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Long-term flood controls on semi-arid river form: evidence from the Sabie and Olifants rivers, eastern South Africa

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Abstract Rivers in the Kruger National Park, eastern South Africa, are characterised by bedrock-influenced 'macrochannels' containing variable alluvial thicknesses and riparian vegetation assemblages. Evidence from the Sabie and Olifants rivers suggests that flows up to moderate floods (<3500 $m^3 s^{-1}$) tend to result in net alluviation, with sediments gradually covering the underlying bedrock. More extreme floods strip alluvium and erode bedrock, effectively exerting the primary control over long-term river morphologic development. On the Olifants River, post-flood aerial LIDAR imagery reveals that the 2012 extreme flood (~14000 $m^3 s^{-1}$) resulted in extensive stripping of stored alluvial sediment, exposing and eroding the underlying weathered bedrock. On the Sabie River, preliminary optically stimulated luminescence ages for remnant alluvium are all less than 1000 years, highlighting typical timescales of sediment storage. Together, these results suggest that while periods of general alluviation occur on these systems, long-term river development results from extreme flood-generated bedrock erosion.

Key words semi-arid river; channel development; flood impact; Sabie River; Olifants River