WATER QUALITY CHANGES AND ENVIRONMENTAL IMPACTS ON THE BOGGY CREEK WATERSHED IN EAST AUSTIN, TEXAS

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ABSTRACT

Texas is one of the fastest growing states in the nation, with population growth projected to be centered in major cities. As climate variability is causing intense drought conditions and water scarcity across the western United States, this presents a significant concern for future water quality and water availability in Austin. East Austin is facing rapid population growth and development and is one of the most environmentally degraded areas in the city. Among Austin area watersheds, the Boggy Creek watershed in East Austin has a longstanding history of environmental issues and continues to be one of the most impaired watersheds in the city. This study focuses on assessing the water quality of Boggy Creek through the measurement of field parameters (pH, temperature, total dissolved solids), chemical compositions (anion and cation concentrations, $^{87}Sr/^{86}Sr$ ratios), and microbial concentrations (total coliform and *Escherichia coli*) in stream water samples to understand environmental impacts to the watershed. Typical stream quality values for Boggy Creek range between 7.1 to 8.1 for pH, 550 ppm to 720 ppm for TDS, 80 ppm to 130 ppm for Ca, and 500MPN/100mL to 4,500 MPN/100mL for *E. coli*. During a drought period which left multiple areas of Boggy Creek dry, high stream flow going through a previously dry site was identified to be supply water through field measurements (pH = 9.2, TDS = 260) and lab analysis (Ca = 12 ppm, *E. coli* = <1 MPN/mL), and reported to the city's water utility company, Austin Water. Water quality analysis following repairs to the supply water leak and the end of the drought period reflected a return to typical stream quality values (pH = 8.1, TDS = 580, Ca = 108 ppm, *E. coli* = 2,000 MPN/mL). At a separate site, a sudden increase in observed *E. coli* concentrations (520 MPN/100mL to >242,000 MPN/100mL) prompted UT researchers to report their findings to the city agency, Department of Watershed Protection. Through collaboration between both parties, a wastewater leak stemming from an apartment complex near the most affected sampling site was identified to be the source of the elevated *E. coli* concentrations. Bacterial analysis following repairs to the wastewater leak reflected a significant decrease in *E. coli* concentrations at the sampling site (147,000 MPN/100mL to 29 MPN/100mL). Within the concrete-lined section of Boggy Creek, water quality consistently differs from the values observed in the unaltered areas of the creek. Water quality values within the concrete-lined section are reflected by increased temperatures (4.0 °C to 8.0 °C higher) and pH levels (8.7 to 11.2), as well as decreased calcium (20 ppm to 64 ppm) and *E. coli* (<1 MPN/mL to 197 MPN/mL) concentrations. Water quality results show that Boggy Creek is highly impacted by municipal water infrastructure failure and anthropogenic alteration of the natural streambed. Results from this work highlight the importance of regular water quality monitoring and were used to inform infrastructure and water management decisions taken by City of Austin agencies.

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