Blind Inlets as Conservation Practices to Improve Water Quality

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Water quality is a pressing issue in modern agriculture, with the focus on nutrients and pesticides polluting bodies of water. The Conservation Effects Assessment Project (CEAP) is a U.S. Department of Agriculture multi-agency effort to evaluate the environmental benefits of conservation practices and to develop new and/or modify existing conservation practices to manage the agricultural landscape for environmental stewardship. In the U.S. Midwest, small closed depressions (potholes) can be productive for farming if drained. The tile riser is a vertical perforated pipe used as a common practice to drain these pothole depressions (Figure 1). However, the tile risers do not provide any other benefits such as filtering the surface runoff; thus, fine sediments and soluble pollutants end up moving through the riser and subsurface drainage tile, and into the outlet channel or ditch. Blind inlets are an alternative conservation practice that can drain the pothole depressions with added benefits (Figure 1). Daily farming operations can be conducted over the blind inlets, including tillage, planting, and harvesting. Furthermore, since the blind inlets are filled with a combination of fine and coarse materials (Figure 2), this bed serves as a filter for sediments and increases the tortuosity of the draining water; thus, sediment runoff and flow rate are reduced. Since losses of nutrients and pesticides are impacted by sediment losses and flow, it is anticipated that surface losses of nutrients and pesticides are impacted by the blind inlet.

Figure 1. Blind inlet and a tile riser on a field with a soybean crop.

In a study in northeast Indiana, USA, we investigated the effectiveness of blind inlets to reduce, compared to the tile riser, the losses of nutrients (phosphate, nitrate, and ammonium) and pesticides (atrazine, glyphosate, 2,4-D, and metolachlor) in two small farmed potholes. Field corn (*Zea mays*) was grown here in 2010 under conventional (chisel plow) tillage. Water samples were collected from the drainage tiles below the blind inlet or the tile riser inlet when rain events occurred (seven in total) during the growing season.

The results of this study demonstrated that the blind inlet, compared to the tile riser, reduced both nutrients and pesticides; the extent of this reduction was dependent on the nutrient and pesticide type (Table 1). Total losses of phosphate were reduced the most by the blind inlet, compared to the tile riser, followed by ammonium and nitrate for the soluble nutrients that were analyzed. The reduction of total atrazine losses were the greatest among the pesticides analyzed,

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followed by metolachlor, glyphosate, and 2,4-D (Table 1). Overall, the blind inlet reduced the total loading of pesticides and nutrients by 63% and 34%, respectively, relative to the tile riser. As expected, the blind inlet reduced the discharge and sediment losses by 62 and 79%, respectively, compared to the tile riser. The effectiveness of the blind inlet compared to the tile riser, to reduce nutrient and pesticide losses can be attributed to several factors, including the reductions in overall flow discharge, greater retention time inducing more sediment deposition in the pothole, and the tortuous pathways in the blind inlet bed. This information can be used by policymakers and agricultural producers in determining conservation planning where nutrient and pesticide loadings to downstream water bodies are a primary resource concern.

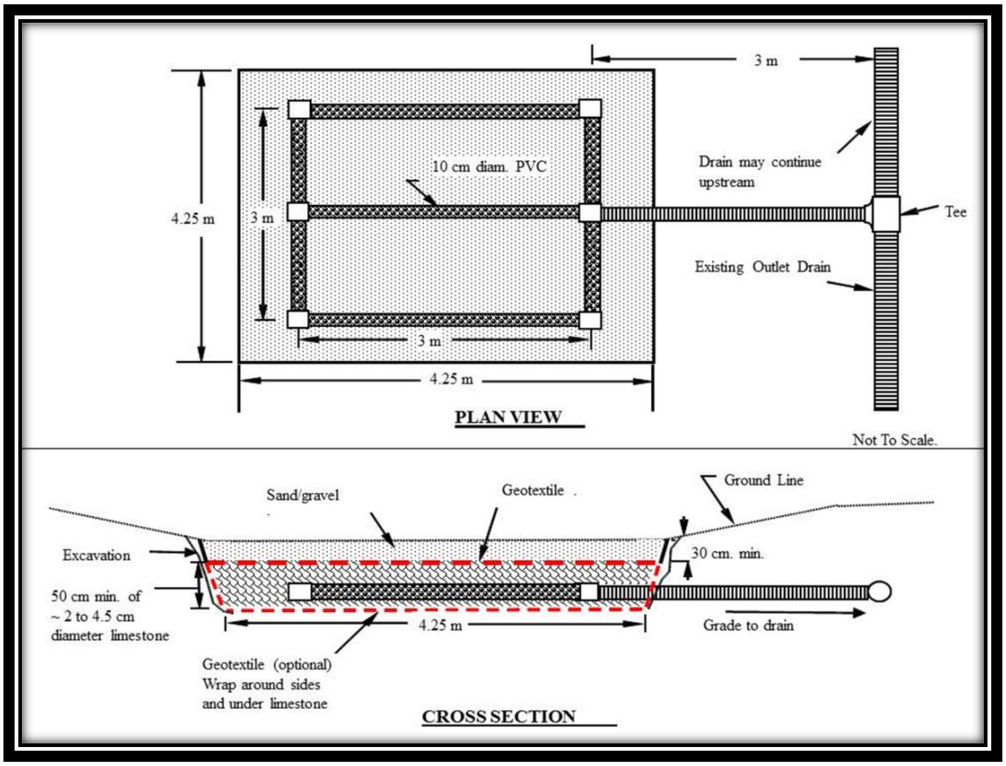

Figure 2. Schematic of the blind inlet.

Table 1. Reduction of discharge, sediment, nutrient, and pesticide loadings from blind inlet, relative to the tile riser during 2010.

Storm	Q*	Sediment	PO_4-P	NH_4-N	NO_3-N	ATZ	GLY	2,4-D	MET
	-- % --								
25-Apr	43	58	68	10	21	36	NA	NA	75
12-May	42	79	51	37	30	54	NA	99	66
21-May	84	85	94	79	80	77	NA	NA	93
31-May	59	84	65	73	-22	79	NA	46	42
12-Jun	63	75	70	72	1	85	74	77	46
27-Jun	63	48	94	57	25	74	83	86	75
Total	**62**	**79**	**72**	**59**	**24**	**82**	**72**	**58**	**80**

*Q: discharge; ATZ: atrazine; GLY: glyphosate; MET: metolachlor; NA: no losses observed.