

Modular approaches to the control of diffuse water pollution from agriculture: buffer zones, bioreactors, ditches and ponds

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Despite the abundance of literature reporting both riparian and non-riparian buffer strip performance in the control of diffuse pollutants from agriculture, the spatial and temporal mechanistics of the processes involved are poorly understood. As a result, buffer zones have often been implemented incorrectly and have failed to deliver the benefits expected of them. One of the main challenges with buffer zone effectiveness has been found to be their by-passing by the passage of polluted water through sub-surface drains which in many regions of the UK has regularly been shown to greatly limit their value with regard to nutrient control [MAFF report, Leeds-Harrison 1996]. In addition, little work has been carried out on the role of additional, complementary structural buffering methods such as managed ditches and ponds, which may provide more benefits, especially if used either alongside or instead of the more conventional use of buffer strips. Also, the compatibility of buffers for both N and P retention has received little attention.

Here we describe a field scale experiment that forms part of a Defra funded project, which is using a multi-scaled approach to understand the abiotic and biotic drivers of the short-term and 'long-term' effectiveness of conventional grassed buffer strips over 5 years. At the field scale, we are using high resolution monitoring methods to compare the effectiveness of 6 m wide buffer strips along with other mitigation methods including buffer strips enhanced with subsurface bioreactors (to intercept drain water), managed ditches and ponds to control a range of water pollutants and hydrology. Each of the mitigation methods is being investigated both individually, and as part of a strategic modular network of mitigation methods in a purposely constructed and replicated experimental site. Preliminary data is presented, showing hydrological and chemical responses during individual storm events.

References

Leeds-Harrison et al. (1996). MAFF–English Nature Buffer Zone project CSA 2285, Cranfield University, Silsoe, Bedford, UK