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DOM photolysis changes copper-complexing properties in mountain streams

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One important ecological role of dissolved organic material in aquatic ecosystems is regulation of the bioavailability of potentially toxic trace metals. We investigated how the alteration of the DOM by photolysis changed the copper complexing properties of dissolved fulvic acids in stream sites in the Rocky Mountains. Increases in ultraviolet radiation combined with the high metal concentrations associated with past and current mining activities make this a potential environmental concern. We determined the copper-complexing properties of fulvic acids isolated from paired wetland and streams sites during the snowmelt and summer period using potentiometric titration. We then irradiated samples under controlled conditions to determine changes in copper-complexation. We found that most samples showed decreases in copper-binding after photolysis, but some samples showed an increase. These differences in response were not correlated with bulk chemical characteristics of the fulvic acids, but did appear to be influenced by the changes in N-containing functional groups. We also followed changes in DOM composition at a larger number of sites through the snowmelt and summer low flow period, and found that the seasonal differences in fulvic acid concentration would also influence copper-binding capacity in the streams.