2022 Poster Session Abstract Submission Synthesis

Volunteer

1. **Julia Schmitz and Debra Dooley:** Fire Leads to Chemical Spill: A Case Study in Understanding Water Quality
2. **Kevin Spingler:** Comparison of Measurements using LaMotte Dissolved Oxygen Test Kits to Vernier Optical Dissolved Oxygen Probes

Graduate School

1. **Mary Elizabeth Sailors:** Tracking the Source of *Helicobacter pylori* in Watersheds of San Juan, Puerto Rico
2. **Samantha G. Alvey:** Human Disturbance of Sediment Influences the Abundance of Antimicrobial Resistance in Surface Water
3. **Megan Robertson:** Aeromonas Prevalence in the Upper Oconee Watershed

Undergraduate

1. **Imani Vincent:** Aqueous Ion Concentrations in Groundwater from a Wetland Environment
2. **Katie Wilhelm:** The Effects of Beaver Dams on *E. coli* in the Water
3. **Wesley DeMontigny:** Tracking the Sources of *Leptospira* and Nutrient Flows in Two Urban Watersheds of Puerto Rico
4. **Eden Grasa, Alana Stevens, Cyaira Vest:** Macroinvertebrate Biodiversity Presence and Stream Health Within Riffle and Pool Microhabitats at Tobler Creek, Georgia

High School

1. **Claudia Castle:** Limited Geotechnical Environmental Survey of Wetland Soil Composition Classification, Texture, and Nutrient Load Compared to Educational Partnerships Locally and Trans-Atlantic
2. **Isabella Powell:** Waterfalls and Water Quality
3. **Jaden Jones:** Identification of Members of a Freshwater Plankton Community in Cobb County

Volunteer

Julia Schmitz and Debra Dooley, Upper Oconee Watershed Network (UOWN)

Title: **Fire Leads to Chemical Spill: A Case Study in Understanding Water Quality**
Co-Authors/Project Partners: Bruno Giri, Reilly Farrell, Piedmont University, University of Georgia

The Upper Oconee Watershed Network (UOWN), has been monitoring creeks within the Upper Oconee watershed for 20 years in response to citizens' concerns about rapid population growth in the area. In 2010, a fire caused chemicals from a toilet cleaning plant to pollute the nearby creek, Trail Creek. The next morning Trail Creek was neon blue with floating fish. Ten years later, the creek has since rebounded and been declared clean. Looking at data collected by UOWN since 2000, a case study has been created to lead high school and college students through how continuous monitoring can be used to identify and quantify stream health, in addition to learning the importance of keeping our waterways protected and clean. The presentation will go through

how the case study uses data that has been collected by UOWN over the years to monitor stream health and promote stream conservation and education.

Kevin Spingler, Cobb County/Whitefield Academy

Title: **Comparison of Measurements using LaMotte Dissolved Oxygen Test Kits to Vernier Optical Dissolved Oxygen Probes**

Over the course of a year measurements of the dissolved oxygen concentration in Nick-A-Jack Creek in Cobb County were taken using the standard AAS LaMotte Dissolved Oxygen test kits and a Vernier Optical Dissolved Oxygen sensor. The data over the course of the year is presented and a comparison is made between the values for dissolved oxygen for the two methods.

Graduate

Mary Elizabeth Sailors, Georgia College and State University

Title: **Tracking the Source of *Helicobacter pylori* in Watersheds of San Juan, Puerto Rico**
Advisor/Teacher: Dave Bachoon

The goal of this study was to determine the presence of *Helicobacter pylori* in the rivers and streams of San Juan, Puerto Rico and use Microbial Source Tracking (MST) to identify its source. During the two years in which this study was conducted (June 2020 to August 2021), a total of one hundred and seventy six samples were collected over the wet (88) and dry (88) seasons. Quantitative polymerase chain reaction (qPCR) amplification of the 16s ribosomal RNA gene was used to determine the presence and concentration of pathogenic *Helicobacter pylori* in each sample. In addition, analysis of human (HF183), dog (BacCan-UCD), and horse (HoF597) MST markers led to the identification of possible sources of fecal contamination at each site. *Helicobacter pylori* was detected in 15.91% of the samples collected during the wet season and 13.64% of the samples collected during the dry season. Human fecal pollution was the dominant source of fecal bacteria in both the wet and dry seasons, and accounts for 47.73% and 43.18%, respectively. There was a positive association between the detection of human fecal pollution and the detection of *Helicobacter pylori*. Both human fecal pollution and *Helicobacter pylori* detection should be of concern due their pathogenicity and clinical manifestations.

Samantha G. Alvey, Georgia Southern University

Title: **Human Disturbance of Sediment Influences the Abundance of Antimicrobial Resistance in Surface Water**
Advisor/Teacher: Risa A. Cohen
Co-Authors/Project Partners: Asli Aslan

According to the World Health Organization, antibiotics, which enter waterways through wastewater discharge and runoff, are contaminants to which microorganisms become resistant. Antimicrobial resistance (AMR) poses risks to environmental and public health through increased transmission of resistant pathogens, and disruption of microbial populations. Once AMR from the water settles into the sediment, recreational activity (fishing, boating, and swimming) has the

potential to re-suspend AMR, thereby contributing to risk of transmission. We investigated how sediment disturbance influences the amount and duration of AMR resuspension in artificial streams. Streams contained sediment from Kings Ferry Park Public Beach, Chatham County, GA, an area known to have AMR. Artificial streams received one of three treatments: no, low, or high disturbance (n=5). Water was sampled pre-disturbance and 0, 6, 24, 48, and 72 hours post-disturbance for the presence of total and antibiotic (tetracycline) resistant Escherichia coli. Immediately after low and high disturbance treatments, antibiotic resistant E. coli was detectable at relatively low concentrations (maximum: 11 CFU/100ml). Total E. coli increased the most from pre-disturbance levels in the high disturbance treatment (119%). Antibiotic resistant and total E. coli decreased 6 hours post-disturbance and were below detection limits (<1 CFU/100ml) by 72 hours in both low and high disturbance treatments. Understanding how recreational disturbance affects AMR resuspension, transport and downstream exposure risk in streams and rivers and is an essential component in community education and improving water quality monitoring efforts.

Megan Robertson, University of Georgia

Title: **Aeromonas Prevalence in the Upper Oconee Watershed**
Advisor/Teacher: Dr. Erin Lipp

Aeromonas is a genus of bacteria that naturally occurs in freshwater but is also pathogenic to fish and humans. Aeromonas infection in humans usually leads to symptoms including diarrhea, wound infections, "near drowning" respiratory infections, eye and ear infections, and sepsis. Aeromonas is considered an emerging pathogen. This exploratory research examined Aeromonas prevalence and abundance in the Upper Oconee Watershed. Samples were collected quarterly from Fall 2020 to Summer 2021, from an average number of 25 sites. Grab samples of water and sediment were filtered through a membrane and plated onto Aeromonas media, incubated, and colonies counted after 24 hours. An average of 4 presumptive Aeromonas isolates were picked from each site's plate. Isolates were screened for resistance against clinically relevant antibiotics. Our results show that Aeromonas was detected in every sample with a seasonal fluctuation, with higher levels in summer. Aeromonas levels were compared to available metadata, including E.coli levels (in regards to EPA water quality standards). These findings suggest that Aeromonas is prevalent in the Upper Oconee Watershed and further research is needed to understand the risk for recreational exposure.

Undergraduate

Imani Vincent, Piedmont University

Title: **Aqueous Ion Concentrations in Groundwater from a Wetland Environment**
Advisor/Teacher: Debra Dooley

This research details the sampling of groundwater via wells scattered throughout Piedmont University's wetlands to analyze aqueous metal concentrations in various topographical environments. It was hypothesized that the areas of a higher gradient would yield a higher concentration of aqueous metals. Groundwater from the former Lake Demorest, GA, U.S. lakebed was collected from beneath substrates of impounded and free-flowing aquatic environments using a homemade test tube apparatus at three different locations and four replicates were analyzed

for each location. Concentrations were measured using Atomic Absorption Spectrometry (PerkinElmer AAnalyst100). It was determined that there were significant differences in the Iron, Calcium and Magnesium concentrations statistically analyzed using a one-way ANOVA (SPSS version 25) comparing the absorbance values measured for the aqueous metals. However, the data suggested that aqueous metal concentrations were different at all locations for Mg, and Ca but not for Fe. No consistent relationships were observed relative to slope or proximity to surface water with aqueous metal concentrations. It should be noted in all wells Fe concentrations exceeded acceptable drinking water standards and would not be appropriate for municipal or household use.

Katie Wilhelm, Piedmont University

Title: **The Effects of Beaver Dams on *E. coli* in the Water**
Advisor/Teacher: Julia Schmitz
Co-Authors/Project Partners: Courtney McDaniel

Beavers could be a point source of pollution due to contributing bacteria to the stream flow. Their impact will depend on geographical location, habitat type, and the density of the population present. Beavers are also known to alter their surrounding habitats, and it has been shown that they alter nitrogen, dissolved organic carbon, dissolved oxygen, and other chemicals. Previous researchers have suggested that beavers are a keystone species and are very important to the ecosystems in which they inhabit. Since E. coli is found in all mammal feces, it has became a part of drinking water regulations. Testing for E. coli has proven to be affordable and sensitive, thus could be the most reliable indicator of pollution. The EPA has published a method for determining E. coli in water by using membrane filtration, and it is the method being used for this research. The purpose of this study was to determine if beavers contribute to the presence of E. coli in the water by comparing the levels of E. coli above and below their dams. Data and results are pending.

Wesley DeMontigny, Georgia College & State University

Title: **Tracking the Sources of Leptospira and Nutrient Flows in Two Urban Watersheds of Puerto Rico**
Advisor/Teacher: Dr. Dave Bachoon
Co-Authors/Project Partners: Dr. Christopher Burt, Taylor Chapman

The goal of this study was to determine the presence of Leptospira in streams that drains onto the San Juan Bay Estuary (SJBE) and flows through the northern coastal zone of Puerto Rico in relation to nutrient concentrations (nitrogen and phosphorus). In addition, Microbial Source Tracking (MST) was used to identify the possible source of the fecal contamination and pathogenic Leptospira in these watersheds. Eighty-seven water samples were collected during the dry (44) and wet (43) seasons. Phosphorus and nitrogen levels were assessed using standard methods, USEPA Method 365.4 for TP and DP; Method 351.2 for TKN and $NH4+$; and Method 353.2 for ($NO3-$). The level of pathogenic Leptospira was determined using quantitative polymerase chain reaction (qPCR) targeting the Lipl32 gene. Human (HF183), dog (BacCanUCD), and horse (HoF597) MST assays were performed to identify the likely sources of fecal contamination at each site. Forty-nine of the samples exceeded the standards in Puerto Rico for estuarian environments (1000 µg L-1 for TP and 5000 µg L-1 for TN (USEPA 2019)), indicating that approximately half of the water sampled was in eutrophic condition. MST suggested that approximately 50% of the sites were impacted by human and dog fecal waste.

Leptospira was detected in 32% of the samples collected in the dry season and was not detected in the wet season. There was also a strong correlation (r =0.89) linking the presence of pathogenic Leptospira to human fecal bacterial marker (HF183).

Eden Grasa, Alana Stevens, Cyaira Vest, Georgia College & State University

Title: **Macroinvertebrate Biodiversity Presence and Stream Health Within Riffle and Pool Microhabitats at Tobler Creek, Georgia**
Advisor/Teacher: Dr. Allison Vandevoort

Maintaining stream health and quality are of utmost importance to local ecosystems as well as human health. Streams are not only damaged by pollution, but may also transport these contaminants through the hydrologic cycle. Anthropogenic pollution implies drastic, adverse effects on macroinvertebrate ecology, as these creatures are extremely sensitive to environmental changes. In order to assess overall stream quality of Tobler Creek, Adopt-A-Stream visual assessments, as well as chemical monitoring including pH, dissolved oxygen (DO), and water temperature was conducted for two microhabitats, a riffle and a pool site. Data obtained from macroinvertebrate sampling were analyzed using the Shannon-Weaver diversity index. It was hypothesized that water in pool areas of the stream would have lower temperature and DO levels, but similar pH to riffle areas. Macroinvertebrate richness and diversity in pool areas was expected to be lower, while riffles were expected to harbor more diversity and richness. There was no significant difference found between the pH, DO, and temperatures between the riffle and pool areas measured. The riffle area did exhibit higher macroinvertebrate species diversity and richness, while the pool showed a higher evenness across macroinvertebrates found. Overall, stream health was within parameters given by Adopt-A-Stream, and it was speculated that differences in macroinvertebrate biodiversity of the two sites varied due to bed substrate size. Our experimental hypothesis was accepted in terms of the macroinvertebrate samples, but is inconclusive regarding the chemical parameters. Assumptions regarding species diversity and richness of the riffle and pool were supported.

High School

Claudia Castle, South Paulding High School

Title: **Limited Geotechnical Environmental Survey of Wetland Soil Composition Classification, Texture, and Nutrient Load Compared to Educational Partnerships Locally and Trans-Atlantic**
Advisor/Teacher: Tema Hoskins

Soil is something that seems very plain and simple, but in reality, it has a lot of different properties, classifications, and characteristics. In my project I will be presenting a tri-fold board containing the properties and classifications from soil samples from the Spartan Swamp. I will run tests on multiple soil samples from different areas of the swamp, and some of the tests will include pH levels, elevation, hue value and chroma, and what type of soil it is. In one of my samples, I even plan to test for organic content. Currently, I have five samples, but plan to collect more as the semester goes on and as the weather changes, temperature drops, and see how the levels change. Our class is partnering with a sister school in Forchheim, Bavaria in Germany, and I plan

to work on simplifying how to classify soil so they can collect their own data, so I am able to compare how these qualities differ between Douglasville and Forchheim. By the time I complete my project, I should have adequate data on pH, organic content (if applicable), classification, hue value and chroma, and elevation, all neatly presented on a tri-fold board.

Isabella Powell, Rockdale Magnet School for Science and Technology

Title: **Waterfalls and Water Quality**
Advisor/Teacher: Shelley Seagraves

Water quality is one of the most important factors in determining the health of an ecosystem. The purpose of the research was to determine if the presence of waterfalls significantly improves water quality. The research was split into two parts: a field test and a lab test. For the field test, water was collected from a local stream and brought to school for testing. For the lab test, an artificial waterfall was constructed and stream water was run through the system and tested weekly. The water was tested for phosphates, nitrates, pH, dissolved oxygen, and biological oxygen demand. In both the field test, and the lab test, dissolved oxygen was increased in the presence of waterfalls. The field test showed an increase in biological oxygen demand and a decrease in phosphate and nitrate concentration. Further research could include testing other possible influences on water quality. Additionally, this research project provides a baseline for implementation of a natural alternative to water quality improvement.

Jadon Jones, Whitefield Academy

Title: **Identification of Members of a Freshwater Plankton Community in Cobb County**
Advisor/Teacher: Kevin Spingler

In the center of Whitefield Academy sits a small retention pond. Many unobservant viewers may consider the lake to be uninteresting, but beneath its surface lies a complex and dynamic ecosystem of countless microorganisms. Of these microorganisms, plankton is relatively easy to investigate because of their abundance and their ability to be identified. The point of this research is to document and identify as many types of lake Whitefield's plankton as possible while also tracking the conditions of the lake throughout the year. Several times per week, lake Whitefield is sampled, and a variety of chemical and bacterial tests are used to determine the approximate pH, dissolved oxygen, conductivity, total dissolved solids, E. Coli counts, and more of the lake. To sample the lake's plankton, a plankton net is cast several times in different locations of the lake, concentrated in a centrifuge, and analyzed through a microscope. Through the microscope, several pictures are taken and the species are identified later. All of this data is put either in a spreadsheet or in a document containing all identified species. The end product of this research is an identification guide of all of the different types of plankton recorded in lake Whitefield. Although the sampling methods were not as rigorous as they could have been, hopefully, this guide and data will stand as the basis of further investigation of plankton in lake Whitefield or any other retention pond.