2021 Research Abstract Submission Synthesis

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Volunteer

Pragya Bhadani and Riya Bhadani, Clean and Beautiful (G-2829)
Co-author: Archana Seth

Title: **Targeted Monitoring at Level Creek, an Impaired Stream**

There are about 20 impaired streams in Gwinnett County. The Gwinnett County Source Identification (SID) program focuses on finding and removing sources of non-point pollution within impaired watersheds. However, the program can only handle 4 to 5 streams at a time. More citizen scientists need to be involved in monitoring impaired streams to increase the likelihood of the streams being delisted. The volunteer Targeted Monitoring program compliments the SID program by adding additional streams. With the support of Mr. John Butler from the Gwinnett County Department of Water Resources, our group, Clean and Beautiful, monitors Level Creek, which is impaired for Fecal coliform and Bio F. We do bacterial and chemical monitoring monthly at four sites of Level Creek. In late November of last year, the bacterial levels for an upstream site were TNTC. We brought it to the attention of a local coordinator, who addressed the problem. The E. coli levels were high because of an overflowing sanitary sewer. We intend to monitor Level Creek for at least one more year, after which we will adjust our targeting route, if necessary. The goal is to locate pollutant sources in the Level Creek watershed and work with local agencies to get the stream delisted.

Description of the 305(b)/303(d) List of Waters [PDF File]. (n.d.). Georgia Environmental Protection Division. descriptionof305b_303dlistofwaters (1).pdf.

Integrated 305(b)/303(d) List – Streams. [PDF File]. (2020). Georgia Environmental Protection Division. Streams_2020_305b303d (4).pdf.

Undergraduate

Sabrina Hodges, College of Coastal Georgia and Glynn Environmental Coalition
Teacher: Dr. James Deemy

Title: **Water quality evaluation to assess the impact of waste transfer facility on a stormwater drainage system**

Waste transfer facilities are an economically beneficial form of waste management, however if improperly managed, effluent from the facilities can make their way into the stormwater drain systems and negatively impact the health of the surrounding ecosystem. The objectives of this project were to 1) Evaluate site location to identified possible discharge points from the waste transfer facility into the stormwater drain system; 2) Analyze chemical and bacterial parameters for each water sample collected; and 3) Evaluate water quality trends and conditions in to identify the area of interest for this study is Liberty Roll-Offs and Recycling, a waste transfer facility located in Brunswick, GA. With the use of property maps and ArcMap 10.8.1 two possible points of discharge were identified, and 6 sample locations were selected at up-, mid-, and downstream locations from these discharge points. The Chemical and bacterial data were then collected following procedures set by Georgia's Adopt-A-Stream program. Monthly precipitation data was obtained from NOAA Local Climatological Data. The data was then statistically analyzed using R to determine the trends and the relationships between water quality parameters. The results of this project indicated that the water quality functioned in a mostly uniform condition. There is some indication of contamination, however the pollutant source in unidentified. Due to observed runoff towards the end of the sampling period, further research is required to understand the long term impacts this facility has on the water quality of these storm drainage systems.

LaTosha Walker, Georgia Aquarium
Teacher: N/A

Title: **How do the Properties of Cigarette Butts Influence the Quality of Fresh and Saltwater?**

In a world of pollution, cigarettes are no different from the plastics that can be found in the oceans and rivers. The production of leachate from the combination of cellulose acetate and water serves as a detrimental aspect to aquatic life and its ecosystem. Previous research discovered that pH was unaffected in freshwater systems after an hour. However, this experiment served to understand what properties of water quality (pH, alkalinity, carbon dioxide, dissolved oxygen, salinity, ammonia, phosphate, nitrite, turbidity, and bromine) were affected after five weeks using Hach and La Motte equipment from Georgia Aquarium. Each independent variable's results were analyzed using a two-sample t-test through the SPSS Statistical Software. The three parameters that changed from the control were freshwater alkalinity ($t=3.394$, $df=8$, $p\text{-value}=0.009$), freshwater turbidity ($t=2.679$, $df=8$, $p\text{-value}=0.028$), and saltwater turbidity ($t\text{-value}=2.796$, $df=8$, $p\text{-value}=0.023$). It was determined that the addition of cigarettes stabilized the pH for freshwater systems, which increased alkalinity. Additionally, increased sensitivity, lack of sodium chloride in freshwater, and the presence of cadmium caused an increase in freshwater turbidity and a decrease in saltwater turbidity.

High School

Isabella Powell, Rockdale Magnet School for Science and Technology
Teacher: Shelly Seagraves

Title: **The Effects of Submersible Aquatic Plants on Stream Water Quality**

Water quality is one of the most important factors in determining the health of an ecosystem. Submersible aquatic plants are plants that can thrive underwater. Submersible aquatic plants were investigated as a potential way to naturally improve water quality. Submersible aquatic plants were placed into onion bags and steaked into the stream. The water quality was tested at regular intervals. Vallisneria showed a 150% increase in average biological oxygen demand. Vallisneria also showed an 86% decrease in average nitrate concentration. The implications of this show that submersible aquatic plants could be a potential to improving water quality. Further research on this project involve testing more plant types or testing more aspects of water quality with the same plant species. This project presents a biological alternative for water quality improvement.

Annabelle Stultz, Kennesaw Mountain High School & Cobb County Watershed Stewardship Program
Teacher: Mike Kahle

Title: **Chemical Effect of Schools Re-Opening on Allatoona Creek**

Watersheds are a major part of the water cycle and a home to all forms of life. Urbanization is the main cause for unhealthy watersheds as polluted waters fill with chemicals, fuels, or other substances. Allatoona Creek lacks macroinvertebrate life, which is an indicator of pollution, but there is no visible cause of the uninhabitable waters. This quantitative study evaluated the short-term and immediate effects of school pollution with an exploratory casual design. However, the natural variation of dissolved oxygen and conductivity with temperature may overcome the indication of pollution. The research was exploratory as there was no prior data or research based on Allatoona Creek. A Shapiro-Wilks test confirmed normality of each data set, as there were no outliers. A paired t-test showed no significant difference in means of pH, conductivity, or dissolved oxygen at three sites along Allatoona Creek before and after schools opened and traffic increased. The p-values at all three sites were greater than 0.05. These results indicate that the schools and their related traffic do not contribute to the lack of macroinvertebrates. However, dissolved oxygen and conductivity did not follow their expected relationship with cooling temperatures. Future research should include a long-term study, as pollutants may reach the creek at different times, and a study to determine the influence of temperatures compared to pollution on dissolved oxygen and conductivity.

Amy Pham, Elite Scholars Academy AAS Group: G-2873
Teacher: Reshawdra Hutchins

Title: **Microplastics everywhere: Quantifying the difference in the number of microplastics in point and nonpoint sources of pollution in Metro-Atlanta.**

Microplastics are plastic particles that are under 5mm and are a growing domain of concern. These small plastics have adverse effects on organisms and are vectors for harmful microbes and virulent chemicals. They have been detected in soil, gastrointestinal tracts of organisms, drinking water, atmospheric deposition, etc. However, microplastic abundance in freshwater watersheds is rarely addressed. These sources are crucial and affect thousands of organisms, including humans. As different levels and sites of pollutants from sources such as agricultural runoff and urban development pervaded ecosystems, I analyzed whether point or nonpoint sources of pollution introduced more microplastics into the water per liter, and measured pH and dissolved oxygen to examine whether levels shifted in the presence of varying amounts of microplastics. Four sites were selected, two were point sources of pollution (PSP) and two were nonpoint sources of pollution (NPSP). To isolate microplastics, samples were sieved, digested using Wet-Peroxide Oxidation with 30% Hydrogen Peroxide, density separated with Sodium Iodide, and filtered through a Buchner Filter. My hypothesis regarding the number of microplastics was inconclusive since the data was statistically insignificant. Therefore, there was not a clear determination on whether the source of pollution affected the number of microplastics per liter, even though the average number of microplastics in PSP sites was greater with a 13.8% increase. Both water quality parameters supported a partial aspect of the hypothesis since PSP sites had worse levels and a higher average of microplastics. In future studies, polymer identification and increased quality-control may produce more desirable results.