River restoration with complex hydrological and ecological interactions: The RECORD-Project

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Restoration is an essential means to enhance the dynamic stability of rivers while correspondingly improving habitat diversity and variability and lowering long-term maintenance expenditures. Although the number of restoration projects has increased in recent years, scientific understanding is still limited with regards to the underlying principles determining how hydromorphological variability in restored river corridors relates to ecosystem functioning, biodiversity and (ground)water quality. To cope with the challenges of river restoration in a successful and efficient way, we need to increase our mechanistic understanding of the coupled hydrological and ecological processes in near-river corridors. Limitations in scientific advancement in these areas have especially been impaired by discipline-specific research rather than a multi-disciplinary endeavor that collaboratively investigates cause-and-effect relationships and re-examines historical assumptions and approaches. In the multi-disciplinary RECORD Project (Assessment and Modeling of Coupled Ecological and Hydrological Dynamics in the Restored Corridor of a River (Restored Corridor Dynamics)), we investigated coupled hydrological and ecological dynamics in a channelized and restored river section in northeast Switzerland by synthesizing physical, chemical, and biological experiments and modeling. In terms of the hydrogeological research questions we concentrated on infiltration processes of river water into groundwater. From the view point of drinking water protection, it is especially important to determine which portion of the pumped water originates from the river and how long is its travel time from the river to the pumping well. For these questions, we investigated time series of electrical conductivity and temperature which allow quantitative analyses of mixing ratios and travel times.