



**2023 NREC Funded Research Projects**

See the end of this document for objectives for newly funded projects

Project Title	Institution	Principal Investigator	2023 Project Budget
<b>New for 2023</b>			
Quantifying the effects of tillage, fertilizer placement, and winter cover crops on nutrient losses via soil macropore flow	UI	Yu	\$ 98,039
On-farm and farmer-led: quantifying nutrient use efficiencies and contextualizing nutrient losses in corn-soybean production	UI	Margenot	\$ 77,884
Assessing Diverse Crops for N and P Efficiency, C Sequestration, and Economic Impact on Illinois Crop Rotation	ISU	Ryhkerd	\$ 152,421
A missing piece of the Illinois phosphorus puzzle: quantifying statewide streambank erosion in inform effective nutrient loss reduction strategy	UI	Margenot	\$ 286,382
Updating Illinois phosphorus and potassium soil test recommendations for the 21 <sup>st</sup> century	UI	Margenot	\$ 86,870
<b>Ongoing projects</b>			
Intensification of corn-soybean rotation with wheat to improve water quality, soil health and farm profit	SIU	Sadeghpour	\$ 173,242.00
Assessing Illinois WASCoB's - water quality, legacy P and sediment trapping	SIU	Schoonover	\$ 109,317.00
Double-Dipping P Loss Reductions: Integrating and stacking struvite in P BMP's	UI	Margenot	\$ 118,615.00
Improve the N rate calculator and MRTN for Illinois farmers by leveraging NREC historical N trials and new computing tools	UI	Guan	\$ 137,685.00
Evaluating streambank and in-stream erosion as a source of P and sediment in two agricultural watersheds	SIU	Schoonover	\$ 99,854.00
Integrating livestock grazing into the western Illinois corn-soybean cropping system to enhance farm profitability and reduce nutrient loss	WIU	Bernards	\$ 84,242.00
Knowledge is power: Powering up bioreactors and saturated buffers in Illinois	UI	Christianson	\$ 83,456.00
Characterizing sub-field variability for efficient phosphorus management: targeting hotspots	UI	Fraterrigo	\$ 25,420.00

Reducing Nutrient Loads in WASCOBs in Southern Illinois	UI	Yu	\$ 83,573.00
Nitrogen Management Systems in Tile-Drained Fields: 4R Plus – Rate, Source, Time, Place and Cover Crops (Douglas County)	UI	Yu	\$ 171,625.00
Managing the maize microbiome for sustainable nutrient retention in Illinois agricultural soils	UI	Kent	\$ 180,673.00
Precision Nitrogen Management of Corn for Improving Farm Profitability and Water Quality in Southern Illinois	SIU	Sadeghpour	\$ 211,976.00
Next Generation Cover Cropping in Corn-Soybean Rotation to Improve Farm Benefits and Decrease Environmental Losses in South and Central Illinois	SIU	Sadeghpour	\$ 199,784.00
Water and Sediment Control Basins (WASCoBs) influence on Crop Yields and Water Quality	SIU	Schoonover	\$ 136,294.00
Minimizing phosphorus and nitrogen loss from agricultural systems with cover crops and tillage in Southern Illinois	SIU	Williard	\$ 172,231.00
Sources and cycling of nitrate in tile-drained corn-soybean rotation systems: A stable isotope approach	UI	Yu	\$ 116,188.00
Designer Biochar to Capture and Recycle Phosphorous from Tile Drainage Systems	UI	Zheng	\$ 7,551.00
Capitalizing on 150 Years of Soil Samples to Determine Legacy P and Improve Water Quality in Illinois	UI	Margenot	\$ 185,078.00
Nitrogen Rate Research & NREC Project Partnership	IFCA	Schaefer	\$ 290,000.00
A Long-term Evaluation of Nitrogen Application Timing and Cover Crops Impacts on the Fate and Availability of Nitrogen Fertilizer and Crop Production on Tile Drained Fields	Purdue	Armstrong	\$ 215,082.00
The effect of cover crops on surface water quality: A paired watershed experiment in the Lake Bloomington watershed	Purdue	Armstrong	\$ 226,278.00
Evaluating nutrient loss reduction strategies: longer rotation with cover crops and bioreactor (Miller Project)	UI	Yu	\$ 129,190.00

### Project Objectives of Newly Funded Projects

<b>Quantifying the Effects of Tillage, Fertilizer Placement, and Winter Cover Crops on Nutrient Losses via Soil Macropore Flow</b>	UI	Yu
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#### Objectives:

1. To quantify the magnitude and dynamics of soil macropore flow in response to precipitation events in a corn-soybean rotation.
2. To investigate the effects of tillage, fertilizer placement, and winter cover crops on tile N and P losses via soil macropore flow.
3. To include a final report at the conclusion of this project to address each of the objectives stated

<b>On-farm and farmer-led: quantifying nutrient use efficiencies and contextualizing nutrient losses in corn-soybean production</b>	UI	Margenot
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**Objectives:**

1. Install continuous flow and nitrate sensors to monitor real-time nitrate-N loads from three tile-drained fields
2. Use flow measurements to estimate tile flow at additional field sites to estimate nitrate-N loads
3. Measure tile line P loads using farmer-collected tile drainage samples for P and flow measurements

<b>Assessing Diverse Crops for N and P Efficiency, C Sequestration, and Economic Impact on Illinois Crop Rotation</b>	ISU	Rhykerd
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**Objectives:**

1. Evaluate the impact of selected cover crops on soil N and P content.
2. Evaluate soil porewater N and P content at 45 and 90 cm, root zone and tile depths.
3. Measure carbon sequestration of selected cover crops in a corn-soybean rotation.
4. Measure mineralization rates of cover crop residues during the summer growing season.
5. Determine the impact of cover crops on corn and soybean yields.
6. Evaluate the economic impacts of including cover crops in a corn-soybean rotation.
7. Include a final report at the conclusion of this project to address each of the objectives stated above.

<b>A missing piece of the Illinois phosphorus puzzle: quantifying statewide streambank erosion in inform effective nutrient loss reduction strategy</b>	UI	Margenot
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**Objectives:**

1. Quantify the extent and magnitude of long-term (decadal) streambank erosion across Illinois.
2. Assess short-term, fine-scale streambank erosion and its drivers at representative watersheds that capture the diversity of streams, soil and landscape characteristics of Illinois.
3. Develop estimates of state-wide P loading via streambank erosion at the HUC-8 watershed scale.
4. Integrate results to update Illinois NLRs to (i) account for streambank contributions to non-point P losses, both historical and present, (ii) build simple-to-use tools to enable landowner, SWCD and other individuals to monitor streambank erosion, to (iii) support watershed planning and implementation, including targeting bank stabilization.

<b>Evaluating streambank and in-stream erosion as a source of P and sediment in two agricultural watersheds</b>	UI	Margenot
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**Objectives:**

1. Establish CSTV for major soil types of Illinois, specific to corn, soybean and wheat
2. Account for (i) soil type, (ii) nutrient stratification by tillage management (conventional, strip, no-till) and (iii) soil sampling depth to fine-tune CSTV interpretations, as well as (iv) recent advances in modeling CSTV
3. Develop conversion factors among P and K tests to account for new tests being used in the 21<sup>st</sup> century (e.g., Bray P to Mehlich-3 P, ammonium acetate K to Mehlich-3 K)
4. Integrate updated CSTV with recent and ongoing NREC-funded projects on nutrient management recommendations, and disseminate in a robust outreach program