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Sediment and Nutrient Transport by Overland Flow and Subterranean Flow from an Agricultural Watershed in Southeastern Nebraska

Abstract: Understanding the transport of nutrients and sediment in streams draining agricultural lands is important for protection of waterbodies. The objective of this on-going study is to quantify the effects of overland flow and subterranean flow (combination of baseflow, interflow, and tile-line flow) on water quality of a stream entering a 108-ha recreational Wagon Train Lake in southeastern Nebraska. Stream flow and water quality parameters were monitored at an outlet of a main creek (draining 70% of the 4000-ha Wagon Train Watershed). Stream flow was measured every 5 minutes and composite water sample was collected daily. Separation of stream flow into overland flow and the subterranean flow was estimated based on stream hydrograph, rainfall hyetograph, water turbidity, air temperature, and site visits. From November 2003 to July 2004, monthly volume of water from overland flow was greater than that from subterranean flow in February and May, when major snowmelt and major rainfalls occurred. Monthly flow-weighted bio-available P varied from 0.06 to 0.22 mg P L-1 in the subterranean flow and 0.22 to 0.45 mg P L-1 in the overland flow. Monthly flow-weighted nitrate varied from 0.83 to 2.03 mg N L-1 in the subterranean flow and 1.71 to 2.71 mg N L-1 in the overland runoff. Sediment loading passing through the creek outlet was 5.22 Mg and 64% of this occurred during overland flow events. These preliminary results indicate that overland flow is the main carrier of nitrate, bio-available P, and sediment. Extrapolated to the whole watershed, the sediment entering the lake was 7.2 Mg, higher than the 5.2 Mg per year target of sediment loading set for the Wagon Train Lake by the Nebraska Dep. of Environmental Quality. The next step is to find the best management practices to reduce sediment and nutrient loadings associated with overland flow.

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