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Retention and cycling of P in field edge buffer strips

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Non-cultivated, field edge buffer strips are an increasingly common method in the control of diffuse pollution transfers to streams in agricultural areas and appear generally effective in controlling the passage to streams of P enriched, eroded soil fractions. They provide a physical border separating agriculture from the stream edge as well as a filtering capacity by intercepting, retaining and transforming pollutants. At a recent COST 869 Work group 3 meeting (Devon, UK, Nov 2007) there was discussion as to the capacity for buffer strip soils to accumulate P and this was further raised in a review on buffer strips by Dorioz et al. (2006). Theoretically, there may be a threshold point of particulate P addition where a buffer soil becomes a near-channel source of dissolved P forms to a stream.

To address this I undertook an investigation into soil P over a number of transects from fields across buffer strips of different ages. This was carried out in an extensively studied catchment (50 km^2) in NE Scotland where it is known that stream sediment and P declines during the course of ten years have corresponded with installation of non-cultivated buffer strips throughout the period (Stutter and Langan, 2007). The initial results show that soils at the edges of and within buffer strips had consistently greater potential for soluble reactive P release than adjacent field soils, occurring when either arable and pasture land bordered the buffer. Near-channel soil equilibrium P concentrations (EPC_0) in excess of 50 µg L^{-1} (compared to 7-21 µg L^{-1} in fields) suggested that riparian buffer soils had the potential to elevate the baseflow stream SRP status and contribute to downgraded water quality status in terms of Water Framework Directive classification. Preliminary results are also given from laboratory experiments mixing eroded soil fines with bulk soils. The results are discussed in terms of soil properties between buffer and field soils and whether rough calculations of buffer strip P accumulation ‘lifespans’ can be made from knowledge of soil ‘change points’ with respect to P sorption capacities. Given that buffer strips have economic implications due to land taken out of productivity their design and placement should be made most effective by consideration of soil and landscape factors. An improved knowledge of soil conditions in relation to buffer strip P cycling will help in catchment-scale assessment of where and how they should be best targeted and managed.

References

Dorioz et al. (2006). Agr. Ecosyst. Environ. 117, 4-21.
Stutter and Langan (2007). Presentation to COST 869, WG3, Devon, UK, Nov 27th-29th 2007.