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Channel morphology and landscape connectivity in glaciated upland catchments

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The channel morphology of any fluvial system is strongly conditioned by the connectivity with the surrounding landscape. Key landscape controls at the channel reach scale are valley slope, valley confinement and boundary sediment characteristics. These in turn influence the ratio of sediment supply to transport capacity within a river in a way that creates morphologically distinct channel reach types, often over relatively fine spatial scales. Geomorphologic surveys of channel reaches in five piedmont sub catchments (58, 64, 61, 110 and 42 km^2 in area) of the River Dee, Cairngorm Mountains, Scotland, were carried out using GPS-based mapping and GIS applications. These revealed significant inter- and intra-catchment spatial variability of channel types. This generally reflects the local variation in the nature of valley controls as a result of changing catchment characteristics. The spatial variability of catchment architecture is strongly conditioned by the underlying geology, the legacy of Pleistocene glacial erosion and drift deposition and, in places, land use history. Consequently, classical predictive models of downstream changes in channel morphology were not evident in any of the catchments investigated. Instead, downstream changes in channel morphology vary abruptly and non-linearly, reflecting the shifting relative importance of valley controls. Preliminary results of the investigation indicate that a typology of catchments may be developed, ranging from those with channel networks dominated by dynamic alluvial response reach types to those dominated by more stable alluvial and bedrock transport reach types. This difference in the distributions of channel reach types seems to largely reflect the nature and differential impact of glaciation in individual catchments. The investigation highlights the importance of understanding the connectivity between fluvial systems and their adjacent valley hillslopes and riparian zones for improving understanding of temporal and spatial variation of channel

morphology.