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Tracer additions for quantifying stream nitrogen uptake kinetics from ambient to saturation: The physical, biological, and spatio-temporal dynamics of nutrient retention

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This presentation will highlight the importance biologic uptake and hydrologic retention processes in influencing the nutrient dynamics witnessed at watershed outlets and ongoing work to assess the role of the stream network in maintaining, attenuating, and altering the terrestrial signatures and export of nitrogen. Both hydrological and biological processes influence downstream transport. Biological uptake of nutrients within a stream reach is strongly impacted by concentration; however, quantifying this relationship has remained a challenge. Here we present our new rapid tracer-based technique for quantifying nutrient uptake kinetics from ambient to saturation using Tracer Additions for Spiraling Curve Characterization (TASCC). This approach allows one to: 1) quantify continuous uptake kinetic curves, 2) assign and parameterize appropriate kinetic models (e.g. Michaelis-Menten), 3) estimate ambient spiraling parameters, and 4) assess stream reach proximity to saturation. Our results suggest that quantifying in-stream N uptake kinetics from ambient to saturation over space, time, and land-use change gradients can yield new insight into the capacity of stream networks to modify nutrient loading. We suggest that this method can improve basic understanding of stream nutrient biogeochemistry, how stream reaches respond to increased nutrient loads, and improve export models and estimates of downstream transport.