IMPLEMENTING PERFORMANCE-BASED CONSERVATION

APRIL 2025

Options for Modeling Water Quality Outcomes from Farm Management Scenarios

Performance-based conservation (PBC) is an approach to agricultural conservation delivery predicated on planning and modeling whole-farm systems to look for management and practice changes or additions that create the greatest response to resource concerns. There are different modeling tactics to quantify these environmental responses based on goals and time available for analysis. For example, in Wisconsin, the SnapPlus nutrient management planning software is often utilized to estimate phosphorus and sediment loss reductions. This document outlines a few considerations and tips for stakeholders who are interested in implementing a PBC approach.

Quantification Considerations

- What model will be used for calculations and what is the staff competency with that model?
- How many farms will you work with, and how much time can you give each one for analysis?
- How much input data are you willing to gather and is each farm willing to provide?
- Will your project be impacted by permitting rules? This will impact which quantification metric(s) and modeling tools are available.
- Will the farms be willing and able to provide data from the chosen start year of baseline analysis? The quantification method requires baseline (status quo) data.
- Which metric(s) do you plan to base payments on? What payment rate will be enticing for farmers, but cost-effective for the project?

Individual Farm Modeling

To determine the nutrient or sediment reduction potential resulting from the newly implemented practice or management, you can model the baseline or status quo management for each individual farm or field, and then model the potential conservation management scenarios.

These scenarios should be created together with the farmer to be realistic and achievable with their current management. Build out and update the model with the season's actual management as the project progresses, including the newly implemented conservation activities, and verifying management as needed. The incentive payment will be based on the final nutrient or sediment reduction, calculated by the difference between the modeled baseline output versus the output resulting from the implemented conservation scenario.

Baseline timeframe can be:

a) **Historical**- Use the management history to determine the farm's typical baseline management system. This may be established based on an acceptable project timeframe. Either build the baseline forward through your project timeline and use yearly baselines or use an average (i.e., pounds) of phosphorus or sediment lost over the last crop rotation cycle.

b) **Current year**- A farm's baseline is the management to date or the year a project starts. This baseline can be averaged across the land area (i.e., acres) or compiled for each field on an annual basis.

Drawbacks: Individual modeling methods can be time-consuming and complex. They require detailed data collection and extensive discussions with the farmer about each year's actual field management.

Advantages: The results are tailored to a farm's system on an individual basis, taking into account varying topography, soil, and management history. This method responds to management shifts that seem small, but can have big impacts on specific fields. For example, changing a crop rotation.

Geography-Based Estimation

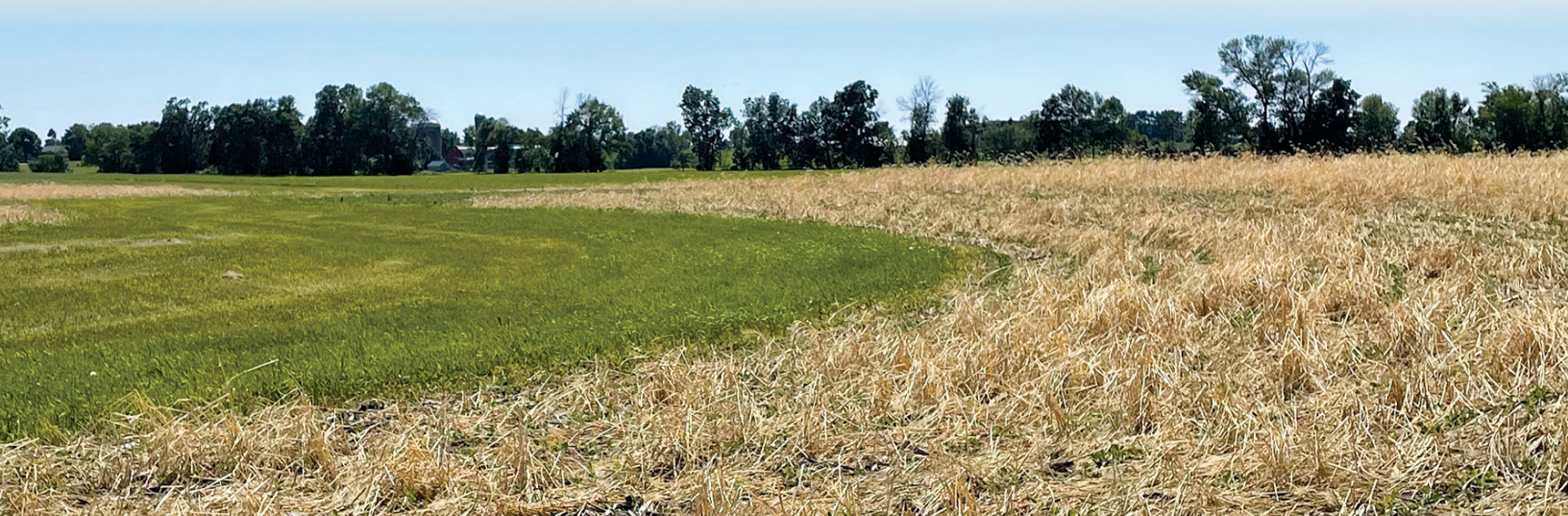
General baseline and conservation scenarios can be built on knowledge of geography and management for a project's territory, and can vary in the level of detail.

Local isolated practice estimations: Baseline farm metrics can be estimated for all farms across a given territory. New management practices are modeled against the common baseline to provide estimated phosphorus and sediment reductions per practice in a region. This isolates the data reported to only the effect of that specific practice.

Matrix: The most impactful geographical features or management practices can be identified for a given area. A matrix is then developed to estimate the potential reductions that a farm could achieve based on those "dominant" geographical features and management practices selected throughout the matrix.

Drawbacks: Estimations leave room for error and reductions may be less impactful to the farmer since they are not based on individual field metrics. This does not account for system-wide changes that results from implementing a new practice (e.g., adjusting tillage timing from fall to the spring to account for cover crop implementation).

Advantages: These strategies can take considerable time up front, but take less time for analysis once organized. This may mean that producers could get exact payments for changes upfront, and the staff time each season will be minimal for ongoing analysis.



Payments: Performance-based incentives provide a direct return for a desired result (e.g., reduced phosphorus). Some methodologies, such as the geography-based estimation, can still estimate phosphorus or sediment reduction based on the specific practice, yet set a payment rate based on the practice implemented (i.e., per acre of buffer).

Modeling Options beyond SnapPlus

- Field to Market's Fieldprint Platform can quantify several metrics. Fieldprint Platform uses field-specific data to calculate eight metrics: biodiversity, energy use, greenhouse gas emissions, irrigated water use, land use, soil carbon, soil conservation, and water quality. These outcomes are tied to the farm's specific management decisions. This tool is accessible across various farms and regions, enabling nearly anyone to use it for outcome estimation.
- Colorado State University's COMET-Planner is a simple tool with minimal data requirements to estimate reductions in greenhouse gas emissions. Reductions are estimated based on the Natural Resources Conservation Service (NRCS) practice standard and the geographic location (zip code) of the field. These reduction estimates are quite generalized, but have the benefit of not requiring much data. COMET-Farm offers a more thorough estimate of greenhouse gas emissions, though it requires extensive data collection, including multiple years of field history.
- Tartleton State University's Nutrient Tracking Tool is a tool for estimating water quality benefits of conservation practice changes. It will estimate nitrogen, phosphorus, and sediment losses from a field based on crop management and conservation practice adoption. The data requirements are similar to that of Fieldprint Platform, but many inputs can be defaulted to the average value for a region. The Nutrient Tracking Tool can also provide an estimate of the economic impacts of adopting a new conservation practice.

Sand County Foundation hosted roundtable discussions across Wisconsin to connect PBC practitioners, including community programs and those working to meet Wisconsin Pollutant Discharge Elimination System (WPDES) compliance strategies. Although each program operates differently, they all aim to improve water quality through farm management conservation improvements. There is a continual balance of efficiency and accuracy.

A significant advantage of PBC is the flexibility it provides to farms when making management decisions. This approach allows farms to transition towards a more conservation-focused system without requiring them to adopt specific conservation practices, regardless of the model or tactic used for quantification. Instead of imposing a particular practice, such as cover crops, PBC enables farms to select the strategies that are most effective for their unique farming operations. This ensures that the chosen practices align with the specific needs and conditions of their fields.

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Sand County Foundation inspires and empowers farmers, ranchers, and forestland owners to ethically care for the land to sustain water resources, build healthy soil, and enhance wildlife habitat.

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