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Sedimentologically Significant Tributaries: Catchment-Scale Controls on Sediment (Dis)Connectivity in the Lockyer Valley, SEQ, Australia

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ABSTRACT

The nature of catchment-scale sediment (dis)connectivity is the primary influence on sediment delivery to trunk streams and controls patterns of bedload sediment fraction. We analyse the potential sediment connectivity of 20 tributaries to their trunk stream, Lockyer Creek, in the Lockyer Valley, SEQ. We examine the distribution of major sediment buffers (floodplains, terraces, alluvial fans, trapped tributary fills) and barriers (weirs), and their impact on effective (sediment contributing) catchment area, to characterize the potential for coarse (bed load) sediment connectivity. We then analyse the distribution of sedimentary links along Lockyer Creek to determine whether certain tributaries or disconnecting features control the trunk stream sediment fractions. We find that buffering increases downstream in the Lockyer Valley, and that tributary position and shape influence the space available for sediment buffering and, therefore, the sedimentological significance of tributaries. Effective catchment areas are strongly related to buffering by a 2° slope threshold of coarse sediment transport. Tributary sediment

connectivity, the extent of overbank flows (floodwater zones), and weir locations all exert an additional influence on the distribution of sediment links along the trunk stream. These controls are related to the physiographic and climatic setting of the Lockyer Valley, and additional anthropogenic influences in this system. We conclude that controls on sediment connectivity and bedload sediment characteristics are highly variable between catchments, and that sediment (dis)connectivity merits equal consideration with tributary basin/channel size when determining controls on tributary-trunk stream relationships and channel sediment regime.

KEYWORDS: buffer, downstream sediment fining, effective catchment area, weirs, sedimentary links