

Assessment of Woodchip Tile Denitrification Bioreactors

Issue: An edge-of-field practice outlined in the Iowa Nutrient Reduction Strategy's scientific assessment for nitrate removal is denitrification woodchip bioreactors. These are excavated pits filled with woodchips. Tile drainage water flowing through the woodchips converts nitrate into a harmless gas. Since bioreactors are relatively new, little research information from in and around Iowa regarding optimal management is available. This project will provide field-based research on the potential of bioreactors to reduce downstream transport of nutrients and other contaminants.

Objective: Bioreactors in Iowa typically are designed to receive 20% of the expected peak flow delivered by the incoming drainage tile. Flows exceeding this level are bypassed around the bioreactor and enter the receiving stream untreated. This project will assess the most efficient and effective water flow for water quality improvement.

Approach: One existing bioreactor will be used as a control, while four others will be manipulated in various ways to assess nitrate removal and carbon loss from the woodchips. Several years of past water quality data will provide insights into possible alternative management and design schemes. Past and future water quality and flow data will be used to evaluate nutrient reduction performance.

Six pilot-scale bioreactors will be constructed to intersect an existing tile line and redistribute flow to the experimental reactors. A system bypass will allow for reduced or no flow through the pilot reactors. The design will allow collection of influent and effluent water for quality analysis, as well as access to bioreactor materials.

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