

# Understanding Riverine Water Quality in High Flow: A Case Study From Apalachicola-Chattahoochee-Flint Basin

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## INTRODUCTION

- Extreme events such as hurricanes and storms bring increased runoff from the watersheds to the rivers and streams (Kelly et al., 2019).
- These runoffs carry pollutants and contributes to the water quality related issues such as nutrient enrichment (Rabby et al., 2024), decline in fisheries ( Fang et al., 2022), etc.
- There is a lack of understanding on how high flow contributes to such variabilities in Apalachicola-Chattahoochee-Flint (ACF) river basin.
- Through data and statistical analysis, this research aims to explore high-flow water quality variability in major rivers in the United States such as *Chattahoochee*, *Flint*, and *Apalachicola* to help better their management.

## METHODS

### Data Collection



- Chattahoochee River
- Flint River
- Apalachicola River

USGS Monitoring Stations



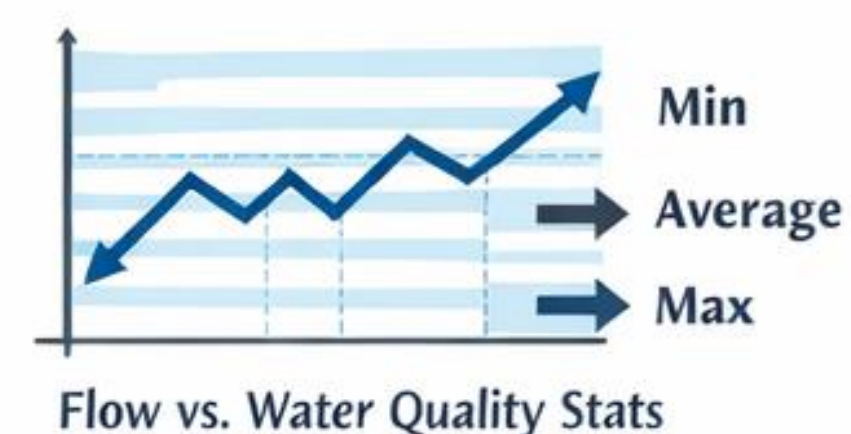
**Figure 1:** A graphic depicting the methods used for this case study. The left depicts the process of collecting data from three USGS monitoring stations. The top right depicts the process of finding high flow regimes. The bottom right depicting the two correlation analysis conducted: Pearson r and Spearman Rank.

### Thresholding for High Flow Regime



### Correlation Analysis

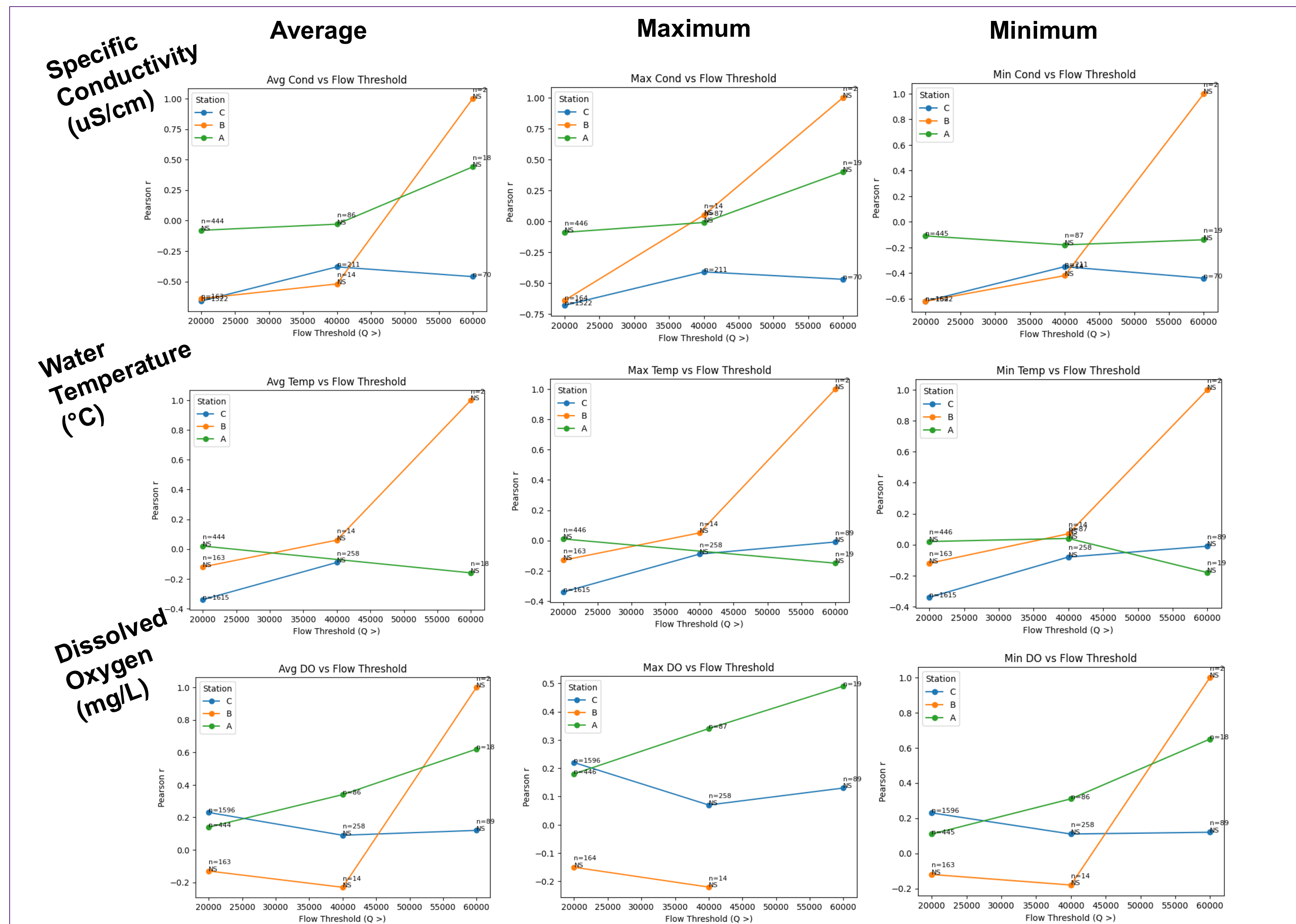
- Pearson's r Test
- Spearman Rank Test



## ACKNOWLEDGEMENTS

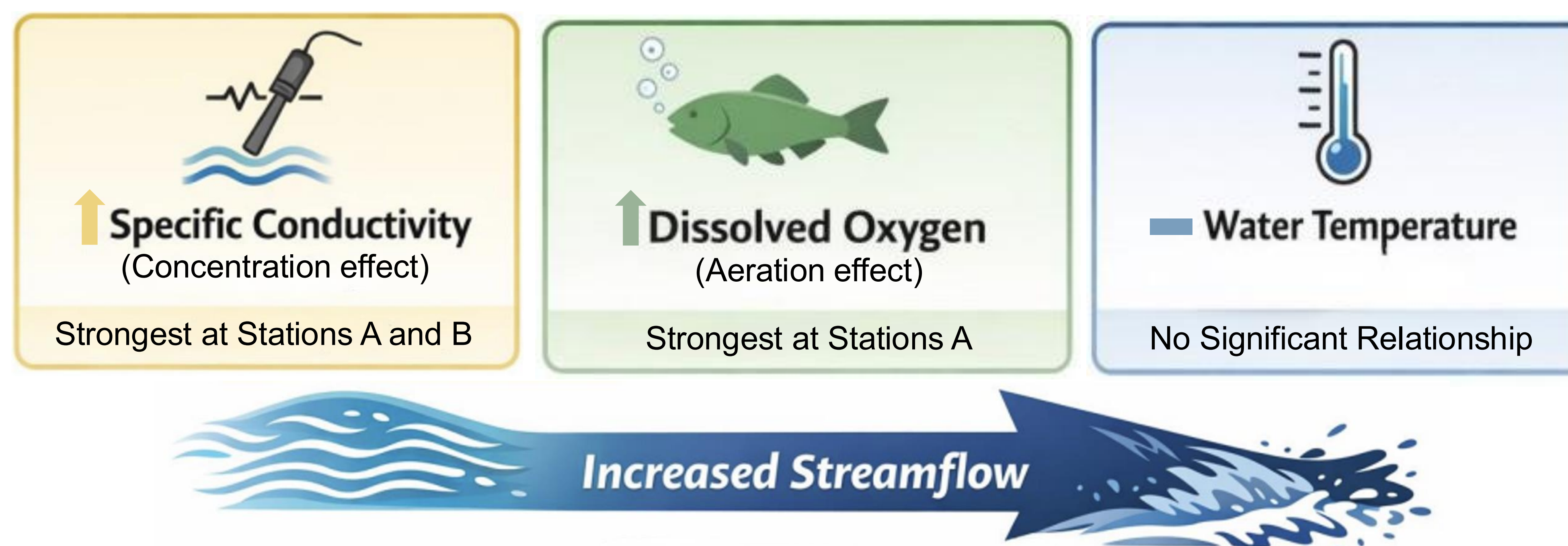
This would not have been possible without the help of my research mentor, Sumon Hossain Raby. Additional thanks goes to UROP and the United States Geological Survey.

## Pearson r Correlation between Water Quality vs. River Flow For Different High Flow Thresholds



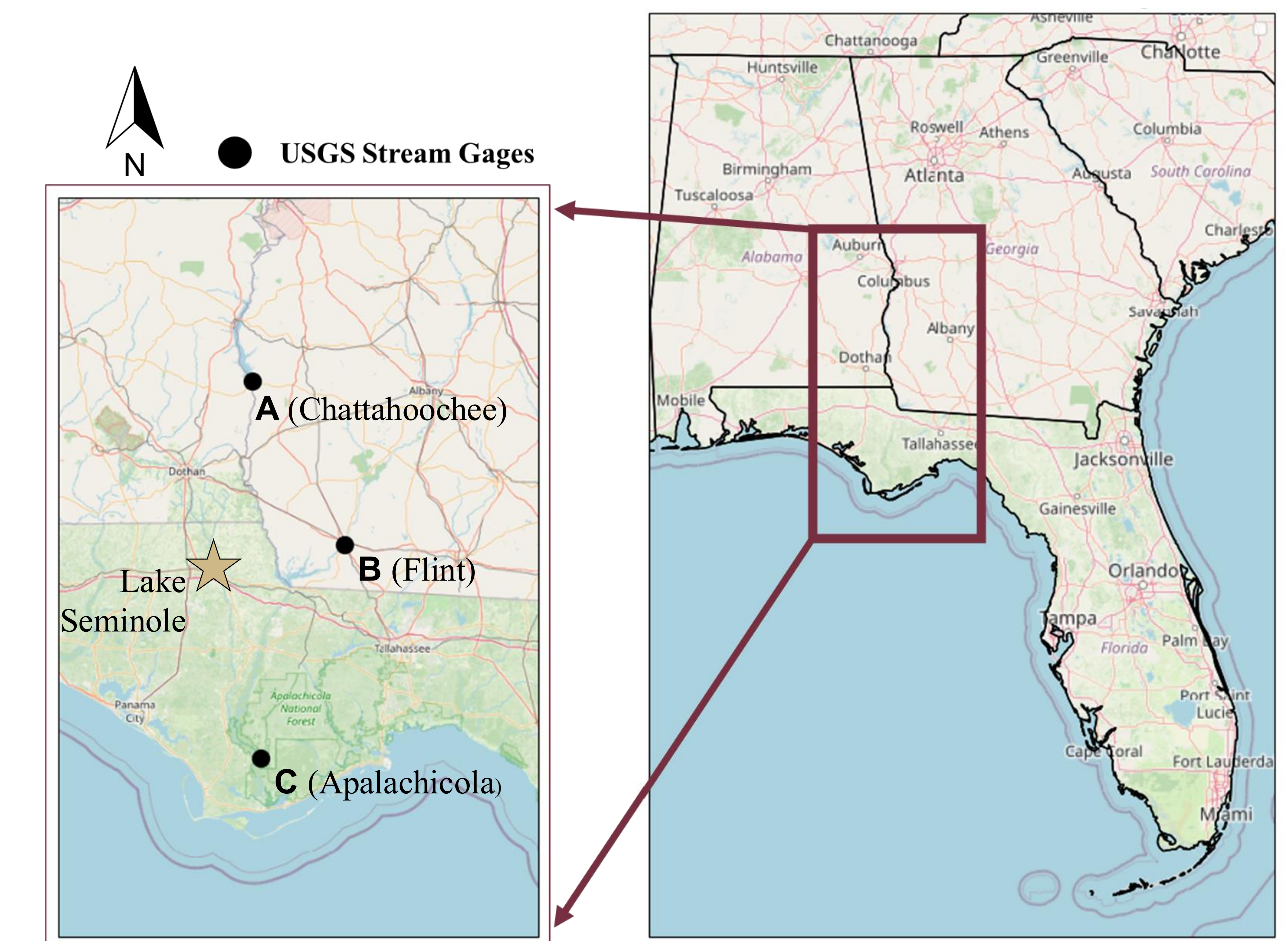
**Figure 2:** Graphs showing Pearson r correlation between various water quality parameters and different high flow thresholds (cubic feet per sec) at three different water monitoring stations located in the ACF river basin. The top row shows average, maximum, and minimum specific conductivity. The middle row shows average, maximum, and minimum temperatures. The bottom row shows average, maximum, and minimum dissolved oxygen values..

## RESULTS



**Figure 3:** A graphic showing the relationship between different water quality parameters and streamflow. Specific conductivity increased with increased streamflow due to the concentration effect (Left). Dissolved oxygen increased with increased streamflow (Middle). There was no statistically significant relationship between temperature and increased streamflow (Right).

## STUDY AREA: ACF RIVER BASIN



**Figure 4:** Map of the Apalachicola-Chattahoochee-Flint (ACF) River Basin. The three United States Geologic Survey water monitoring stations used for this case study are marked. Lake Seminole is also marked.

## DISCUSSION

- Water quality patterns associated with flow was similar in *Chattahoochee* and *Flint* rivers (upstream) but different in the *Apalachicola River* (downstream).
- This is possibly due to the presence of Lake Seminole, where the *Chattahoochee* and *Flint* river meet and flow to the *Apalachicola* river.
- Understanding the flow in the AFC river basin can lead to better management of rivers across state-lines, which can be applied to other major river systems around the world.
- To improve the findings, a more specific high flow threshold could be created, pinpointing the effects of high flow and water quality.
- This case study can contribute to future projects working towards estuarine restoration and protect healthy ones from deteriorating.

### References

