Woodchip Bioreactors for Improved Water Quality

**Issue:** Woodchip bioreactors are a promising strategy for removing NO$_3$-N from drainage water. However, field bioreactor performance varies greatly and is influenced by temperature, influent nitrate concentration, and hydraulic retention time (HRT). More research is needed on how to optimize the size of a bioreactor, while achieving adequate nitrate removal. Also, recent questions have emerged regarding ‘pollution swapping’ in bioreactors wherein nitrate is converted to alternate end products instead of being lost as N$_2$ gas through complete denitrification.

**Objective:** The overall goal of this study is to evaluate NO$_3$-N fate in woodchip bioreactors over a range of water retention times, while gaining knowledge about improved bioreactor design for field implementation.

**Approach:** Previous funding provided for the design and installation of nine experimental bioreactors at the Iowa State University Agricultural Engineering Research Farm west of Ames. The reactors are designed to allow for differing hydraulic retention times, influent nutrient concentrations, and fill materials. Sampling ports are located at two locations to provide access to water and fill materials, and at the effluent location. Experiments will begin in spring 2017 as soon as flow is available in the county tile line to provide water to the pilot systems, and will run as long as flow is available. Water samples will be collected weekly, and experiments will be conducted in triplicate over a range of three HRTs - two hours, eight hours and 16 hours.

**Investigators:**

- Michelle Soupir, Associate Professor, Agricultural & Biosystems Engineering, Iowa State University
- Natasha Hoover, Research Associate, Agricultural & Biosystems Engineering, Iowa State University
- Thomas Moorman, Associate Professor, National Lab for Agriculture & the Environment, Iowa State University
- Thomas Isenhart, Professor, Natural Resource Ecology & Management, Iowa State University