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How does wildfire impact carbon delivery to peatland drainage networks?

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Peatlands are a globally important carbon (C) store, although it is well understood that anthropogenic pressures including drainage can reduce potential for C sequestration, in part due to increased losses of C via the aquatic pathway. Superimposed onto land-use pressures on peatlands are those caused by extreme climate events. Following a drought in 2018 and a subsequent dry period in spring 2019, a large wildfire burnt approximately >60 km^2 of blanket bog and wet heath within the Flow Country peatlands, North Scotland in May 2019. The fire burned various peatland land types, including near-natural peatland and drained peatland areas. This event created an urgent opportunity to quantify the interacting effects of peat condition and wildfire on water quality, with a focus on dissolved organic matter (DOM) losses. An extensive water monitoring programme was established, covering 40 individual headwater stream sampling locations across the Flow Country, and monthly sampling ran from September 2019 to October 2020, with samples analysed for dissolved organic carbon (DOC), nutrients and UV-vis-based measurements to inform DOM composition. Initial data shows that samples from burned, drained areas are associated with higher DOC concentrations relative to both burned, near natural peatland areas, and unburned control sites. Furthermore the DOM from burned, drained sites is of a more aromatic nature, as indicated by elevated specific UV absorbance (SUVA), compared to unburned control sites. Such findings imply that wildfires may adversely affect water quality through changes DOM quantity and quality in areas of damaged (drained) peatland. However, more detailed compositional analyses are required to accurately predict changes in the ecological functioning of this peatland derived DOM as it enters the aquatic environment and, therefore, its likely end-fate.