Modelling feedbacks between geomorphological and riparian vegetation responses under climate change in a Mediterranean context. (Martínez-Fernández et al. 2018) [1]

Climate change is expected to alter temperatures and precipitation patterns, affecting river flows and hence riparian corridors. In this context we have explored the potential evolution of riparian corridors under a dryness gradient of flow regimes associated with climate change in a Mediterranean river. We have applied an advanced bio-hydromorphodynamic model incorporating interactions between hydro-morphodynamics and vegetation. Five scenarios, representing drier conditions and more extreme events, and an additional reference scenario without climate change, have been designed and extended until the year 2100.

The vegetation model assesses colonization, growth and mortality of Salicaceae species. We analysed the lower course of the Curueño River, a free flowing gravel bed river (NW Spain), as a representative case study of the Mediterranean region. Modelling results reveal that climate change will affect both channel morphology and riparian vegetation in terms of cover, age distribution and mortality. Reciprocal interactions between flow conditions and riparian species as bio-engineers are predicted to promote channel narrowing, which becomes more pronounced as dryness increases. Reductions in seedling cover and increases in sapling and mature forest cover are predicted for all climate change scenarios compared with the reference scenario, and the suitable area for vegetation development declines and shifts towards lower floodplain elevations. Climate change also leads to younger vegetation becoming more subject to uprooting and flooding. The predicted reduction in suitable establishment areas and the narrowing of vegetated belts threatens the persistence of the current riparian community. This study highlights the usefulness of advanced bio-hydromorphodynamic modelling for assessing climate change effects on fluvial landscapes. It also illustrates the need to consider climate change in river management to identify appropriate adaptation measures for riparian ecosystems.

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