

How Water Tides and Currents affect E. Coli counts in Magic Island Waters

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Introduction/Background

Brown water is the result of rain running off of the mountains and ending up in the ocean thus creating more E. Coli in shorelines. Enterococcus or E. Coli is a common bacteria found in food, water, people, and animals like. E. Coli is oftentimes harmless or beneficial but harmful types do exist and have the capability to make people sick.

This study explores the relationship between tides and currents with bacteria to explore possibilities of insight on water quality when there are brown water advisories. Tides create a current in the oceans, which are strongest near the shores. In theory, larger tides might dilute E. Coli counts and vice versa for lower tides.

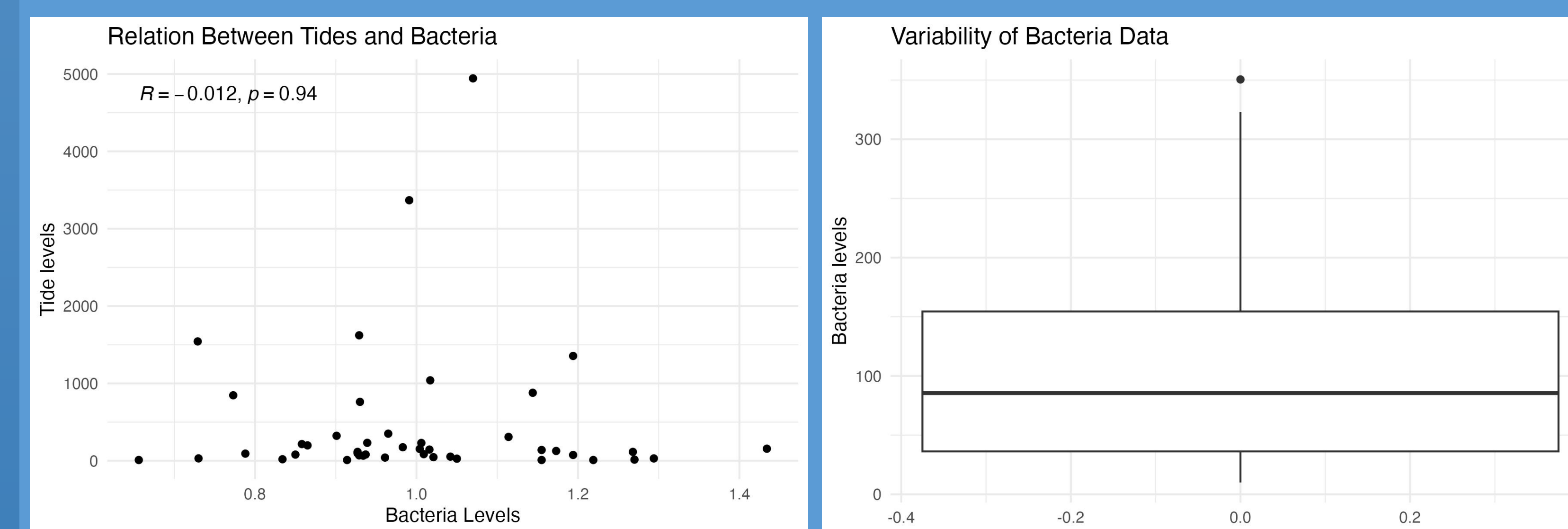
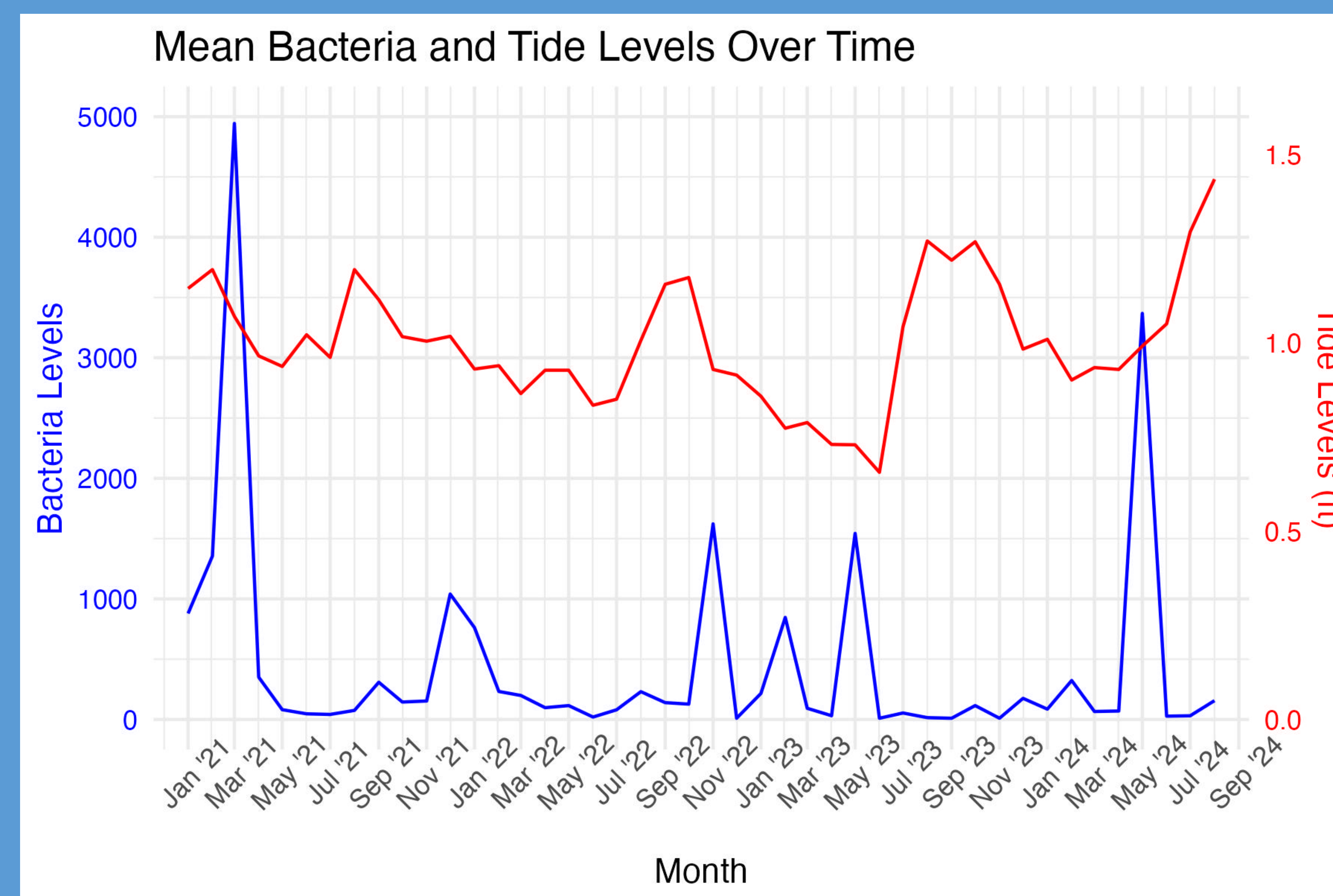
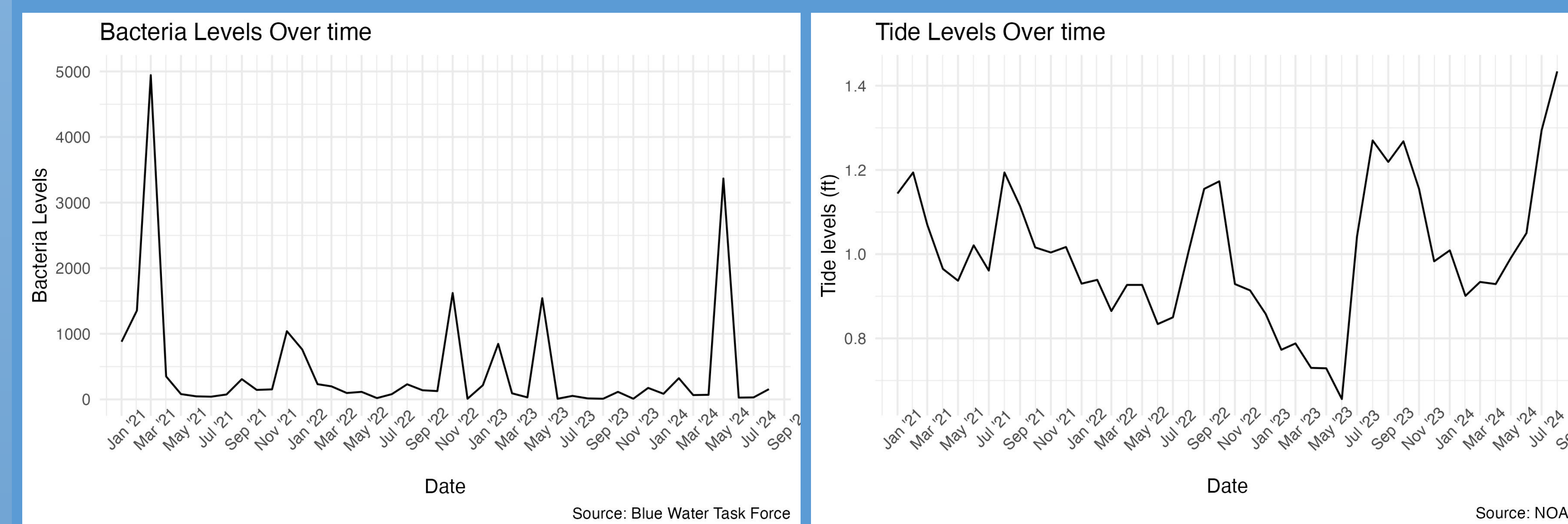
Hypothesis

How does Magic Island's tides and currents affect E. Coli concentration?

Methods

Tide and currents data was sourced from the National Oceanic and Atmospheric Administration's (NOAA) website involving data from January 2021 through August 2024 and E. Coli data was extracted from the Blue Water Task Force website for the same dates. Rstudio was used to clean and analyze data through various packages. Using the dplyr package, unused data was filtered out and remaining data was grouped together by date. Using ggplot, line graphs, dot plots, and boxplots were used to visualize the data collected from Magic Island for further evaluation.

Visuals



Results/Findings

There is little to no correlation between tide levels and E. coli count ($R = -0.012$). All data analyses has shown no relational patterns and the linear regression model has a nonsignificant p value (0.94), which shows a low confidence in our data, even after removing the outliers in the data (2 StDevs).

Discussion

The visuals demonstrate no significant patterns. When viewing the tides and E. Coli on a scatter plot, there is a small clump but no concrete observations to establish assumptions on. In a similar sense, viewing the bacteria data in a box plot, majority of the data resides in the lower values which means the spikes on the line graph are not as significant because they are outliers.

Future Work

- Use different variables from the dataset.
- Use the same method with more data to increase the significance of the bacteria data.
- Try a different testing site.

References

1. Aguilar, P., Piyapong, C., Chamroensaksri, N., Jintasaerane, P., & Sommaruga, R. (2024, October 8). Tidal levels significantly change bacterial community composition in a tropical estuary during the dry season - marine life science & technology. SpringerLink. <https://link.springer.com/article/10.1007/s42995-024-00254-w>
2. Blue Water Task Force. BWTF. (n.d.). <https://bwtf.surfrider.org/report/44/859>
3. Centers for Disease Control and Prevention. (n.d.). About escherichia coli infection. Centers for Disease Control and Prevention. <https://www.cdc.gov/ecoli/about/index.html>
4. Water levels - NOAA tides & currents. Tides & Currents. (n.d.). <https://tidesandcurrents.noaa.gov/waterlevels.html?id=1612340&units=standard&bdate=20210131&edate=20240930&timezone=GMT&datum=MLLW&interval=m&action=data>