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Using SWAT to Assess Diffuse Source Nutrients Reduction Measures in the River Axe Catchment, UK

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The Water Framework Directive (WFD) (Directive 2000/60/EC) requires new ecological standards for rivers, lakes and coastal waters by 2015. In the United Kingdom the English Catchment Sensitive Farming Initiative has identified 40 catchments which are at risk of failing the European Commission WFD targets for good ecological status of water bodies because of a range of issues. The river Axe catchment situated in south-west part of the UK, with a mixture of diffuse and point sources of pollution, is one of these priority sites, as intensive dairy farming and cultivation of high risk crops (maize), cause problems with enhanced suspended sediment, nitrate and phosphorus levels in the river. For the purpose of this research the Soil and Water Assessment Tool (SWAT-2005) and ArcView GIS 3.2 interface AVSWAT-X were used. SWAT has been found to be a useful tool in numerous EU and UK studies addressing the objectives of the EU WFD, which requires identification of pollution sources, their influences and solutions for the studied catchment. The base scenario was based on field observation and interviews with the Environment Agency and farmers; it was run with and without point sources. Model was performing well; achieving hydrological calibration for Nash-Sutcliffe efficiency coefficient (E_{NS}) of 0.62. Three different scenarios, field buffer strips (FBS), extensive land use management (ELUM) and sheep land use management (SLUM), were used to evaluate the ability of SWAT to represent the proposed

mitigation methods and assess the effectiveness of the measures in reducing nutrient loads in the Axe. During the research questions were raised regarding uncertainties in the input data and SWAT being unable to represent certain measures and processes which are normal in real conditions. However, SWAT was found to be able to represent the proposed mitigation methods which were included in these three management scenarios. Management scenarios reduced the average annual loads at the main catchment outlet by 21.21% (FBS), 37.32% (ELUM) and 45.02% (SLUM), for total nitrogen; 47.72% (FBS), 60.58% (ELUM) and 62.41% (SLUM) for total phosphorus; and 3.49% (FBS), 7.34% (ELUM) and 5.58% (SLUM) for annual average sediment yield. To deliver the necessary water quality improvements for the river Axe both diffuse and point sources of pollution will have to be addressed as results show that reduction only in one type of source does not achieve the Environment Agency's Environmental Quality Standard target values which were set to meet the objectives of the EU WFD.