JANUARY 2025

Innovative Agriculture to Build Soil Health, Increase Climate Resilience, and Advance a Land Ethic

A Wisconsin, Lake Michigan Basin-based Demonstration Project led by Sand County Foundation

Project Background

Soil moisture and temperature are key drivers of agricultural production systems, dictating planting schedules, crop development, and timing of field work. Over the past decade, Wisconsin farmers have been challenged with spring hail, persistent rainfall, and severe drought. Under current climate models, soils are expected to be exposed to extended, intermittent flash-drought conditions, as well as periods of more intense wetting and flooding. This on-farm demonstration integrates soil moisture and temperature sensors to enable farmers to make in-season management decisions based on real-time data. Results will address growing farm management concerns in areas challenged by extreme (abundance or deficit) precipitation events.

By comparing data collected on fields where soil health management principles have been implemented with data from adjacent conventionally managed fields, farmers will better understand how management can influence water infiltration and holding capacity, soil trafficability, leaching potential, aggregate stability, and other soil properties critical to improving climate resiliency and reducing erosion.

Evaluation Approach

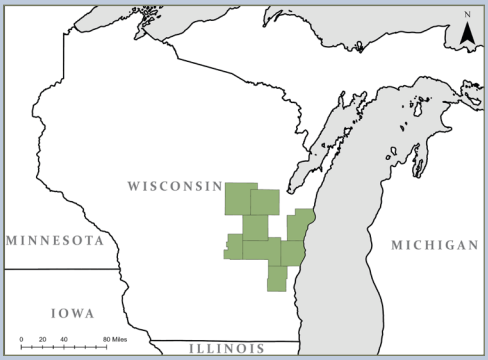
Twelve paired (24 total) fields on similar soil textures and landscapes were selected.

Soil Health Management

Field should have been managed with soil health principles for three or more years.

Conventional Management

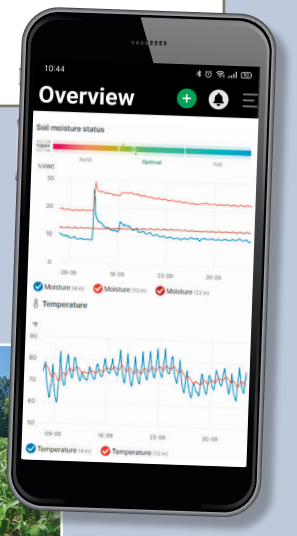
The paired field will be conventionally managed, located adjacent to the soil health managed field.



To verify consistency in soil characteristics between the field pairs, EarthOptics applied their soil mapping technology to confirm electrical conductivity and soil map units for each field. After consulting with each farmer, locations in the paired fields were chosen for the installation of the CropX soil sensors, which collect soil moisture and temperature readings at 4-in, 12-in, and 22-in depths.

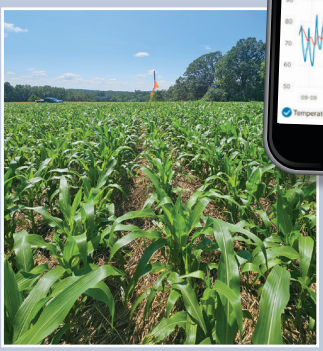
Soil Health Principles

1) Minimize Soil Disturbance
2) Maximize Soil Cover
3) Maximize Plant Diversity
4) Maximize Presence of Living Plants/Roots
5) Integrate Livestock
6) Know your Context



Soil health sampling began September 2024, following harvest, and will occur annually through 2026. Three, 0–6-inch composite samples were collected from three locations within 10-feet from the sensors. Samples were submitted to the University of Missouri for an expanded soil health analysis, which includes:

- Potentially Mineralizable Nitrogen
- Active Carbon
- Total Organic Carbon
- Water Stable Aggregates
- pH (salt and water)
- Effective Cation Exchange Capacity
- Exchangeable Cations
- Plant Available Phosphorus



To prevent damage, most of the sensors are removed each fall and reinstalled in spring following planting. Data collection will continue over two more field seasons, concluding the project in Spring 2027.

The fields will be modeled to quantify carbon sequestration to estimate the potential benefit soil health management has not only on farm resilience but also on reducing greenhouse gas emissions. This project also strives to build collaborative farmer networks to share data and findings, with a goal of improving land stewardship and empowering landowners across the Wisconsin, Lake Michigan Basin.

FOR MORE INFORMATION, CONTACT:

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EARTHOPTICS

Sand County Foundation inspires and empowers land owners and managers to ethically care for the land to sustain water resources, build healthy soil, enhance wildlife habitat, and support outdoor recreation.

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