

Effects of upstream lakes on dissolved organic matter in streams

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Abstract

We examined the effects of upstream lakes on dissolved organic matter (DOM) quantity and the absorbance of ultraviolet (UV) radiation in the streams of northern Michigan. We assessed DOM concentration and absorbance in 15 streams with upstream lakes and 17 streams without upstream lakes located in the same geographic region in May and August 2003. In addition, we estimated watershed land cover and morphology to assess the possibility that other landscape variables could account for DOM differences between the two stream types. The concentration of dissolved organic carbon, its UVB absorbance, and its molar absorptivity (absorbance per unit carbon) were all significantly lower in streams with upstream lakes than in streams with no lakes. Strong predictive relationships existed between upstream watershed metrics and stream DOM properties, but varied by season and the presence of upstream lakes. DOM quantity and UV-absorbing ability were related to different watershed metrics, with DOM quantity being strongly related to terrestrial watershed metrics, whereas UV-absorbing ability was most strongly related to percent water surface area. Upstream lakes strongly influence downstream DOM potentially because of their long water residence times, which could increase opportunities for DOM processing. Upstream lakes represent a strong landscape predictor of stream DOM properties that is not directly tied to terrestrial DOM sources and processing.