



Flow regulation impacts on geomorphic adjustment and riparian vegetation evolution of the anabranching Upper Yellow River

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Guide reach is located at the edge of the source zone of Yellow River, downstream of the first large dam along the trunk stream. The closure of Longyangxia Dam in 1986 permanently altered the flow regime in Guide reach. Two smaller dams upstream of Guide reach, Nina Dam constructed in 2003, and Laxiwa constructed in 2009 had a minor influence on the flow regime. Satellite imagery is used to assess channel planform adjustments from 1975-2015. Historic annual flow regime changes in terms of magnitude, duration, timing, frequency and rate of changes were analysed using the IHA model. Field surveys analysed the current distribution of riparian species and relations to channel geomorphological patches in 2017. Flow regulation transformed this dynamic braided-anabranching river, reducing channel multiplicity, reducing the width of the active channel zone, aggregating instream bars into much larger compound structures, and creating large floodplain areas (most of which have been further manipulated by human activities). Riparian vegetation become more stable and complex. Multiple regression analysis showed that the 1-year interval flood and the 90-day last high flow exert a significant influence upon rates of channel deposition and erosion respectively. In addition, the 3 year interval flood exerts a key impact of vegetation erosion. Relative to regulated rivers in other parts of the world, changes to the flow regime have influenced geomorphic adjustments to a greater degree than vegetation adjustments, suggesting that mutual interactions between geomorphic processes and riparian vegetation have exerted a reduced influence in this instance.