

Geochemical processes in the aquifer of a flood plain before and after re-opening of a meander

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Abstract Flood plains are regarded as reactive interfaces between uplands and receiving waters. A site at the River Spree equipped with several groundwater observation wells was used to study nitrogen and phosphorus retention. A clogging layer in an oxbow on the site inhibited the hydraulic contact between oxbow and aquifer. After removing the mud layer and reopening the meander the hydraulic connectivity was restored. The altered flow regime in the flood plain's aquifer caused minor but significant changes in the biogeochemical groundwater composition. Both before and after reopening of the meander, nitrate is being eliminated very efficiently by denitrification in the anoxic aquifer, while ammonium and phosphate concentrations increase. Phosphate and ammonium originate from the mineralization of organic matter and phosphate is additionally released by reductive dissolution of iron-bound P and weathering of bedrock. Redox conditions desirable for a P sink function of the flood plain are opposite to those desirable for nitrate removal. Thus, redox patchiness of flood plain aquifers favours nitrate and phosphate removal, i.e. a temporal and spatial sequence of anoxic and oxic conditions eliminates nitrogen and causes phosphate retention.

Key words nutrients; phosphorus; nitrogen; flood plain; aquifer; river; river restoration