Farms
- Professional Dairy Producers Foundation

6 CITATIONS

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