

## 1 Supplementary material

**Table S1** Input data for N budget calculations with mean, standard deviation ( $\pm$ , or error range) and number of data points ( $n$ ). Where  $n$  was 1 the error was estimated based on the standard deviations of the measurements in the other zones. In pasture, there was no soil data available, therefore average values from the other FPZ were used to estimate the means and standard deviations for the pasture zone. The data distribution used for the Monte-Carlo-Simulations is given.

Parameter	Unit	Grass (R042)			Willow bush (R041)			Forest (R017)			Pasture (R014)			Data distribution	Data source	
		Mean	Error	n	Mean	Error	n	Mean	Error	n	Mean	Error	n			
$c_{\text{CHANNEL}} \text{NO}_3^-$	$\mu\text{mol L}^{-1}$	137.17	35.98	7	137.17	35.98	7	137.17	35.98	7	137.17	35.98	7	log normal	Fig. 3	
$c_{\text{SOIL}} \text{NO}_3^-$	$\mu\text{mol L}^{-1}$	453.0	502.9	25	55.9	106.4	24	942.5	530.2	24	483.8	379.8	0	log normal	Huber et al. (2012)	
$c_{\text{FPZ}} \text{NO}_3^-$	$\mu\text{mol L}^{-1}$	124.99	27.22	5	53.70	20.30	5	94.79	3.09	3	83.71	18.40	1	log normal	Fig. 3	
$c_{\text{CHANNEL}} \text{NO}_2^-$	$\mu\text{mol L}^{-1}$	0.92	0.52	7	0.92	0.52	7	0.92	0.52	7	0.92	0.52	7	log normal	Fig. 3	
$c_{\text{SOIL}} \text{NO}_2^-$	$\mu\text{mol L}^{-1}$	0.67	0.65	11	0.91	1.38	14	0.25	0.32	24	0.61	0.78	0	log normal	Huber et al. (2012)	
$c_{\text{FPZ}} \text{NO}_2^-$	$\mu\text{mol L}^{-1}$	0.033	0.051	5	2.19	2.17	5	1.82	0.70	3	0.008	0.007	1	log normal	Fig. 3	
$c_{\text{CHANNEL}} \text{N}_2\text{O}$	$\mu\text{mol L}^{-1}$	0.018	0.008	1	0.018	0.008	1	0.018	0.008	1	no data		0	log normal	Fig. 3	
$c_{\text{SOIL}} \text{N}_2\text{O}$	$\mu\text{mol L}^{-1}$	no data		0	no data		0	no data		0	no data		0		Huber et al. (2012)	
$c_{\text{FPZ}} \text{N}_2\text{O}$	$\mu\text{mol L}^{-1}$	0.029	0.021	3	0.076	0.013	3	0.063	0.028	1	no data		0	log normal	Fig. 3	
$c_{\text{CHANNEL}} \text{NH}_4^+$	$\mu\text{mol L}^{-1}$	1.51	0.96	7	1.51	0.96	7	1.51	0.96	7	1.51	0.96	7	log normal	This study (not shown)	
$c_{\text{SOIL}} \text{NH}_4^+$	$\mu\text{mol L}^{-1}$	1.58	13.06	21	5.18	2.55	20	0.87	0.46	18	2.55	5.36	0	log normal	Huber et al. (2012)	
$c_{\text{FPZ}} \text{NH}_4^+$	$\mu\text{mol L}^{-1}$	0.16	0.30	5	0.57	0.96	5	0.49	0.45	3	0.086	0.11	1	log normal	This study (not shown)	
$q_{\text{SOIL}}$	$\text{L m}^{-2} \text{d}^{-1}$	0.73	1.44	317	0.84	1.12	317	0.91	1.38	317	0.83	1.31	0	log normal	Huber et al. (2012)	
$q_{\text{FPZ}}$	$\text{m d}^{-1}$	5.9-17.7			3.3-9.9			1.9-5.7			0.6-1.95			range, uniform	GW flow model	
FPZ length (l)	m	75			135			195.5			64.9				GW flow model	
FPZ width (w)	m	1			1			1			1				assumed	
FPZ height (h)	m	5			5			5			5				Schneider et al. (2011)	
total aquifer volume	$\text{m}^3$	18000			18000			199750			235750				estimated	
Porosity		0.15-0.25			0.15-0.25			0.15-0.25			0.15-0.25			$\pm 0.5$	range, uniform	assumed

2

3