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Interactions between riparian vegetation and river morphodynamics in a sand-bed meandering stream.

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River morphodynamics results from the action of various sediment fluxes associated with different transport mechanisms, and those fluxes are influenced by the presence of riparian vegetation. We present in this study a comprehensive set of flow and sediment measurements required to compute the fluxes in a sand-bed stream with riparian vegetation. We collected data in a reduced-scale, movable-bed laboratory model of a reach that is undergoing rehabilitation using in-stream riparian vegetation. We used light weight sediment in order to ensure similar sediment mobility levels in model and prototype. Laboratory measurements included downstream and transverse velocities, bed shear stresses, bed load transport, suspended sediment concentrations, and bed topography over time with and without riparian vegetation placed along the outer bank of the bend. The results unveiled the importance of secondary circulation as well as converging and diverging flow patterns in shaping the bed topography. Modifications due to the vegetation included a shift of the main flow away from the vegetated outer bank and an overall straightening of the flow in the reach, resulting in an increased deposition near the vegetated bank and a reduced deposition near the inner bank. Our results highlight the need for overall reach assessment of flow and sediment dynamics before revegetation, as its effects go beyond local bank protection. We discuss implications for reach-scale morphodynamic modelling.