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Are River Styles ecologically meaningful? A test of the ecological significance of a geomorphic river characterization scheme

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ABSTRACT

1. Classification is a useful tool for researchers and managers wishing to group functionally similar sites or to identify unique or threatened habitats. A process-based river classification scheme that successfully integrates physical and biological aspects of lotic form and function would enhance conservation and restoration efforts by allowing more meaningful comparisons among sites, and improving functional understanding of lotic ecosystems.

2. The River Styles framework provides a geomorphological river characterization scheme in which assemblages of geomorphic units vary for differing River Styles, presenting differing arrays of aquatic habitat diversity for each style.

3. The ecological significance of the River Styles framework is tested by comparing the macroinvertebrate assemblages and habitat characteristics of pool and run geomorphic units for three different River Styles on the north coast of New South Wales, Australia.

4. Multivariate ordinations and analysis of similarity (ANOSIM) revealed that macroinvertebrate community structure differed between Bedrock-Controlled Discontinuous Floodplain rivers and Gorge rivers, and between Bedrock-Controlled Discontinuous Floodplain and Meandering Gravel Bed rivers, especially in pools. Differences between Gorge and Meandering Gravel Bed rivers were less apparent, largely due to variations within the Meandering Gravel Bed rivers group.

5. The variability in macroinvertebrate assemblage structure among geomorphic units was most strongly related to variability in substrate and hydraulic variables. Substrate composition differed significantly among all River Styles and geomorphic units, but other habitat variables showed few consistent differences among River Style groups.

6. These results suggest that the ecological similarity of macroinvertebrate communities within River Styles may presently be limited because some important large-scale drivers of local habitat conditions are not included in River Styles designations. Integrating River Styles classification with other large-scale variables reflecting stream size, temperature and hydrological regime may produce a process-based physical classification capable of identifying river reaches with similar ecological structure and function.

KEY WORDS: physical habitat; habitat assessment; geomorphology; River Styles; river health; macroinvertebrates