

IOWA Nutrient Research Center



FY18 Request

An incremental increase of \$26,500 (2.0%) for the Iowa Nutrient Research Center to continue research in improving Iowa's water quality and developing new ways for farmers to manage nutrients. Current FY17 funding is \$1.325 million. (The increase is included as part of Iowa State University's Special Purpose Appropriations Requests.)

The Iowa Nutrient Research Center was established in 2013 by the State Board of Regents in response to legislation passed by the Iowa Legislature and signed by Governor Branstad. The center, administered by Iowa State University, is meeting the need for continued research and innovation to address Iowa's water quality concerns. Center research evaluates the performance of current and emerging in-field and edge-of-field practices, providing recommendations on implementing new or tested practices and developing tools to help decision-making in adopting effective management practices.

Meeting Iowa's Needs in Water Quality

The work of the Iowa Nutrient Research Center is important to fill gaps in nitrogen and phosphorus research that are important to Iowa in reducing loss of nutrients to the environment. The center has funded over 40 projects in its first four years, led by scientists at Iowa State University, the University of Iowa and University of Northern Iowa and in collaboration with other agencies, organizations, cities, farmers and landowners. Scientists meet on an annual basis to discuss research results, gauge progress, and identify research priorities.

Highlights of Research Progress

- ▶ Field and lab experiments are improving the understanding of winter cover crop management and the relationship to impacts on corn yield.
- ▶ Saturated buffers are being evaluated to better assess their ability to remove nitrates from tile flow.

- ▶ Research is evaluating nutrient removal effectiveness of promising edge-of-field practices such as restored oxbows, prairie strips, and prairie potholes.
- ▶ Work is underway to better understand farm profitability impacts of precision conservation and grazing cover crops.
- ▶ Intensive research in the Onion Creek Watershed in Boone County is providing new insights on the contributions of stream bed and bank erosion to phosphorus transport.
- ▶ Research is taking a much more precise look at nutrient movement at the scale at which they are delivered to surface waters from various watersheds—for most of Iowa's cropland, a scale of a few hundred to a few thousand acres.
- ▶ How trading nutrient credits may benefit cities and farmers—and water quality as a whole—is explored in a pilot project in the Catfish Creek Watershed near Dubuque.
- ▶ Work on research farms and in farmers' fields is evaluating species and mixes of native perennials for prairie strips to reduce soil erosion and nutrient losses.
- ▶ Research is seeking to improve bioreactor performance, reduce cost, and understand potential unintended consequences.

www.cals.iastate.edu/nutrientcenter

IOWA STATE
UNIVERSITY

THE
UNIVERSITY
OF IOWA

University of
Northern
Iowa

IOWA Nutrient Research Center



Accomplishments and Impacts, 2013 - 2016

The Iowa Nutrient Research Center was established in 2013 by the State Board of Regents in response to legislation passed by the Iowa Legislature and signed by Governor Branstad. The Dean of the College of Agriculture and Life Sciences shall appoint a director and there is designated an eight person advisory council. www.cals.iastate.edu/nutrientcenter

The purpose of the center shall be to pursue a science-based approach to nutrient management research that may include but is not limited to evaluating the performance of current and emerging nutrient management practices, and using an adaptive management framework for providing recommendations for the implementation of nutrient management practices and the development of new nutrient management practices.

Accomplishments to date

- Advisory Council meets annually
- Collaboration across three universities, USDA, IDNR, and IDALS
- \$5.475 million state appropriation in first four years
- Over 99% of funds to faculty for research projects
- Over 40 research projects and 76 investigators
 - Infield (9), Edge-of-field (17), Land use (7), Streams (6), Humans (4)

Impacts

- Leveraged with federal, state and NGO funding. At ISU-CALS-AES-EXT alone:
 - \$2.28 million annually allocated faculty and staff salary
 - \$17 million of grants in 110 projects from 49 agencies across 5 years
 - Federal funds represent 50% of the total from USDA, NSF, EPA and others

Impacts (cont.)

- Additional leverage with HUD grant and at other Regent's institutions
- Saturated buffer research
 - USDA recognized research and developed a national practice standard
 - Changed Federal policy to allow saturated buffers with cost share on CRP
- Cover crop barriers
 - Identified sources corn yield impact of rye cover crops and management to address. Exploring alternative cover crops with less negative impacts.
- Better understand nutrient movement in landscape
 - Impact of stacked practices across paired watersheds
 - Identify nutrient movement at delivery scale in sub-watersheds
 - Precision conservation and within field management

IOWA STATE
UNIVERSITY

THE
UNIVERSITY
OF IOWA

University of
Northern
Iowa

IOWA Nutrient Research Center



Iowa Nutrient Research Center Projects

2016

1. Advancing Longitudinal, Multilevel, and Spatial Analysis of the Iowa Nutrient Reduction Strategy Farmer Survey Data
2. Establishment and Monitoring of Saturated Buffers
3. Land Tenure and Nutrient Management Practices: Identifying Economic Barriers and Incentives for Landowners and Tenants to Meet Growing Soil and Water Conservation Needs
4. Building Cost-Effective Prairie for Multiple Nutrient Reduction Practices
5. Evaluation of Measurement Methods as Surrogates for Tile-Flow Nitrate-N Concentrations
6. Evaluating the Nutrient Processing Capacity of Roadside Ditches
7. Phosphorus Contributions from Eroding Iowa Stream Banks
8. Woodchip Bioreactors for Improved Water Quality
9. Impacts of Prairie Pothole Hydrology on Field-Scale Losses of Nitrogen and Dissolved Phosphorus
10. Improving the Capacity to Detect Load Reductions
11. Potential Methylmercury Production in Bioreactors and Wetlands Intercepting Elevated Nitrate Loads in Iowa

2014

1. Measuring the Effectiveness of Stacked Nutrient Reduction Practices
2. Scientific and Technological Tools to Implement Iowa Nutrient Reduction Strategy
3. Stream Nitrate Trends Affected by Farming Practices in the Walnut Creek Watershed
4. Phosphorus Loss from Ephemeral Gully Formation and Sediment Transport
5. Modeling of Nitrate Loads and Concentrations in the Raccoon River
6. Developing Remote Sensing Protocols for Inventory of Nutrient Management Practices
7. Drainage Water Quality Impacts of Current Future Agricultural Management Practices
8. Nutrient Trading in Iowa: A Pilot Study in the Catfish Creek Watershed
9. Prairie Seed Mixes for Contour Buffer Strips: On-Farm Demonstration and Workshops
10. Developing Remote Sensing Protocols for Inventory of Permanent Vegetative Practices

2015

1. Evaluation of Stacked Conservation Practices on Phosphorus and Sediment Loss
2. Linking Nutrient Reduction Practices with Biomass Energy: Quantifying Thermal Energy Demand and Supply Capacity for Representative Farms in Eastern Iowa
3. Scientific and Technological Tools to Implement Iowa Nutrient Reduction Strategy
4. Identifying and Quantifying Nutrient Reduction Benefits of Restored Oxbows
5. Water Quality Performance of Prairie Strips
6. Quantification of Nutrient Reduction Practices Benefits from the Hillslope to the Watershed Scale
7. Quantifying Temporal and Spatial Variability in NO₃-N Leaching Across Iowa
8. Reducing Nutrient Losses While Increasing Farm Profit Through Precision Conservation
9. Impacts of Cover Crops on Phosphorus and Nitrogen Loss with Surface Runoff
10. Utilizing Beef Stocker Cattle to Enhance the Value of Cover Crops
11. Cover Crops Influence Nutrient Cycling, Yield and Diseases of Corn and Soybean
12. Woodchip Bioreactors for Improved Water Quality

2013

1. Social-Economic Research Work Plan
2. Investigating Causes of Corn Yield Decreases Following Cereal Rye Winter Cover Crop
3. Establishing Pragmatically Dynamic Program for Extending Water Quality BMP Financial Information: Farmer Tools for Iowa Nutrient Reduction Strategy
4. Phosphorus Transport in Iowa Streams: Importance of Stream Bed and Bank Erosion
5. Establishment and Monitoring of Saturated Buffers within High-Priority HUC-12 Watersheds
6. Nonpoint Source Nitrogen and Phosphorus Loads at Implementation Scale: Direct Agricultural Nutrient Loads to Surface Waters in Relation to Land Use and Management
7. Impacts of Cover Crops on Phosphorus and Nitrogen Loss with Surface Runoff
8. Bioreactor Research and Assessment of Woodchip Tile Denitrification Bioreactors: Optimal Design/Performance and Experimental Bioreactor Installation and Study
9. Iowa Institute of Hydraulic Research (IIHR) - Hydroscience and Engineering Work Plan
10. Distribution, Transport, and Biogeochemical Transformations of Agriculturally Derived Nitrogen and Phosphorus in Cedar River Watershed