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Hydraulics, water quality, biodiversity and policy research to support nature-based water management using vegetated floodplains

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A b s t r a c t

There are increasing needs to bring more of the lost riparian ecosystem functions back to human-impacted streams. Nature-based solutions (NbS), such as vegetated floodplains, aim at improving the state of the ecosystem while addressing the water management needs of the society. However, there are substantial knowledge gaps on how to efficiently implement and up-scale NbS considering e.g. the complex societal boundary conditions and the multi-faceted impacts of vegetation on the physico-chemico-biological environment. This contribution aims at describing research developments by the author and a large number of colleagues on floodplain vegetation as well as linking the findings with the mainstreaming of NbS with vegetated floodplains. Firstly, I will describe findings on the impacts of flexible woody vegetation on flow processes as well as some proposed modeling approaches. Secondly, I will present two-stage channels with vegetated floodplains as an example of a NbS for agricultural streams. I will cover recent findings on the performance of two-stage channels from the viewpoints of fine sediment transport, water quality and biodiversity. Thirdly, I will show examples of how the research on natural sciences and engineering can be complemented with considerations of costs, benefits, financing, governance and capacity. In conclusion, the combination of these various aspects enables making changes in the associated water and river management practices and policies.