

Interactive comment on “Technical Note: A comparison of two empirical approaches to estimate in-stream nutrient net uptake” by D. von Schiller et al.

M. Gooseff (Referee)

mgooseff@enr.psu.edu

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This manuscript as a technical note is a very useful and practical comparison of two approaches to calculating ambient nitrogen uptake in streams. The multiple repeat data collected from 2 streams provides a compelling database for evaluation. The authors fairly explore the interpretations and limitations of the two approaches. I believe that this will be an excellent contribution to the literature on the biogeochemistry of streams, and will likely be well-cited.

In general, I agree with the other full review, though I have one more perspective on potential bias in both method approaches that I think the authors might consider ad-

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ressing. As the authors indicate, the influence of groundwater can be potentially great on the patterns of nitrogen concentrations observed in a stream. However, accounting for only groundwater inputs of nitrogen (as others have done before) ignores the potential influence of concurrent gain and loss of stream water on stream nitrogen concentrations (e.g., Covino and McGlynn 2007; Payn et al., 2009). Losses of stream water do not change the stream concentration of any solute, and as such, losses are rarely identified. However, when concurrent gains and losses occur, the gains to the stream, regardless of the nitrogen concentration of that groundwater (though this is made more complicated when this value is highly uncertain) may have a disproportionate influence on stream nitrogen concentrations, compared to ignoring losses. This is perhaps best considered by assessing mass load changes (combination and losses as well). Most biogeochemistry studies do not account for the dynamic hydrology, and therefore the data to inform such estimates of gains and losses is rarely available. My points here are that 1) the conceptual model that streams can only gain water (and solutes) limits biogeochemical advances because the gains can be misinterpreted if losses are not accounted for, and 2) because the hydrology can be complicated by gains and losses the actual influence of gaining nitrogen concentrations, despite the variability in groundwater concentration, is likely bidirectional and temporally varying. I urge the authors to consider a paragraph discussing this potential limitation to the use of the two methods they use so as to raise awareness of a fundamental limitation of both.

Two minor comments - 1) I had to read the abstract twice to recognize that this manuscript was about background/ambient nitrogen dynamics (the 2nd time I see 'ambient' jumps out at me). Given the title, I expected enrichment approaches to be evaluated. Perhaps add 'ambient' to the title? 2) page 7531 - "a" is included in equation 1, but it is defined 2 paragraphs before (very odd placement) and after equation 3. I suggest moving that definition to just after equation 1 and removing the current ones.

One minor suggested change to the writing: 1) p 7536, line 19 - remove "sort of"

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References: Covino, T. P. and B. L. McGlynn (2007), Stream gains and losses across a mountain-to-valley transition: Impacts on watershed hydrology and stream water chemistry, *Water Resour. Res.*, 43, W10431, doi:10.1029/2006WR005544.

Payn, R. A., M. N. Gooseff, B. L. McGlynn, K. E. Bencala, and S. M. Wondzell (2009), Channel water balance and exchange with subsurface flow along a mountain headwater stream in Montana, United States, *Water Resour. Res.*, 45, W11427, doi:10.1029/2008WR007644.

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