Water Quality Conditions in the Stormwater Ditches and Retention Ponds at Coastal Carolina University

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Contact | Paper

COASTAL CAROLINA UNIVERSITY

Background & Motivation

- Human activities such as agriculture and urban development can send pollutants into the local ecosystem and negatively affect the environment.
- Monitoring water quality is therefore important to determine any pollutant releases and to quickly resolve them.
- **Conductivity** is a measure of resistance to current over some area, often converted to a measure of total dissolved solids for this reason (Pawlowicz, 2008).
- **pH** is a parameter used to describe the hydrogen activity in a solution, specifically by defining the acidity or basicity of water (Ramjukadh et al., 2018).
- **pH** is important because many organisms are very sensitive to seemingly small changes in pH.
- **Dissolved Oxygen (DO)** refers to the level of free, non-compound oxygen present in water or other liquids and relevant sources for this study are photosynthetic oxygen production and the introduction of DO from other sources.
- **DO** is important because values for water bodies lower than 4 mg/Lwill become stressful and dangerous to aquatic life.
- Data site used is the 544 West site on the CCU campus (Figure 1).

Materials and Method

- Data collection has been on going biweekly since October 2011, and recorded data referenced goes through November 2020, totaling between 700 and 750 samples.
- All sample data is stored for public access on the CCU website.
- Data was collected using a Thermo Scientific™ Orion™ Star A329 pH, ISE, Conductivity, DO, and RDO Portable Meter (Orion™ A329 multimeter), an extendable pole with a ~1-quart bucket fixed to it, and printed data collection sheets (Figure 2).

Figure 1: Overview of CCU Campus (544 West site bottom left).

Figure 2: Tools used for data collection (Orion™ A329 multimeter, extendable pole with a ~1-quart bucket fixed to it, & data collection sheets).

References

El-Agha, D. E., Molle, F., Rap, E., El Bialy, M., & El-Hassan, W. A. (2020). Drainage water salinity and quality across nested scales in the Nile Delta of Egypt. Environmental Science and Pollution Research, 27(26), 32239–32250. https://doi.org/10.1007/s11356-019-07154-y

Kükrer, S., & Mutlu, E. (2019). Assessment of surface water quality using water quality index and multivariate statistical analyses in Saraydüzü Dam Lake, Turkey. Environmental Monitoring and Assessment, 191(2), 1–16. https://doi.org/10.1007/s10661-019-7197-6

Nacar, S., Bayram, A., Baki, O. T., Kankal, M., & Aras, E. (2020). Spatial Forecasting of Dissolved Oxygen Concentration in the Eastern Black Sea Basin, Turkey. Water, 12(4), 1041. https://doi.org/10.3390/w12041041

Pawlowicz, R. (2008). Calculating the conductivity of natural waters. Limnology and Oceanography: Methods, 6(9), 489–501. https://doi.org/10.4319/lom.2008.6.489

Ramjukadh, C. L., Silberbauer, M., & Taljaard, S. (2018). An anomaly in pH data in South Africa's national water quality monitoring database - implications for future use. Water SA, 44(4), 760–763. https://doi.org/10.4314/wsa.v44i4.23

Yevenes, M. A., Figueroa, R., & Parra, O. (2018). Seasonal drought effects on the water quality of the Biobío River, Central Chile. Environmental Science and Pollution Research, 25(14), 13844–13856. https://doi.org/10.1007/s11356-018-1415-6

Results and Discussion

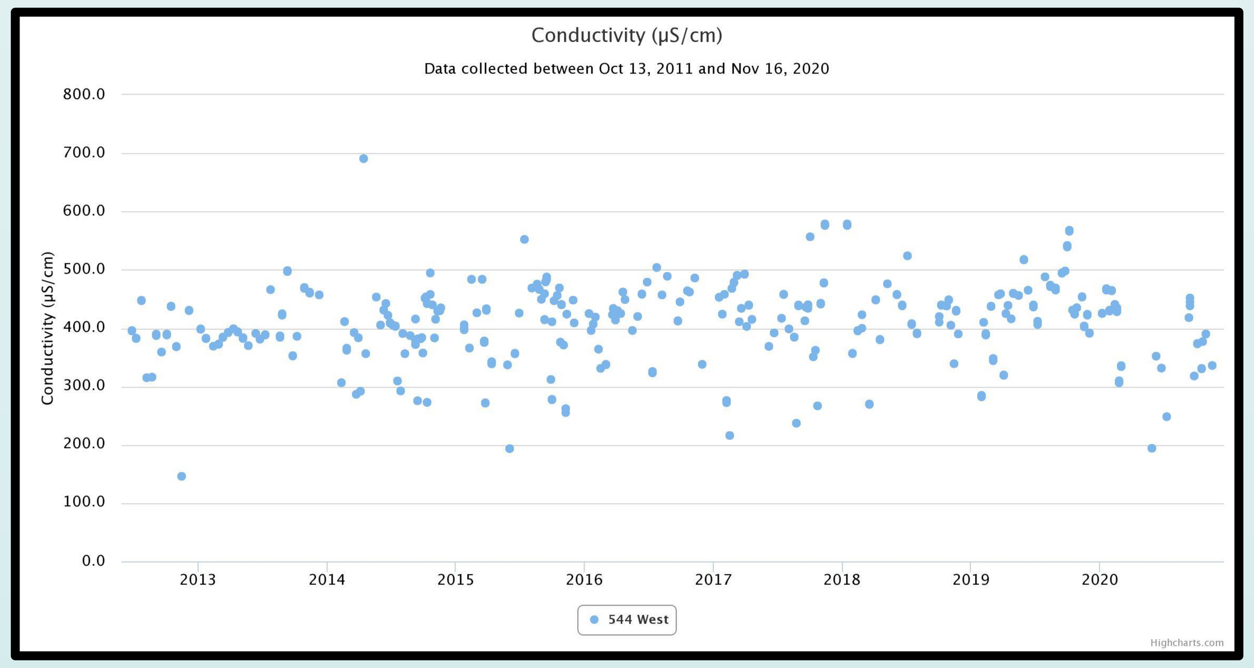

Figure 3: Conductivity data from Oct. 2011 through Nov. 2020 as a time trend.

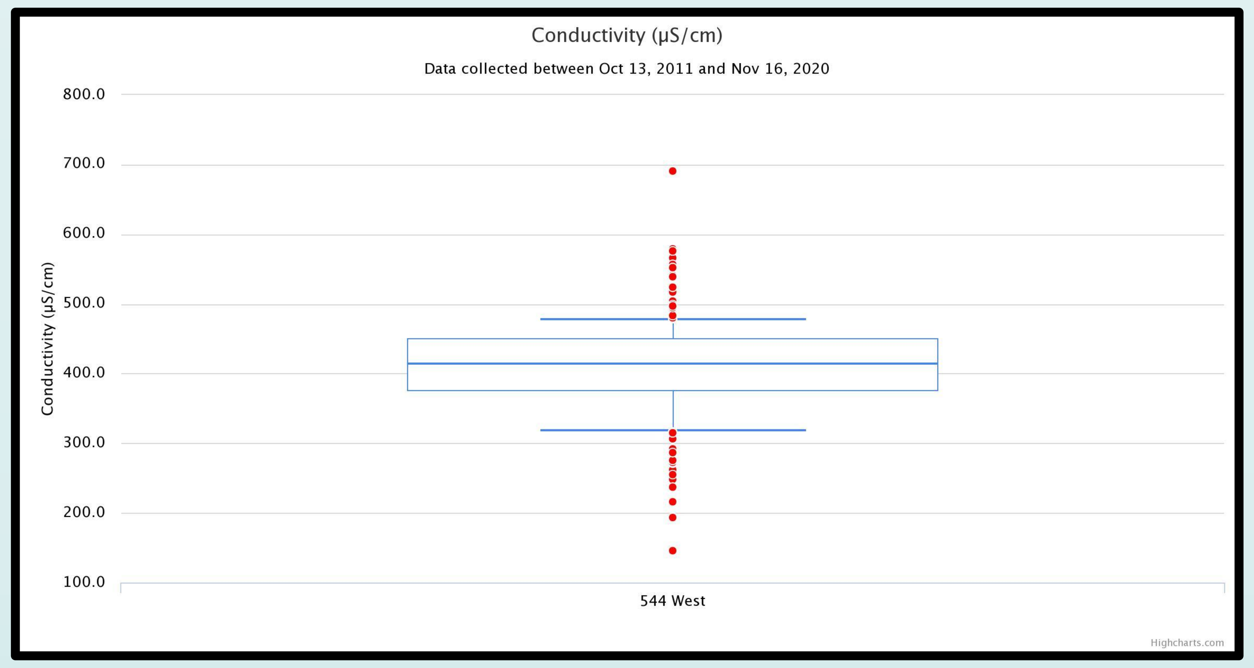

Figure 4: Conductivity data from Oct. 2011 through Nov. 2020 as a box plot.

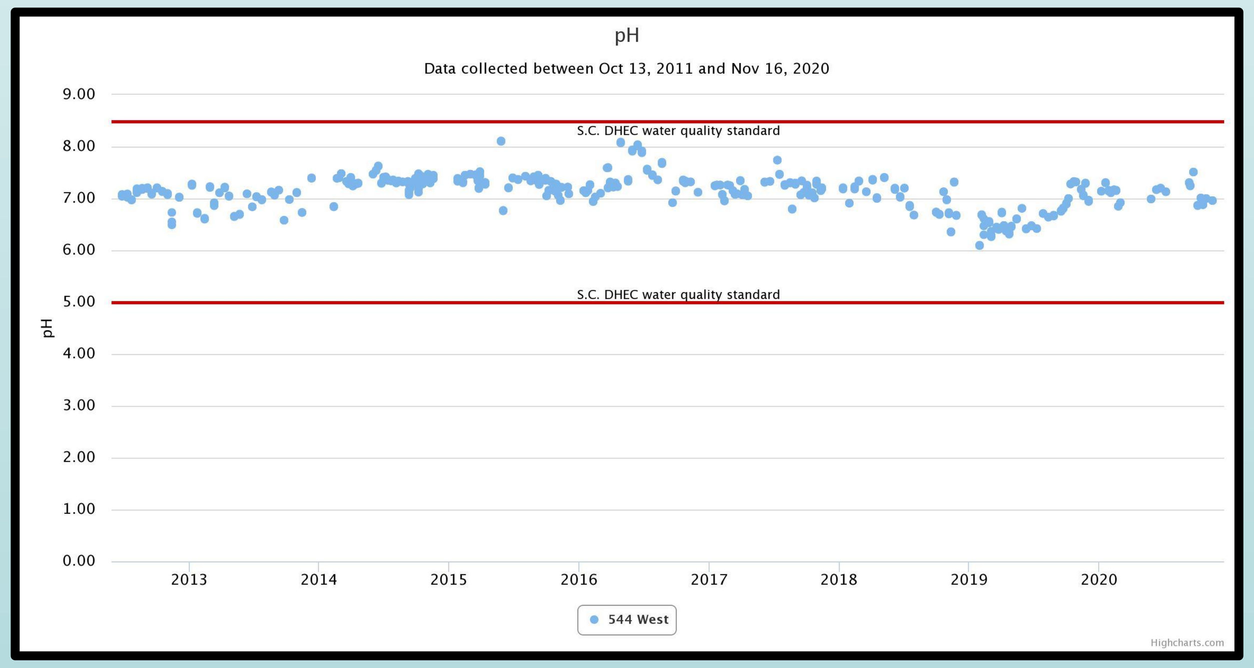

Figure 5: pH data from Oct. 2011 through Nov. 2020 as a time trend.

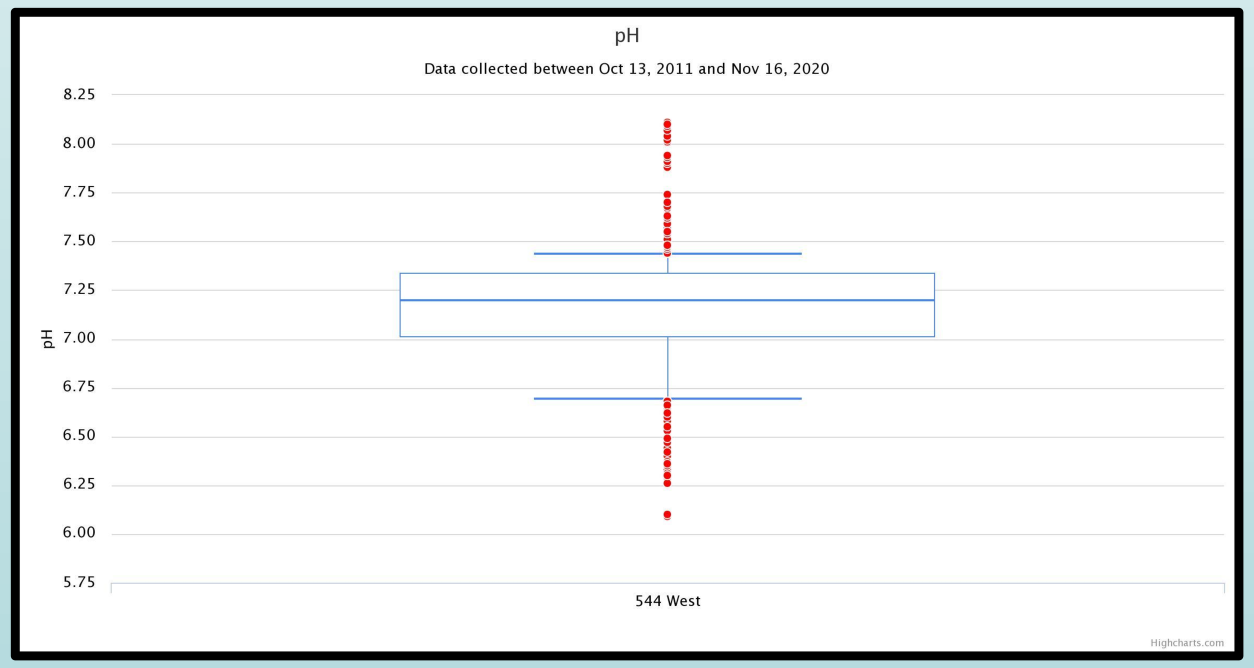

Figure 6: pH data from Oct. 2011 through Nov. 2020 as a box plot.

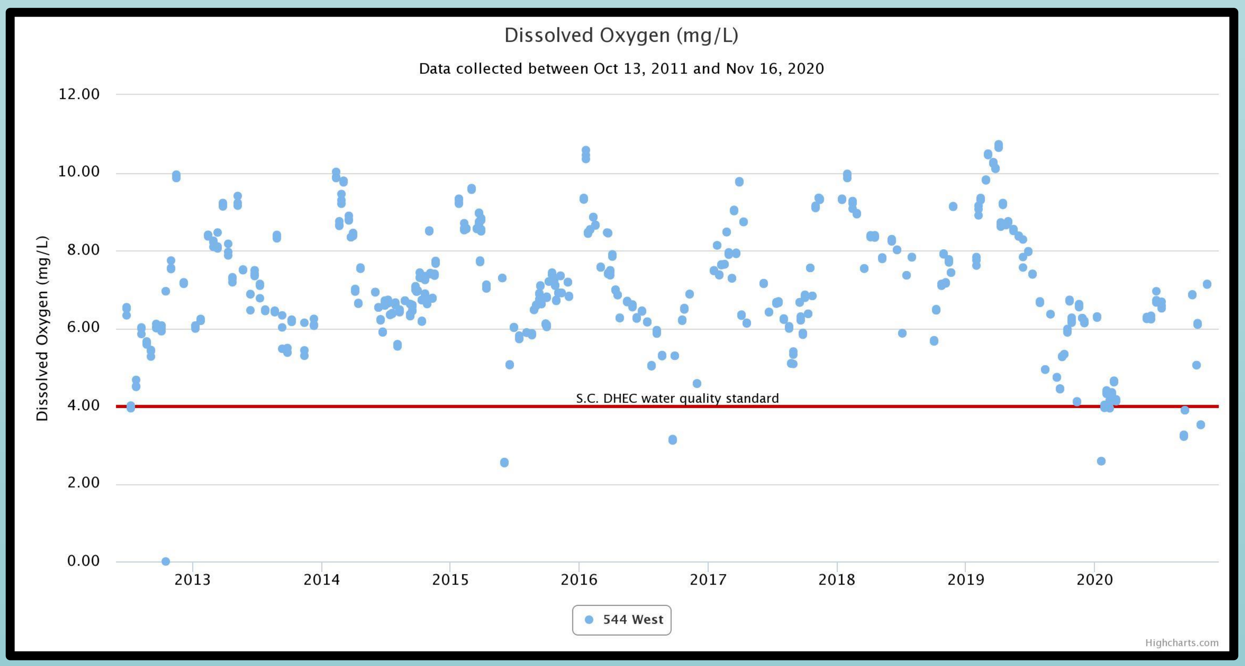

Figure 7: Dissolved Oxygen (DO) data from Oct. 2011 through Nov. 2020 as a time trend.

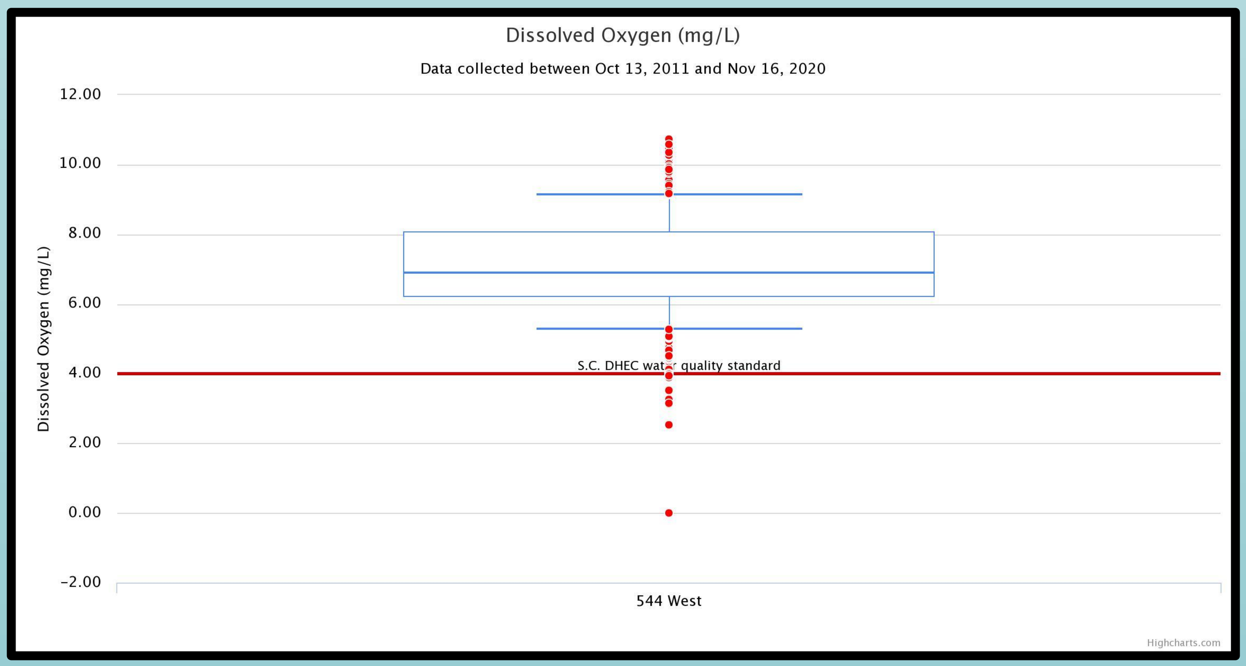

Figure 8: Dissolved Oxygen (DO) data from Oct. 2011 through Nov. 2020 as a box plot.

- **Conductivity** appears to be seasonally affected by plant growth and decay due to filtration of organic matter.
- Outlier in 2015 could have been a result from Tropical Storm Ana as flood waters may have deposited organic mater that would have then decayed and increased **pH** (Yevenes et al., 2018).
- **DO** appears to be seasonally effected as it tends to reach highs in the Springs and lows in the falls, DO increased seasonally due to photosynthesis (Kükrer & Mutlu, 2019).
- **DO** appears to be seasonally affected by water temperature as cooler water has higher DO and warmer water has lower DO (El-Agha et al., 2020).

Conclusions

- pH levels remained relatively constant.
- Weather phenomena may increase pH.
- Conductivity and DO are seasonally affected by plant growth and decay due to filtration of organic matter.
- DO is higher in cooler temperatures (winter) and lower in warmer temperatures (summer).

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