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The contribution of soil structural degradation to catchment flooding: a preliminary investigation of the 2000 floods in England and Wales

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Abstract. During the autumn of 2000, England and Wales experienced the wettest conditions for over 270 years, causing significant flooding. The exceptional combination of a wet spring and autumn provided the potential for soil structural degradation. Soils prone to structural degradation under five common lowland cropping systems (autumn-sown crops, late-harvested crops, field vegetables, orchards and sheep fattening and livestock rearing systems) were examined within four catchments that experienced serious flooding. Soil structural degradation of the soil surface, within the topsoil or at the topsoil/subsoil junction, was widespread in all five cropping systems, under a wide range of soil types and in all four catchments. Extrapolation to the catchment scale suggests that soil structural degradation may have occurred on approximately 40% of the Severn, 30–35 % of the Yorkshire Ouse and Uck catchments and 20% of the Bourne catchment. Soil structural conditions were linked via hydrological soil group, soil condition and antecedent rainfall conditions to SCS Curve Numbers to evaluate the volume of enhanced runoff in each catchment. Such a response at the catchment-scale is only likely during years when prolonged wet weather and the timing of cultivation practices lead to widespread soil structural degradation. Nevertheless, an holistic catchment-wide approach to managing the interactions between agricultural land use and hydrology, allowing appropriate runoff (and consequent flooding) to be controlled at source, rather than within the floodplain or the river channel, should be highlighted in catchment flood management plans.

Keywords: flooding, soil structure, land management, Curve Number, runoff, agriculture

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