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Under the Surface: Biological Monitoring Along Hunnicutt Creek Restoration

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Project #803

Abstract

Hunnicutt Creek Restoration Project is an ongoing effort started in 2013 with the goal of re-establishing the natural functions and conditions of a degraded watershed located on Clemson University's campus. The current research is focused on monitoring the key factors of an aquatic ecosystem that indicate habitat viability and overall water quality. Data contributing to our research include the levels of bacteria, dissolved oxygen, pH, conductivity, and the quantified species richness of amphibians and macroinvertebrates.The results presented in this poster are the baseline comparisons between the improved sections of Hunnicutt Creek and identified reference sites.

Introduction

Georgia Adopt-A-Stream (GAAS) is a volunteer-based monitoring program that started in Georgia and has now spread to the Upstate of South Carolina. The program's five goals are summarized by ADOPT: increase public **A**wareness, collect quality baseline water quality **D**ata, gather **O**bservations, encourage **P**artnerships between citizens and their local government, and provide citizens with the **T**ools and **T**raining to evaluate and protect their local waterways. GAAS emphasizes research regarding chemical qualities (pH, temperature, conductivity, dissolved oxygen), bacteria (E.coli), macroinvertebrates, and amphibians. We have implemented these GAAS protocols into our adaptive management plan and are monitoring the stream and adjacent wetland for both chemical and biological factors. These factors will be monitored monthly with the results uploaded to the GAAS website to form a documented data set. The data collected from these surveys help us to determine overall water quality and stream health for not only the restoration site, but for the Hunnicutt Creek watershed as a whole.

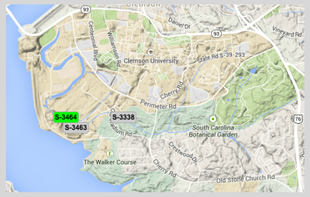


Figure 1. A map of the three monitoring sites along Hunnicutt Creek and their proximity to campus.

Two team members testing for dissolved oxygen at the restoration site.

Chemical and Bacteria Monitoring

Following the Georgia Adopt-A-Stream protocol, chemical monitoring has been in progress along Hunnicutt Creek since Fall 2014. Four parameters are being tested on the stream: temperature, pH, conductivity, and dissolved oxygen (DO). Conductivity can range anywhere from 50 and 500 µs/cm depending on the type of bedrock. The optimal level of pH ranges from 6.5 to 8.2, with 7 being a neutral stream. DO levels from 5-6ppm are ideal for growth and activity, levels below 3ppm are stressful for aquatic species and 1-2ppm will not support fish life.The amount of dissolved oxygen in the stream depends on temperature and salinity, with lower temperatures typically holding higher amounts of dissolved oxygen. Figure 3. shows the DO content in Hunnicutt Creek is above the state threshold and has sufficient levels for aquatic life to grow. Collecting baseline data is important to know when drastic changes happen due to either a failing sewer lines or stormwater pollution.

Bacteria monitoring looks for *E. coli* in the stream. *E. coli* is considered a good indicator of fecal contamination in the stream according to the US EPA. The allowable amount of bacteria for the South Carolina bacteria standards are 346 cfu/100 mL for a single sample.

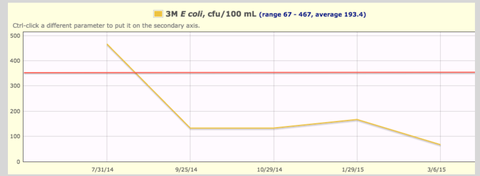


Figure 2. The E. coli content in S-3464 Hunnicutt Creek site. The red line is the state threshold and yellow depicts the data collected.

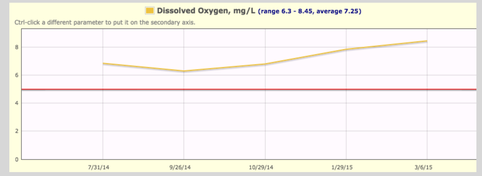


Figure 3. The dissolved oxygen content in S-3464 Hunnicutt Creek site. The red line is the state threshold and yellow depicts the data collected.

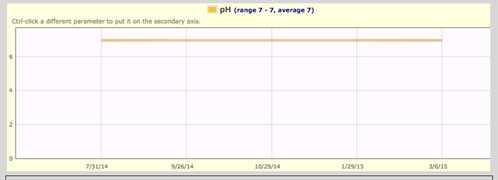


Figure 4. The pH of S-3464 Hunnicutt Creek site.

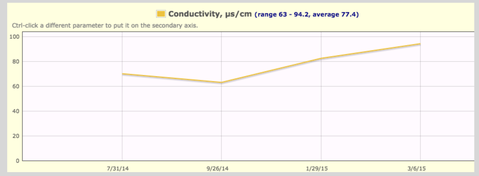


Figure 5. The conductivity content in S-3464 Hunnicutt Creek site.

Macroinvertebrate Monitoring

Identifying and counting aquatic macroinvertebrates reveals the ecological integrity of a habitat and reflects the synergistic effects of the environmental conditions. Certain species are more sensitive to pollution than others, so the presence or absence of a population provides insight on overall stream quality. A D-frame net was used to sample a variety of habitats, including woody debris with leaf packs, the vegetative bank margin, and the stream bed. The species collected at Hunnicutt Creek indicate that the majority are only somewhat sensitive to pollution while most of the macroinvertebrates of the reference site are sensitive. A change in the species composition of Hunnicutt is expected in the future as the site improves.

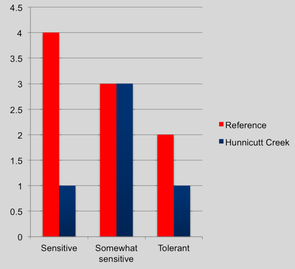


Figure 6. Species diversity based on pollution tolerance.

Several of the specimens collected at the reference site.

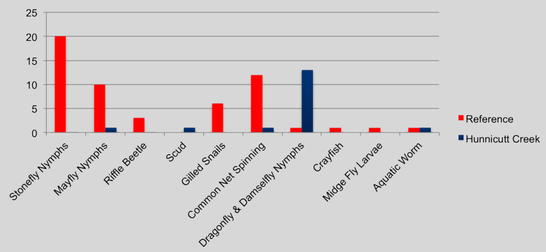


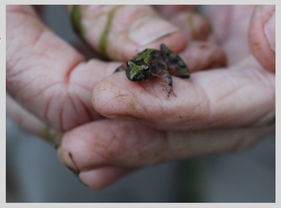
Figure 7. The macroinvertebrate species identified on site.

Goals

- Monitor Hunnicutt Creek Watershed for chemical and biological factors, as well as bacteria levels according to GAAS protocols.
- Accumulate data sets associated with the bacteria levels and chemical factors in order to observe variation over time and see how the watershed is affected by storm events.
- Establish amphibian monitoring stations to gain further information concerning species diversity and abundance.

Current and Future Work

Amphibian monitoring is currently being established in the restored sections of Hunnicutt Creek and around the wetland to discover the species richness. A reference site has been determined in the North Forest, which serves as a model for the wetland's progress. Over the next few weeks, we will be installing and checking coverboards and PVC pipe traps. The coverboards are 1'X1'X1" boards that are put on the ground, intended to attract salamanders, snakes, and other animals avoiding the sun. The PVC pipes are designed to allow treefrogs to enter and feel safe from predators because it is protected on almost every side. Both will be placed next to the stream and the wetland to ensure we have a higher capture rate. Six stations will be set up along our stream and wetland reach, with two PVC pipes and two coverboards at each station. Since the PVC pipes will only be used by a few species of treefrogs, our team will listen for frog calls in the evenings to more thoroughly detect all of the different frogs species present. We will be using a frog call sheet that includes the native species that are expected in this area and their mating season.



A Northern Cricket frog found in our reference site.

Acknowledgements

We would like to thank the Clemson Creative Inquiry Program, Jeremy Pike, Dr. Sawyer, and Dr. Hagan for supporting and encouraging our project.

References

- Georgia Adopt-A-Strem Protocol, for more information visit: http://www.georgiaadoptastream.com/db/