

# **SPATIAL AND TEMPORAL VARIABILITY IN NUTRIENT CONCENTRATIONS IN SURFACE WATERS OF THE CHATTAHOOCHEE RIVER BASIN NEAR ATLANTA, GEORGIA**

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## **ABSTRACT**

Nutrient concentrations from the early 1970's through 1995 were evaluated at several sites along the Chattahoochee River and its tributaries near Atlanta, to determine general patterns and processes controlling nutrient concentrations in the river. A spatial analysis was conducted on data collected in 1994 and 1995 from an intensive nutrient study of the Chattahoochee River and its tributaries by the Georgia Department of Natural Resources, Environmental Protection Division. The 1994-95 data show step increases in ammonium ( $\text{NH}_4\text{-N}$ ), nitrite plus nitrate ( $\text{NO}_2\text{+NO}_3\text{-N}$ ), and total-phosphorus (Tot-P) concentrations in the river. The step increases occur downstream of two wastewater treatment facilities (WWTF) and Peachtree Creek, a small tributary inflow with degraded water quality draining a predominantly urban and industrial area. Median  $\text{NO}_2\text{+NO}_3\text{-N}$  and Tot-P concentrations in the mainstem increase downstream of these inputs from 0.5 to 1 mg l<sup>-1</sup> and from 0.04 to 0.13 mg l<sup>-1</sup>, respectively.  $\text{NH}_4\text{-N}$  concentrations were typically low with 95 percent of the 2,575 observations less than 0.2 mg l<sup>-1</sup> throughout the river system; however, some tributaries had high values (>1 mg l<sup>-1</sup>), particularly near the central part of Atlanta. High  $\text{NH}_4\text{-N}$  concentrations are attributed to sewage discharge because sewage discharge is also associated with high biological oxygen demand and fecal coliform bacteria concentrations. Nutrient concentrations vary temporally. An assessment of four sites, two mainstem and two tributaries- from 1970 to 1995- indicates a progressive increase and variability in  $\text{NO}_2\text{+NO}_3\text{-N}$  concentrations during the period. The progressive increase in  $\text{NO}_2\text{+NO}_3\text{-N}$  concentrations and their variability is similar to that reported in surface waters throughout the world. Tot-P concentrations increased at mainstem sites in the Chattahoochee River basin in Georgia through the middle to late 1980's and decreased markedly thereafter because of improvements to WWTF and a 1990 Statewide phosphate detergent ban.  $\text{NH}_4\text{-N}$  concentrations, although less pronounced than Tot-P, display a similar decrease from the late 1980's to 1995 at the four sites. Tot-P concentration variability has increased at the four tributary sites since 1993, although recent concentrations, on average, are the lowest since 1970.