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Robust identification of hydraulic biotopes using terrestrial laser scan data of water surface properties

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There is a growing need to understand and improve the ecological status of many riparian systems. Considerable emphasis has been focussed on the classification of instream habitat in terms of local fluvial geomorphology and hydraulic regime. A rising number of these approaches use physical biotopes – habitat types defined largely on substrate character and local flow velocity that identifiable through the appearance of the water surface locally, and biotope diversity has been directly linked to biotic diversity through empirical studies. The common approach is to subjectively identify biotope units based on their water surface characteristics, however, hydraulic characteristics attributed to individual biotope types suggest considerable overlap in the current array used for management purposes. It is suggested that the subjective nature of visual biotope identification and delineation has resulted in an overly complex set of biotopes and a poorly defined set of hydraulic conditions associated with each biotope type. Rapid objective mapping of the water surface using a robust character delimiter would allow the biotope concept to be critically evaluated and would generate a set of clearly delineated biotopes allowing survey repeatability between river locations. Data from terrestrial laser scanning of the water surface of the River South Tyne at Slaggyford, Cumbria, UK is presented which illustrates the spatial and tem-

poral heterogeneity of water surface roughness. A moving window standard deviation approach is taken to specify tentative roughness limits for several biotope types. It is clear from the research that while heterogeneity is high, broad biotope units may be robustly defined in space and time using surface metrics derived from terrestrial laser scanner data. Issues remain concerning scan angle and data quality and this is discussed with reference to airborne scan data.