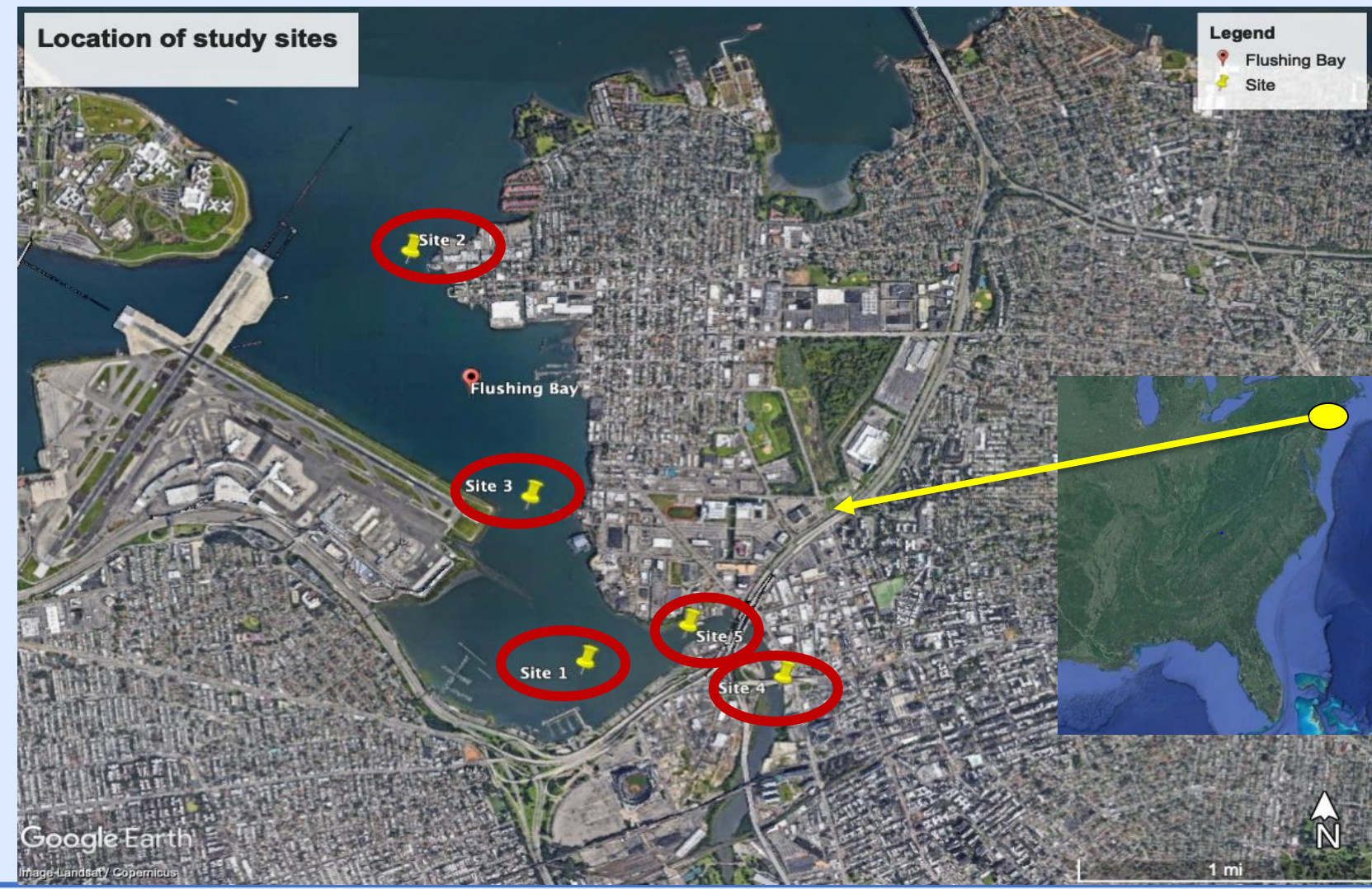


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## Introduction

Water quality is closely linked to human health, and contaminated water can cause serious health problems over time. Human activities are a major source of water contamination in general. Fecal indicator bacteria (FIB) have long been utilized as a fecal contamination marker in surface waterways affected by point and non-point source discharges of treated or untreated human waste. As the temperature become warmer, anthropogenic activity increase, resulting in an increase in pollutants in the water. By using data collected from Flushing Bay over the past 10 years by (NYC DEP) we sought to compare one of the FIB, fecal coliform (FC) bacteria occurrence with the levels Nitrate/Nitrite, Ortho-Phosphate, Ammonia, Dissolved oxygen (DO), and Temperature. In addition, using data collected in recent years, temporal and spatial variation in occurrence of fecal coliform is also assessed.

## Hypothesis

Excess nutrients flowing into open water body could cause eutrophication followed by the enrichment of chemical and biological contaminants in open water body. We predicted that with all the nutrients load through unregulated surface runoff into Flushing Bay could cause higher occurrence of microbial population particularly fecal indicator bacteria (FIB) in this case fecal coliform. Additionally, we also hypothesized that the FC occurrence is most likely to be higher in the summer compared to the other seasons.

## Methodology

- ✓ The historical data file was downloaded from NYC DEP (New York Department of Environmental Protection).
- ✓ Google Earth Pro was used to create the map of the study site with the 5 sites pinpoint
- ✓ The data was sorted according to FC and the different physical and chemical Parameters.
- ✓ Graphs were made to compare the occurrence of Fecal Coliform bacteria with the levels of the different parameters.
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- ✓ Using the averages that were calculated a graph was made to look at the seasonal variation for all 5 sites.

## Abstract

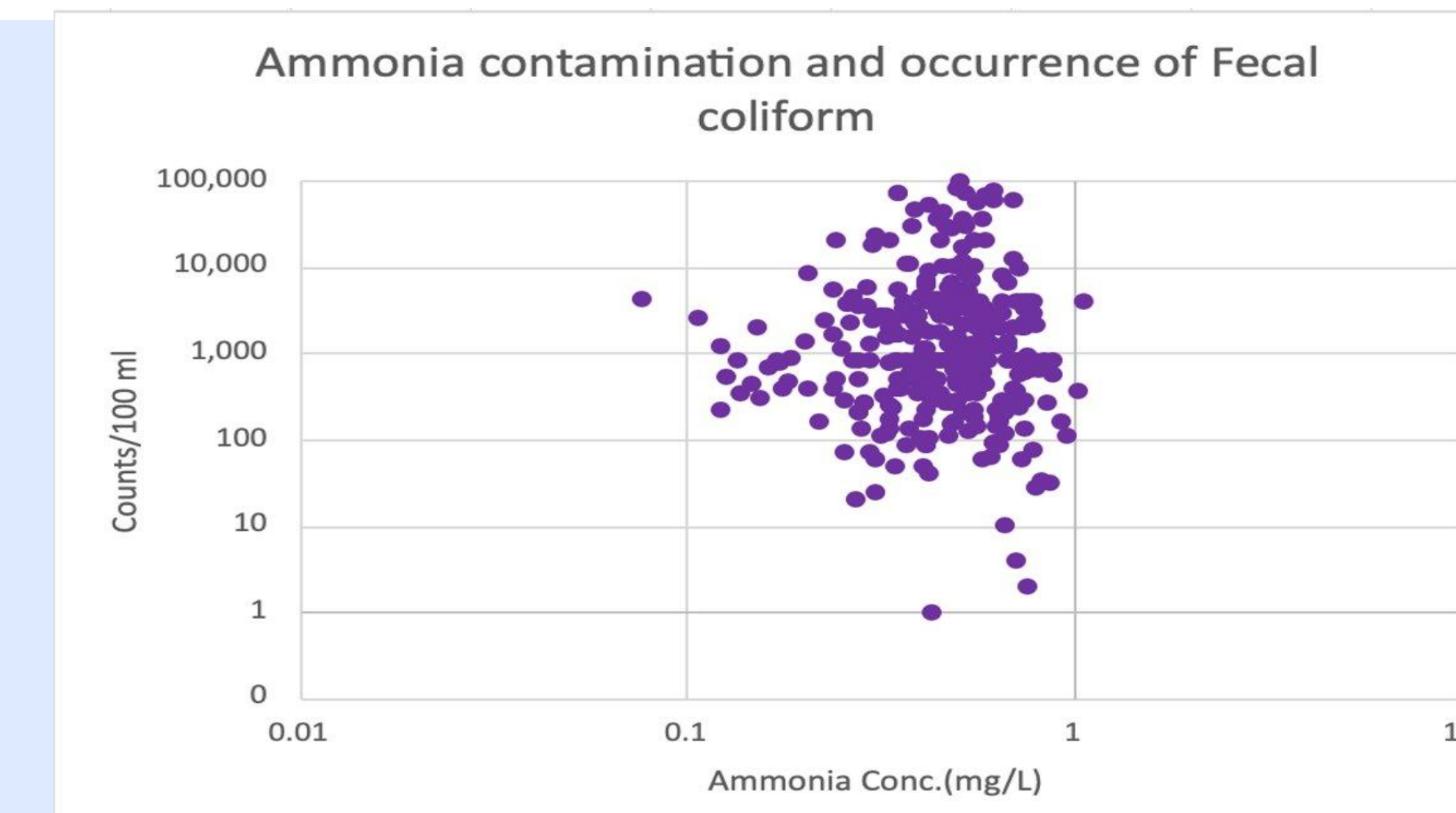
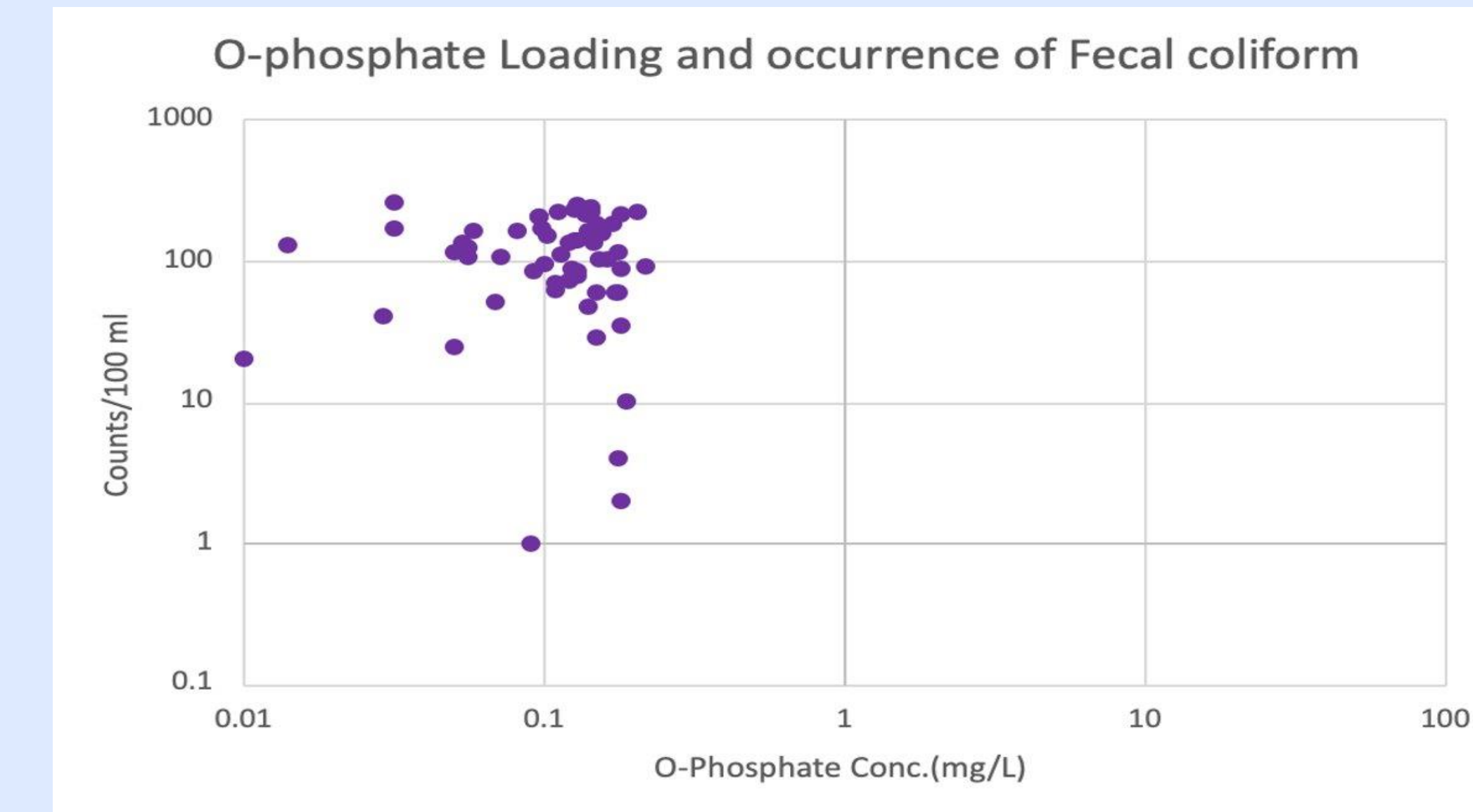
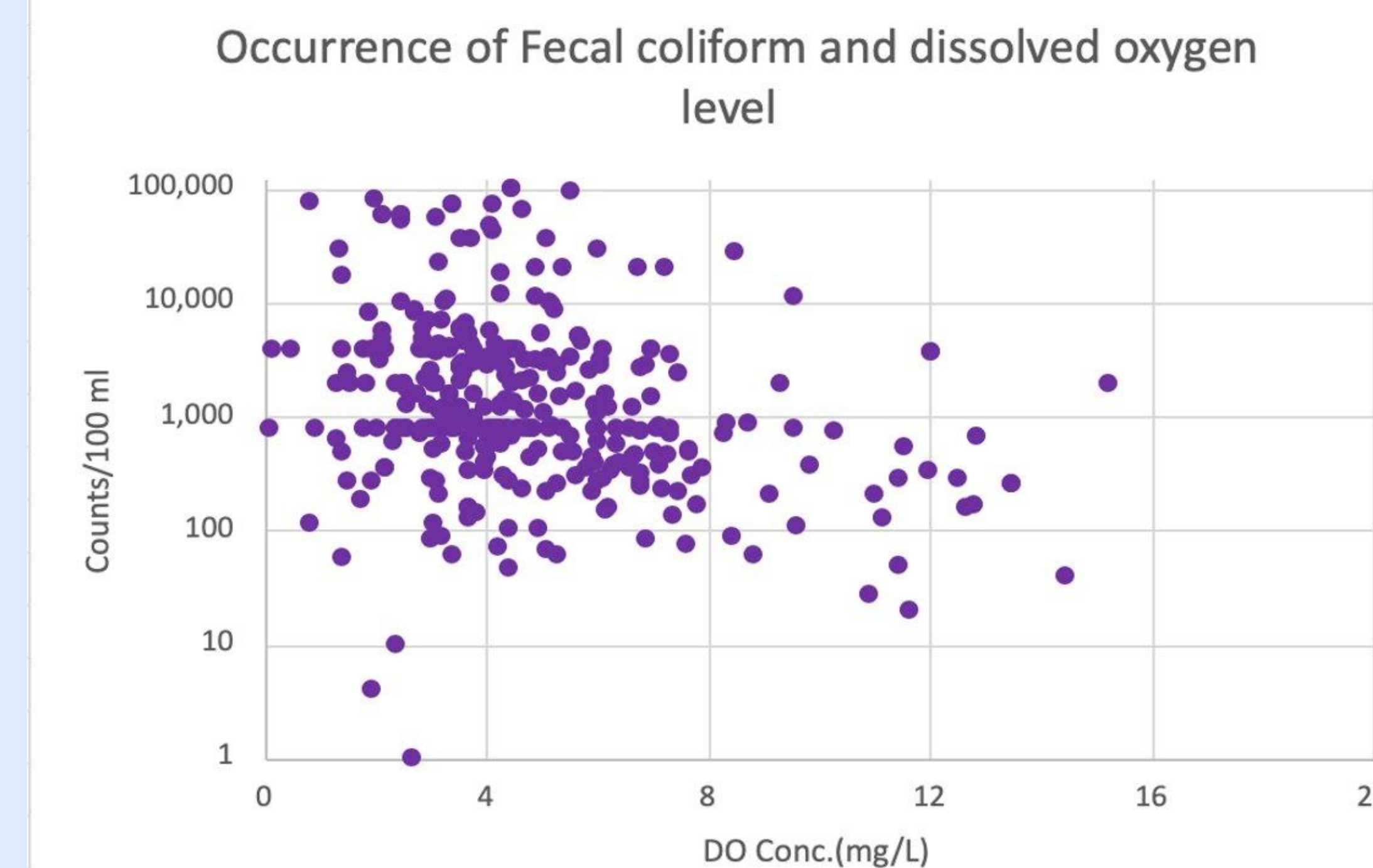
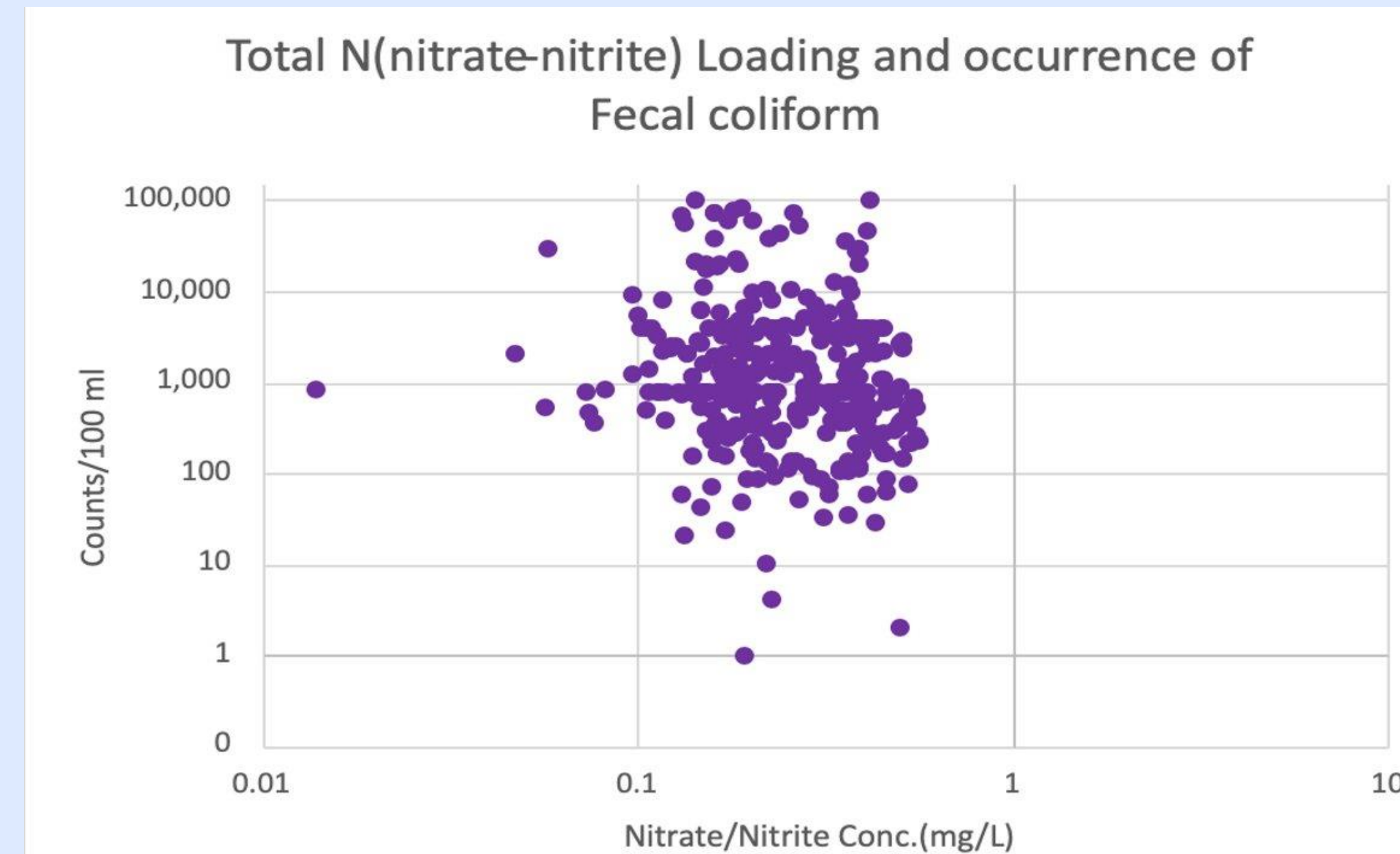
Flushing Bay is a saltwater tidal embayment located in North-Central Queens. Due to urbanization of the Flushing Bay watershed an increase in the pollutants coming in from the sewage and storm water was seen. A significant increase in run-off in the waterbody has also been observed where run-offs from roofs and street basins in the combined and separate sewer systems get discharged directly into the Flushing Bay. With all the anthropogenic activities occurring around the bay area has led to contaminants depositing in the water through the help of run-offs caused by rainfall and huge storms which can pose danger to the public health. Along with run-offs the CSO (Combined Sewer Overflows) contributes to the contaminants depositing in such water bodies. Using data generated by NYC-DEP (New York City Department of Environmental Protection) from Flushing Bay over the past 10 years there is a clear connection with the microbial growth in the water and the physico-chemical parameters. Of all fecal indicator bacterial contamination, one that draws our attention is Fecal Coliform (FC) bacteria. In the historical data the samples were taken from 5 different sites at Flushing Bay which are sites 1-5. Parameters that are being compared with FC bacteria in the existing data include Nitrate/Nitrite, Ortho-Phosphate, Ammonium, Dissolved oxygen, ORP, and Temperature. One of the chemical parameters that correlates with microbial growth is nitrate. Based on the data when the nitrate level gets above 0.1 ppm there is an increase in the microbial (fecal indicator bacteria) occurrence. Similarly the majority of the microbes were seen between 0.1 ppm to 1 ppm for both the O-Phosphate as well as the Ammonium. With such an increase in microbial growth the dissolved oxygen level was consistently get decreased. FC occurrence was found to be maximum when the temperature was warmer around 20 to 25°C. This trend is consistent with increased microbial growth during warmer weather when most of the anthropogenic activities occur. All the parameters connect one way or another leading to overall poor water quality in Flushing Bay and with such unregulated water draining into the bay it clearly poses a threat to aquatic life and public health.

## Summary

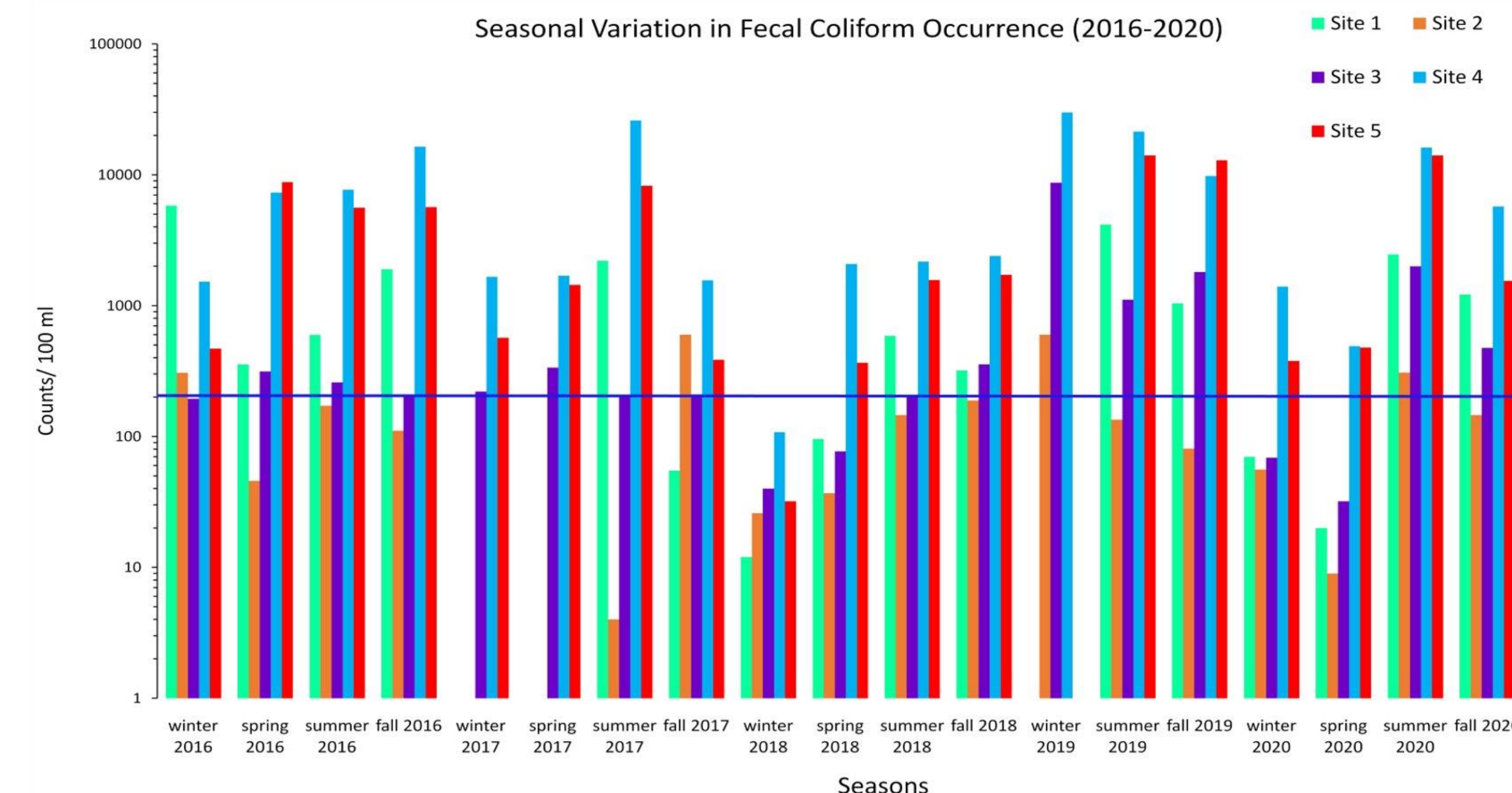
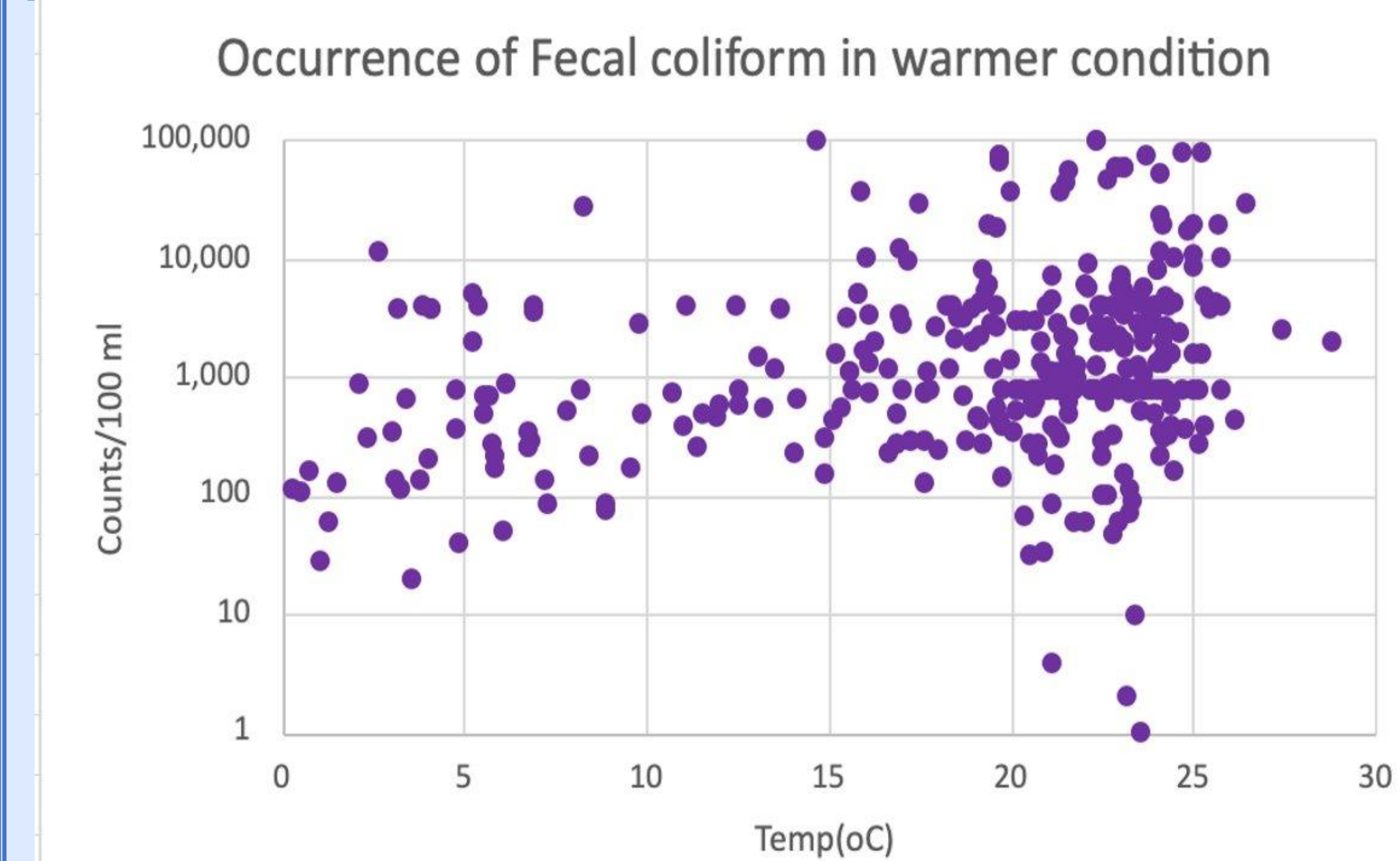
- ❖ The presence of FIB particularly fecal coliform indicates fecal contamination as well as the presence of other pathogens which can pose risk of waterborne diseases.
- ❖ Fecal coliform bacteria consistently shows relatively higher occurrence in the warmer weather which is due to different anthropogenic activities that goes on that period.
- ❖ Concentration of Nutrients are found to be linked in some way with microbial occurrence, resulting in overall poor water quality in Flushing Bay, and with such unregulated water entering the bay, it plainly poses a significant hazard to aquatic life as well as the general public.
- ❖ Although occurrences of FIB in this case fecal coliform is highest in summer months however site 4 and 5 which are surrounded by dense population, consistently showed the high occurrence throughout the period (2016-2020).

## References

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**Results:** The graphs presented shows one of the sites which shows the general trend observed in all 5 sites due to the sites bring in the same body of water. A few key findings from the data analysis for all 5 sites shows that majority of the microbial occurrence was seen between 0.1 ppm to 1 ppm for Nitrate/Nitrite, Ortho-Phosphate, and ammonia. The microbial growth was observed when the dissolved oxygen level was between 4 ppm to 8 ppm. Also, FC occurrence was the highest when the temperature was warmer around 20 to 25 degrees Celsius. Additionally, when looked at variations in the seasons the microbial growth is relatively higher in the summer.



## Acknowledgment

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