

# LINKING HYDROMORPHOLOGY, ECOLOGY AND ECOSYSTEM SERVICES: ACHIEVEMENTS AND CHALLENGES

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Abstract

Hydromorphological alterations represent the most frequent pressure to European water bodies (EEA 2018). These alterations affect river ecology e.g. by modifying habitats and flow regimes. As hydromorphological alterations are closely linked to human uses of rivers and floodplains, it is assumed that any restoration efforts may be supported by considering at the same time the ecosystem services provided by them. As many river corridors have been profoundly regulated and modified, their ecological functions have been altered, leading to a decrease in ecosystem services. Tools to quantify hydromorphological variables of rivers are widely available and increasingly widespread, yet the quantitative linkages between hydromorphological models and ecosystem services is still unclear. Here we present recent achievements to quantify the relationships between hydromorphological and ecological processes and consequently ecosystem services. We present tools that quantify and predict hydromorphological variations of rivers, and how they can be used to assess ecosystem services. Focusing on Alpine rivers, we describe how the application of hydrological and hydraulic models, of habitat modelling methods, the use of available data from the EU Water-Framework-Directive as well as from field surveys can be used to quantify river ecosystem services. Together with the successful application of the tools, we discuss remaining challenges. Although datasets are increasingly available the data are partially heterogeneous across regions, the consequences of land cover changes are difficult to predict, the scale of the analysis is services-dependent, the interactions with the upstream or downstream areas are not considered. In conclusion, it is challenging to properly quantify ecosystem services specifically addressing characteristics of a riverine landscapes, hereby the definition of the relationship between hydromorphological processes and ecosystem services is crucial. In this regard, the ecosystem service concept can foster collaboration between different disciplines, where in future the inclusion of experts from physical and engineering should be increased.

Keywords

Ecosystem services, hydromorphology