

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

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Abstract River restoration is an essential means to enhance the dynamic stability of watercourses while concurrently improving habitat diversity and variability, as well as 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. In order to deal with the challenges of river restoration in a successful and efficient way, the mechanistic understanding of the coupled hydrological and ecological processes in near-river corridors has to be extended. Limitations in scientific progress in these areas have been particularly impaired by specific research rather than a multi-disciplinary endeavour that collaboratively investigates cause-and-effect relationships and re-examines historical assumptions and approaches. In the multi-disciplinary RECORD Project (Assessment and Modelling 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 as well as modelling approaches. Hydrogeological research was focused on the infiltration processes of river water into aquifers. From the viewpoint of drinking water protection, it is of particular importance to determine which portion of the pumped water originates from the river and how long it takes to travel from the river to the pumping station. Therefore, we investigated the electrical conductivity and temperature of the water over a period of time, thereby gaining a tool for the quantitative analysis of mixing ratios and travel times.

Key words river restoration; engineered river; ecology; water quality; groundwater; groundwater-surface water interactions