**Introduction**

Nutrient transport from runoff events has affected crop production and revenue due to loss of nutrients, and deteriorated water quality, leading to harmful algal blooms and hypoxia in receiving water bodies in the continental United States.

**Need:** To assess these runoff risks, an enhancement of the existing runoff risk assessment tools (e.g., the Runoff Risk Advisory Forecast, RRAF) system is needed to support agricultural producers to avoid nutrient application before significant runoff events.

**Idea:** Develop a statistical model to predict the occurrence/magnitude of EOF runoff events at a daily scale for the lower 48 using the outputs from the National Water Model (NWM).

**Method**

1. **Observations and Model Outputs**
   
   Edge of field (EOF) observations were collected from over 50 locations across the upper Midwest and Great Lakes. Together with 72 out of 172 NWM outputs, these EOF measurements are used to train a statistical model for each watershed.

2. **Workflow**

   **Step 1:** Identify the influential variables using Directed Information (DI) ([Hu et al., 2018](#)).

   **Input:** $X = (X_1, X_2, ..., X_j)$ and $Y$.

   **Output:** $Y = f(X_1, X_2, ..., X_j)$.

   **Step 2:** Predict the occurrence of an EOF event using boosted classification Trees (BCT).

   **Step 3:** Predict the magnitude of an EOF event using boosted regression Trees (BRT).

**Results and Discussion**

1. **Influential Variables**

2. **Prediction of the occurrence of EOF runoff**

   For all 11 missing events

   - $P_{hit} = 82/102 = 80.4%$
   - $P_{false} = 7/102 = 6.9%$

   For all 193 false alarms

   - $P_{hit} = 183/124 = 146.3%$
   - $P_{false} = 124/124 = 100%$

**References & Acknowledgments**