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Peatland rewetting effects on carbon cycling and water quality: results from the UK uplands and lowlands

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Interest in peatland restoration and rewetting has grown in recent years, in response to the desire to deliver improved ecosystem services, such as (i) climate change mitigation through carbon (C) sequestration, and (ii) provision of potable water. However, knowledge gaps remain in some areas, and desired outcomes of restoration projects, such as the re-establishment of wetland vegetation, may not always be achieved. Here, we present the results of two such projects in the UK from contrasting peatlands. One site is a formerly drained upland bog, in a catchment used to supply drinking water. Extensive ditch blocking took place throughout the catchment, yet four years later no changes to dissolved organic carbon (DOC) quality or quantity were observed, suggesting that rewetting delivered no improvement in drinking water quality. The second site is a drained lowland fen, that was taken out of arable use twenty years ago, with the aim of restoring it to a semi-natural state through grazing, reseeding and hydrological management. A full C budget of the site reveals that it is still a net source of C to the atmosphere (130 g C m-2 y-1), in contrast to an adjacent conservation-managed fen that is a strong C sink (-124 g C m-2 y-1), although a much smaller source of emissions than nearby areas of deep peat remaining under arable use. We discuss the reasons for the lack of rewetting ‘success’ at both sites, and place these results into a wider context, considering drainage/rewetting responses of DOC and C balances observed at upland and lowland peatlands elsewhere in Europe.