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Riparian Vegetation Dynamic and River Stability on Intermittent Rivers: Impact of Water Transfer Project on Tropical Drylands

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Rivers on semiarid landscapes typically are characterised by sandy geomorphic units and riverbanks, a natural factor that enhances lateral mobility. Vegetation cover is a crucial factor on lateral instability due to its impact on riverbank and geomorphic units erosion resistance. Nevertheless, riparian vegetation on intermittent and ephemeral channels show growing patterns directly affect by the flow temporality, that controls the water availability. Extended dry intervals hinder the succession ecological on geomorphic units, like bars and islands, and riverbanks and retard the growing process. This work analysed the effects of hydrological changes, caused by one water transfer project, on the bio-geomorphological patterns on riverbanks of a main intermittent river of Brazilian Drylands. Flow data series was used to understand the hydrological pattern changes; Google Earth images and UAV surveys to analyse the vegetation and riverbank behaviour from 2008 to 2020. Lastly, the identification of riverbank material resistance was based on sedimentology analysis. The water transfer Project PISF (Projeto de Integração do São Francisco), operating since 2017 March, increase the average flow days from 137,5 to 260/300 days and decreasing the continuous dry period from 200 to 30/45 days. The impact on average annual discharge was slightest, whereas the average water transfer volume was $3m^3/s$. It is essential to highlight the short period of data posterior to the water transfer and the non-regulatiry of water volume transferred; what limits the temporal representativity of the results. There were different types, and level of impacts depending on the river reach characteristics. However, in general, the longer flow permanence increases riparian vegetation density, vertical incision, and lateral stability. Riparian vegetation cover increase, from 20% to 100% on the 9 reaches analysed, across the entire channel, including bedrock reaches, with riverbanks having some rock outcrops percentage. The main changes were on sand bed reaches, that used to have, before 2017, a dynamic braiding pattern, without a clear main incised channel and thalweg shifting. Afterwards, the flow permanence, due to the water transfer project, enabled herbaceous stratus temporal continuity, contributing to surface stability and progressive bushes/trees cover growing. Lastly, the increase in lateral stability, mainly on thalweg position, facilitates the vertical incision on the sand bed reaches, representing 85% of this channel. As a secondary impact, there were necessary, to the road network, built floodway crossings at several points, which changes the channel

morphology and the (dis)connectivity process. It can generate distinct channel position and morphology changes causing water and sediment retention upstream and erosion downstream. Lastly, there were slight differences in textural characteristics on riverbanks and geomorphic units, with a rise in fine sediment on the most vegetated areas/units. This analysis reveals that a fast response of riparian vegetation and sand bed reaches morphology, affecting the bio-geomorphological process and all environmental dynamic. It points to fundamental elements which need monitoring after hydrological changes, especially to intermittent and ephemeral rivers.