How imprints of the past influence patterns of terraces and contemporary river processes in the Upper Mōtū River, East Cape, Aotearoa New Zealand

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# ABSTRACT

The Upper Mōtū River on the East Cape of Aotearoa New Zealand is a high-elevation, low-relief landscape where accommodation space on the valley floor has facilitated the development of river terraces and significant sediment storage. Tectonic uplift and Quaternary climate change instigated phases of aggradation and reworking that created a complex sequence of river terraces upstream of the Mōtū Falls. Five terraces in headwater reaches (up to 40 m above contemporary river level) transition downstream of a choke point to two terraces that lie up to 15 m above contemporary river level. The uneven distribution of terraces and their persistence and erasure correlates to the width of the bedrock margin (i.e., accommodation space).

The pattern of geomorphic units of the contemporary river is shaped by the interaction of the river with the confining margin of bedrock and terraces. Seven River Styles and associated geomorphic units reflect a downstream continuum of reducing slope and energy. Downstream change in dominant process from sediment transfer to accumulation corresponds to the change from a partly confirmed to laterally unconfined system. Instream geomorphic units are products of system response to incision and reworking.

Landscape memory exerts a key control upon contemporary landscapes of the Upper Mōtū Catchment. It dictates which parts of this river system are now subject to incision and bank erosion, wherein sensitive reaches with significant capacity for geomorphic adjustment are the dominant active sediment source. This contrasts to neighbouring catchments in the region where hillslope sediment sources dominate (Fuller et al., 2023). This highlights the importance of place-based, catchment scale geomorphic insights to understand the nature of sediment storage and reworking. System vulnerabilities can be identified through the pattern of geomorphic units and their form-process relationships to inform effective catchment management planning.

# REFERENCES

Fuller, I., Brierley, G., Tunnicliffe, J., Marden, M., McCord, J., Rosser, B., Hikuroa, D., Harvey, K., Stevens, E., & Thomas, M. (2023). Managing at source and at scale: The use of geomorphic river stories to support rehabilitation of Anthropocene riverscapes in the East Coast Region of Aotearoa New Zealand. Frontiers in Environmental Science, 11, 1162099.