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Quantifying the short-term effects of instream gravel mining on the geomorphic unit diversity of an intermountain river

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Human disturbances may alter the dynamic equilibrium state of a river system, which infers a balance between processes and forms. Within the human disturbances, instream gravel mining is one of the most widespread impacts in intermontane fluvial corridors since these systems have been historically used as: (i) preferential pathways for accessing and bypassing mountain barriers; and (ii) sources of local and available gravel for building industrial and transportation infrastructures. Instream gravel mining has a rapid and localised impact on channel morphology that may cause subsequent channel adjustments upstream and downstream. Traditionally, the classification of fluvial morphology of in-channel units has been centred on field-based and planimetric identification approaches, but these involve subjective interpretation of unit type and unit boundaries. In response of these limitations, fluvial taxonomy approaches based on the objectively and consistently delineation of geomorphic units from high-resolution topographic data, are presented as a more consistent approach to mapping geomorphic units. At the same time, these approaches has potential for assessing changes in geomorphic units as part of quantitative instream gravel mining monitoring, allowing testing gravel mining actions design hypotheses. In this context, the aim of this work is to quantify the short-term effects of instream gravel mining on the geomorphic unit diversity of an intermountain river. To pursue this objective, we use pre and post-gravel mining high-resolution topographic surveys of the Upper Cinca River (Southern Pyrenees) to systematically map changes in the geomorphic units by the application of the Geomorphic Unit Tool (GUT).