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Hydrol. Earth Syst. Sci., 8, 205-219, 2004
www.hydrol-earth-syst-sci.net/8/205/2004/

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Nitrogen Risk Assessment Model for Scotland: II. Hydrological transport and model testing

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Abstract. The amount and concentration of N in catchment runoff is strongly controlled by a number of hydrological influences, such as leaching rates and the rate of transport of N from the land to surface water bodies. This paper describes how the principal hydrological controls at a catchment scale have been represented within the Nitrogen Risk Assessment Model for Scotland (NIRAMS); it demonstrates their influence through application of the model to eight Scottish catchments, contrasting in terms of their land use, climate and topography. Calculation of N leaching rates, described in the preceding paper (Dunn *et al.*, 2004), is based on soil water content determined by application of a weekly water balance model. This model uses national scale datasets and has been developed and applied to the whole of Scotland using five years of historical meteorological data. A catchment scale transport model, constructed from a 50m digital elevation model, routes flows of N through the sub-surface and groundwater to the stream system. The results of the simulations carried out for eight different catchments demonstrate that the NIRAMS model is capable of predicting time-series of weekly stream flows and N concentrations, to an acceptable degree of accuracy. The model provides an appropriate framework for risk assessment applications requiring predictions in ungauged catchments and at a national scale. Analysis of the model behaviour shows that streamwater N concentrations are controlled both by the rate of supply of N from leaching as well as the rate of transport of N from the land to the water.

Keywords: nitrogen, diffuse pollution, hydrology, model, transport, catchment

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Citation: Dunn, S. M., Lilly, A., DeGroot, J., and Vinten, A. J. A.: Nitrogen Risk Assessment Model for Scotland: II. Hydrological transport and model testing, Hydrol. Earth Syst. Sci., 8, 205-219, 2004. ▣ [Bibtex](#) ▣ [EndNote](#) ▣ [Reference Manager](#)



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