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Where does diffuse pollution come from? A multi-scale risk-based approach grounded in hydrological conductivity

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This paper is concerned with understanding the causes of diffuse agricultural pollution from a very different perspective to that adopted in traditional water quality models: rather than prediction of time-series of water quality parameters at a point, we focus explicitly upon identifying the risky parts of drainage basins using an approach that combined hydrological risk (a measure of how well connected a point in the drainage basin is) with production risk (a measure of the likelihood of a particular land use producing a particular risk). This is undertaken in a GIS framework, integrating data up from a very small spatial scale (25 m^2) to entire catchments (over 1000 km^2) in order to compare the relative risk of different points in the catchment. This is then followed by downscaling into the riskiest sub-catchments, tributaries, and eventually fields, to prioritise where to focus alternative land management practices. The model is driven by basic digital data resources. As the model is time-integrating but space-disaggregating, we need to obtain spatial datasets for model validation. Thus we used distributed surveys (of for example fish populations) to show that the models estimates of spatial variation in risk match available field evidence. Given the impetus from the Water Framework Directive and the need to develop catchment-sensitive farming, we believe that this approach could be a major new framework for management of diffuse pollution.