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Environmental Justice Implications of Variations of Stream Water Quality in Austin, Texas

Abstract

This research aims to examine the extent to which stream water quality has been impacted by urbanization, and the extent to which this impact disproportionately affects communities within Austin. With projected growth in Austin's population, urbanization, and climate change extremes, there is a strain on local water resource quality. Social and environmental costs of water quality degradation are being examined to develop ways to minimize these negative impacts. Notably, the racial geographic history of Austin has led to a disparity in water policy and quality between east and west Austin watersheds. Two questions related to Austin natural water resources and sociodemographics are essential to this study: 1) Who is most vulnerable to degrading stream water quality?; 2) Do the sources of water quality degradation vary among different watersheds and neighborhoods?

To address these questions, stream water sampling sites were selected to represent a range of relatively rural and urbanized watersheds, while accounting for sociodemographic indicators. EPA's EJScreen mapping tool is used for overlaying sociodemographic and water quality data, including cation and anion concentrations, bacterial concentrations, and Sr isotopes. Microbial Source Tracking (MST) tools is being used to characterize sources of microbial contamination in the stream water samples collected. This integration of analytical approaches has seldom been used in environmental justice studies.

Water quality results indicate that most streams comprise Ca-Mg-HCO_3 type waters. Watersheds with larger extents of urbanization (e.g., Waller and Boggy Creek), however, have Ca-Na-HCO_3-Cl type waters. This suggests that land use changes associated with urbanization impacts the chemistry of stream water through input of anthropogenic sources of ions such as municipal water leakage and runoff. Of the 28 stream sites sampled, 23 samples have fecal coliform concentrations over the US EPA limit for recreational waters of 400 MPN/100mL. The Waller Creek and Boggy Creek watersheds are extensively impacted, with fecal coliform concentrations one to two orders magnitudes greater compared with the other Austin watersheds. This trend is also apparent for *E. coli*. concentrations. Statistical analysis indicates that 80% of the variation in fecal coliform concentrations of the watersheds studied can be explained by five of EJScreen's indexes: demographic characteristics, traffic proximity, and hazardous waste proximity. These results serve as a framework for MST analyses for investigating potential sources of microbial contamination that may ultimately be used in management strategies to improve water quality in these watersheds.