Do Tropical Storms have an effect on water quality in Nacogdoches?

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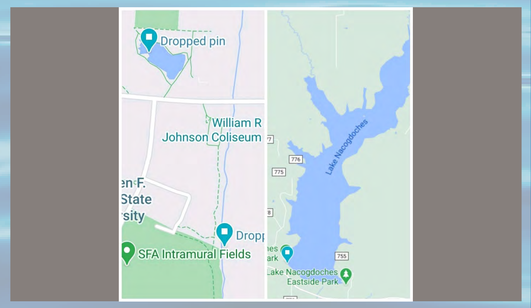
Abstract

The purpose of this research was to determine the effects tropical storms had on the water quality of water in Nacogdoches. This research investigated if rainwater distributed during the storms affected the levels of pH, nitrate, nitrite, phosphorous, alkalinity, turbidity, and total dissolved solids (TDS). Sampling was conducted on three water bodies before and after the storms. Measurements were taken with LaMotte kit to measure alkalinity, turbidity tube to measure turbidity, Colorimeter to test the nutrient levels, and Multi-Parameter Tester to measure TDS and pH. The results showed that Laura had a greater impact than Beta. Tropical storms are unforeseeable, so the hypothesis was partially correct.

Objectives

The overall objective of this research project was to observe and collect data about the tropical storms around the area of Nacogdoches by collecting water samples from each location.

- To measure the impact of Tropical Storm Laura and Tropical Storm Beta in Nacogdoches' water quality.
- Compare the pH, alkalinity, TDS and phosphorus and nitrite and nitrate in Lake Nacogdoches, Lana Creek and Ag Pond.



Sampling Sites. *The sampling sites were chosen because each represented a body of water that could be affected uniquely by the heavy rainfall from tropical storms. The dates that they were collected were August 26, August 27, September 21, and September 24. The sites were chosen using judgemental sampling.*


Ag Pond

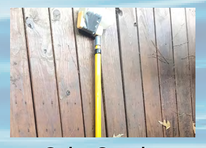

La Nana Creek


Lake Nacogdoches

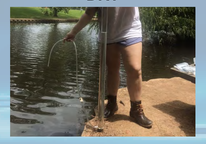
Methods

Procedures:
To compare the water quality in Nacogdoches before and after Hurricane Laura and Tropical Storm Beta, we collected and tested water samples from three separate locations the day before the storm hit and the day after it had passed through. The water samples were collected with a swing sampler, and then deposited into a separate container and distributed to each person testing in the group. Out of the 12 water samples collected over our entire sampling time, a total of 168 measurements were taken, with 3 blanks per site per sampling period, or 36 blanks total. For each test, each water source was measured twice and then averaged. The parameters we measured were turbidity, pH, Total Dissolved Solids (TDS), and alkalinity, as well as the phosphorus, nitrate, and nitrite levels.

Equipment:
- Swing Sampler to take samples
- Plastic containers for storage
- Glass containers for storage
- LaMotte Total Alkalinity DRT, 0-200 ppm [Code 4491-DR-01]
- Tubidity tube
- DR/850 Colorimeter
- APERA PC60 Premium Multi-Parameter Tester


Swing Sampler

LaMotte Total Alkalinity DRT


Turbidity Tube

DR/850 Colorimeter


APERA PC60 Premium Multi-Parameter Tester

Results

Tropical Storm Laura

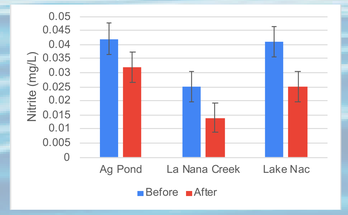


Figure 1. This bar graph represents nitrite levels before and after Tropical Storm Laura.

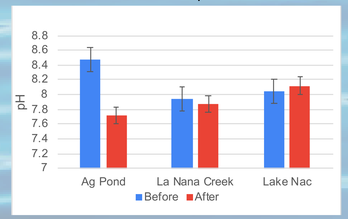


Figure 3. This bar graph represents pH levels before and after Tropical Storm Laura.

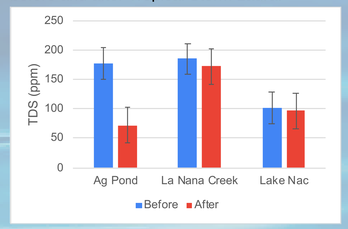


Figure 5. This bar graph represents TDS levels before and after Tropical Storm Laura.

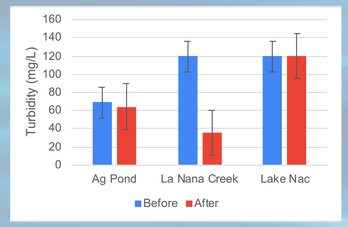


Figure 7. This bar graph represents turbidity levels before and after Tropical Storm Laura.

Tropical Storm Beta

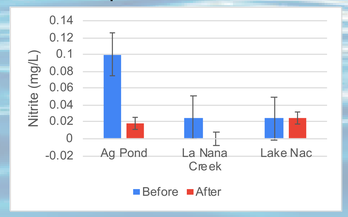


Figure 2. This bar graph represents nitrite levels before and after Tropical Storm Beta.

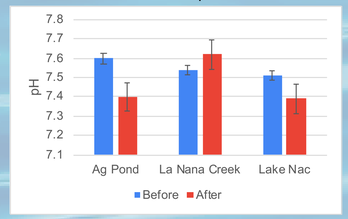


Figure 4. This bar graph represents pH levels before and after Tropical Storm Beta.

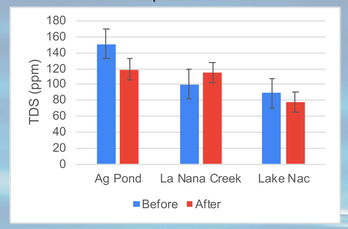


Figure 6. This bar graph represents TDS levels before and after Tropical Storm Beta.

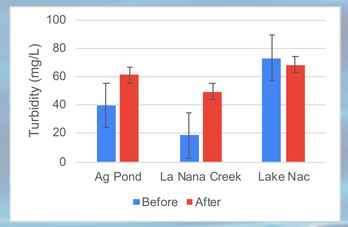


Figure 8. This bar graph represents turbidity levels before and after Tropical Storm Beta.

Discussion

Looking at the results, for Tropical Storm Laura the water was more turbid after the storm had passed. However, for Tropical Storm Beta, the water was less turbid. The results for TDS showed that the value decreased. This outcome could change depending on what solids are present, the pH difference in the water, or the temperature of the water. Since there are more suspended particles and less dissolved solids, there is reason to believe that the saturation of water was maximized. Therefore, there isn't enough space for more solids to be dissolved. Since the water was more acidic, the water is more soluble. However, since that didn't happen there must be another parameter that had a larger effect. The nitrite levels were shown to have an overall decrease after the storms had passed, which possibly could have been the factor that affected TDS.

Conclusion

During this research we were able to see a change in Turbidity, TDS, pH, and Nitrite. Hurricane Laura had a larger impact than Tropical Storm Beta. The hypothesis was partially confirmed, observing a more parameters and sampling over a larger period of time would conclude the effects of pH and Alkalinity. Due to timing and the unpredictable nature of tropical storms, we weren't able to accomplish that. However, there is a consistent drop in most of the nitrite samples after both storms, which is also true for the TDS values. The purpose of this research was to observe and collect data regarding the effects of tropical storms coming into Nacogdoches, which was met despite dropping some of the hypothesis.

References

Mallin, M. A., & Corbett, C. A. (2006). How hurricane attributes determine the extent of environmental effects: Multiple hurricanes and different coastal systems. *Estuaries and Coasts, 29*(6), 1046-1061. doi:10.1007/bf02798667.

Kegges, J. (2020, October 29). Tropical Tracker: A hurricane season in the Gulf of Mexico to remember, or forget. https://www.clickorlando.com/weather/2020/10/29/tropical-tracker-a-hurricane-season-in-the-gulf-of-mexico-to-remember-or-forget/.

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