



The role of riparian wetlands in hillslope-channel connectivity in upland catchments: hydrological, hydrochemical and ecological significance

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Riparian areas in upland catchments are spatially variable in character, reflecting differences in geology, topography and soils cover. This results in contrasting hydrological pathways and differential influences on stream hydrology, hydrochemistry and ecology. In some areas, riparian areas are characterised by wetlands that remain saturated for much of the year. Although such areas are often characterised by peaty / gley soil cover, and mainly generate runoff by saturation overland flow, hydrochemical studies show that they are usually fed by groundwater seepage from upslope. In other places, riparian areas may be characterised by various drift deposits that primarily result in subsurface discharge into stream channels via groundwater flow paths. The complex spatial structure of riparian-channel inter-linkages is now becoming more apparent and the dynamic nature of the resulting groundwater-surface water connectivity has recently been highlighted.

In this contribution we report on recent research in the 30km² Girnock catchment in the Cairngorm Mountains, Scotland. At the catchment-scale, we use a GIS to classify the physical structure of riparian areas using a DTM and hydrologically-based soil maps. Spatially distributed tracer surveys are used to gain "snap-shots" of the hydrochemical characteristics of riparian wetlands with wet and dry antecedent conditions; to show the shifting relative importance of recharge sources. At the reach-scale, detailed examination of groundwater - surface water exchange through the riparian and hyporheic zones are undertaken using multiproxy methods combining hydrometric, thermal and hydrochemical characterisation. The threshold-like nature of these exchanges is stressed, and the implications for hyporheic ecosystems are highlighted.

A tentative conceptual model of riparian-channel interactions will be presented for upland catchments and the major research challenges needed to extend and quantify such models will be given.