Tile Drainage Modifications to Reduce Nitrate Losses in an Agricultural Watershed: Integration of Biophysical and Social Sciences with Extension and Education

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Project Summary

Drainage losses from tile-drained agricultural fields in the upper Midwest are now well established as the major source of nitrate to the Gulf of Mexico, delivered by the Mississippi River. This is a major factor in causing an hypoxic zone that forms each summer in the Gulf. The flat, productive soils of central Illinois produce high yields of corn and soybeans, but the tile-drainage needed to make agricultural production practices feasible and timely on these fields leak large amounts of nitrate. Therefore, the long-term goal of our project is to develop biophysical and social science techniques that could lead to large watershed scale reductions in nitrate export. Our project will focus on the effectiveness and social barriers to implementation of two drainage-related management practices; drainage water management (controlled drainage) and saturated riparian buffers in the heavily tile-drained and high nitrate Spoon River subwatershed of the Upper Salt Fork watershed in east-central Illinois. We will work closely with an active watershed group in all phases of our work that includes a wide range of stakeholders. Modified drainage systems will be installed on the watershed and their effectiveness fully assessed, focusing on where the water goes as well as overall nitrate removal. Simulation modeling will be used to better understand how modified drainage systems would work under varied climate conditions leading to a more complete understanding of what we could expect at the watershed scale. We will implement a full range of extension activities including: fact sheets that highlight research results and document the water quality benefits of the project; field days to demonstrate results to producers, landowners, and the general public; DVD developed that explains the benefits of modified drainage systems; and information on the watershed group's website about the benefits of modified drainage systems. Surveys and focus groups will assess stakeholder interests and motivations before and after extension programming. At the end of our study we will have a thorough understanding of the biophysical aspects of modified drainage systems, as well as knowledge of stakeholder acceptance and barriers (and what incentives might overcome the barriers), effective extension programs, and evaluations of our work. The next generation of professionals will receive education from both biophysical and social science viewpoints, including a field methods course using the watershed as a laboratory, a seminar discussion course that integrates biophysical and social sciences, and a service learning course for 6-8 grade students about watersheds and water quality problems.