A WATERSHED-SCALE CHARACTERIZATION OF DISSOLVED ORGANIC CARBON AND NUTRIENTS ON THE SOUTH CAROLINA COASTAL PLAIN

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Dissolved organic matter (DOM) is recognized as a major component in the global carbon cycle and is an important driver of numerous biogeochemical processes in aquatic ecosystems, both in-stream and downstream in estuaries. This study sought to characterize chromophoric DOM (CDOM), dissolved organic carbon (DOC), and dissolved nutrients in major rivers and their tributaries of the South Carolina Coastal Plain as a screening assessment of the impact of land cover, soils, stream order, and other factors on DOC characteristics and water quality. During eight trips from June 11 to July 9, 2014 throughout the South Carolina Coastal Plain, we visited 54 sites and collected water samples for laboratory analysis of DOM ultraviolet absorbance and concentrations of DOC, dissolved organic nitrogen (DON), and dissolved inorganic nitrogen (DIN). Sample sites included headwater wetlands and springs, streams and rivers, and water table monitoring wells. Spectral analysis of the filtered water samples was done from 200-800 nm using a Shimadzu UV-1700 spectrophotometer. We calculated the spectral ratio (SR, the ratio of slope coefficients at 275-295 nm: 350-400 nm) to facilitate broad characterizations of the nature of the CDOM in the water based on stream order, water type (black, brown, clear), and physiography (lower Coastal Plain (LCP), upper Coastal Plain (UCP)). We performed analysis of variance (ANOVA) to test for significant differences ($p<.05$) in measured values and interaction and multiple regression to determine dominant influences of land cover and soils. Dependent variables were DOC, SR, DON, and DIN. Independent variables were proportions of land cover types and soil order. ANOVA showed the largest concentrations of DOC occurred in black water and in low order streams. The DOC concentration was larger in black water on the LCP than the UCP. There were significant differences in SR (lowest in LCP and low order streams), DON concentration (largest on LCP), and DIN (largest in clear water on the UCP). Regression analysis indicated that most of the variability in DOC concentration was explained by amount of forested wetlands and soil type (mostly Spodosols) in the watershed. Most of the variability for both DON and DIN was explained by the amount of agricultural land cover although for DON some soil orders were dominant on the LCP and in low order streams. There were few significant regression models for SR and no clear patterns. Our results indicate that low order streams on the Coastal Plain are important channels for delivery of high molecular weight organic carbon to coastal estuaries.

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