NATURAL ARCHIVES TO UNDERSTAND TEMPORAL CHANGES OF MUNICIPAL WATER INPUT TO AN URBANIZING WATERSHED

Sneha Nachimuthu

ABSTRACT

Austin, TX, has grown rapidly, over the last 50 years, driving infrastructure growth including municipal water networks. Once water networks are built, municipal water can enter the hydrogeologic system through irrigation and degradation associated leakage of aging water networks. Understanding the timing and mechanism of municipal water input in stream networks allows for the preservation of natural water quality through more informed urban planning, in Austin and elsewhere. To better understand the rate and timing at which municipal water effects the hydrogeologic system, we have reconstructed stream and spring water geochemistry temporally in the Bull Creek watershed by using two natural archives: calcium carbonate mineral precipitates from a spring and bald cypress trees (*Taxodium distichum*) that take up water directly from streams. Such natural archives can record strontium isotope values ($^{87}Sr/^{86}Sr$), a key tracer of municipal water in Austin (DeMott, 2007; Christian et. al, 2011; Beal et al. 2020; Sananda, 2023). Cores from travertine and bald cypress trees have been analyzed for $^{87}Sr/^{86}Sr$ to reconstruct natural and municipal water input between 1976 to 2023. The travertine and the bald cypress tree $^{87}Sr/^{86}Sr$ reflect an increasing municipal water input with time. Trace elements such as Ca, Mg, and Sr provide important environmental context and can indicate processes such as bedrock dissolution and water-rock interaction potentially preserved within the natural archive. Here, population is used as a proxy for water infrastructure. The Bull Creek watershed has had a consistently increasing population through the same time interval as the increasing municipal water input recorded by the travertine and bald cypress tree $^{87}Sr/^{86}Sr$ records. These findings highlight the use of natural archive geochemistry and reveal the relationship between urbanization and municipal water impact through time in an urbanizing watershed.

Jay L. Banner

Supervisor: Jay Banner