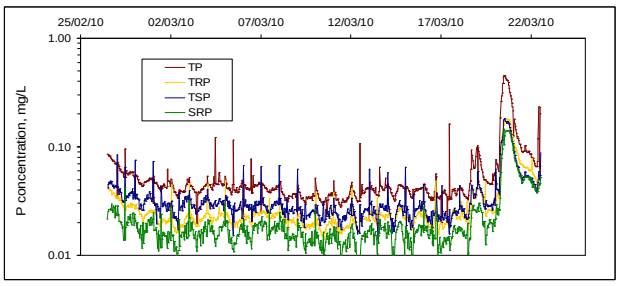
Observations from high resolution nutrient monitoring in rivers

Phil Jordan[1,2], *Alice Melland*[1], *and Rachel Cassidy*[2]

1.Introduction

In rural catchments with high soil fertility, low soil permeability and with dispersed point sources, P transfers in rivers can be broadly categorised as those with long residence times from point sources or episodic from diffuse sources (Fig. 1). With multiple transfers from multiple catchment sources, grab sampling has a high probability of monitoring point source transfers and not diffuse events and storm-water sampling does not account for the potential impacts of point sources on streamwater ecology.

Figure 2. High-resolution P monitoring suite and output trace of four measured fractions indicating the dominance of particulate P at both low and high flows.



3. Results and Conclusions

Dominance of PP (over SRP) at all flows, even in grassland catchments, may require modification of transfer risk theory or augmentation that accounts for in-stream enrichment. Annual sub-hourly P concentration data (e.g. Fig. 3) show high-frequency concentration ranges (0.1 – 0.3 mg/L) that will likely have a sustained ecological impact in rivers and how diffuse events can be described by a power-law relationship. Changes in the amplitude of the frequency-magnitude curve most likely indicate improvements in point source inputs and slope differences on the high and less frequent concentration distributions may indicate changes in the diffuse P signal between years.

Figure 1. Potential point and diffuse P sources in a rural catchment

2. Methods

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) (Fig. 2).

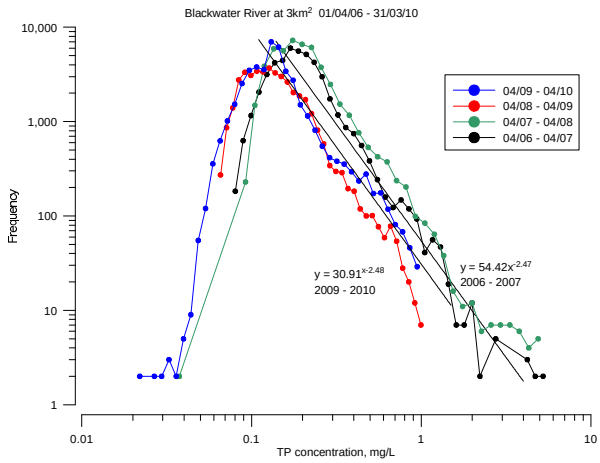


Figure 2. Indication of improvement in chemical water quality with a step-change in peak frequency possibly due to septic system mitigation, and low frequency of high concentration events in the period 2008 to 2010 compared with 2006 to 2008.

1 Environment Research Centre, Teagasc, Wexford, Co. Wexford, Ireland
2 School of Environmental Sciences, University of Ulster, Coleraine, N. Ireland phil.jordan@teagasc.ie; www.teagasc.ie/agcatchments