“Effect of Photochemical Transformation on Dissolved Organic Carbon Concentration and Bioavailability from Watersheds with Varying Landcover”

The transformation of freshwater dissolved organic carbon (DOC) has important implications for the health of aquatic ecosystems, status of climate, and water quality. Aquatic ecosystems rely on the bioavailability of dissolved nutrients through biogeochemical cycles to remain productive. Evolution of Vermont’s land cover and land use (LCLU), as well as changing climate, can have important consequences on local waterways. Specifically, these landscape alterations can affect the concentration (quantity) and bioavailability (quality) of carbon within the watershed. Water samples were obtained from the three major LCLU watersheds (forested, agriculture, urban) in the Lake Champlain basin of Vermont and were irradiated with sunlight. This study analyzed how sunlight degraded DOC in different LCLU areas to alter quality and increase accessibility for aquatic heterotrophs. Absorbance spectra were used to determine SUVA254 and spectral slope values that could infer changes in DOC complexity. Additionally, fluorescence was measured in order to determine the relative abundance of humic-like and protein-like fluorescing molecules. The spectral data concluded that photodegradation increased the bioavailable fraction of DOC in all three landscapes analyzed. Photochemical processing of DOC appears to transform an originally recalcitrant nutrient into a simpler form, ultimately increasing nutrient resources for heterotrophic organisms and increasing carbon dioxide mineralization.