# South Carolina Water Resources Center
# Clemson University

## Annual Technical Report
## 2019

## Products

Peter van den Hurk (PI)

The students involved in the project presented the results at a local symposium (Clemson Biological Sciences Annual Student Symposium (CBASS)). The students created a poster for the conference and integrated the results from this study to disseminate scientific information to a non-expert audience. Because of the COVID-19 pandemic, results could not be presented at regional or national scientific meetings. Plans are developed to summarize the results in a small manuscript for publication in a scientific journal.

This project contributed to outreach within the local community by partnering with a Boy Scout/High School student from Rock Hill, SC. A key part of this project was communicating with and assisting the Scout with sample analysis. The Boy Scout and his father were able to visit Clemson, participate in sample work up, learn how to identify microplastics by light microscopy, and observe university-level laboratory work.

Michele Harmon (PI)

Presentations produced:

Hebert, A.S., S.M. Harmon, J.R. Yates. 2019. Identifying Fecal Pollution in an Urban Watershed in Aiken SC, Using Quantitative PCR. Poster presentation at USC Aiken's SSI Summer Symposium, Aiken, SC. July 31, 2019.

Harmon, S.M., JR Yates. Tracking Fecal Pollution Sources in an Urban Watershed in Aiken, SC. Invited Seminar Presented at *Science on Tap*. September 12, 2019. Aiken, SC.

Padro-Perez, D.M., S.M. Harmon. 2020. Identifying Sources of Fecal Coliform Bacteria in Hitchcock Woods, Aiken, SC. Poster presentation at USC Aiken's SSI Summer Symposium. September 25, 2020.

Jameson, B., S.M. Harmon. 2020. Indicating the Presence of Tetracycline in an Urban Watershed in Aiken, SC using Quantitative PCR. Poster presentation at USC Aiken's SSI Summer Symposium. September 25, 2020.

## Information Transfer Program

Peter van den Hurk (PI)

Project information was disseminated through the Clemson University Creative Inquiry program where students are required to make presentations and supply project information to university websites and Twitter feeds. The project also worked closely with a Boy Scout troop in Rock Hill, SC as part of an Eagle Scout project for one of its members. Project information was shared with the Rock Hill community through the Boy Scout troop.

Michele Harmon (PI)

Students were required to make presentations as described in the Products section. Additionally project information is made available through the University of South Carolina – Aiken website as well as other social media outlets.

SC Water Resources Center (PI)

Project information for all funded programs is made available through the SCWRC website, the SCWRC Twitter feed and other social media outlets.

## Student Support

Peter van den Hurk (PI)

1 PhD student

4 undergraduate students

Michele Harmon (PI)

2 Master of Science students

2 undergraduate students

SC Water Resources Center

1 PhD student

1 undergraduate student

## Notable Achievements and Awards

We anticipate this tire wear project will continue as part of the What's in Our Waters (WOW) Creative Inquiry at Clemson University. The sampling methodology is relatively simple and provides an opportunity for students to participate in field work and laboratory work in a cost-effective manner. These activities may also be incorporated into the high school outreach portion of the WOW program to gather additional data on the distribution of microplastics in the area as well as provide an opportunity for high school students to collect microplastics. There are also conversations to include these sampling programs into the South Carolina Adopt-A-Stream protocol of citizen science water quality monitoring. The Adopt-A-Stream program is run through the Clemson University Center for Watershed Excellence, a partnership with the South Carolina Department of Health and Environmental Control and the U.S. Environmental Protection Agency.

# Tire Wear Particles In Road Runoff As Non-point Source Microplastic Pollution In SC Waterways

**Project Type:** Annual Base Grant
**Project ID:** 2019SC235B

**Project Impact:**

Major Conclusions
Results indicate that the major microplastic type encountered across all samples were tire wear particles. A greater abundance of microplastics, specifically tire wear particles, were collected from urban sampling locations. Urban sampling locations had significantly more microplastics compared to rural sampling locations. There were significantly more total microplastics recovered from the smaller sieve size (53 µm), indicating that most microplastics collected were less than 500 µm in size.The greater number of microplastics recovered from the smaller sieve size may be attributed to the density separation method employed in the study. A NaCl solution of 1.17 g/cm3 was used to separate the lower density microplastics from heavier components such as sediment and denser microplastics. It is possible that only smaller, more lightweight microplastics and tire particles were effectively separated by this method and thus a portion of the heavier microplastics were missed in sample preparation. Overall, this project provided insight into the distribution and types of microplastics collected from both urban and rural areas in South Carolina.

Future Directions
To improve the accuracy of microplastic identification, implementing advanced microscopic analysis of a subset of microplastics would be beneficial to confirm polymer type. We would like to use AT-FTIR or Raman spectroscopy in the future to confirm identification of microplastic types encountered in our samples. Additionally, increasing our sample size and sampling site type to include samples from storm drains, creeks or streams, and stormwater ponds would help shed light on the fate of microplastics in our local area.

# Fecal Coliform Pollution And Antibiotic Resistance In Sand River In Aiken, SC

**Project Type:** Annual Base Grant
**Project ID:** 2019SC236B

**Project Impact:**

Analysis of Microbiota
Overall, fecal coliform counts in drainage samples were higher than the pooled wetland sites, and the contribution of B. dorei to the total Bacteroides counts from the drainages was higher than the pooled wetlands. Our data indicate that of the sites tested, the drainage sites are most likely to be the sources of fecal contamination. This would be consistent with the idea that fecal contamination is entering the drainage streams from the surrounding areas. All three drainage sites had similar fecal coliform counts and B. dorei presence, therefore we cannot identify any one as a major source of human contamination.
Antibiotic Residues
Tetracycline was the only antibiotic detected in the overlying water in the drainages. However, several antibiotics were detected in sediment from the both the drainages and the pooled wetland areas. These included fluoroquinolones, kanamycin, streptomycin, tetracycline and sulfamethoxazole.
Antibiotic Resistance Genes
Our data indicate that antibiotic resistance genes are not widespread in either the drainages or pooled wetlands. Our analysis indicated that tetA was present in sediment samples, but not in samples of flowing water. In addition, it appears that tetA was more likely to be found in drainages than in pooled wetlands. These data are consistent with the hypothesis that bacteria with tetA are entering the drainages and becoming entrained in the sediments. The widespread presence of tetracycline is consistent with presence of bacteria with tetA, since these bacteria are likely to be found in organisms that are exposed to tetracycline.