Confluence 2017 Water Science Poster Abstracts

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Volunteer

Jessica Warren, UGA Extension -- Camden County
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Water Quality Education and Outreach Improves Coastal Communities

In 2014, the Camden County Extension Agriculture and Natural Resources (ANR) program developed a strong emphasis on water quality education and outreach. As a coastal county with a large expanse of salt marsh and estuaries, the health of our aquatic ecosystems is very important to the health of our community and economy. Camden County Extension holds multiple volunteer river cleanups annually to remove litter from our communities and waterways that can affect the health and safety of our citizens, tourists, and natural assets. The ANR agent also serves as a local trainer, coordinator, and board member for the Georgia Adopt-A-Stream program. The agent offers multiple certification and re-certification workshops in bacterial and chemical water monitoring each year and works with three local teachers and their classes, who monitor regularly. In addition to cleanup and monitoring efforts, the ANR agent partners with a local Department of Natural Resources (DNR) biologist to hold volunteer days to remove island apple snails, an aquatic invasive species that severely impacts the ecology and health of the waterbodies that it invades.

Luke Morneault, oconeewaters Group ID: AAS-G-2206

Water Quality Analysis of Three Oconee County Creeks

The Upper Oconee Watershed Network (UOWN) is a community non-profit that has been performing quarterly water quality monitoring of creeks and rivers in Athens Clarke and Oconee County since 2001. In 2006, data for conductivity, nitrate, turbidity and E.coli were analyzed for key creeks and rivers in Athens Clarke and the results were graphed based on land use categories (rural, suburban, urban). For this project, the 15 years of data for McNutt, Calls and Barber Creeks in Oconee County were analyzed and matched it against the same land use designation categories in the 2006 research. The results show a mix of rural and suburban matches for the water quality parameters based on comparison to the results for Athens Clarke creeks. Conductivity and E.coli best matched rural land use and turbidity and nitrate best match suburban. McNutt, Calls and Barber Creek are in the northern, more developed, portion of Oconee County. Thus, the results are consistent with the changes in land use over the past 15 years for that area. In addition, conductivity, E.coli and nitrate data from a site upstream and downstream of the Calls Creek Water Treatment plant were compared. Because of the differences found, additional data were collected by walking Calls Creek while taking conductivity, nitrate, nitrite and ammonia samples. Only the conductivity data showed significant differences upstream and downstream of the water treatment plant pipe.

Graduate

Sohyun Cho, University of Georgia (Microbiology)
Teacher: Jonathan G. Frye
Co-authors: Lari M. Hiott, Charlene R. Jackson

Phenotypic and Genotypic Characterization of Salmonella, Escherichia coli, and Enterococcus Isolated from the Upper Oconee Watershed, GA

This study was conducted in order to monitor Salmonella, Escherichia coli, and Enterococcus in the Upper Oconee Watershed, GA. Water samples (n= 222) were collected from four quarterly sampling events in 2015 from different locations in the watershed. The presence of Salmonella, E. coli, and Enterococcus and their antimicrobial resistance phenotypes were evaluated. 315 Salmonella were isolated, some of which were serotypes also isolated from humans. Multidrug resistant (MDR: resistance to 2 or more classes of antimicrobials) Salmonella were detected. 260 E. coli were isolated, one-third of which belonged to a potentially pathogenic group B2. Enteropathogenic and Shiga toxin genes were detected in 5.0 and 0.4% of the isolates respectively. Few MDR E. coli were detected. 405 enterococci were isolated and speciated. Almost all the isolates were intermediate or resistant to more than two drugs. Resistances to daptomycin and tigecycline, which are newer antimicrobials to treat human infections caused by MDR bacteria, were seen. This study indicates the presence of pathogens, such as Salmonella, E. faecalis, E. faecium, and virulent E. coli in the Upper Oconee Watershed, many of which are resistant to antimicrobials. The presence of bacteria in the aquatic environment that are resistant to antimicrobials used to treat human infections, especially newer drugs, is concerning. Widespread occurrence of pathogens in the surface water suggests that water can serve as a reservoir for pathogens and play a role in its transmission.

Undergraduate

Adiba Khan, Department of Chemistry and Physics, Oglethorpe University
Teacher: Md Humayun Kabir
Co-authors: Michael Rulison, Md Humayun Kabir

Nanoparticles Matrix on the Removal of Heavy Metals from Surface Water

Water contamination by heavy metals is receiving increasing attention throughout the world in the recent decades because of its adverse effects on human health and management problem. Heavy metals are bioaccumulated and biotransferred both by natural and anthropogenic sources. Heavy, hazardous are introduced in aquatic systems as a result of the weathering of soils and rocks, from volcanic eruptions, and from a variety of human activities involving the mining, processing, and, use of metals and/or substances that contain Hg^{2+}, Pb^{2+}, $Cr^{2+, 4+}$, Ni^{2+}, Cu^{2+}, Cd^{2+}, Ag^{+}, and $As^{3+, 5+}$ ions. Conventional methods for the removal of heavy metals from aqueous solutions are not economically and environmental friendly. In this work a filter was developed using Fe_3O_4 nanoparticles, biochar, and sand to remove Ni^{2+}, Cu^{2+}, Cd^{2+}, Pb^{2+}, and As^{3+} ions from contaminated water. The performance of the filter will be discussed in this meeting.

Ashley Deal, Aubrie Goodson, Candace Moon, Georgia Southern University Freshwater Ecology Lab, AAS-G-2114
Teacher: Dr. Checo Colón-Gaud
Co-authors: Checo Colón-Gaud, V. Byron Collins

Education, Outreach, and Monitoring at Beautiful Eagle Creek in the campus of Georgia Southern University

Beautiful Eagle Creek on the campus of Georgia Southern University has been a symbol of pride and tradition since legendary football coach, Erk Russell, mentioned of its magical waters during The Eagles championship run in 1985. Historically, Eagle Creek has been envisioned as a symbolic staple of the successful program that practices near its banks, as well as inspired the name of business entities within the Statesboro community. Realistically, Eagle Creek's near 500m stretch has remained no more than a drainage ditch with little to no aesthetic appeal, much less ecological health and biological integrity. As part of an interdisciplinary effort, the Georgia Southern University Freshwater Ecology Lab (AAS-G-2114) has been working since 2015 to transform Beautiful Eagle Creek into a venue for K-20 education, community outreach, and monitoring programs that promote environmental sustainability, as well the ecological health and integrity of freshwater ecosystems in the region. In this presentation, we'll highlight the findings from our efforts at the creek and the progress made since registering the site with the resources of the Georgia Adopt-A-Stream Program.

Whitney Hudson, Georgia Gwinnett College
Teacher: Dr. Kathryn Zimmermann
Co-authors: Chloe Fernandes

Analysis of heavy metal concentrations in the Conasauga, Oostanaula, and Coosa Rivers utilizing a PerkinElmer NexION 350D ICP-MS

During the 1960s, pollution from upstream carpet factories heavily affected the connected rivers of the Coosa River Basin. The Clean Water Act of 1977 and actions by local and municipal authorities led to significant efforts to restore the river. The purpose of this experiment was to monitor how well these efforts have continued in the following years. This study details trace metal analysis of 84 samples collected by Adopt-a-Stream volunteers during the 2016 Paddle Georgia journey. Samples and blanks were collected at 84 individual sites over a 100-mile span along the three rivers. They were prepared according to EPA 200.9 acid digestion method. Once digested, they were analyzed for 16 different metals and their isotopes utilizing a NexION 350D ICP-MS located at the PerkinElmer Technical Center in Johns Creek. The NexION ICP-MS was configured with helium gas to eliminate polyatomic interferences, which could lead to inaccurate data and false positive results. Although a few sites contained levels of certain trace metals above the advised EPA Drinking water threshold, none of these are considered particularly harmful. This seems to demonstrate that the efforts of Adopt-a-Stream, local government, and volunteers are continuing to have a positive effect on the health of this river system.

Sanjay Patel and Shayna Markel, Georgia College and State University
Teacher: Dr. Dave Bachoon
Co-authors:

Monitoring the Water Quality of the Oconee River Greenway

The purpose of our project was to monitor the water quality of the Oconee River Greenway in Milledgeville, Georgia to determine if the water is safe for primary contact recreational use. Monthly samples were collected from multiple sites along two rivers in the Oconee Greenway. A YSI multi-parameter probe was used to measure physicochemical parameters such as pH, temperature, conductivity, and dissolved oxygen. The pH values in the study sites ranged from 4.86 to 8.35 and the DO ranged from 7.16 mg/L to 11.41 mg/L. Fecal Indicator Bacteria were enumerated using IDEXX Colilert-18 for fecal coliforms and Escherichia coli specifically. The level of E. coli ranged from 2 cfu/100ml to 770 cfu/100ml. The highest concentrations of E. coli were detected in one site along Fishing Creek (770 cfu/100ml) and one site in Tanyard Branch Steam (410.6 cfu/100ml). These results indicated that the water quality in some regions of the Oconee Greenway exceeded the EPA's recommended fecal bacteria criteria for safe recreational use. In addition the source of the high level of fecal pollution will be determined using PCR based Microbial Source Tracking.

Zamara Ruby Garcia Truitt and Brennan Poon-Kwong, Georgia College and State University
Teacher: Dr. Dave Bachoon

Assessment of the impact of fecal pollution on streams of Puerto Rico

Water quality of 32 freshwater sites located across streams and rivers of coastal locations across Puerto Rico in Puerto Rico was assessed using IDEXX's Colilert assay to enumerate fecal indicator bacteria (FIB). Improper wastewater treatment is a threat to public health and aquatic resources, as human pathogens and nutrient pollution are detected alongside FIB's. Detection of fecal contamination exceeding the U.S. EPA's recommended threshold for recreational water quality at eleven of the sites, called for the use of quantitative PCR to identify the source of fecal contamination through molecular source tracking (MST) techniques. Probe based Taqman qPCR assays were utilized in the targeting of Bacteroides human-specific (HF183) marker, and a cow-specific (BacCowP) Bacteriodales 16S rRNA gene. The human-specific HF183 assay detected the presence of human fecal contamination in 34% of the sampled locations, whereas the cow-specific assay confirmed cow fecal contamination in 22% of the locations sampled. Assays to detect the presence of pathogenic genes associated with enterohemorrhagic Escherichia coli O157:H7, Campylobacter jejuni, and Helicobacter pylori, are currently being developed and results will be added to the final presentation of collected data.

High School

Rachel McNeil, Maeva Makendi and Taylor Cook, Paulding County High School
Teacher: Mr. Marc Pedersen

Biodiversity Analysis with Environmental DNA

This experiment was aimed at evaluating local bodies of water to garner a better understanding of the species living within our environment using environmental dna (eDNA).eDNA is DNA that is extracted from various biotic materials, such as, fluids, tissues, etc found in the aquatic ecosystems, and is utilized to identify specific organisms that reside in the area. Environmental DNA proves to be an efficient tool in analyzing biodiversity at a larger scale in a less time consuming way compared to common practices involving morphological taxonomy. In morphological taxonomy one species is examined at a time, whereas environmental DNA allows for the examination of multiple species at a time. This proves to be significant because the area studied, Racoon Creek, is home to numerous species including those who are endangered. In recent years concerns have grown regarding the deterioration of the Raccoon Creek and efforts to restore the watershed have been implemented by various conservation organizations. We decided to use eDNA as a barcoding tool to identify species in contact with local waterways. Water samples were collected from four sites along the Raccoon Creek river shore a sub attachment of the Etowah river which passes through Georgia. This site was chosen because it considered to be the most biologically diverse tributary of the Etowah River below lake Allatoona. DNA sequences for the organisms Callibaetis pretiosus, and Aeolosoma were successfully identified, which gives us a basis for the biodiversity of the area we are studying.

Kylah Brabson, Eagle's Landing Christian Academy/AAS group ID: AAS-G-2205
Teacher: Denise Martin

Effects of Grey Water on Plants

My topic was on grey water and how it affected different types of plants. I chose it because water is a vital component of life and without it, we couldn't live. Therefore if it can be reused, then people with extremely limited water will be able to use and reuse it. My hypothesis was that if plants were watered with grey water, then the plants would grow at about the same as a plant with regular water. In my experiment, I watered 3 different species of plants, one set with grey water and one set with regular water, and measured the height and appearance over the course of a month. After a months time, my plants had either increased or decreased in height but they were all at the same rate. Through this experiment, I learned that grey water could be an effective way for water conservation but further testing needs to be done to ensure the safety of certain plants that produce fruit if this method is implemented in places that grow their own produce