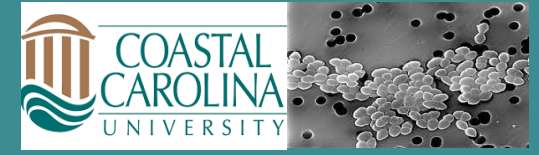




Enterococci, Conductivity and Salinity in Myrtle Beach

Kove Lambert, Ivy Sparring & Dr. Monica Gray



Introduction

- Myrtle Beach welcomes approximately 20.4 million visitors annually and \$10.8 billion is generated from tourists coming and using all the amenities including the beaches. It is safe to say that the beach is an important part of the culture and economy in Myrtle Beach.
- To protect these tourists from harmful bacteria in the ocean, The S.C. DHEC (South Carolina Department of Health and Environmental Control) does near-real-time testing for harmful bacteria such as Enterococci.
- My experiment consisted of samples taken from May 2008- January 2021 for Salinity, Conductivity and Enterococci. About 2000 samples were taken over all three parameters from WAC-15, Singleton Swash, which is a beach just North of the most popular tourist destination in Myrtle Beach.
- Salinity is the distribution of dissolved salts in the ocean, one of those salts is sodium chloride. Salinity can be affected by many things such as temperature, freshwater inlets, rain and depth.
- Electrical conductivity of the ocean is a fundamental parameter in the electrodynamics of the Earth's system. Salinity and Conductivity levels are highly related because Sodium Chloride (NaCl) dissolves in the water and breaks down on a molecular level to form cations (Na+) and anions (Cl-) that migrate in the presence of an electric field, thereby producing an electric current.
- Enterococcus are bacteria that is found in the intestinal tract of humans and warm-blooded animals. If high levels of enterococcus are detected in the samples, that means there are harmful disease-causing bacteria, viruses, and protozoa lurking in that area. Swimmers, fisherman or raw fish consumers are at the highest risk for obtaining protozoa infections that can cause the African Sleeping Sickness, amoebic dysentery, and malaria.



Materials & Methods

- Salinity was measured using the standard methods 2520 A-2011 and 2520 B-2011. These standard methods use an HACH "HQ Series Portable Meters." The user manual: 2006 Sept, ed. 5 shows specific steps to take in order to use this material correctly when conducting the samples of salinity.
- Conductivity was measured using the standard methods 2510 A-2011 and 2510 B-2011. These standard methods also use an HACH "HQ Series Portable Meters." that has instructions on the user manual; 2006 Sept, ed. 5. Just like salinity, conductivity also uses the Environmental Quality Lab Quality Assurance Manual for Chemical Testing 2012.
- Enterococcus was measured using the IDEXX Enterolert^o Test Kit instructions (IDEXX 06-02150-07) and IDEXX Quanti-Tray and Quanti-Tray/2000 Dilution Guidelines (IDEXX 06-31855-00). These are a specific set of instructions and guidelines that need to be followed in order to properly carry out correct samples for enterococcus. Just like salinity and conductivity, enterococcus also uses the Environmental Quality Lab Quality Assurance Manual for Chemical Testing 2012.

Results

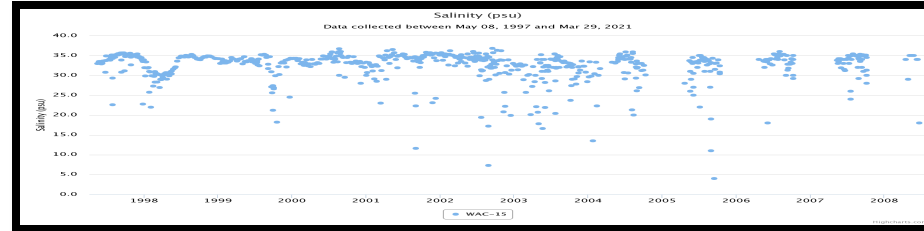


Figure 1: Median value of all 708 samples for salinity, was 33.6 psu which is just under that standard of 35 psu for salinity.

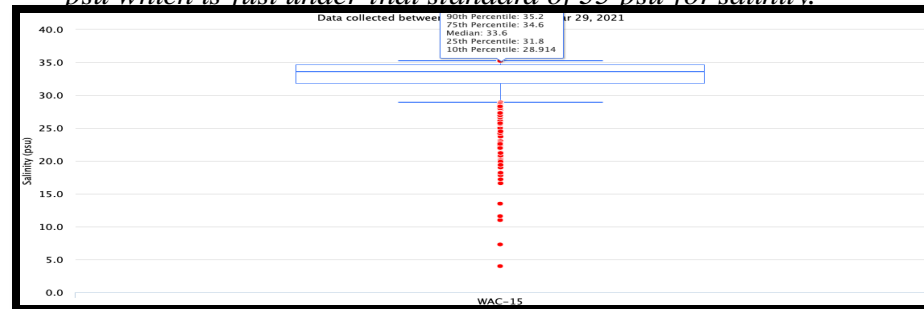


Figure 2: The box plot for salinity showing all percentiles and all outliers

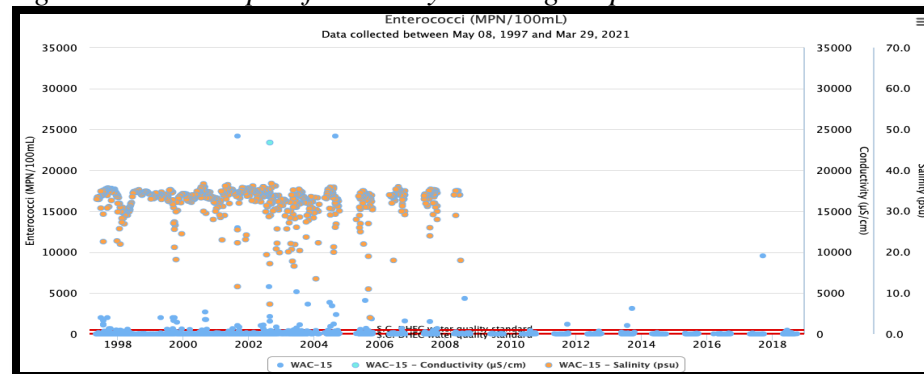
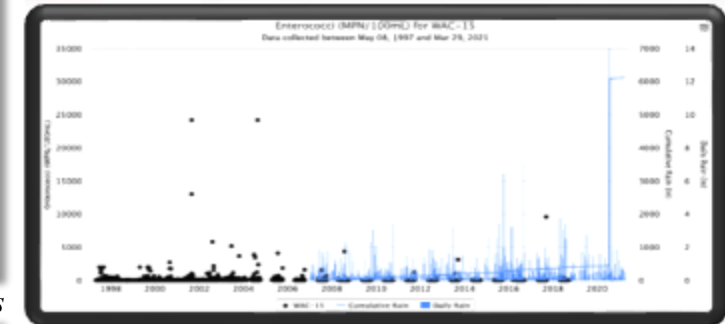


Figure 3: Time Trend graph for all three parameters. Showing all the samples and their highest recorded values. So, people can see that conductivity and enterococci highest reading was above the standards.



Conclusions

In conclusion The mean salinity level was 33.6 psu which falls under the standard of 35 psu, meaning that WAC-15 has good salinity levels. Since the one sample taken for conductivity was 23,400 µS/cm, the conductivity levels of WAC-15 are extremely high but still under the max standard so people could still swim in it. Now for the most dangerous parameter of them all, enterococcus, it's helpful when it is inside the intestinal tract, but very harmful when it reenters the body. Enterococcus had a median of 20MPN/100mL, which is under the median sample standard of 104 MPN/100mL. But the max sample taken was 24,193 MPN/100mL which is well beyond the 500 or 750 MPN/100mL. Which means that WAC-15 will be put on a no swimming advisory hold until the levels of enterococcus go down. In order to open WAC-15, singleton swash back up for the public, future experiments need to be done with certain bacteria that will kill the enterococcus bacteria. That way enterococcus will not be a problem anymore.

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Materials & Methods

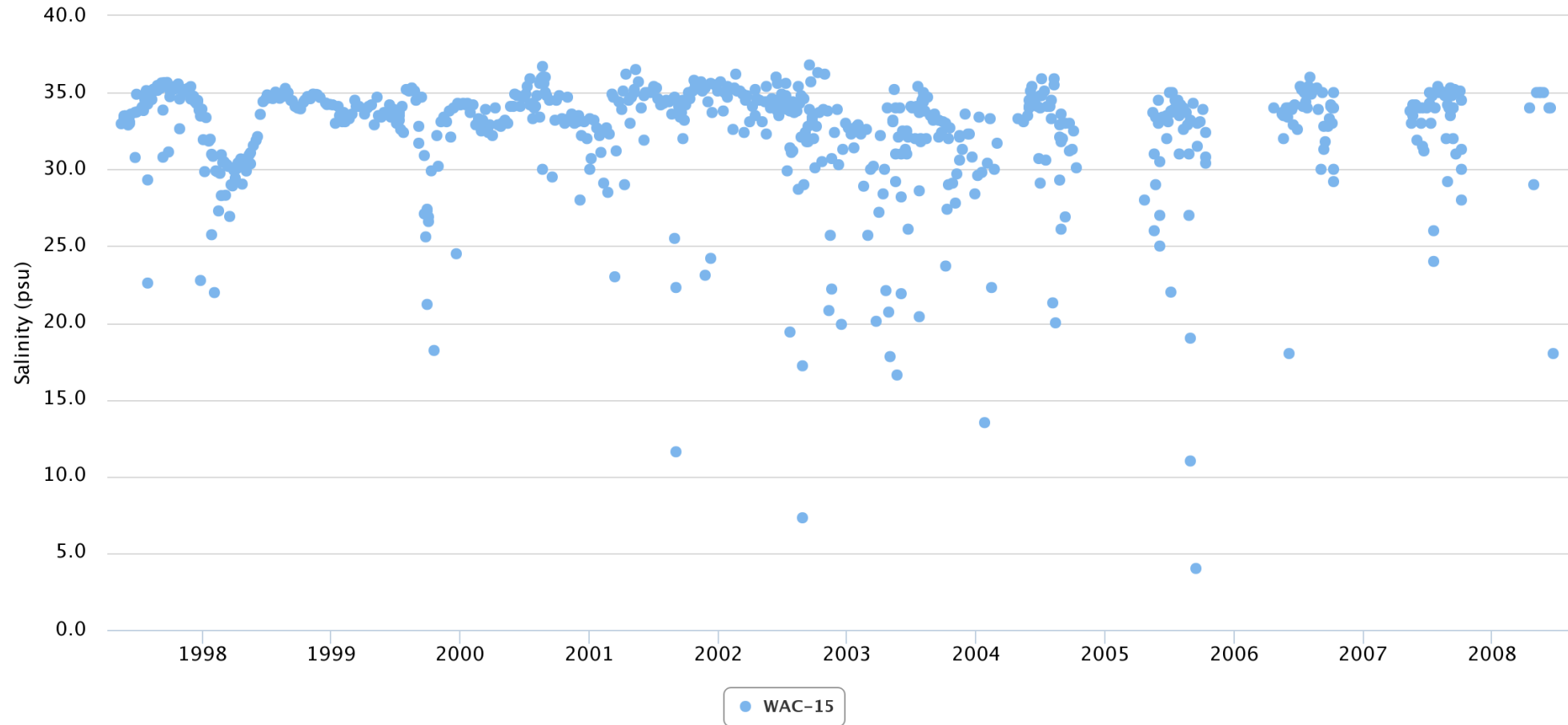
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Results

Salinity (psu)

Data collected between May 08, 1997 and Mar 29, 2021



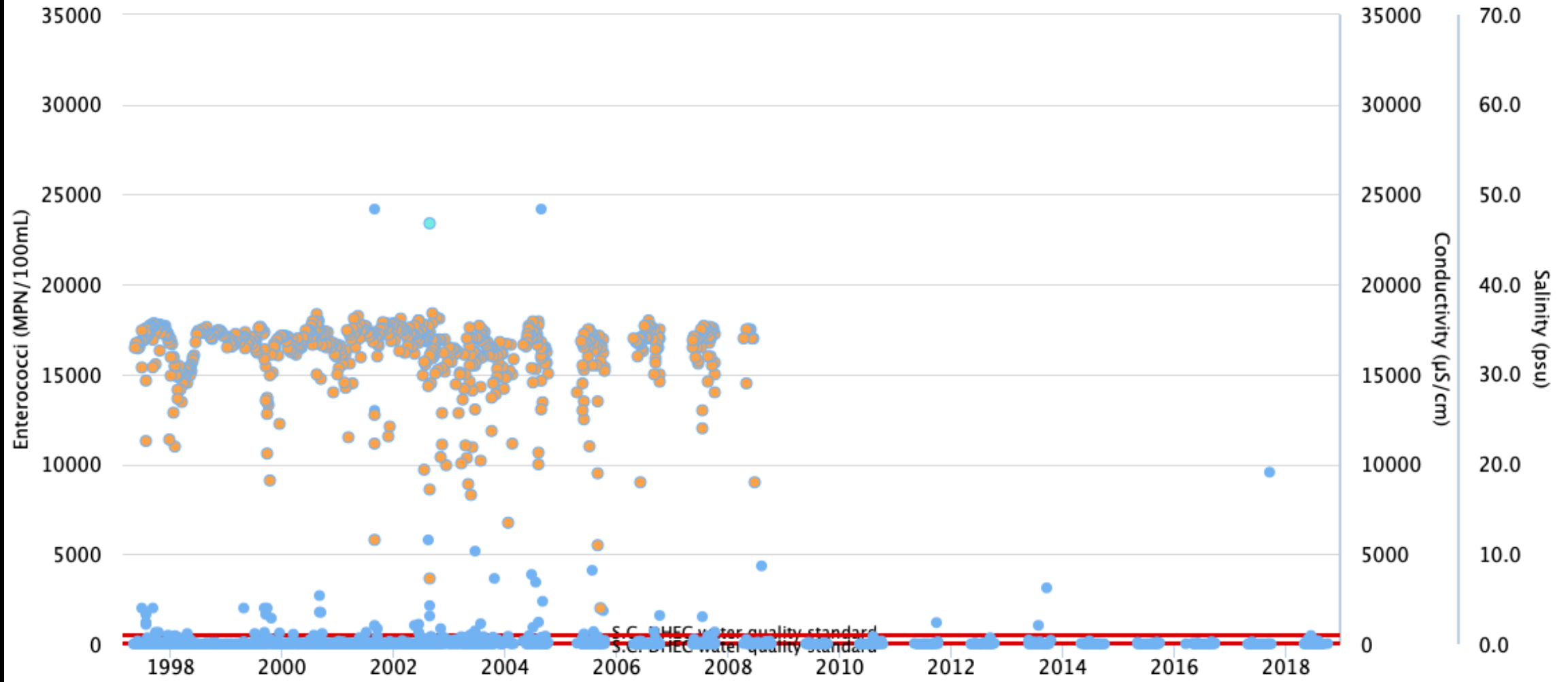
Data collected between [unclear] ar 29, 2021

90th Percentile: 35.2
75th Percentile: 34.6
Median: 33.6
25th Percentile: 31.8
10th Percentile: 28.914



Enterococci (MPN/100mL)

Data collected between May 08, 1997 and Mar 29, 2021



● WAC-15 ● WAC-15 - Conductivity (µS/cm) ● WAC-15 - Salinity (psu)

Median value of Conductivity ($\mu\text{S}/\text{cm}$)
Data collected between May 08, 1997 and Mar 29, 2021

0% - 25%
(0.00 - 419.00)

26% - 50%
(428.00 - 1,001.00)

51% - 75%
(1,052.00 - 4,660.00)

76% - 90%
(4,920.00 - 14,940.00)

91% - 100%
(17,580.00 - 55,500.00)

Conductivity ($\mu\text{S}/\text{cm}$)

30000
20000
10000
0

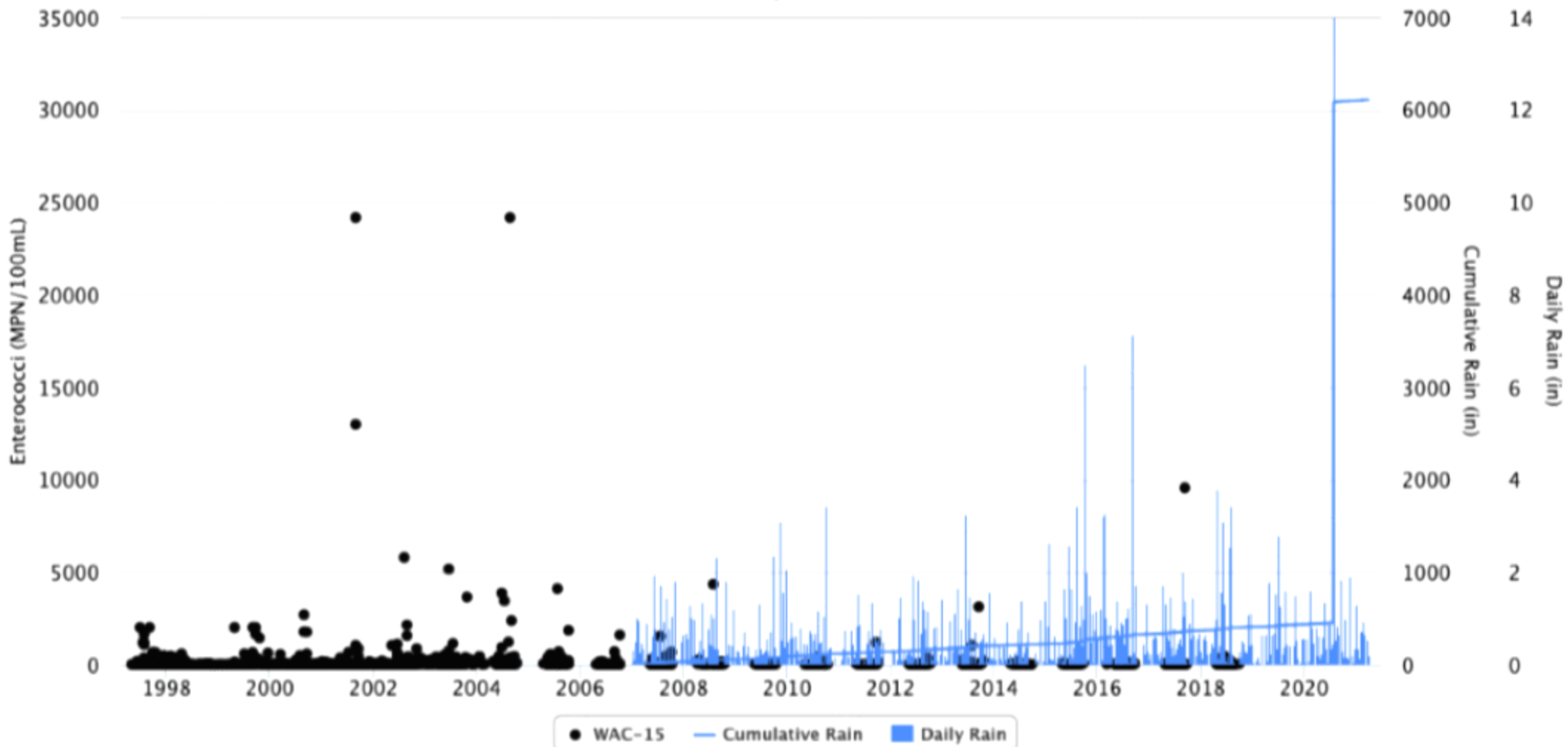
WAC-15: 23,400 $\mu\text{S}/\text{cm}$

WAC-15



Highcharts.com

Enterococci (MPN/100mL) for WAC-15
Data collected between May 08, 1997 and Mar 29, 2021



Highcharts.com



Conclusion

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