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Water Quality in Terms of Metals during Flooding in Two Ecosystems of the Conchos Watershed, Mexico: Rangeland-Forest and Urban Areas

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Mobilisation and Transport of Sediments , Colloids and Phosphorus from Intensively Managed Grasslands

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Introduction Soil erosion can cause serious ecological degradation when suspended solids (SS) and sorbed contaminants are delivered into surface waters .As such soil erosion is a process which needs to be controlled if we are to meet water quality guidelines and good ecological status in surface waters .The effective control of soil erosion and the delivery of SS into surface waters requires a holistic understanding of the land-uses that are susceptible to erosion and the land-management factors that influence soil erosion and the mobilisation and transport of SS .However , a review of the soil erosion literature in the UK reveals that almost all of this research relates to erosion on arable land or upland areas , with a generally implicit assumption that intensively managed lowland grassland does not erode and therefore does not present a threat in terms of sediment-related water quality problems .

Materials and methods This paper presents results from 3 years of environment-based experiments and monitoring at a range of scales , from small plots (0.2 m²) , to field-scale lysimeters (1 ha) , up to a headwater catchment (48 ha) .The rates of erosion and yields of sediment , colloids and phosphorus (P) from intensively managed grasslands are discussed and compared in relation to that from arable land and international water quality guidelines .Furthermore , the influence of two common , but currently poorly understood , land management options are also examined ; (1) subsurface drainage , and (2) stocking density .

Results Results show that 1-ha grassland fields can yield up to 15 kg of SS in response to rainfall events lasting less than 24 hours .These yields of SS are within the ranges of those recorded on arable land , a land-use considered to be more susceptible to erosion .The concentrations of SS and P in runoff from 1-ha intensively managed grasslands are ecologically significant ; frequently exceeding international water quality guidelines such as those of the European Union's Freshwater Fisheries Directive and the United States Environmental Protection Agency's ecoregional nutrient criteria .The presence of subsurface drainage attenuates hydrological response to rainfall events , relieving saturation and reducing the occurrence of saturation-excess overland flow , resulting in reduced yields of SS and P by up to 40 % .Evidence from the plot scale experiments suggests that increasing stocking density tends to cause an increase in the soil bulk density and a reduction in the vegetation cover , leading to a faster hydrological response and higher concentrations and yields of both SS and P .

Conclusions Evidence presented in this paper suggests that contrary to the popular assumption , intensively managed grasslands do erode and do present a significant threat to water quality in terms of sediment-related water quality issues .Land-management within intensively managed grasslands has massive potential to influence the mobilisation and transport of sediment , colloids and phosphorus , and the overall rate of erosion from these environments .