

Proactive mitigation of nutrients at small catchment

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European countries are currently working towards the achievement of common goals for the quality of their freshwaters, as set out in the Water Framework Directive (WFD,2000/60/EC). In 2006, the UK's Environment Agency stated that, 'diffuse pollution (especially from agricultural nutrients) will make it very difficult for the UK to achieve the Water Framework Directive's objectives'. Consequently much research effort is being made to devise effective methods to control diffuse pollution from agriculture. A four-year project, funded by the Environment Agency, UK, evaluated new and improved mitigation measures to target diffuse pollution and flooding from agriculture. The mitigation features included infiltration ponds, sediment traps, algal pods, straw barriers, and wetlands. They were constructed and instrumented at farms in Northumberland and Essex in the UK using an approach which disconnects fast polluting pathways and reduces flood peaks by creating transient storage and allowing sedimentation by slowing, storing, and filtering runoff. The results from both sites demonstrated that this approach reduced nutrient concentrations and flood risk associated with runoff from farmed land and thus demonstrated the potential for whole catchments to be managed through soft engineering interventions (Jonczyk *et al*, 2008). The cost-effectiveness of the mitigation features were evaluated, and concluded that there is a cost effective basis for nutrient pollution management, especially through sediment trapping (Jonczyk *et al*, 2010). This project has demonstrated the science, engineering, and end user engagement that can potentially yield whole catchment solutions to sediment loss, pollution control and the reduction of flood risk in rural areas. A whole catchment solution is currently underway in a 5.9 km² catchment in North East England, where soft engineered runoff management features were constructed to reduce flooding. With funding from the Northumbria Regional Flood Defense Committee, the Environment Agency North East Local Levy team and Newcastle University have created a partnership to address the flood problem using soft engineered runoff management features (Wilkinson *et al* 2010). The multi-purpose benefits of these features, originally designed to reduce flooding, have not yet been fully realised, especially with respect to phosphorus and nitrate concentrations. Nutrient data upstream and downstream of these features are currently being collected and will be used to maximize the full potential of the features to capture nutrients and offer greater protection to the downstream SSSI.

- Jonczyk, J.C., P.F. Quinn, D.L. Rimmer, S. Burke, M.E. Wilkinson. 2010. The effectiveness of soft engineering interventions in controlling flooding and diffuse pollution from agricultural land. p. 75-82. In K. Crighton and R. Audsley (ed.) Climate, Water, and Soil: Science, Policy and Practice. Proc. Biennial Conf. Edinburgh, UK. 31 March-1 April 2010. SAC and SEPA, Scotland, UK.
- Jonczyk, J.C., P.F. Quinn, D.L. Rimmer, S. Burke, M.E. Wilkinson. 2009. Farm Integrated Runoff Management (FIRM) Plans as a tool to reduce diffuse pollution and lower flood risk. In: Sustainable Hydrology for 21st Century. Proc. 10th National Hydrology Symposium. Exeter, UK. 15-18 Sept 2008. British Hydrological Society, UK.
- Wilkinson, M.E., P.F. Quinn and P. Welton. 2010. Runoff management during the September 2008 floods in the Belford catchment, Northumberland. Journal of Flood Risk Management (*in review*).