The United States Environmental Protection Agency (USEPA) regulates public water systems and has established limits for certain disinfection by products (DBPs) that have been linked to health effects, such as bladder cancer. The regulation of DBPs, specifically total trihalomethanes (TTHMs) and haloacetic acids (HAAs), have encouraged water treatment professionals to assess the type and amount of organic precursors in their supplies. Two of the more common water quality parameters that are monitored as DBP surrogates include dissolved organic carbon (DOC) and ultraviolet absorbance (UV254). Although DOC and UV254 have been effectively correlated to DBP formation, efforts to correlate fluorescence excitation emission matrices (FEEM) to DBP formation remains limited within the drinking water community. In this research, a fluorescence regional integration (FRI) approach was used to compare FEEM with DOC and UV254 as an alternative surrogate for characterizing TTHMs for groundwater sources located in south central Florida.

To quantitatively evaluate FEEM, DOC, and UV254 as TTHM precursor surrogate parameters, a statistical correlation analysis was employed. Thirteen groundwater samples were collected from various Central Florida groundwater wells in Lake County, Polk County, and Palm Beach County, and analyzed for FEEM, DOC, and UV254 prior to determining the four-day TTHM concentration using a simulated distribution system dosing procedure. The FRI method was then used to quantify FEEM by dividing the three-dimensional matrix into five distinct regions, each representing a unique organic constituent. The volume under each region was determined and used for the correlation analysis.

It was determined that a combinations of regions III and V of the FEEM possessed the strongest linear TTHMFP correlation ($R^2 = 0.95$) as compared to the DOC ($R^2 = 0.94$), UV254 ($R^2 = 0.84$), and the individual regions of the FEEM. Results for the individual regions of the FEEM revealed four day simulated TTHM correlation coefficients of 0.25, 0.62, 0.86, 0.74, and 0.88 for regions I through V respectively. These results indicated that a combination of regions III and V, which represent the fulvic and humic-like organic fractions detected by FEEM respectively, was the most accurate four day simulated TTHM precursor surrogate parameter based on the groundwater supplies tested.