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Structure and Process in Modified Landscapes.

We often conceptualise headwater catchments as having hillslopes, riparian zones and a channel network and consider the pathways and residence time of water moving through these catchments. In this talk we question the adequacy of this conceptualisation when considering nutrient transport in agricultural catchments by reference to a case study near Melbourne in South East Australia. The main landuse in this catchment is the grazing of dairy cows and associated farm infrastructure for milking the cows. The catchment is in a high rainfall environment and has a mix of runoff processes including saturation excess runoff, subsurface storm flow and, possibly, infiltration excess runoff. In particular the role of farm tracks, farm dams and other farm infrastructure is considered and we attempt to quantify the impacts of these in the export of Nitrogen and Phosphorus. As with the traditional catchment elements, these elements occur at various scales and this can significantly impact on monitoring results. Our results show that these additional elements have little impact on the catchment scale hydrograph but that there is a profound influence on nutrient export. In general our field observations show that particulate nutrients are more flow dependent with loads more dominated by events, indicating surface pathways are important. Nitrate is mobilised by subsurface flow, with concentrations almost independent of total flow. Transport through the stream network is rapid and it is difficult to find evidence of major within channel impacts on loads, although this may simply reflect experimental difficulty. In terms of the additional components mentioned above, farm dams are minor sinks of nutrients. A major source exists around the farmyard infrastructure and tracks leading to this. Nutrients become concentrated in certain parts of the landscape through faeces and urine deposition and are easily transported from these concentrated locations. A further interesting conclusion is that cows constitute a major nutrient mobilisation and transport mechanism in this catchment and in fact it can be argued that they are of similar importance as water flows.