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Estimating river nutrient concentrations across North West England using catchment characteristics

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Understanding the linkages between catchment characteristics and river nutrient concentrations is important for identifying sources and hydrochemical processes. This understanding is crucial for informing management strategies, especially with expected changes in land use and climate. Despite the North West of England being one of the most environmentally diverse regions in the UK, and home to major industrial and urban heartlands, there is a scarcity of information on the variability in river nutrient concentrations in this region. Linear relationships between average nitrate and orthophosphate concentrations and catchment characteristics (land cover, terrain, geology, rainfall and base flow index) are examined for rivers in North West England using a GIS-based approach and an extensive water quality database from the Environment Agency of England and Wales. The results reveal that average nitrate concentrations are most strongly related to arable cover, although point sources in the region appear to have a significant effect on river nitrate levels. Orthophosphate concentrations are most closely related to urban cover. The linear models for nitrate and orthophosphate are tested on an independent dataset, resulting in maps of estimated nutrient concentrations across the North West. The simple approach works well for the estimation of nitrate concentrations, but the linear approach to estimating orthophosphate concentrations using catchment characteristics is problematic. Exceptionally high orthophosphate concentrations at sites associated with point source inputs may disproportionately influence underlying relationships with catchment characteristics.