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Supporting analysis of floodplain restoration options by historical analysis

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ABSTRACT

The presented case study deals with the hydromorphological alterations over a period of nearly 400 years and their ecological effects as shown by macrophytes in the urban floodplain Lobau along the Danube River within the city limits of Vienna for a period of about 160 years. Socio-economic pressures, such as flood protection (especially the Vienna Danube Regulation between 1869 and 1875), navigation and hydropower production, have modified the natural channel network in this anabranching river section into a shallow lake system in which habitat aging and sediment accumulation proceed. The aquatic and semi-aquatic habitats and their rich biodiversity would become reduced severely without any restoration measures promoting enhanced surface water exchange. The effects of restoration measures approaching pre-regulation conditions were evaluated for the macrophyte vegetation, a key ecosystem component. To collect monitoring data of the pre-regulation conditions, detailed literature data and mappings since 1846 up to recent surveys including the long-term development of aquatic vegetation patterns and aquatic habitat composition in the floodplain Lobau were analyzed. The potential effects were evaluated by analyzing how hydraulic parameters (water velocity and suitable habitat area for macrophytes) have controlled macrophyte composition and development. The study aimed at assessing the differences between the current and the historic situation caused by human impacts at different spatial scales and changes over time. By evaluating these differences we discussed intended as well as unintended effects of potential restoration measures.

Primarily due to the loss of aquatic habitats the species diversity of aquatic vegetation is currently endangered and would decline without any restoration measures. However, a complete upstream reconnection of the remaining floodplain area Lobau to the Danube main channel (maximum achievable restoration goal) could also have unintended negative effects such as facilitation of the dispersal of non-native invasive species, decline of palaeopotamal species, and exposure of the floodplain to the present, altered water regime. Considering these alterations, the design of restoration projects would need to be adapted accordingly. In the presented case study Lobau, a partial reconnection instead of a complete reconnection might be the option optimizing the given management goals best.

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