Geophysical Research Abstracts
Vol. 18, EGU2016-8316, 2016
EGU General Assembly 2016

Characterising and classifying agricultural drainage channels for sediment and phosphorus management

Mairead Shore (1), Phil Jordan (2), Per-Erik Mellander (1), Mary Kelly Quinn (3), Karen Daly (4), James Tom Sims (5), and Alice Melland (6)

(1) Teagasc, Agricultural Catchments Programme, Johnstown Castle, Wexford, Co, Wexford, Ireland, (2) School of Geography and Environmental Sciences, Ulster University , Coleraine, N. Ireland, (3) School of Environmental and Biological Sciences, University College Dublin, Dublin, Ireland, (4) Teagasc, Environmental Research Centre, Johnstown Castle, Wexford, Co, Wexford, Ireland, (5) Department of Plant and Soil Sciences, University of Delaware, Newark, DE, USA, (6) University of Southern Queensland, Toowoomba, Australia

In agricultural landscapes, surface ditches and streams can significantly influence the attenuation and transfer of sediment and phosphorus (P) from upstream sources to receiving water-bodies. The sediment attenuation and/or transfer capacity of these features depends on channel physical characteristics. This is similar for P, in addition to the sediment physico-chemical characteristics. Therefore, a greater understanding of (i) channel physical characteristics and (ii) the associated sediment physico-chemical characteristics could be used to develop channel-specific management strategies for the reduction of downstream sediment and P transfers.

Using a detailed field survey of surface channel networks in a well-drained arable and a poorly-drained grassland catchment (both c.10km2), this study (i) characterised all ditches and streams in both catchments, (ii) investigated the physico-chemical characteristics of sediments in a subset of ditches, (iii) classified all channels into four classes of fine sediment retention and/or transfer likelihood based on a comparison of physical characteristics (slope and drainage area) with observations of fine sediment accumulation and (iv) considered P management strategies that are suited to each class.

Mehlich3-Al/P and Mehlich3-Ca/P contents of ditch sediments in the well (non-calcareous) and poorly (calcareous) drained catchments, respectively, indicated potential for soluble P retention (above thresholds of 11.7 and 74, respectively). In general, ditches with low slopes had the greatest potential to retain fine sediment and associated particulate P. As sediments in these catchments are likely to primarily adsorb, rather than release soluble P, these flat ditches are also likely to reduce soluble P loading downstream. Ditches with moderate-high slopes had the greatest potential to mobilise fine sediment and associated P during event flows. Ditch dimensions were not closely related to their indicative flow volumes and were over-engineered, which likely reduces downstream P transfer. Streams had the greatest potential to convey fine sediment and associated P during event flows.

Optimising these linear features for eutrophication management in headwaters, periodic removal of fine sediment and maintenance of channel vegetation in net attenuating and transferring channels, respectively, would help to minimise sediment and P transfers from these catchments.