



Using Macroinvertebrates to Test the Water Quality of Lake Nacogdoches

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Abstract

The target of this assessment was to conduct a water quality test on Lake Nacogdoches in Nacogdoches TX. Lake Nacogdoches is operated by the city of Nacogdoches for municipal water supply and recreation. One of the tests that we ran to determine water quality was a macroinvertebrates test. To do this, we kicked up substrate to expose the organisms burrowed deep in the soil and caught them in a d-frame kick net. We then used our macroinvertebrate key to identify the organism and find the level of biodiversity in the lake. This test is essential because biodiversity affects climate stability, the food web, and the maintenance of the entire ecosystem. Therefore, this test will tell us the overall health of the ecosystem as well. Water quality tests will be used to find any pollutants in the area. Testing at the boat ramps by the dam where the water is taken to the Nacogdoches surface water treatment facility is key to find pollution that could be entering our water. At both the East and Westside park, we collected water samples over three different days and then took the samples to the Environmental Assessment lab for testing. Using a thermometer, Hq40d Probe, spectrophotometer, and colorimeter, we tested the samples for temperature, PH, dissolved oxygen, and nitrite (low range).

Introduction

Water is one of the most important resources that earth has to offer, and yet 2 million tons of waste is dumped into the world's water every day. This quantity of waste being dumped causes extreme human health issues as well as environmental destruction. In order to estimate the water quality in Lake Nacogdoches in east Texas are group conducted a study in which we analyzed macroinvertebrates to determine if there are signs of contamination in the lake.

Macroinvertebrates are animals without a backbone such as crustaceans, worms and aquatic insects that can be seen with the naked eye. When conducting this study our group used the Macroinvertebrates Identification Key. This is a dichotomous key, in which each step you choose between the different characteristics eventually leading in identifying the type of macroinvertebrate. In order to enhance our study our group took water samples in different locations of the lake.

The objective of this study was to identify the different macroinvertebrates in two different locations of the lake and to analyze and test the water quality of Lake Nacogdoches. When analyzing the water we tested for PH, temperature, dissolved oxygen, and nitrite. After gathering the data, we could determine if there were potential threats to human health, and the ecosystem.

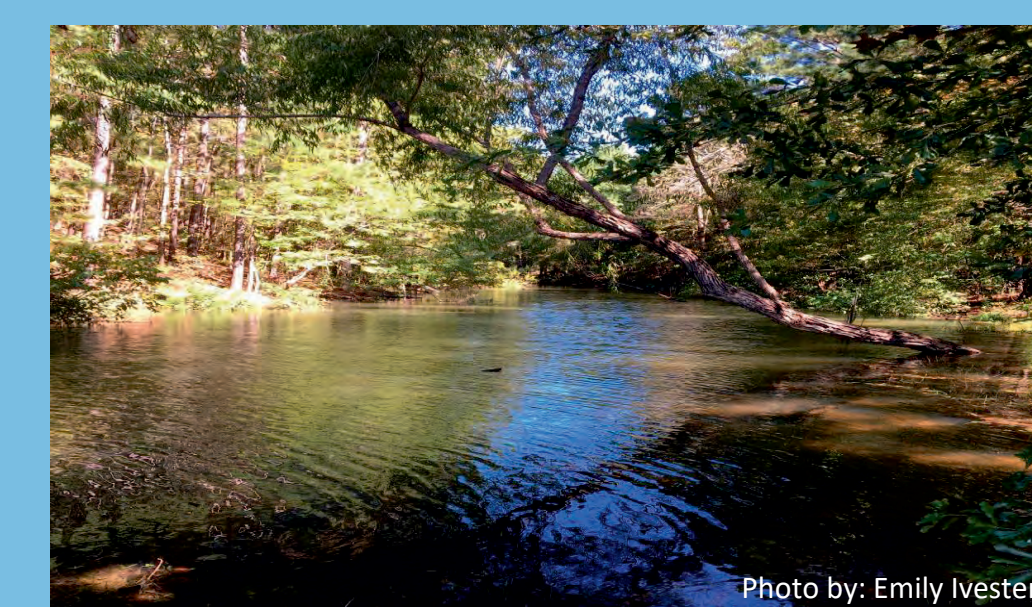
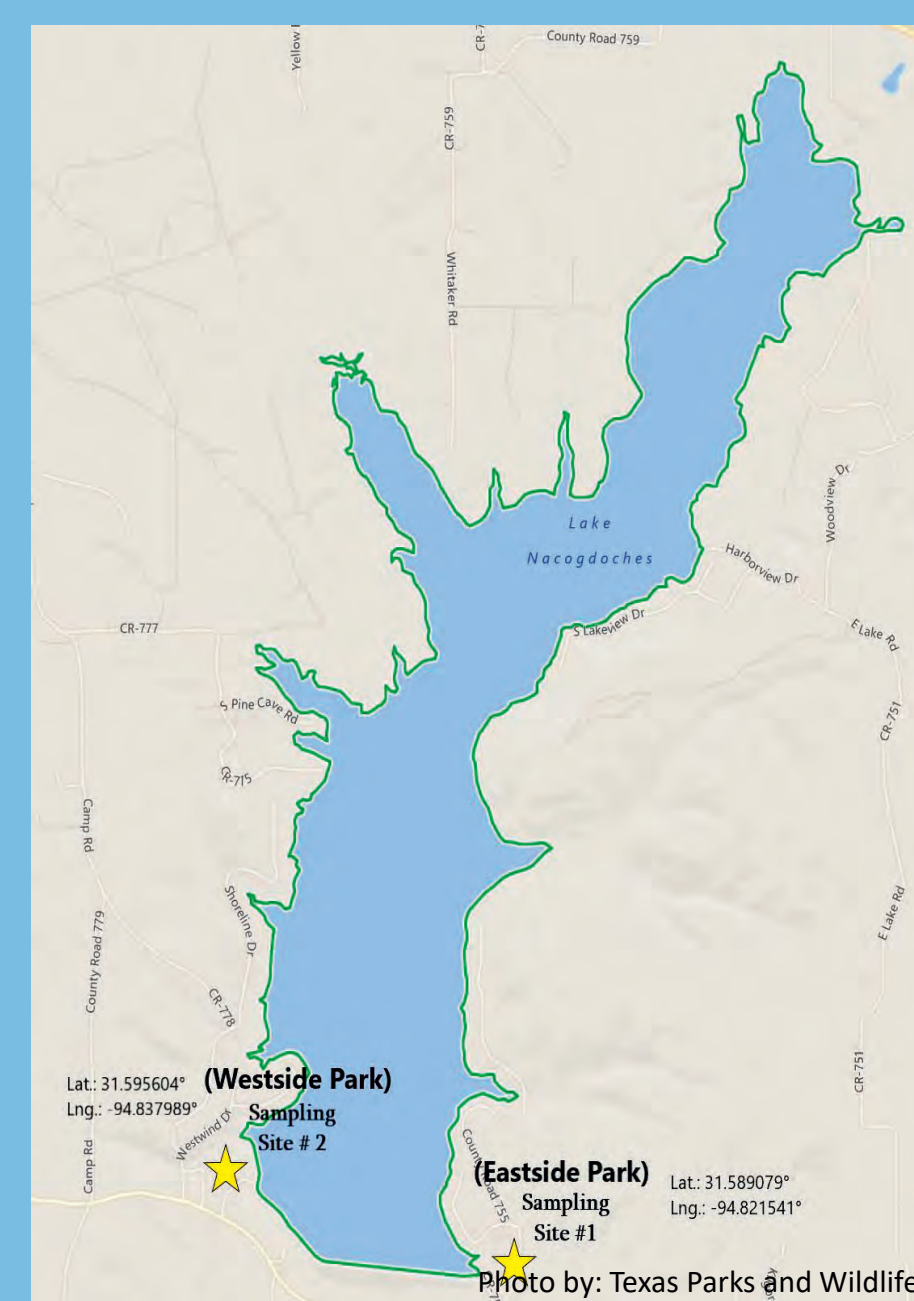


Figure 2. Eastside Park Sampling Site

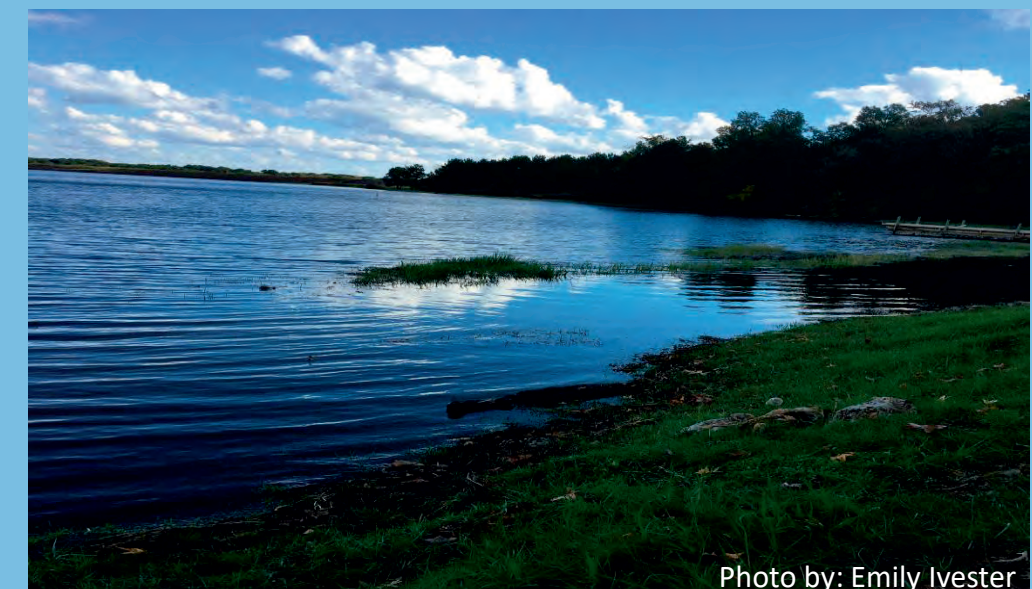


Figure 3. Westside Park Sampling Site

Methods

To sample for macroinvertebrates in Lake Nacogdoches we chose two sampling sites (Figure 1), Eastside Park and Westside Park. We followed the same procedure for both sites over three different sampling days. Once we arrived on site, one person put on waders and used a D-Frame Kick Net to kick up substrate and collect macroinvertebrates buried deep in the substrate. The contents of the net were poured into a sieve to reveal organisms. Using tweezers, macroinvertebrates were placed into a clear container and identified using a magnifying glass and a macroinvertebrate identification key. After the data was recorded, we released the organisms back into the water and repeated the procedure for both sites over three different days. To analyze our results we compared our data to a macroinvertebrate pollution tolerance index to see the levels of sensitivity to pollution.

To sample for water quality, we filled one water sampling container with lake water and used a thermometer to test the temperature. We did this for each sampling site and day. We then refrigerated the samples until analysis. To analyze the water quality, we used an Hq40d Probe to test DO and pH. Then we used a spectrophotometer to test high range nitrite levels, and a colorimeter to test low range nitrite levels for all six samples.

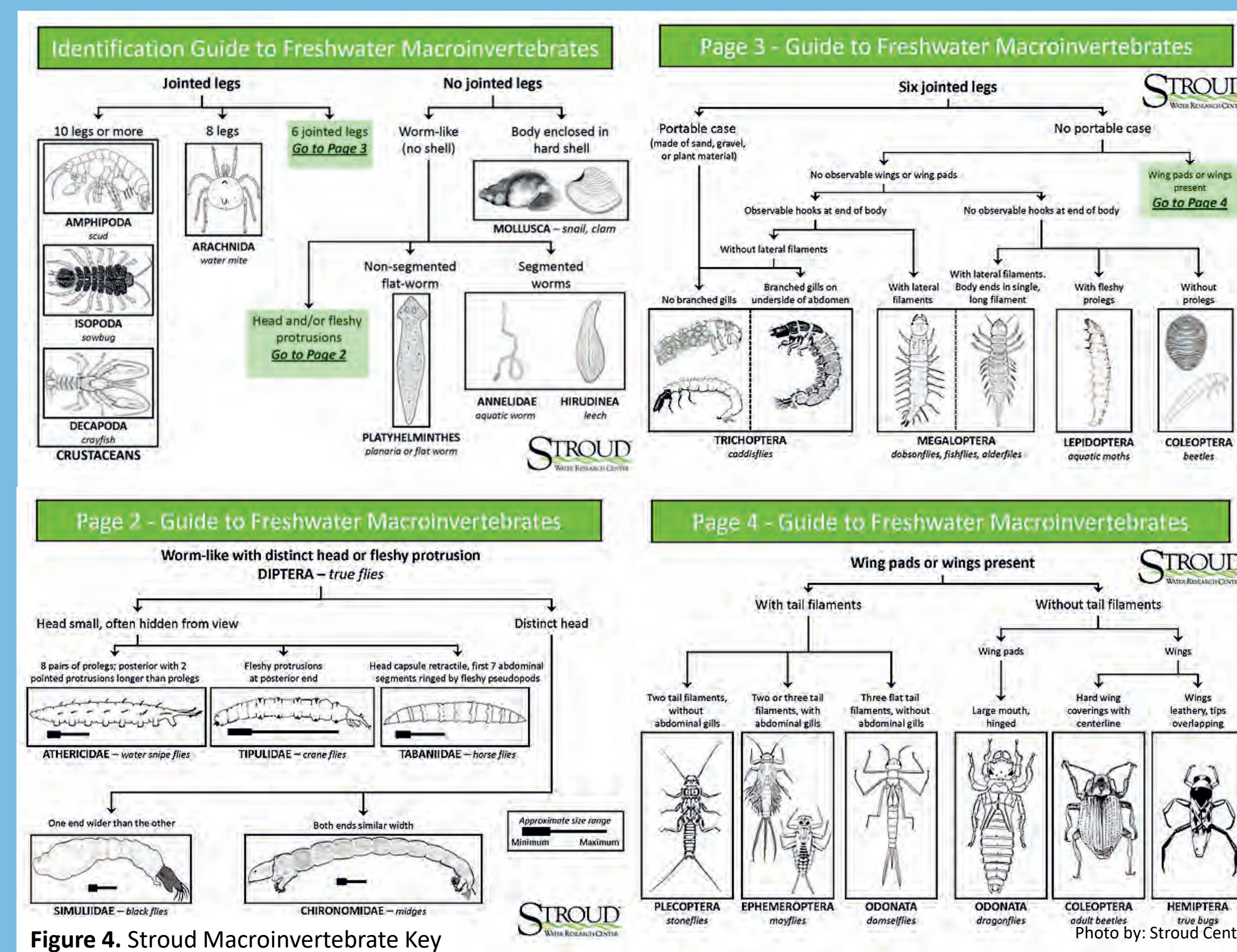


Figure 4. Stroud Macroinvertebrate Key



Figure 5. Hollyn kicking up the substrate.



Figure 6. Nick, Emily, and Augusto searching for macroinvertebrates.

Results/Discussions

Table 1. Macroinvertebrates found at Eastside and Westside Parks in Lake Nacogdoches on 10/28/2018, 10/29/2018, and 11/09/2018 and their corresponding levels of tolerance to pollution.

Table with 7 columns: Types of Macroinvertebrate, 10/28/2018 (Eastside Park, Westside Park), 10/29/2018 (Eastside Park, Westside Park), 11/9/2018 (Eastside Park, Westside Park), and Pollution Tolerance. Rows include Amphipoda, Isopoda, Decapoda, Arachnida, Mollusca, Platyhelminthes, Annelidae, Hirudinea, Athericida, Tipulidae, Tabanidae, Simuliidae, Chironomidae, Trichoptera, Megaloptera, Lepidoptera, Coleoptera, Placoptera, Ephemeroptera, Odonata, and Hemiptera.

Table by: Hollyn Grizzaffi

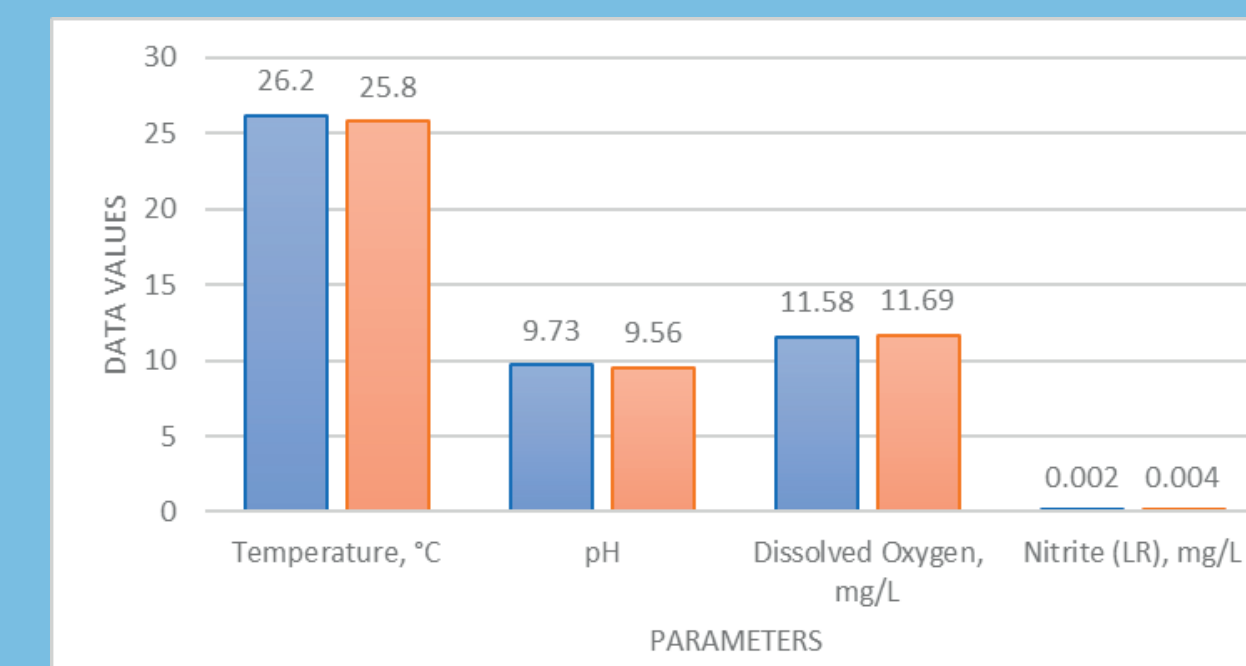


Figure 7. Water quality data gathered from Eastside and Westside Park 10/28/2018.

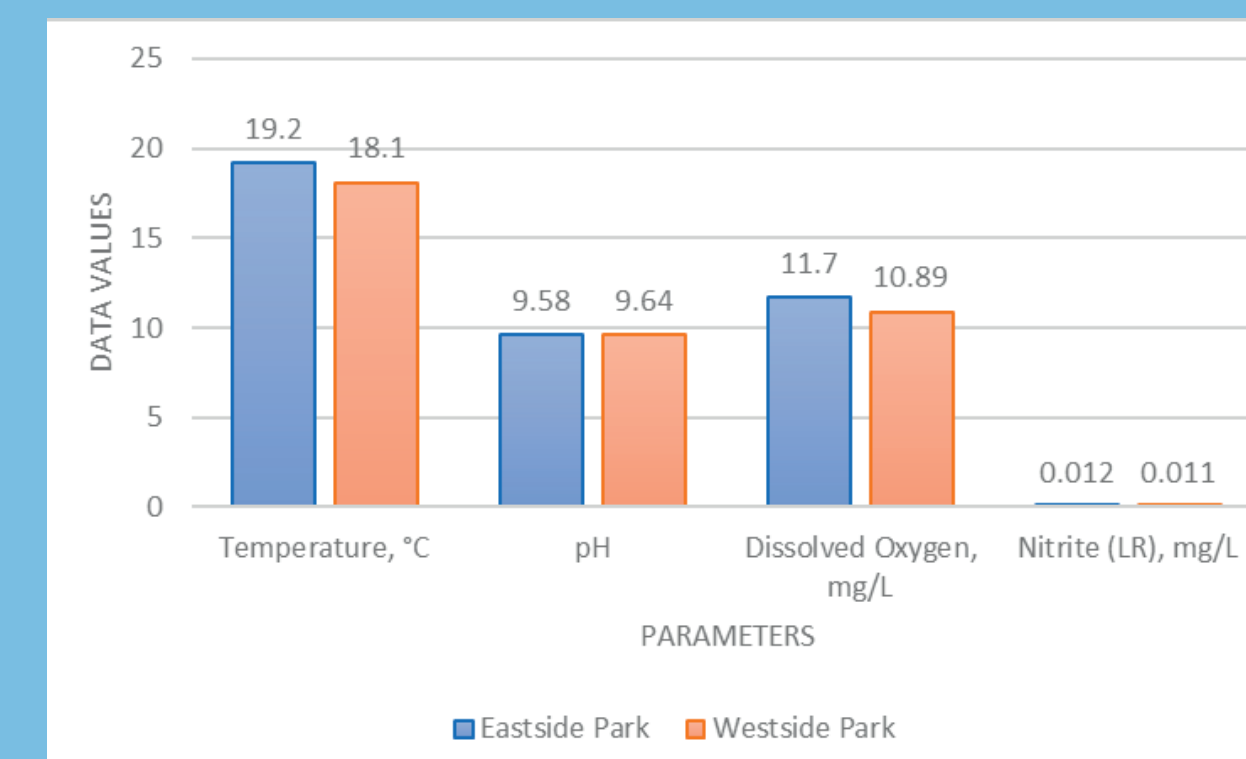


Figure 8. Water quality data gathered from Eastside and Westside Park 10/29/2018.

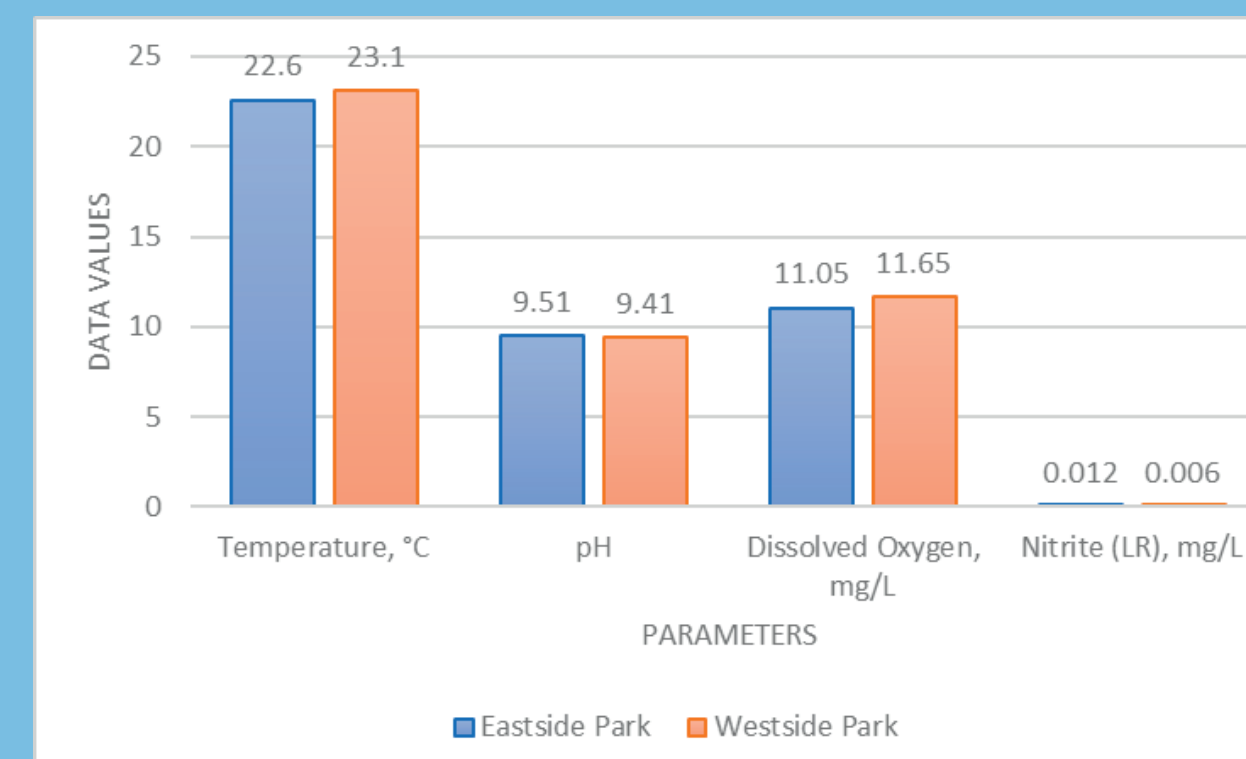


Figure 9. Water quality data gathered from Eastside and Westside Park 11/09/2018.

According to Table 1, the variety of macroinvertebrates we collected at Eastside and Westside Lakes during the three sampling days showed that the pollution levels in Lake Nacogdoches are relatively low. The macroinvertebrate species we collected ranged from coleoptera which are intolerant to pollution to hemiptera which are very tolerant to pollution. As shown in Figures 7, 8, and 9, the different water quality parameters we collected during our three sampling days were temperature, dissolved oxygen, pH, and nitrite levels (low range). The temperature of the water ranged from 18.1 °C to 26.2 °C; dissolved oxygen values ranged from 10.89 mg/L to 11.7 mg/L; the pH of Lake Nacogdoches fell between 9.41 and 9.73; and nitrite levels measured ranged from 0.002 mg/L to 0.012 mg/L.



Figure 10. Dragonfly Larva



Figure 11. Dragonfly larva



Figure 12. Freshwater clam



Figure 13. Crayfish

Conclusions

According to the macroinvertebrates found at Lake Nacogdoches and water samples that were collected and analyzed, we have determined that there are low levels of pollution in the lake. Since Lake Nacogdoches has low levels of pollution, it can keep a stable and thriving aquatic environment. A couple of sources of pollution we assume is affecting the lake is gas and oil leakage from boats and fertilizer draining from surrounding properties.

Citations

Definition of Water Quality Parameters. (n.d.). Retrieved October 3, 2018, from http://fosc.org/WQData/WQParameters.htm
Macroinvertebrate Identification Key. (n.d.). Retrieved October 3, 2018, from https://stroudcenter.org/macros/key/
T. (n.d.). Nacogdoches Lake. Retrieved October 25, 2018, from https://tpwd.texas.gov/fishboat/fish/recreational/lakes/nacogdoches/

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