PURDUE ENGINEERING

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Multi-scale responses of river corridor exchange to dynamic hydrologic forcing

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Abstract

Dynamic hydrologic forcing (e.g., storm event responses, seasonal baseflow recession) is recognized to affect exchange between rivers and their corridors across many scales. Hydrologic forcing can alter flowpath-scale exchange fluxes and timescale, which may aggregate to changes in ecological function at the scale of features and reaches. At broader network scales, these dynamics manifest as the expansion and contraction of river networks. These network-scale dynamics control longitudinal connectively along the river corridor. In this presentation, I explore hydrological forcing as a driver of connectivity at scales spanning the flowpath and river network for a complete year (water year 2016) at the H.J. Andrews Experimental Forest. First, flowpath through reach scale dynamics are studied using a 2-D groundwater flow model. Results highlight hyporheic exchange responses to storms, baseflow recession, and diurnal fluctuations driven by evapotranspiration. Additionally, the study considers the transferability of observations in space and time. Next, I develop a novel conceptual model based on extensive field study, and translate this into a numerical model of flow, transport, and connectivity in the river corridor. This model is applied at the same study reach, and more broadly at the scale of a river network, to assess network scale dynamics. Finally, I highlight application of this parsimonious model as a useful tool for water resource managers who need to estimate connectivity and flow initiation location along the river corridor over broad, unstudied catchments.

Brief Bio

Environmental scientist Dr. Adam Ward joined IU in 2014 following three years with the University of Iowa in the Department of Earth and Environmental Science. He specializes in quantifying the transport of water, energy, and pollutants through hydrological landscapes, and the ecological implications of these fluxes.