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Effect of small impediments on channel morphology – intermittent rivers in Brazilian drylands.

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Land use on rural drylands has as its occupation process developing a hydric security and transportations infrastructure system. Dryland tropical systems present fluvial hydrological regime controlled by precipitation inputs, with few or none springs, showing ephemeral and intermittent rivers. Floodway crossings are a widespread infrastructure, on the countryside road network, to cross small creeks, especially intermittent and ephemeral rivers during the rainy seasons. Floodways are concrete or rock block structure, with or without culverts, that allows the river flow goes through or over it. They are part of a set of small longitudinal impediments, like small earth dams and check-dams, and can significantly impact the connectivity, notably by the high density of these impediments on rural areas. This research analysed the effect of floodways crossing on longitudinal connectivity of intermittent small rivers, focusing on morphological and sedimentological impacts in Brazilian Dryland. We analysed four floodways crossing with culverts installed on sandbed intermittent rivers, with upstream catchment are from 10 Km^2 to 130 Km^2. The analyses were based on rainfall data, lateral and longitudinal topographic profiles, generate by UAV surveys; and sedimentological samples of upstream and downstream of each structure. The Effective Catchment Area (ECA) was the first step to understand that several dams, and other longitudinal disconnect elements, decrease the ECA sharply, from 2 Km^2 to 38 Km^2 of the floodways analysed. Consequently, it affects the magnitude and frequency of water and especially sediment that reaches the floodway crossings. The results reveal the increase of upstream local base level, affecting 500 to 1000 meters, and coarse sediment retention, which is 1.7 to 3.6 times the standard percentage of very coarse sand and gravel. The retained sediment can be re-worked (reconnect) by extreme rainfall/discharges events, recurrence 0,22/year, and when the silting surface reaches the culvert level. The evolution of the upstream silting process is controlled not only by construction age but also by ECA spatiality and changes, and frequency and magnitude of rainfall/discharges events. The results discussion enabled developing an evolution model based on four stages: Installation, Adaptation, Coexistence, and Silting up. The Installation stage is the building process that locally deconfigures the channel morphology and, sometimes, inserts unfamiliar materials on channels. The Adaptation Stage starts with the first flow events that recreate a channel morphology but affected by the floodway, with the beginning of enhanced upstream sedimentation and downstream erosion. The Coexistence stage the disconnectivity effect is evident with the upstream sedimentation moving upstream. The downstream erosion creates a pool, expanding the floodway/riverbed height gap, and progressively increasing the vertical incision downstream. Lastly, when the sedimentation reaches the culvert level or the

floodway, sediment retention decreases, and most of the transported sediment overpass the impediment. The frequency and magnitude of flow events control the time to progress through each stage, remembering the ECA analysis importance over space and time. This proposed model that still on initial development stage can help the integrative environmental management on areas impacted by widespread small longitudinal impediments.