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The influence of subsurface drainage on sediment and phosphorus export from intensively managed grasslands

Bilotta, G.S.1,2, Brazier, R.E.1, Butler, P.2, Granger, S.2, Haygarth, P.M.2

1Department of Geography, The University of Exeter, Devon, EX4 4RJ, UK

2Cross Institute Programme for Sustainable Soil Function (SoilCIP), Institute of Grassland and Environmental Research (IGER), North Wyke Research Station, Okehampton, Devon, EX20 2SB, UK.

The installation of subsurface drainage is one type of agronomic improvement which has been used widely in grasslands to alleviate problems such as waterlogging (which can inhibit plant productivity), and to reduce the incidence of soil and vegetation damage by grazing animals through the processes of compaction, pugging and poaching. However, during the last decade there has been increasing concern over the environmental impacts of subsurface drainage. One particular area of concern which remains a controversial and poorly understood issue relates to the influence that subsurface drainage has on the transport of contaminants, such as sediment and phosphorus (P), from intensively managed grasslands to surface waters.

The work presented here is based on results from a field experiment designed to investigate the influence of subsurface drainage on sediment and P export from intensively managed grasslands. The experimental site, run as part of the Rowden Experimental Research Platform at the Institute of Grassland and Environmental Research, in Devon (UK), comprises four one-hectare paired lysimeter plots (two drained and two undrained). The lysimeter plots were monitored for overland flow, subsurface throughflow and/or subsurface drainflow, as well as sediment flux and total P flux, over the 2005-2006 hydrological season. Plots are equipped to monitor surface flow and drained flow in isolation, so that the effect of land drainage, common to intensively grazed land on heavy soils, can be assessed not only in terms of the threat posed to water quality from individual hydrological pathways, but also in terms of the overall

effect of subsurface drainage (i.e. drained versus undrained land) on the sediment and P export budget. Results are presented as time series from each plot as well as event, monthly, seasonal and annual budgets. Data from individual storm events suggest that subsurface drainage causes a reduction, by approximately 40%, in the total quantity of suspended sediment and TP transferred from the 1 ha grassland plots. These results challenge existing environmental concepts which often suggest that subsurface drainage can act to as a preferential pathway which enhances sediment and P transport from land to surface waters. These findings will have important implications for those involved in land-use and mitigation of effects on water-quality.