Title: Spatial and temporal variation in nitrogen processing in the Wisconsin River

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The Wisconsin River drains a predominantly agricultural watershed, resulting in a system with high nitrogen concentrations. This aquatic nitrate may be denitrified, utilized in production or exported. The fate of aquatic nitrogen varies seasonally, due to changes in temperature, nutrients and river flow. We examined the spatial and temporal variability in nitrate concentrations and denitrification rates in riverine sediment and hyporheic zones of riverine sandbars. Water samples were taken from the river and the depth of hyporheic flow in each of eighteen sandbars, filtered and analyzed for nitrate-N and ammonia-N concentrations. Sediment samples were taken from riverine benthos and sandbars and the denitrification enzyme activity was measured in the lab using the acetylene block technique. Samples were taken after spring flooding, during midsummer and during autumn low flow in 2004 and 2005. Nitrate concentrations varied significantly over time, with little spatial variation. In 2004, samples were significantly higher than in 2005 ($p < 0.0001$). However, spatial variability in denitrification rates was higher than temporal variation, due to high rates in riverine sediment and low rates in sandbars. While variation in nitrogen processing in the Wisconsin River is high, nitrate availability is more temporally variable while denitrification varies more over space.