Appendix C

NREC Project Topics
Fox River Implementation Key Findings

Nutrient Research & Education Council Project Topics

In 2017, NREC is focusing on the following key areas of investigation that farmers have identified as needs based upon the goals outlined in the Illinois Nutrient Loss Reduction Strategy. Included in the list are questions that have arisen from results of existing projects funded by NREC.

Nitrate-Nitrogen and Total Phosphorus Management Projects

1. Continue/expand studies testing the impact of nitrate-nitrogen management systems on efficiency of nitrate-nitrogen use.
    a. Expand the work on optimum nitrate-nitrogen rate to include more Illinois soil types, especially in Southern Illinois.
    b. Evaluate the efficacy of combinations of method and time of application on nitrate-nitrogen efficiency. For example, combination of preplant nitrate-nitrogen and late nitrate-nitrogen application using conventional application methods (UAN injected preplant and Y drop method for late application) for corn.
    c. Evaluate the efficacy of fertilizer additives that claim to enhance the efficiency of nitrate-nitrogen fertilizer use. This would include but not be limited to nitrification inhibitors and urease inhibitors.

2. Determine factors impacting release and/or tie-up of organic and fertilizer nitrate-nitrogen (mineralization immobilization, nitrification, denitrification, leaching, and plant uptake). This research will require the use of N^{15} as well as established tile system.

3. Cover Crops: Evaluate the feasibility, economics and best management practices of growing cover crops to address nitrogen and phosphorus loss as well as crop productivity. Best management practices should look at all aspects of cover crops from crop selection and seeding through crop termination. NREC is particularly interested in funding research on projects that:

    a. Identify the best combination of cover crop species to use depending on crop to follow and geographic location within the state.
    b. Provides options for farmers to consider when selecting product and times to use to kill cover crops.
    c. Identify factors that effect when and how much nitrate-nitrogen is released from cover crop to the following year crop.
    d. Identify what pool of inorganic nitrate-nitrogen was used by cover crops.

4. Evaluate the utilization of nitrate-nitrogen from DAP and/or MAP in comparison to Triple Superphosphate (TSP) for both fall and spring application.

5. Evaluate the agronomic and environmental benefits of tillage and the placement and timing of phosphorus applications.

Tile and Conservation Systems

6. Tile Drainage: Evaluate drainage water management practices such as managed drainage (controlling flow) and the impact of tile spacing and depth on nutrient loss from a field

7. Bioreactors, Buffers and Saturated Buffers: An evaluation of practical approaches to installing these systems in areas where drainage ditches are the conduit for tile drainage. Focus should be on ways to utilize these systems to provide the most practical benefit while limiting the amount of land taken out of production.

In addition, NREC has asked that all projects contain an economic cost/benefit analysis as to the practicality of the adoption or utilization of these practices in a farming operation.

All projects submitted are subject to an external peer review as well as internal review by the Council's Research Committee. Projects are then evaluated and ranked by the committee to make a recommendation to the full NREC Council.

In addition to detailed mid-year and year-end project reports, NREC also requires that each project identify at year-end any critical observations learned from the study that can be shared with the industry and the general public. A detailed Annual Report is compiled in the spring of each year and is available on the NREC website.

For details on all NREC projects, visit www.illinoisnrec.org.

Fox River Implementation Plan key findings are:

- The annual average total phosphorus load to the Fox River is 1.29 million pounds per year. This comes from multiple sources—46 percent from wastewater treatment plant effluent discharges, 27 percent from agricultural area runoff, 16 percent from the 1,200 square miles of the watershed upstream of the Stratton Dam, and 11 percent from urban area runoff (MS4 communities).
- Summer low flow conditions are critical times when algae blooms and oxygen levels in the river drop below water quality standards. Total phosphorus runoff does not play a significant role during summer low flow periods, even taking into account its contributions to sediment total phosphorus flux. Reduction of total phosphorus loads from farm and urban runoff are likely to play a greater role in the health of tributaries to the Fox River.
- No combination of different mixes of total phosphorus load reductions in the effluent from wastewater treatment plants and removal of two or nine of the river's remaining 13 Illinois dams was identified that met dissolved oxygen water quality standards in the Fox River at all locations and at all times under the critical low flow condition. Dam removal simulations suggested an increase in bottom-growing algae, although when two dams were removed in the early 2000s, there is no evidence that benthic algae growth increased.
- Model results show good agreement with calibration data for total phosphorus and algae in the water column, but it significantly over-predicts the minimum dissolve oxygen and under-predicts maximum dissolved oxygen measured in many locations on the Fox River. This model limitation is now taken into account when reviewing results for dissolved oxygen.
- The Fox River Phosphorus Reduction Tool, developed as part of FRIP, allows communities and farmers to evaluate total phosphorus reductions by the use of practices such as bioretention, dry and wet detention, street sweeping, vegetated swales, conservation tillage, constructed wetlands, field borders, grassed waterways, and nutrient management.