

Negligible in-stream processing of dissolved organic matter in low order boreal streams

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Low order boreal streams have been considered to be reactive interfaces where dissolved organic matter (DOM) enters inland waters from the surrounding catchment soils. Disentangling the relative influence of key environmental factors suspected to influence stream water DOM composition is highly relevant for predicting the reactivity, and fate of terrestrial DOM. Here, we examined changes to DOM composition using optical approaches from 17 boreal streams, ranging from first to fourth order, over 14 months. We identified two specific fluorescing components, which expressed either a clear mire-wetland or forest signature, providing distinct molecular markers of land cover that is typical of the boreal ecozone. In fact, land cover alone explained 49% of the variability in stream DOM composition. In contrast, seasonal fluctuations in hydrology only contributed to minor shifts (8%) in DOM composition. Perhaps most intriguingly, in-stream transformations to DOM composition were undetectable, suggesting that the extent of in-stream processing was negligible. These findings suggest that low order boreal streams act as passive pipes rather than active reactors. Ultimately, we find that that in-stream processing of DOM was restricted by water residence times (less than 2 days). In summary, these results now leave us better equipped to predict where in the landscape, and when during the year, key DOM transformations may occur within the aquatic conduit.