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Trapping runoff, sediment and nutrients at the edge-of-field: Using constructed wetlands to control runoff and improve water quality in agricultural catchments

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Across Europe, many rivers and lakes are polluted. In the UK, the Biodiversity Action Plan estimates that over 70% of lakes are eutrophic. Diffuse pollution from agriculture is currently of extreme concern, but pollution and flood risk can be mitigated by management activities. The use of in-field mitigation options such as reduced tillage has been found to be effective at reducing runoff, sediment and nutrient loss in overland flow, but pollutants can still be lost from hillslopes unchecked via subsurface flow pathways, some of which may contribute very high loads of nutrients to streams. Edge-of-field mitigation approaches, which can tackle both surface and subsurface pathways at locations where they discharge into ditches and streams, therefore have greater potential as runoff control measures than in-field measures alone. In the UK, the implementation, effectiveness and functioning of seven new wetlands constructed at the edges of agricultural fields is currently being assessed. The constructed wetlands, of different designs, which are fed by different flow types and are located on different farm and soil types, are continuously monitored for discharge and turbidity at inlets and outlets, while storm sampling allows assessment of sediment and nutrient transfer into and out of the wetland at times when there is a high risk of pollutant transfer. Pond surveys and sediment sampling will take place annually, and tracer experiments will be carried out in the course of the project. The data will be used to generate information on sediment and nutrient load reductions or wetland effectiveness, wetland sediment and nutrient budgets, and water and sediment residence times. In this paper we present the initial results, including novel high-resolution data from the first monitored events. Early outputs suggest that constructed wetlands which receive surface runoff inputs can retain flood waters and may reduce flood peaks, wetlands built to take drain outfalls may be effective but may not be practical management options in all circumstances, and that turbidity measurements may be a good indicator of sediment and total nitrogen and phosphorus concentrations and hence sediment and nutrient transfer through wetland systems.