SIGNATURES OF HUMAN IMPACT: LEGACIES, LAND USE, AND LONG-TERM TRAJECTORIES

Rivers are known to be powerful integrators of the landscape. Biogeochemical processes in rivers are, at any point in the stream, understood to be the sum effect of not only all inputs and retention mechanisms within the upstream catchment, but also the intertwined geomorphologic and anthropogenic factors that slow or expedite the flow of water and contaminants across the landscape. In my work, I expand this idea of the river as spatial integrator and suggest that watersheds must also be seen as temporal integrators. In other words, watersheds are not just the sums of their parts. They are the sums of their pasts and their presents. Every point on the landscape has a history and a memory. A parcel of restored prairie may carry with it a fragmented history of row cropping, livestock grazing, and suburban development. Such a history is not just an interesting story, but integral to the hydrologic and biogeochemical functionality of that piece of land. Through a combination of top-down analysis--using large datasets to identify patterns in landscape behavior--and mechanistic modeling, I attempt to capture the ways in which long-term legacies of land use and management impact current dynamics in water quality.