Spatiotemporal Assessment of Long-Term Stream Water Chemistry Across Louisiana

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Abstract

Louisiana uses a set of 475 state-defined sub-segment watersheds as the spatial framework for its watershed assessment. The main goal of this assessment program is to develop Total Maximum Daily Loads (TMDLs) to meet water quality standards that designate the beneficial uses of surface waters. However, continuous long-term water quality data are lacking for most of the sub-segment watersheds. This study employed most recent and long-term data (1978-2001) selected from 25 monitoring stations to identify spatial and temporal patterns in water quality changes across the state's five major landforms from the coastal march to the coastal plain, Mississippi alluvial, upland terrace, and upland hills. Temporal trends of stream water quality including dissolved oxygen (DO), nutrients (total N, P, OC), total suspended solid (TSS), fecal coliform (FC), and toxic elements (copper, lead, and arsenic) were analyzed. The study shows that historically the streams in the coastal march and coastal plain regions contained higher nutrient loads and lower DO than those in the upland regions. The DO levels and nutrient concentrations remained relatively consistent over the past 24 years, whereas the concentrations of the toxic elements in the streams largely decreased during the late 1980s and early 1990s. Monthly TSS varied largely in all 25 streams and across seasons. These results indicate that the development of water quality standards needs to be site specific, and that more intensive, storm-based sampling is necessary to adequately characterize TSS in Louisiana's watersheds.

Keywords: stream water quality, spatiotemporal assessment, watersheds, Louisiana lowland

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