





Functional relationships between N processing  
and concentration

There are three models we consider most likely to

## Methods

### Study sites

This study was conducted in the Flint Hills region of Northeast Kansas, USA, which is home to the

golf course (that has retained a portion of native

Samples of dissolved gaseous N were collected at 10 locations along the length of the reach during the  $^{15}\text{NO}_3^-$

station. The shape of the  $\text{Br}^-$  pulse at the downstream site was used to quantify the size of the transient storage zone using the OTIS-P model (Stream Solute Work2opf

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$\text{NO}_3^-$  entering and leaving the reach.  $\text{NO}_3^-$  concentration was multiplied by discharge at stations 1 (most upstream) and 6 (most downstream) below each  $^{15}\text{NO}_3^-$  addition site to achieve influx (IN) and out flux (OUT) rate measurements, respectively, of  $\text{NO}_3^-$  in each experimental stream reach. Groundwater  $\text{NO}_3^-$  flux rate (GW) inputs were calculated as



Average water velocities ranged from 0.9 to 6.7 m min<sup>-1</sup>. The relative size of transient storage zones ( $A_s/A$ , the ratio of transient storage zone area to stream channel area) also differed across streams, ranging from 0.06 in the channelized reach of Ag North to 1.34 in the natural prairie reach of Kings Creek-K2A. Exchange rates of these transient storage zones (a) differed across streams but were not correlated with size of the transient storage zone. We were unable to obtain estimates of transient storage for Natalie's Creek

and nitrification. These ratios of  $U_t$ :nitrification did not significantly differ from one during either day or night samplings.

Total denitrification ranged from below detection to  $2.0 \text{ l g N m}^{-2} \text{ s}^{-1}$  in Swine Creek (Fig. 5).



evidence for saturation, the slope of the relationship was not significantly distinguishable from 1 and marginally distinguishable from zero, therefore the relationship fits the criteria for the 1st order model. Denitrification estimates from Kings Creek-K2A and Shane Creek were excluded from this analysis because denitrification could not be detected in these streams. The denitrification velocity ( $V_{den}$ ) did not have a significant relation-

created by human activities, and to characterize saturation according to three potential models. We found that increased  $\text{NO}_3$

(Fig. 1



gradient of NO

the relative proportion of  $\text{NO}_3^-$  retained by the stream decreased, resulting in longer uptake lengths and a lower  $V_f$ .

Garcia-Ruiz R, Pattinson SH, Whitton BA (1998) Kinetic parameters of denitrification in a river continuum. *Appl Environ Microbiol* 64:2533-2538