

Reducing Agricultural Nitrate Losses in the Embarras River Watershed through Bioreactors, Constructed Wetlands, and Outreach

Proposed by the University of Illinois at Urbana-Champaign

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Project Summary/Abstract

Our project will combine research, education, and extension on using tile-fed constructed wetlands and wood chip tile bioreactors to reduce nitrate losses in the upper Embarras River watershed in east-central Illinois, a dominantly tile-drained, agricultural watershed. We have an 18 year record of riverine nitrate concentrations and loads for this watershed and have used it for many past studies on water quality, so we have a good understanding of agricultural nutrient export. We can determine the long-term effectiveness of wetlands using three constructed in 1994, while at the same time install two additional wetlands in other areas of the watershed for further studies of their initial effectiveness and for outreach programming. Three tile bioreactors will be installed in various locations in the watershed, again for determining their effectiveness and for outreach programming. Surveys of producers and landowners in the watershed at the start of the project, and then again following installation and outreach programming will provide an assessment of the effectiveness of our outreach, and give us further understanding of barriers to adoption. We will work with UIUC students, Northeastern Illinois University (an HSI), and Illinois 4-H in education programs on wetlands, bioreactors, and the watershed.

Specific objectives include for our tile-drained agricultural watershed in east-central Illinois are to:

1. Determine the effectiveness of both new and previously established tile-fed constructed wetlands in reducing nitrate export from corn and soybean fields, as well as measure wetland greenhouse gas emissions (N_2O , CH_4 , and CO_2) (**research objective**).
2. Determine the effectiveness of wood chip tile bioreactors in reducing nitrate export from corn and soybean fields, including measurements of greenhouse gas emissions from the bioreactor bed (N_2O , CH_4 , and CO_2) (**research objective**).
3. Demonstrate how constructed wetlands and tile bioreactors can reduce nitrate loss from fields with a variety of outreach tools (**extension objective**).
4. Evaluate the acceptance by stakeholders of constructed wetlands and tile bioreactors that reduce nitrate loss from fields, including possible incentives needed to implement either practice to obtain watershed scale improvements (**research and extension objective**).
5. Develop both seminar/discussion and field based courses for undergraduate and graduate students (including a Hispanic-Serving Institution), leading to students equipped with both biophysical and social science skills who can deal with watershed scale water quality issues (**education objective**).
6. Involve Illinois 4-H kids in local water quality issues through development of a wetland module and hands on activities in the watershed (**education objective**).

This project is directly relevant to the “Nitrogen Cycling in Agricultural Watersheds” request in the NIWQP.