

## **Global study of ecosystem dynamics in a context of ecological restoration by sediment recharges and bank erosion in the Upper Rhine River.**

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Over the last two centuries, the Upper Rhine River was subjected to important hydraulic engineering works which have severely damaged its functioning. These changes (rectification, groyne construction, damming and lateral canal construction) have resulted in severe hydro-morphological changes that have contributed, among others, to purge the river a part of its coarse sediment load and greatly alter the biodiversity of the entire floodplain. These effects concerned particularly the "Old Rhine", a 50-km long by-passed single bed channel, which is located downstream the Kembs dam. Given these functional deficits, restoration actions were initiated via experimental sedimentary recharge and erosion works control. We explored how the modification of the physical environment should lead to structural and functional diversification that is likely to restore typical biodiversity of alluvial environments. Three biological compartments closely related to the physical quality of the environment were studied: vegetation, macroinvertebrates and fish. The general objective of the study includes the assessment of ecological impacts of restoration actions and the identification of factors of sustainability and effectiveness, in a context of multiple pressures (climate change, water pollution, biological invasions and food web changes). The results of this research will yield concrete keys to the management of large rivers about biological responses to restoration, species interactions in biodiversity structuring, sensitivity of these river ecosystems restored to invasive species and relationship between geomorphology and ecology.