

An assessment of temporal habitat availability in a gravel-bed river using a Lidar-derived CFD model

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Abstract Riffle-pool sequences in gravel-bed rivers provide the template for a number of fish and invertebrate habitats. Water flowing over these morphologies creates spatial hydraulic variations over a rivers flow regime that are logistically impossible to measure in the field. This paper utilises the FLUENT Computational Fluid Dynamics (CFD) model to construct a 0.2 m DEM for a 180 m reach of Kingsdale Beck, UK. CFD modelling allows spatial estimation of flow hydraulics for flows up to bankfull. With increasing discharge, complex patterns of hydraulic variation are revealed that exist within larger macroscale flow structures. During elevated flows these could act as biotic refugia. The spatial distribution and areal extent of habitat refugia for two commonly occurring macroinvertebrate species: *Gammarus pulex* (Amphipoda, Crustacea) and *Ephemerella ignita* (Ephemeroptera, Insecta), are explored for three discharges from baseflow up to bankfull. Temporal modelling permitted mapping of these refugia across the flow regime.

Key words Terrestrial Laser Scanning; CFD; gravel-bed shear stress; habitat availability