Title: **Deciphering Controls on Nutrient and Contaminant Migration Within Floodplains: The Critical Role of Redox Environments and Hydrologic Extremes**

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Project Abstract:

The fate and transport of nutrients and contaminants in soils and sediments are controlled by a complex network of biogeochemical reactions coupled with hydrologic processes. A major control on metal mobility in surface and subsurface systems is exerted by natural organic matter (DOM), albeit one that is poorly understood. Divergent OM transformation pathways drive variation in the chemical composition of DOM across watersheds. Yet, how this variation influences the functional composition and metal binding properties of DOM remains largely unexplored. Further, the source and impact of hydrologic extremes on biogeochemical processes and resulting fate and transport of nutrients and contaminants need to be assessed.

Our project elucidates the effect of redox conditions resulting from differing hydrologic regimes on formation and transport of soluble metal-organic complexes, and we explore the impact of varying sources of hydrologic extremes on nutrient-contaminant fate and transport. We use a combination of field measurements and laboratory experiments to examine the relationships between redox conditions, functionality of dissolved organic matter, and metal speciation (specifically examining metal-ligand complexes). Floodplain biogeochemical variation through climatic extremes and beaver-induced hydrologic variation at East River provide a unique look at controls on nutrient-contaminant fate and transport. Through our work, we have developed a novel approach that provides an unprecedented ability to resolve aqueous metal-organic complexes that reveals metal binding preferences for NOM based on metal-ligand chemistry. Importantly, we show that beaver dams have an outsized influence on hydrologic extremes, dwarfing the impact of climatic variation, that ultimate control biogeochemical conditions and water quality. Ultimately, our work is helping to advancing a robust predictive understanding of how hydrologic changes in watersheds affect water quality and inorganic element/contaminant loading.