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Compiling and Analysing Bedrock River Data Across the USA to Unpick Bedrock River Geomorphology

James Buckley¹, Rebecca Hodge², and Louise Slater³

¹Durham University, Durham, United Kingdom of Great Britain – England (kmgr74@durham.ac.uk)

²Durham University, Durham, United Kingdom of Great Britain – England (rebecca.hodge@durham.ac.uk)

³Oxford University, Oxford, United Kingdom of Great Britain - England (louise.slater@ouce.ox.ac.uk)

Active incision of bedrock rivers exerts a vital control on landscape evolution in upland areas. Previous research found that bedrock rivers were typically steeper and sometimes narrower than alluvial rivers. However, most of the literature on partially-exposed bedrock rivers has employed small samples mostly from mountainous regions, so their geomorphological properties remain poorly understood. In contrast with the existing literature, a large-sample analysis of bedrock river channel properties would allow the controls on bedrock river width and slope to be unpicked and reveal whether or not the existing literature is biased towards pristine, mountainous bedrock rivers. Overall, such an analysis could improve the reliability of upland landscape evolution models.

Here we present an analysis of 1,924 river sites from the EPA National Rivers and Streams Assessment to assess the geomorphological differences between bedrock and alluvial rivers. The influences of lithology and uplift on bedrock channel properties are examined using external datasets. We find bedrock rivers to be significantly steeper and wider than alluvial rivers. Sedimentary bedrock rivers were seen to be significantly wider than igneous/ metamorphic bedrock rivers, consistent with findings from Ferguson et al. (2017). We estimated shear stress and critical shear stress for each river site and assessed correlation with bedrock exposure. We found that exposed bedrock could not always be explained by local sediment transport exceeding local sediment supply, indicating that bedrock exposure may be controlled by other factors in some bedrock rivers. Currently, uplift data are being compiled for further analysis.