

TENNESSEE TECH UNIVERSITY | FALL 2020

SOES

School Of Environmental Studies

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Newsletter

Message from the Director

Welcome to the Fall 2020 edition of the SOES Newsletter! In this issue you'll find our students working on community sustainability, completing internships with local agencies, and conducting research on karst groundwater systems and endangered species. You can also catch up on the latest news from SOES alumni and read an entertaining interview with Environmental Law adjunct faculty member Matthew McClanahan. We always enjoy receiving updates from our alumni, so please make sure you share any news with us. Special thanks to Bailey Carter, Kate Moffitt and Irene Mauk for their writing and design work on this issue. I hope you enjoy the newsletter and please do stay in touch!



Hayden Mattingly

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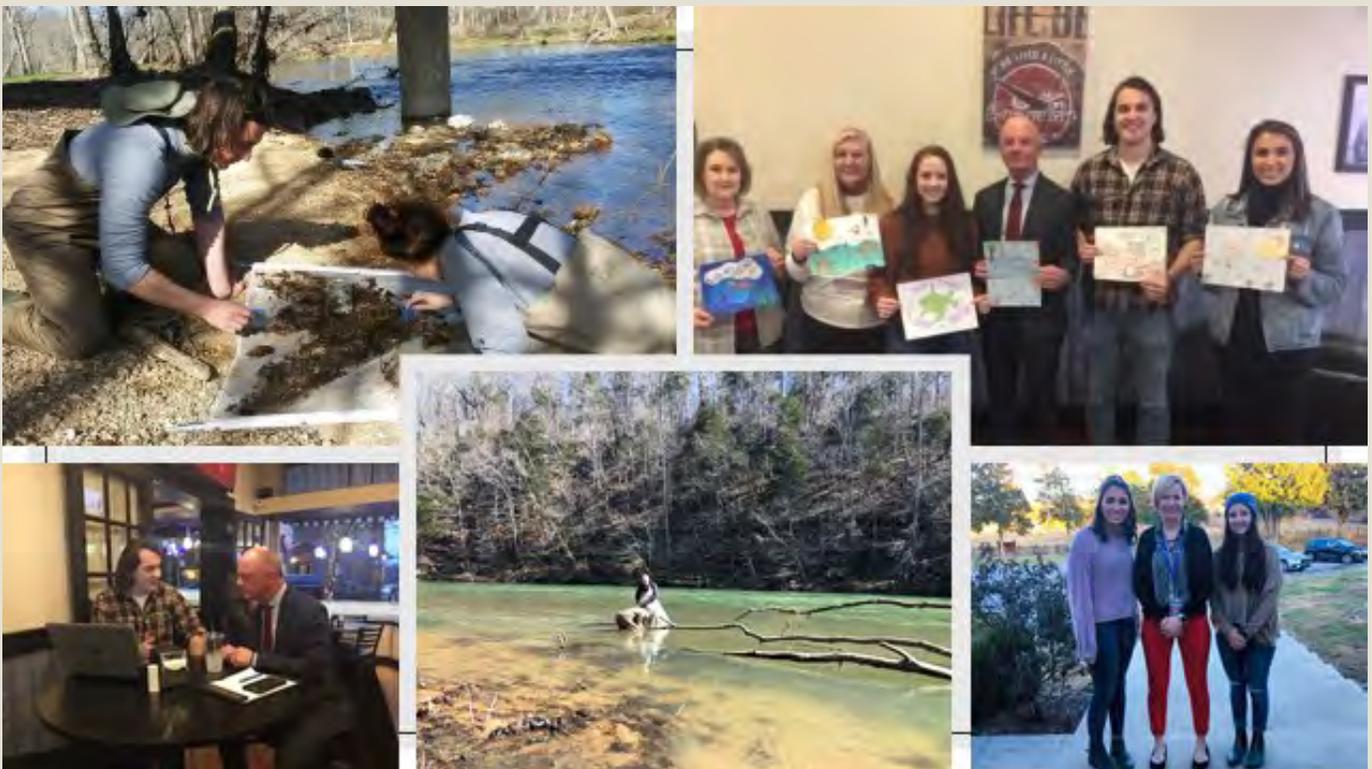
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BACHELOR OF SCIENCE

Environmental & Sustainability Studies

Capstone Experience

The 2019-2020 ESS Capstone class worked with Rachel Killebrew and Janie Robbins of the McMinnville Breakfast Rotary to address the issue of illegal dumping in Warren County waterways. Some of the aspects of illegal dumping they considered included basic water quality concerns with particular focus on tire disposal, the economic impact of illegal dumping, the legal environment and how best to inform the citizenry about illegal dumping. Capstone students looked to the literature for relevant studies and to potential models for best practices. One group began work on a predictive model using GIS in order to determine likely locations of illegal dumpsites. Another group initiated a poster contest in public schools to raise awareness about the issue, while others conducted an aquatic organism water quality survey and delved into relevant laws and economic models. Despite the difficulty of completing the task because of the COVID-19 restrictions, the team members responded with determination and the project culminated with a virtual presentation of their findings to a group of Warren County community leaders regarding potential ways to prevent illegal dumping.



PROFESSIONAL SCIENCE MASTER'S

Concentration in Environmental Informatics

Bailey Carter is in her last semester as a PSM-EI student. She earned her bachelor's degree in Environmental Geology from Tennessee Tech. For the past two summers, Bailey has been working as an intern with the U.S. Army Corps of Engineers (USACE) at Center Hill Lake as a natural resource specialist-student trainee. Bailey recently started an internship project

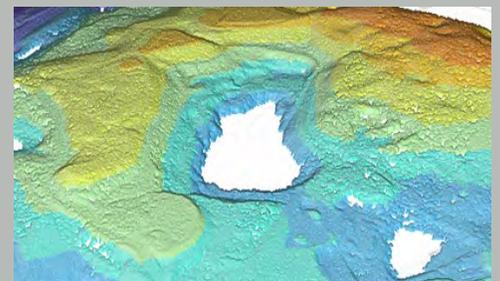


focused on visitation at Center Hill Lake and surrounding Tennessee State Parks. Her study will analyze visitation data from March to July 2020 and compare those numbers to historical averages for the same months. This project is intended to analyze the high numbers of people that were participating in recreational activities as the COVID-19 pandemic was taking place. GIS heat maps will be used to show visitation volumes for the lake areas and state parks. Environmental and economical impacts of the



visitation are of great interest. The recreation areas experienced an overwhelming amount of trash and facility usage from the large number of people. The marinas and restaurants on the lake saw an increase in business. Bailey's research will benefit the USACE and Tennessee State Parks in their efforts to bring awareness to recreating responsibly and addressing areas that are subject to environmental impacts.

Johnathan Nixon graduated in August 2020 with a PSM-EI degree. He earned his bachelor's degree in Environmental and Sustainability Studies, with a concentration in Natural Resources from Tennessee Tech. He recently finished a graduate assistant position with the Testing and Learning Center at Volpe Library and



finished an internship with Tennessee Department of Environment and Conservation (TDEC). Due to the Covid-19 pandemic, his internship was unique. All work was performed remotely due to restrictions. Johnathan is currently making maps for a local nonprofit, investigating ways to increase response rate of customer service surveys, and trying to detect illegal surface mines using LIDAR. He presented his internship experience through Arc GIS Story Maps.

DOCTOR OF PHILOSOPHY

Environmental Sciences

Concentrations in Agriculture, Biology, Chemistry, Geosciences or Integrated Research

Samantha Allen is a PhD student in Environmental Sciences with a concentration in Integrated Research at Tennessee Tech. She lives in Cookeville with her husband, Daniel, and their two boys. She enjoys photography, travel and spending time outdoors with her family.



Samantha began her career working at Oak Ridge National Laboratory on the Spruce and Peatland Responses Under Changing Environments (SPRUCE) project during her undergraduate studies. The opportunity to work alongside researchers in the field of environmental science sparked her interest in pursuing her graduate degree in Environmental Informatics at Tech. Upon completing her master's degree, Samantha enrolled in the Environmental Sciences PhD program at Tech.

Samantha's past research has focused on utilizing Geographic Information Systems (GIS) technologies to gain insight into species distributions of aquatic species in Tennessee, including the endangered bluemask darter and the endangered pygmy madtom. Additionally, she assisted in creating a web-based geodatabase for the Falling Water



River Watershed to facilitate data sharing and collaboration amongst watershed stakeholders.

As remote sensing data is made with greater resolution and more readily available, it can help provide innovative ways to understand our environment and how to

protect it. Karst landscapes are especially vulnerable to the impact from human activities. Water and the pollutants it carries may travel quickly in karst landscapes, making it increasingly important to gain insight into the connectivity of these landscapes. Samantha's goals are to apply remote sensing and GIS techniques to better understand karst groundwater systems, create a human threat index to highlight areas at-risk to human effects, and to model aquatic species distributions for the study area, Arnold Air Force Base in Tullahoma, Tennessee. Samantha's advisor is Hayden Mattingly.

Kenny Pierce is a PhD student in Environmental Sciences with a concentration in Agriculture. He is the manager of the School of Agriculture's plant and soil science research and teaching facilities at TTU's Shipley Farm. His research is based on allelopathic challenges sometimes encountered

with the agronomic practice of growing cover crops for improving soil health, which is gauged by its capacity to perform agronomic and environmental functions.

Those functions can usually be enhanced by increasing the organic matter content of the soil and cover crops are those grown primarily for the purpose of adding organic matter to the soil rather than for market or sales.



Allelopathy is broadly defined as the biochemical interactions between all types of plants, including microorganisms, and sometimes has unanticipated effects on the market crops that follow the cover crops. Because allelopathic effects may be species and cultivar specific, screening crops and weeds for allelopathic interactions is needed to make better cover crop selection, crop rotation and weed management decisions. Unfortunately, screening in a field setting can be time consuming, labor intensive and impacted by variable weather and environmental conditions, so the objective of Kenny's research is to develop growth chamber and greenhouse protocols for rapidly screening plant species and cultivars for allelopathic interactions that are consistent with those observed in field production situations. Kenny's faculty advisor is Brian Leckie.



AWARDS & RECOGNITION

Grant Awarded and Publications

PhD Student Receives Grants

Rachel Kaiser, an Environmental Sciences PhD – Geosciences student, received a \$3000 grant from the Cave Research Foundation. Rachel will be using this funding to help support her sample analysis she will be conducting for her research. She also received the National Speleological Society research grant and the Geological Society of America Graduate Research grant. Rachel's proposal received very good reviews from a panel of distinguished scientists.

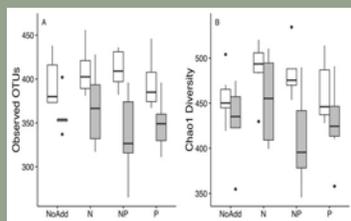
Rachel is being mentored by Tania Datta and Evan Hart. Her research focuses on the presence of antibiotics and antibiotic-resistant bacteria (ARB) in source waters such as groundwater, a growing global concern. The purpose of her research is to determine the presence, type of resistance and level of resistivity of ARB in karst groundwater systems. Moreover, how the unique nature of these karst systems, their water quality and adjoining land-use impacts the presence and level of resistivity in ARB is not well studied. Addressing these data gaps will aid in forming regulations to protect water resources and human health.



Student Publications

Congratulations to two of our PhD students, Samantha Allen and Cody Godwin, for their recent publications!

Samantha was co-author on [“Constraints on microbial communities, decomposition and methane production in deep peat deposits”](#) published on PLOS ONE.



Cody was the main author on [“Varanus Gouldii \(Gould’s Monitor\). Diet and Cannibalism”](#) published in Herpetological Review 51(1), 2020.



Research & Creative Inquiry Day

Research and Creative Inquiry Day is an annual event designed to promote



student research and creative inquiry and provide a venue for presenting that work. The event is open to undergraduate and graduate students from all departments who want to show their research and creative projects. The 2020 Research and Creative Inquiry event was held in a digital format this year. The School of Environmental Studies had two project winners for this year's event: Rachel Baker, an undergraduate, with her project titled “Determination of Microplastic Content in Western Tennessee Lakes” and Chioma Onwuchekwa, a PhD student, with her project titled “Evaluation of Microplastic Load in a Waste Water Treatment Plant.”

ALUMNI UPDATES

The School of Environmental Studies



Steven Hewett (P.S.M. '16) has been working for the City of Clovis, New Mexico, for three years. He is still working as a **GIS specialist**. Steven has been maintaining a dashboard of COVID-19 in the state of New Mexico that was used by emergency managers across the state while building their own. Steven has also been working on a project dealing with **Roadbotics** collection. Roadbotics is a company that uses artificial intelligence (AI) to look at video from a cell phone to give a score from one to five on how bad a road is. The AI can find 28 different faults in a road bed and use that to score a road from intersection to intersection and overall length.

Kate Moffitt (B.S. '17) is currently pursuing her **P.S.M. in Environmental Informatics** here at Tennessee Tech. She lives in Cookeville, Tennessee, and is our newest graduate assistant in the SOES. She plans to focus on environmental policy.

Faranak Mahmoudi (Ph.D. '18) is currently working on a post doctorate at **Western Kentucky University** and **U.S. Department of Agriculture (USDA)**. Faranak utilizes analytical instruments to detect and quantify environmental pollutants such as antibiotics and estrogenic compounds in solid and aqueous samples.

Lahiru P Gamage (Ph.D. '19) is currently living in Nashville working on a climate change project at **Tennessee State University**. They have established a soil warming infrastructure and collect high-frequency data on soil microbial responses to temperature changes in switchgrass cropland.



Jessi Vannatta (Ph.D. '19) is currently working as an environmental scientist at **Hungry Valley State Vehicular Recreation Area** in Gorman, California. She recently finished her first monitoring season in the park, which included bird, herpetofauna, small mammal and vegetation monitoring. She has also been working with her colleagues to implement a strong bat monitoring program in the park by developing acoustic, mist net and bat house surveys. This is a photo of Jessi holding a Blainville's Horned Lizard (*Phrynosoma blainvillii*) caught incidentally during small mammal surveys earlier this year.



Brittany Burke (P.S.M. '19) moved to Murfreesboro, Tennessee, and started working for **Wiser Imagery Service** as a geospatial analyst. Brittany makes maps using ArcMap and satellite imagery.

Anna Webb (B.S. '19) is halfway through her master's program at **Washington State University**. Anna is studying entomology with a focus on honey bees. Her recent experiments have been utilizing an entomopathogenic fungus to treat parasitic mites that plague honey bee colonies. By using this biological treatment, if the results are statistically significant, commercial beekeepers can decrease the amount of chemical treatments used in colonies. Anna treats the colonies, takes more samples, plates the samples and waits to see if the fungus grows on the plates of mites in agar.



Graduates & Alumni Updates

2019-2020 Graduates

Bachelor of Science

Dylan Belcher

Melody Culver

Jordan Durham

Phillip Fox

Emma Jones

Madison Lester

Jonathan Pack

Jordan Platt

William Ponder

Professional Science

Master's

Daniel Adams

Brittany Burke

Czarinna Clay

Rebecca Place

Oliver Wade

Doctor of Philosophy

Lahiru Gamage

Kayla Key

Robert Paine

Jessica Vannatta



Continuation of Alumni Updates

Melody Culver (B.S. '19) is continuing her education at Tennessee Tech by pursuing a Professional Science Master's degree in Environmental Informatics. She received a Diversity Fellowship through the Office of Graduate Studies. Melody is also interning with at **TDEC Cookeville Environmental Field Office** with Tracy Daughtery. Melody is getting married this fall and is on track to graduate in the spring 2021 semester.

William Ponder (B.S. '20) has been living at the **Smithsonian Conservation Biology Institute** in Front Royal, Virginia. He was working as temporary field technician for **Battelle**

Memorial on the **NEON (National Ecological Observatory Network)**, where he conducted field operations and collected ticks and mosquitoes to check for various pathogens. He recently moved to **Page, Arizona**, to do boat inspections on Lake Powell for aquatic invasive species, focusing on Guagga Mussels under the Arizona Game and Fish Department.



FACULTY INTERVIEW

MATTHEW McCLANAHAN, J.D.

ADJUNCT PROFESSOR



Tell us a bit about your educational and professional journey that led you to Tennessee Tech University.

I graduated from Tennessee Tech in 2011 with a degree in Agriculture, concentrating on Agribusiness Management with a minor in History. I worked for four years as an insurance agent with Farm Bureau. In 2018, I graduated from the University of Tennessee College of Law with a concentration in Advocacy and Dispute Resolution. I am the managing partner of McClanahan & Winston, PC, and I serve as the executive director of the Tennessee Association of Conservation Districts. I also serve on the Executive Committee for TennGreen Land Conservancy.

What courses do you teach here at Tennessee Tech and what do they entail?

I teach Agricultural Law and Environmental Law. In my Agricultural Law class, the course is designed to provide students with a basic knowledge of concepts and terminology used in agricultural law and the legal system, and to apply them to real-life situations. The students learn the sources of legal information and are able to understand how legal principles may affect them, their families, farms, or businesses.

In my Environmental Law class, we discuss the basics of environmental law and its interactions with various stakeholders (i.e. businesses, governments, and private citizens). A special emphasis is placed on domestic laws of the U.S. and the roles of federal and state agencies in executing their missions, while still reviewing pertinent international agreements.

In both of my classes, I want my students to come away with a basic understanding of our legal system to set them up for success in their future careers.

How or why did you become interested in environmental law?

I have always loved the outdoors, and I want to see our state's natural beauty protected. I enjoy hiking, camping, hunting and fishing. Being a farmer, environmental laws directly affect our farm, and we strive to utilize sustainable farming practices. Also, I was blessed to have some wonderful professors that were excited about environmental law and their excitement and interest drew me in. I hope to be that type of professor for my students.

What is a fun fact about yourself?

My wife and I won first place for our Blues Brothers lip sync dance performance during a talent show in law school. We danced to "Soul Man" and I must say we had some pretty sweet moves.

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