RELATIONSHIPS BETWEEN METAL CONTAMINATION IN WADABLE STREAMS IN SOUTH CAROLINA AND LAND USE CHARACTERISTICS

ABSTRACT
At present, little data are available concerning the overall quality of small aquatic ecosystems in South Carolina. A study of waterborne metals in South Carolina is currently being conducted in the Pee Dee Atlantic Southern Loam Plains and Pee Dee Carolina Flatwoods watersheds. The goal of this work is to assess overall ecosystem quality in order to provide information needed for improved management strategies. This project employs fish population methods and in addition performs measurements of stream characteristics, chemical contaminants present, and fish exposure to chemical contaminants. This presentation focuses several contaminant trends in water and sediments in 2006 and 2007 and relationship between metals and land use in the drainage areas or watersheds of the sites sampled. Sites were randomly selected within known streams and GIS-determined watersheds of appropriate size (less than 150 km2). GIS and the National Land Cover Data (NLCD) were used to determine the land use types associated with each site. Each site was analyzed using ICP-MS, ICP-AES and Cold Vapor AAS. Among the metals of interest are aluminum, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, tin, and others. Results indicate that a small number of sites exceed the published US EPA constant contaminant concentration and contaminant maximum concentration for a few waterborne or dissolved metals (e.g., cadmium, copper, nickel). In addition, a small number of sites exceed published risk threshold values for metal-contaminated sediments. Linear regression was used to correlate individual dissolved metal measurements with land use activities in individual and combined watersheds. Results indicate that changes in land use can affect the waterborne or dissolved metal concentrations. As expected, a number of metals were observed for agricultural and forest land use with several metals (e.g., arsenic, nickel, selenium, and others). Developed land uses also showed significant effects on these small and largely rural watersheds. Concentrations are also considered for the whole study and are separated by individual catchments. Principle component analysis (PCA) is applied to watershed land use to simplify interpretation and to reveal parameters responsible for metal contamination variability.

OBJECTIVE
To support South Carolina Department of Natural Resources in their goal to design an implement an effective strategy to protect, conserve, and restore the aquatic resources of the State of South Carolina.

METALS ANALYSIS

AQUEOUS RESULTS

SEDIMENT RESULTS

SITE SELECTION

LAND USE CORRELATION

DISCUSSION
• Results strongly indicate the presence of metals in the water column and in sediments, with several sites at concentrations above the EPA Constant Contaminant Concentration (CCMC), Contaminant Maximum Concentration (CMC), and sediment risk thresholds.
• Significant trends between metal concentrations and land use within the watersheds are evident.
• Geographic hot spots of metal contamination are evident. This indicates that metals are geographically distributed.

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