AS> Vol.3 No.4, July 2012

OPEN ACCESS

Storm phosphorus concentrations and fluxes in artificially drained landscapes of the US Midwest

PDF (Size:1518KB) PP. 474-485 DOI: 10.4236/as.2012.34056

Author(s)

Philippe Vidon, Hilary Hubbard, Pilar Cuadra, Matthew Hennessy

ABSTRACT

This study investigates phosphorus (P) concentrations and fluxes in tile drains, overland flow, and streamflow at a high temporal resolution during 7 spring storms in anagricultural watershed in Indiana, USA. Research goals include a better understanding of 1) how bulk precipitation and antecedent moisture conditions affect P concentrations and fluxes at the watershed scale; 2) how P concentrations and fluxes measured in tile drains translate to the whole watershed scale; 3) whether P losses to the stream are significantly affected by overland flow. Results indicate that bulk precipitation and antecedent moisture conditions are not good predictors of SRP or TP losses (either concentration or flux) to the stream. However, along with previously published storm data in this watershed, results indicate a threshold-based behavior whereby SRP and TP fluxes significantly increase with precipitation when bulk precipitation exceeds 4 cm. Although total SRP and TP fluxes are very much driven by flow, SRP and TP fluxes are somewhat limited by the amount of P available for leaching for most storms. On average, SRP fluxes in tile drains are 13% greater than in the stream, and stream SRP fluxes account for 45% of TP fluxes at the watershed scale. Our results indicate that when P is the primary concern, best management practices aimed at reducing P losses via tile drains are likely to have the most effect on P exports at the watershed scale.

KEYWORDS

Total Phosphorus; Dissolved Reactive Phosphorus; Scale, Precipitation; Sub-Surface Drainage; Export Rate

Cite this paper

Vidon, P. , Hubbard, H. , Cuadra, P. and Hennessy, M. (2012) Storm phosphorus concentrations and fluxes in artificially drained landscapes of the US Midwest. *Agricultural Sciences*, 3, 474-485. doi: 10.4236/as.2012.34056.

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