

# PRELIMINARY ANALYSIS OF THE WATER QUALITY VARIABILITY OF URBAN STREAMS, ATLANTA, GEORGIA, MAY 2003–OCTOBER 2004

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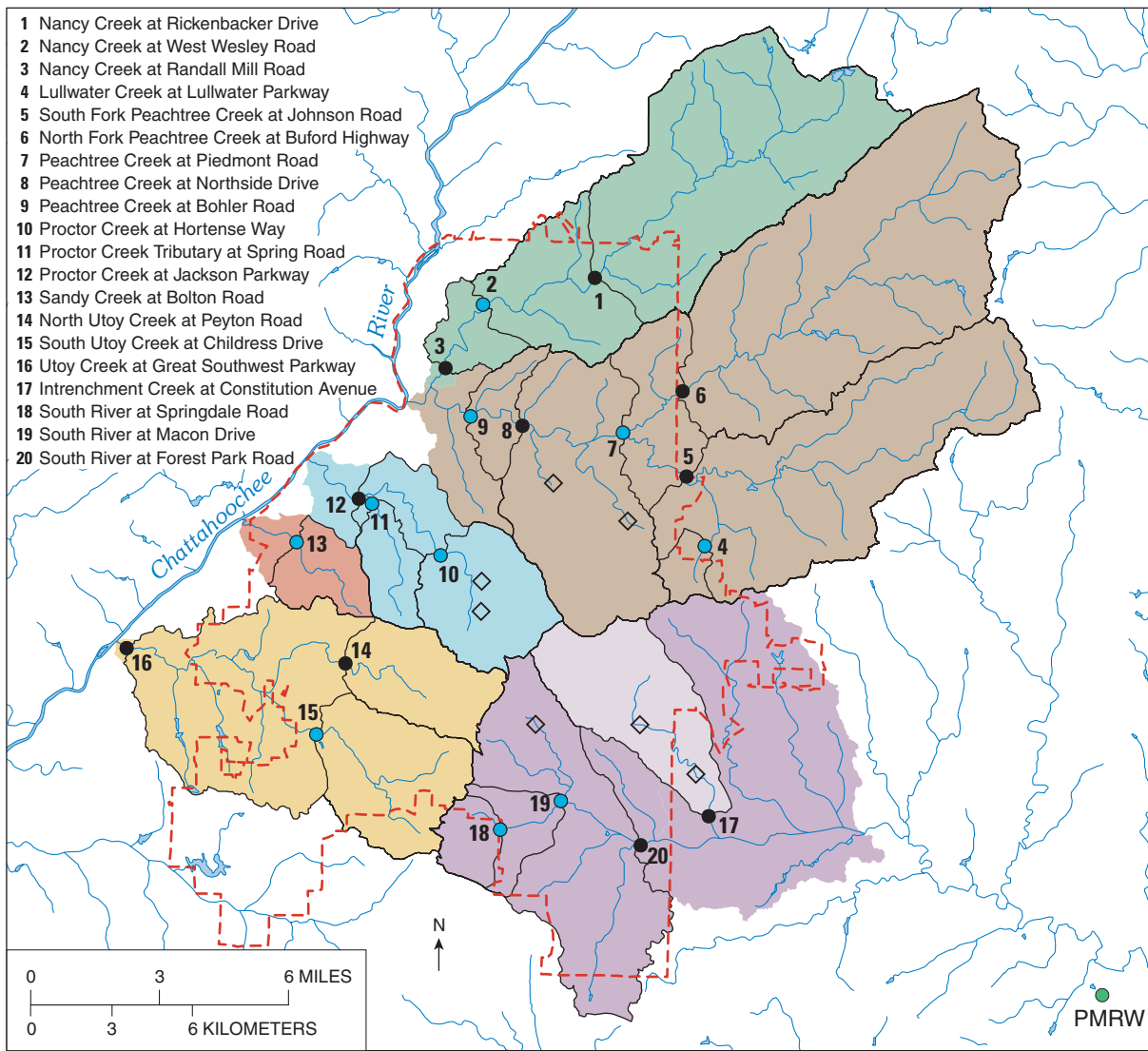
**Abstract.** The City of Atlanta began long-term streamwater-quality monitoring during the spring of 2003 as part of a long-term watershed monitoring program to evaluate the effects of proposed and ongoing wastewater-treatment infrastructure upgrades on water quality. As part of the streamwater-quality monitoring, the U.S. Geological Survey routinely collected and analyzed concurrent manual grab and equal-width increment samples from 20 urban stream sites in the City of Atlanta from May 2003 through October 2004. Discrete automatic samples are collected and real-time streamflow and water-quality measurements are monitored at 10 of the sites (Fig. 1).

The relations among dissolved solute concentrations at the routine sites were evaluated with respect to land use and compared among sites and to a background stream in a relatively undisturbed watershed at the Panola Mountain State Conservation Park, 25 kilometers southeast of Atlanta (Panola Mountain Research Watershed [PMRW]). Relations among solute concentrations were relatively consistent at most sites for naturally-occurring solutes, that is, those solutes derived primarily from rock weathering. In addition, streamwater at most sites shows the effects of more urbanized land use through elevated concentrations of some solutes—such as calcium, magnesium, sulfate, and chloride—relative to other solutes or parameters such as dissolved silica and alkalinity. The streamwater solute concentrations do not show a distinct seasonal pattern, but most major solute concentrations are flow dependent, showing a decrease with increasing streamflow, that is, dilution of background concentrations during stormflow.

Nutrient (nitrogen and phosphorus) concentrations generally are low relative to U.S. Environmental Protection Agency (USEPA) standards, but about 10 times higher than at PMRW and do not correlate with streamflow or season. Bacteria concentrations vary markedly among the sites. *Escherichia coli* (*E. coli*), a subset fecal coliform, is a strain of bacteria that lives in the intestines of humans and animals and produces a powerful toxin, which can cause illness. Fecal coliform and *E. coli* concentrations varied markedly among sites. Although the median fecal coliform concentration at PMRW was higher than most of the routinely sampled urban stream sites,

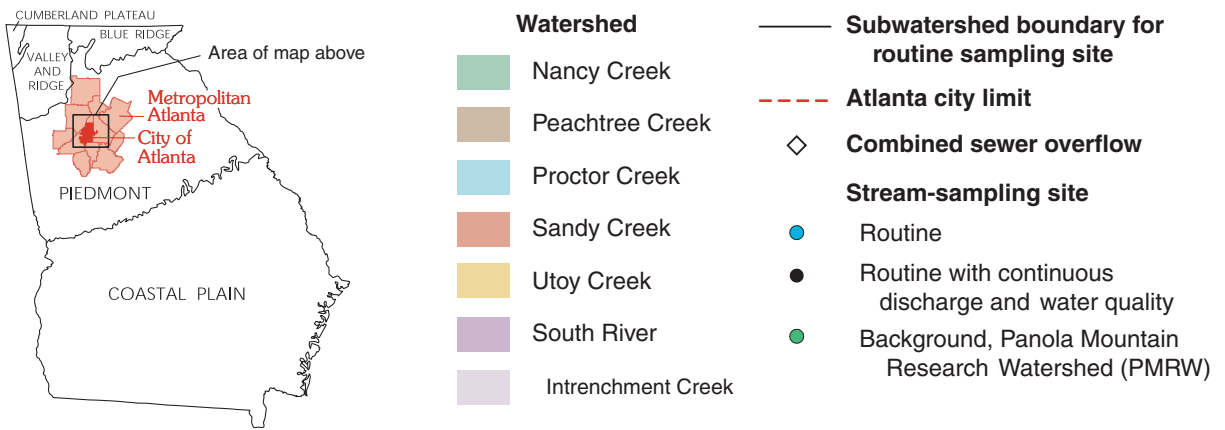
median *E. coli* concentrations were only slightly lower than two sites on Nancy Creek draining predominantly residential area, higher than two upstream South River sites having other water-quality issues as noted below, and less than or equal to one-eighth of the median concentration at other sites. Furthermore, the *E. coli* concentrations were positively correlated with turbidity and streamflow at the urban sites, but the significance of the relations varied markedly among sites. The median *E. coli* concentration at each site, except the South River at Springdale Road, exceeds the USEPA standard for freshwater bathing of 126 colonies per 100 milliliter.

Samples collected at some sites on Intrenchment Creek, South River, and Proctor Creek have different solute concentration relations than most of the other streams. Intrenchment Creek solutes appear to be derived from two distinctly different water types. One type is attributed to combined sewer overflow (CSO) releases, which are apparent from a rapid and sustained streamflow increase during baseflow periods. This water type is characterized by high concentrations of all major solutes, which are poorly correlated among each other, and sporadically low concentrations of bacteria. The high chloride concentrations may be caused by chlorine disinfection prior to release; residual chlorine in CSO discharges would result in low streamwater bacteria concentrations. The other water type is similar to samples collected at sites dominated by residential land use; high correlations among concentrations of solutes derived from mineral weathering. The streamwater solute concentrations at two sites on the South River upstream of the confluence with Intrenchment Creek also are sporadic but have atypical characteristics compared to other sites including high sulfate concentrations, low pH (4.5), and low alkalinity (0 parts per million). These conditions may result from the discharge of sulfuric acid or another acidic substance, which has not been determined. Proctor Creek generally has much higher concentrations of calcium, magnesium, and alkalinity than the other sites and these elevated concentrations were measured in the headwaters at Hortense Way and downstream at Jackson Parkway. The Proctor Creek sites also have relatively high and variable chloride concentrations, which may be attributed to disinfection of the CSO.



Base from U.S. Geological 1:24,000-scale digital data

**EXPLANATION**



**Figure 1. Location of a background and 20 routine stream sampling sites, City of Atlanta, Georgia.**