

Observations from high resolution nutrient monitoring in rivers

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Phosphorus transfers in rivers can be broadly categorised as long residence time patterns from point sources or episodic patterns from diffuse sources – this is especially noticeable in rural catchments with high soil fertility, low soil permeability and with dispersed point sources such as domestic sewage systems. With multiple transfer patterns from multiple catchment sources, sampling representative water chemistry is problematic; discrete sampling has a high probability of monitoring point source transfers and not diffuse events and storm-water sampling ignores the potential impacts of point sources on streamwater ecology. High resolution methods offer a solution to these issues and have the potential to capture diffuse, point and singular pollution events. In several Irish catchments bankside analysers are measuring sub-hourly TP and TRP concentrations synchronously with water discharge. A further development is the addition of a 0.45µm filtration step that can provide measurements of four P fractions per hour (TP, TRP, TSP and SRP). Results indicate that sediment associated P is the primary fraction transferred in the main river networks during storm events, even from grassland dominated catchments, and that when the storm pathways are disconnected the magnitude of residual P concentrations appears to be concomitant with upstream soil impermeability. Annual sub-hourly P concentration data (e.g. Fig.1) can be organised to show high duration concentration ranges that will have a high ecological impact in rivers and how diffuse events can be described by a power-law relationship indicating a fractal process. These high-resolution concentration-frequency relationships may form the basis for assessing change in river chemistry in catchments with multiple P sources that are controlled under different hydrological conditions.

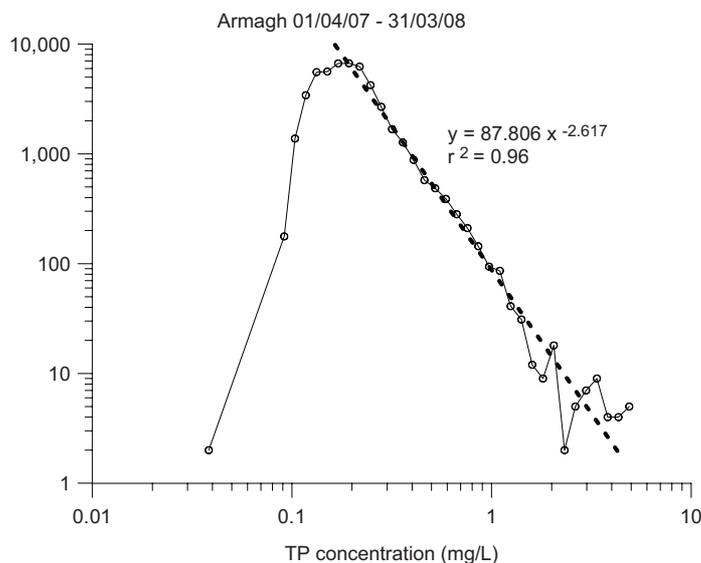


Figure 1. One year discrete magnitude-frequency distribution of TP concentrations from sub-hourly sampling in the Blackwater River, Northern Ireland. The TP range of 0.1-0.2mg/L is due to continuous point source inputs. For concentrations >0.2mg/L the frequency of occurrence of events with size scales as a power-law and is more related to diffuse transfers.