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The Multi-Scale Response of Water Quality, Biodiversity and Carbon Sequestration to Coupled Macronutrient Cycling from Source to Sea: TURF2SURF

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Turf2Surf is a large, multi-disciplinary project that aims to test the hypothesis that the spatial and temporal patterns of water quality, C sequestration and biodiversity are better explained through the large-scale coupling of C, N and P cycles than by single cycle, single system approaches. To achieve this, a catchment-scale study of the River Conwy (349 km2) in Wales is being done with emphasis on determining when, where and how coupled macronutrient (C, N, P) cycling occurs in the biogeochemical hot-spots of the soils, the riparian zone, instream and in the river-estuarine transition zone. A major integrated measurement programme is now largely complete. New data are being analysed to understand which soil properties have greatest influence on above and below-ground productivity including plant traits and how microbial processing is controlled by stoichiometry and nutrient priming. Within the stream network, new understanding is being produced on the in-river algal and whole ecosystem (metabolic) response to CNP additions and the factors affecting the fate and cycling of organic matter. In the estuary, initial results indicate a subsurface jet is causing stratification and a velocity anomaly has been observed. Both are important in terms of suspended matter transport and floc break-up. An integrated model is being built to describe the soil-atmosphere-vegetation processes which is linked, firstly, to flow and water quality models that describe the CNP flux transport and transformations from the headwaters to the estuary and, secondly, to biodiversity models. The purpose of the integrated model is to quantify how coupled CNP cycles may respond to environmental change and thereby affect C sequestration, water quality and biodiversity in the future. The team are now in the major phase of data synthesis and model development and are interested in linking with similar studies involving coupled CNP cycles across the atmospheric-terrestrial-freshwater-coastal continuum.