



United States  
Department of  
Agriculture

# Edge-of-Field Monitoring

## Ohio Network



The USDA-ARS Edge-of-Field Network consists of multiple paired fields, the majority of which are located in northwest Ohio.

## Purpose

Edge-of-field research focuses on monitoring, identifying and reducing agricultural nutrient loss, which can impact the health of streams, rivers and lakes. The USDA's Natural Resources Conservation Service (NRCS), Agricultural Research Service (ARS) and other partners utilize edge-of-field research to measure the quantity and quality of agricultural runoff to evaluate the overall effectiveness of conservation practices that aim to reduce sediment and nutrient loss.

By partnering with researchers, producers provide important insight on how conservation practices interface with farm activity. This data plays a critical role in informing producers on how to apply impactful conservation practices on their land, responsibly managing natural resources and ensuring the commercial viability of their operations.

## Ohio Efforts

ARS operates approximately 20 paired edge-of-field sampling sites which collect both surface and subsurface water samples throughout Ohio. With an initial infrastructure investment of \$2 million and an average annual operating cost in excess of \$400,000, these samplers are maintained year-round to provide a comprehensive picture of nutrient and sediment loss through data collection, analysis and interpretation.

Since the project began in 2005, more than 400 site years of data have been collected utilizing automated ISCO water sampling monitors. By implementing a Before-After-Control-Impact (BACI) research design, ARS scientists are able to isolate the effects of various management and conservation practices on edge-of-field water quality.

The research results are integral to identifying management and conservation practices that reduce agricultural nutrient loss. The annual and long-term data collected by this network are also used to develop and validate many modeling tools used to predict nutrient loading to Lake Erie.

Edge-of-field data includes:

- **Runoff Quantity & Timing:** Amount of water passing by each site
- **Climatic Data:** Precipitation amount, timing and intensity
- **Water Quality Data:** Dissolved reactive phosphorus, total phosphorus, nitrate nitrogen and total nitrogen.





## Nutrient Loss Factors

Edge-of-field testing has pointed to factors that impact nutrient loss, including:

- Connectivity to water
- Placement of phosphorus fertilizer
- Time of fertilizer applications
- Rate of fertilizer applied
- Source and legacy phosphorus effects

## Improving Water Quality: Proven Practices

The USDA works closely with conservation partners and farmers to implement a comprehensive plan to enhance water quality based on lessons learned from edge-of-field data.

Farmers apply conservation practices to manage nutrients, control nutrient and sediment movement and trap nutrient and sediment loss. These practices improve water quality and include:

- Conservation Tillage: Enhances soil health, improves agricultural productivity and drought resilience
- Crop Nutrient Management: Efficient application reduces the loss of

nutrients and the cost of application

- Cover Crops: Prevents soil and wind erosion, improves soil health and improves water filtration
- Conservation Buffers: Traps sediment, controls flooding and creates wildlife habitat
- Drainage Water Management: Conserves water use and may reduce nutrient loads (especially nitrogen)
- 4R Nutrient Management: Proper rate, timing and placement of nutrients reduces edge-of-field losses and retains nutrients for crop use
- Erosion and Sediment Control: Reduces downstream exports of sediment and nutrients, keeping the soil on the land

Farmers recognize the importance of water quality. These voluntary initiatives provide producers with science-driven tools to implement and accelerate on-farm conservation practices to improve the health of Ohio's streams, rivers and lakes.

This project and the resulting data would not be possible without the partnership and efforts of participating farmers and Ohio's strong network of agriculture organizations and institutions.

### 4R Nutrient Stewardship



Right Source



Right Rate



Right Time



Right Place