2014 Additions to the Iowa Nutrient Reduction Strategy Section 2: Nonpoint Source Nutrient Reduction Science Assessment.

Nitrogen Reduction Practices

Edge-of-Field

Saturated Buffers

Riparian buffers are a proven practice for removing nitrate-N from overland flow and shallow groundwater. However, in landscapes with artificial subsurface (tile) drainage, most of the subsurface flow leaving fields is passed through the buffers in drainage pipes, leaving little opportunity for nitrate-N removal. Saturated buffers are designed to intercept the field tile outlet where it crosses a riparian buffer and divert a fraction of the flow as shallow groundwater within the buffer. The infiltrated water would potentially raise the water table within the buffer into organic rich soil layers and provide an opportunity for the nitrate-N contained in the field tile drainage water to be removed by denitrification before entering the adjacent stream.

Saturated buffers are intended to be implemented on a farm scale. Since the practice is relatively new, little research information from in and around Iowa is available. However, one study assessed performance of a saturated buffer over a three-year period in Iowa (Jaynes and Isenhart 2014). In this study 55% of the total flow from the tile outlet was redirected as infiltration within the riparian buffer. On the basis of the strong decrease in nitrate-N concentrations within the shallow groundwater across the buffer, it was hypothesized that the nitrate-N did not enter the stream but was removed within the buffer by plant uptake, microbial immobilization, or denitrification. Like several other conservation buffer practices, the potential for nitrate-N reduction within saturated buffers is a function of drainage area, hydraulic loading, and riparian soil characteristics.

Nitrogen Reduction Practice Performance

Table 1.

	Practice	Comments	% Nitrate-N Reduction ⁺			% Corn Yield Change ⁺⁺		
			Min	Average (SD*)	Max	Min	Average (SD*)	Max
Edge-of-Field	Saturated Buffer	Additional P removal of about ½ pound of P per year	35	50 (13)	59			

Additions to Appendix A – Literature Reviewed

Saturated Buffers

Only one study was reviewed as saturated buffers are relatively new and effect on nitrate concentration reduction is heavily dependent on design considerations (sizing) (Jaynes and Isenhart, 2014).

(Jaynes and Isenhart, 2014)

This research evaluated a saturated buffer established in in Fall, 2010 within the Bear Creek Watershed in Central Iowa. Load reduction estimates were based on measured flow rates through the water control structure and water samples collected within the structure and within groundwater collected within transects of groundwater monitoring wells downgradient from the distribution tile. Nitrate reduction ranged from 35 to 59% over the first three years. All available data were added to the practice table.