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Fluvial macronutrient concentration and export during wind farm development

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Onshore wind farm development has increased during the past decade in upland peatlands in the UK, but there is limited knowledge of how this emerging land use impacts on peatland carbon sink strength and downstream aquatic carbon and nutrient concentrations. To improve understanding and management of possible impacts of wind farms on peatlands and aquatic systems, knowledge is required on the effects of specific wind farm development activities which include installation of turbine bases, construction of sub-stations, tracks and laying of cable trenches, temporary quarries, and forest felling. In this study, concentrations of dissolved and particulate organic carbon (DOC and POC), soluble reactive phosphorus (SRP) and total oxidised nitrogen (TON) were measured every 3-4 weeks and discharge monitored at 18 sites for 30 months during and after the development of a wind farm in central Scotland, UK. Study catchments were nested and were selected to represent the spectrum of typical wind farm development activities. There were no significant differences during the study period in DOC, POC, SRP and TON concentrations and exports between sampling points at the site entrance and exit. Elevated concentrations and exports of DOC, POC, SRP and TON occurred in headwater catchments subject to recent (1-2 years) and slightly older forest felling, respectively, in which the brash materials were left on-site. Nevertheless, the increased carbon and nutrient concentrations and exports were largely attenuated at the exit from the wind farm development. The results indicate that forest felling conducted within wind farm developments is the activity with the most significant short-term effect on concentrations and export of carbon and nutrients downstream and therefore suggest that careful management has the potential to mitigate against these effects.