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Restoration of the Hydrosedimentary and Ecological Continuity: Hydromorphological Impacts on the Yerres River, Seine Catchment, France

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The European Water Framework Directive (WFD) aims to achieve "a good ecological and chemical status" by 2015. Hydromorphology influences ecological status in three ways: (i) hydrological regime (flow and groundwater), (ii) morphological conditions, and (iii) longitudinal and transverse continuity of rivers. Physical and ecological impacts of those structures upon hydrosystems are known, but removal's impacts are misunderstood due to lack of scientific feedbacks. According to particular methodology (following hydromorphological protocols established by ONEMA – the French National Agency for Water and Aquatic Environments), which is based on field measurements and modelling, we aim at characterizing and quantifying hydromorphological impacts of dam removals on riverbed and bank structures. This study is applied to the Yerres watershed particularly significant due to its anthropic pressure conditions. We study limnimetric adjustments, stream power variations, transport capacity variations and riverbanks dynamics in no-dam context, at the reach scale. Our results show that there is a clear morphological adjustment of the riverbed and bank structures, even though locally those possibilities are constrained by anthropogenic facilities. Run-of-the-river dam removals result in: (i) systematic lowering of water level, (ii) shrinkage of the cross-section, (iii) increase of stream-power and transport capacity, proportional to uncompartmentalised context (calculated values can be greater than 35 W/m^2, hence suggesting that flow would have theoretical capacity to modify the channel geometry notably in sections without protection); (iv) clear recovery of bank erosion processes during flood events. Finally, our study demonstrates that the Yerres River can be hydromorphologically restored; yet higher hydrodynamic conditions in no-dam context involve new issues particularly in relation with the human occupation of the Yerres's valley (wetlands and channels disconnection, patrimonial buildings destabilization, impacts on recreational uses), that river managers have to consider.