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Hydrological connectivity as an evolutionary control for the ecohydrology of montane drainage systems

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Hydrological connectivity is usually a strong control on the vegetation ecology of montane landscapes and the functioning of stream ecosystems. In the Scottish Highlands, peat-dominated riparian wetlands often characterise the zone of connection between terrestrial drainage and the river network. Although differences in vegetation provide a first approximation of the location of these saturated zones, the dynamics of saturation – and degree of connectedness – varies greatly in response to hydro-climatological forcing factors. This can be evaluated directly by field mapping and easily parameterised within hydrological models to provide more appropriate model structures for stream flow simulation. As well as providing an improved conceptual basis for hydrological modelling, insights into the connectivity between landscapes and riverscapes also provide a more holistic basis for understanding the ecology of upland streams. The hydrological regime provides an important control on the function of terrestrial and aquatic ecosystems; thus the seasonality of many key ecological events can be viewed as being structured by hydrological connectivity. Conversely, hydro-climatological extremes can result in significant deviations from "normal" or average conditions of connectivity, with important ecological implications. This contribution will present examples from catchments in the Cairngorms of Scotland and explore the intimate relationships between catchment hydrological connectivity and in-stream ecological response. The focus will be on the life cycle of Atlantic salmon and in-stream primary production. Downscaled output from GCMs will be used to explore how this may be affected by a changing climate and provide a context for prioritising research needs.