The Influence of Subsurface Drainage on Watershed Stream Flow and Nitrate Load, and Potential for Water Conservation

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Justification:
Subsurface tile drainage from agricultural watersheds can significantly alter the stream flow pattern and increase nitrate load to receiving streams. Drainage water management, or controlled drainage, may reduce nitrate load and also conserve water resources in rain-fed agricultural areas. The overarching goal of this study is to quantify the influence of subsurface drainage on watershed stream flow and nitrate load in the Wabash River basin in Indiana and to assess the potential of drainage water management for water conservation. The unique aspects of this research approach include an emphasis on the regional scale, to formulate and estimate tile drainage influences for the entire Wabash River, an analysis of the potential water conservation with wide-spread adoption of drainage water management and the use of a decision tree analysis for mapping of potential subsurface tile drainage at a higher resolution than previously performed.

Objectives:
The project aims to identify and evaluate producer management behaviors that could improve water conservation in corn and soybean crop production in the Upper Midwest. Specific objectives of the study are to: 1) quantify the volume of subsurface drainage per watershed by partitioning the stream flow volume, 2) assess the influence of subsurface drainage on the watershed stream flow pattern in comparison to public perceptions regarding the influence of subsurface drainage, 3) quantify the nitrate load specifically derived from subsurface drainage systems in the Wabash River basin, and 4) assess the potential for nitrate load reduction and water conservation in the Wabash River basin through implementation of drainage water management. A combination of observed data analysis, including stream flow partitioning, hydrologic and statistical modeling, coupled with GIS, will be used to meet the objectives.

Progress to date:
The project officially started on September 1, 2008. To date we have hired a post-doctoral assistant to start in March 2009 and have begun compiling data sources.

Impacts:
Expected outcomes from this project include: maps of potentially tile-drained area in the Wabash River basin; quantification of the influence of subsurface drainage on the stream flow distribution and the potential for drainage water conservation in Indiana; and estimates of nitrate load from subsurface drainage at the regional level. The nitrate load estimates will impact identification and targeting of watershed areas in need of nitrate load reductions which will in turn reduce nitrate loading to Wabash River in Indiana and the Gulf of Mexico.