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Historic river floodplain engineering causes channel pattern shift from multiple to single-thread rivers

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It is well-known that floodplain fine-grained alluvial sedimentation rates have been increasing due to human impact. In most catchments, the onset or acceleration of floodplain deposition is dated to medieval times, which has been attributed to increased hillslope soil erosion due to high population densities causing deforestation and slope instability. The also increasing river sediment load has then changed rivers into a single-thread, meandering channel pattern, which is now considered to be the ultima ratio in river restoration. In this presentation, we challenge this view and argue that current channel pattern and shape are related to historic channel engineering, and are hence not the product of fluvial processes associated with a meandering, or avulsing single-thread river system. Here, we present a study from a mountainous region in central Europe (Germany), in which we reconstruct the natural, pre-medieval channel pattern of two low order streams (3rd and 4th Strahler order), and their transition into the current, single-thread channel pattern which is characterised by meanders. This study is based upon a multi-proxy analysis of the chrono-stratigraphy, cross-valley ground penetrating radar, river surveying, analysis of historic maps, and hydrological data for channel pattern prediction. Finally, based on our analysis, we suggest that currently observed channel widening processes and island formation likely represent a tendency of the studied streams to re-create a braided channel pattern, which should be embraced by river management instead of forcing streams into a meandering pattern, as multi-thread, braiding channels are the most natural condition for these streams, producing a sustainable and resilient river ecosystem.