

The role of the riparian zone in complex Chalk aquifer-stream systems

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Hydrological and hydrogeological processes in Chalk catchments can show a significant degree of spatial variability. Riparian wetlands found within these catchments have been found to act as biogeochemical cycling hotspots, with the potential to transform and attenuate the nutrient and geochemistry signal from the catchment. As part of a larger programme of lowland catchment research in the UK, we have investigated a sub-catchment of the River Lambourn in southern England, encompassing a reach of the river and a riparian wetland. We have used an array of hydrogeochemical and geophysical techniques to further understand surface water-groundwater interactions within this system. This multi-disciplinary approach has demonstrated that there are a number of pathways and a number of water sources which give rise to large spatial and temporal variations in nutrients in the river corridor.

Gravels in the river corridor indicate a mixture of at least three source terms that include Chalk groundwater from upslope, recent local recharge and river water. The river component is present beneath the gravels in the Chalk down to at least 20 metres with better connection between the Chalk and the river than the gravels and the river. The system is also dynamic with varying proportions of these sources mixing at different times of the year. We suggest that surface water-groundwater interactions are governed not only by Chalk/river connectivity but that the superficial geology and its hydrogeological nature fundamentally determines these interactions. Major connections with the groundwater component occur in the dry valleys. In addition, the river corridor acts as a linear aquifer/river system and this system is very heterogeneous. Consequently much of the nutrient transformation capacity of the riparian zone can be by-passed to a variable extent because of the geological and hydrogeological complexity.