Microbial source tracking in the recharge and contributing zones of Edwards Aquifer

The Edwards Aquifer serves as a primary source of drinking water to more than 2 million people in south-central Texas, and as a karst aquifer, is vulnerable to human and animal fecal contamination which poses a serious risk to human and environmental health. A one-year study (Jan 2018 – Feb 2019) was conducted to determine the primary sources of fecal pollution along the Balcones and Leon Creek within the Edwards Aquifer recharge and contributing zones using general (*E. coli*, enterococci, and universal *Bacteriodales*) and host-associated (human-, dog-, cow- and chicken/duck-associated *Bacteriodales*) microbial source tracking (MST) assays. Additionally, sites were classified based on surrounding land use as a potential source predictor and marker levels were correlated with rain events and water quality parameters. Levels for the three general indicators were highest and exhibited similar trends across the sampling sites, suggesting that the sole use of these markers is not sufficient for specific fecal source identification. Among the host-associated markers, highest concentrations were observed for the dog marker (BacCan) in the Leon Creek area and the cow marker (BacCow) in the Balcones Creek area. Additionally, Chicken/Duck-Bac, BacCan and BacCow all exhibited higher concentrations during the spring season and the end of fall/early winter. Relatively lower concentrations were observed for the human-associated markers (HF183 and BacHum), however, levels were higher in the Leon Creek area and highest following rainfall events. Additionally, relatively higher levels in HF183 and BacHum were observed at sites having greater human population and septic tank density and may be attributed to leaks or breaks in these infrastructures. This study is the first to examine and compare fecal contamination at rural and urban areas in the recharge and contributing zones of the Edwards Aquifer using a molecular MST approach targeting *Bacteroidales* 16S rRNA gene-based assays. The *Bacteroidales* marker assays, when combined with land use and weather information, can allow for a better understanding of the sources and fluxes of fecal contamination, which can help devise effective mitigation measures to protect water quality.