



SOES

School Of Environmental Studies

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Newsletter

Message from the Director

Welcome to another edition of the SOES Newsletter! As I write this message in late August, students are returning to campus, finalizing their course schedules, and settling in for a productive fall semester. It is always an exciting time of year and we look forward to another successful round of teaching, learning, service and scholarship. In this issue of the newsletter, you can read about the latest capstone project to assist the endangered Bluemask Darter, along with updates from our graduate students and alumni. We also have a profile of our PSM Industrial Advisory Board members, who generously volunteer their time and share their experience and insights to benefit our students. In addition, you'll find an interview with Sarah DiFurio, who teaches our course on environmental management systems. Special thanks to Natalie Robbins, Amy Stafford and Irene Mauk for their writing and design work to produce this edition of the newsletter. Stay in touch with us, and keep up the good work.



Hayden Mattingly

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BACHELOR OF SCIENCE

Environmental & Sustainability Studies

Capstone Experience

The 2016-2017 capstone course partnered with the **U.S. Fish & Wildlife Service** to aid in the reintroduction of the Bluemask Darter (*Etheostoma akatulo*) into the Calfkiller River in Sparta, Tennessee. The Bluemask Darter is an endangered fish species that is indigenous to the Caney Fork River System. Currently, it is found in four streams of the system: Collins River, Rocky River, Caney Fork River and Cane Creek. Although it was historically found in the Calfkiller River, the Bluemask Darter has not been sampled there



since 1968. The capstone project was divided into two parts: a habitat assessment of the Bluemask Darter using GIS, and community and youth outreach and education. Students were able to work interchangeably between the two

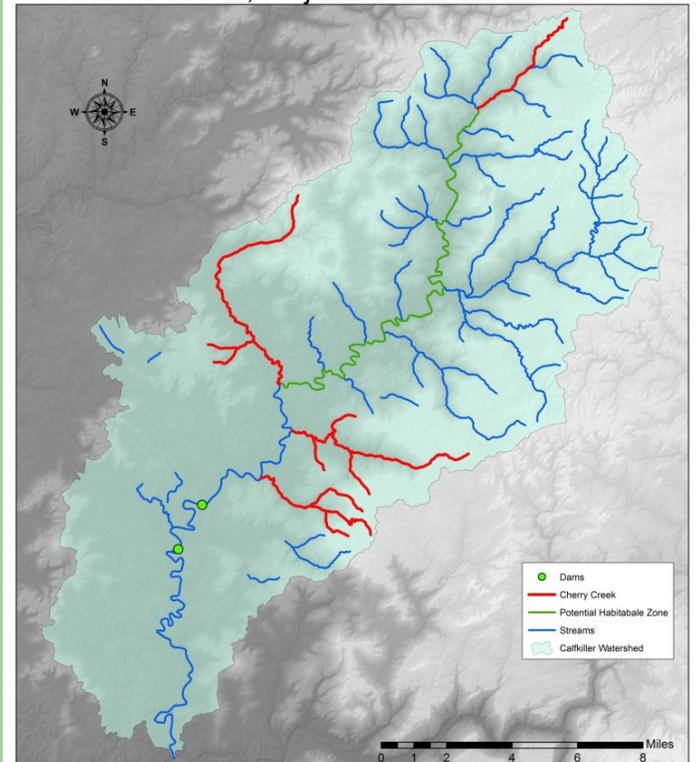
groups, but ultimately presented a poster project on one of the two focuses. The GIS group worked to model the sections of the Caney Fork River System which would provide suitable habitat for the Bluemask Darter. During this study they also identified potentially threatening factors for the darter, including wastewater treatment effluent being released into the rivers, impaired tributaries, poor land-use practices, and artificial impoundments. One of the group's main conclusions is that the Calfkiller River has a high silt content, which is not suitable for the Bluemask Darter, as it prefers gravel and sand substrates. The GIS group consisted of **Brent Walker, Kevin Turner, Kate Moffitt, Zack Taylor** and **Ellie Fetzer**. The education-focused group created methods to educate residents who coexist with the Bluemask Darter about harmful land use practices. They created a survey to disseminate to community members so that they might better understand how residents perceive and use the Calfkiller River. Along with community outreach, the group initiated the development of middle-school curricular materials related to the darter for **White County Middle School**. **Emily Warren, Briana Baines, Tully Watson, James Scott** and **Rachel Gambrell** presented a poster on community outreach through education about the Bluemask Darter.



Fall 2016 Capstone Group Photo

Front: Emily Warren, Brent Walker, James Scott, Rachel Gambrell and Rafael Diaz Back: Kevin Turner, Ellie Fetzer, Kate Moffitt, Tully Watson and Zack Taylor

Calfkiller River, Projected Potential Habitat



PROFESSIONAL SCIENCE MASTER'S

Concentration in Environmental Informatics

Samantha Allen began the P.S.M. program in August 2016. During her first year in the program, she worked as a teaching and graduate assistant in the School of Environmental Studies. This summer, she was hired on as a research assistant with the **TTU Water Center**. For her internship, she is working with the Water Center and Tania Datta and Alfred Kalyanapu from the College of Engineering. For this project, she is developing an online geodatabase that will host data for the Falling Water River Watershed. The watershed is home to two state parks, Burgess Falls State Park and Rock Island State Park, as well as three city parks and several natural areas. Once completed, this database will serve various stakeholders such as **TDEC**, **TDOT**, the **City of Cookeville**, **TTU** and **TNC**. She is also analyzing past and present data gathered from this watershed to understand, characterize and model the long-term needs of the watershed. Because the Falling Water River Watershed is home to various types of water recreation, one of the parameters she is studying is how recreation may be affecting water quality.

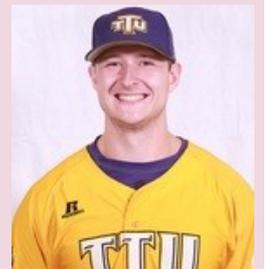


Incoming PSM Students



Javion Lee is from Jackson, Mississippi. He received his undergraduate degree in geography with a minor in environmental studies and sociology from **Samford University** in Birmingham, Alabama. While at Samford, Javion ran track, holding the school records for the triple jump event. He holds high school state records in power lifting in Mississippi for the 123-lb weight class. This fall, Javion will be working as a research assistant in the Department of Biology.

Jake Usher will be a teaching assistant for the B.S. capstone course in the School of Environmental Studies. Jake is originally from Columbia, Tennessee. He attended Walters State Community College for two years on a baseball scholarship before coming to TTU in the Fall of 2015 on a baseball scholarship. He is a right-handed pitcher. Jake completed his undergraduate degree in interdisciplinary studies with an emphasis in environmental science at **Tennessee Tech University** and became intrigued with GIS while taking Theory of GIS 1 and 2 as an undergraduate student.

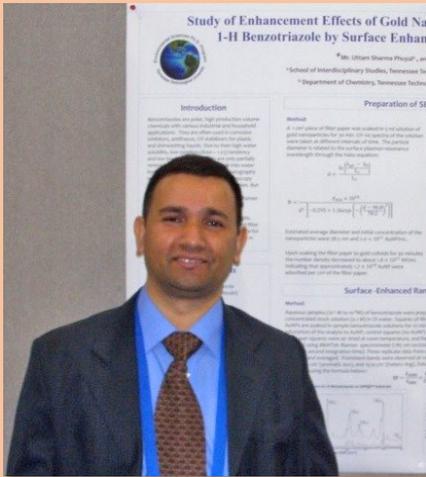


Natalie Robbins comes to TTU all the way from Chandler, Arizona. She will be working as a teaching assistant in the Department of Earth Sciences and a graduate assistant in the School of Environmental Studies. Natalie received her B.S. in environmental science with a focus in science and policy from the **University of Arizona**. While there, she worked with the University of Arizona Cooperative Extension office on school garden development and nutrition education.

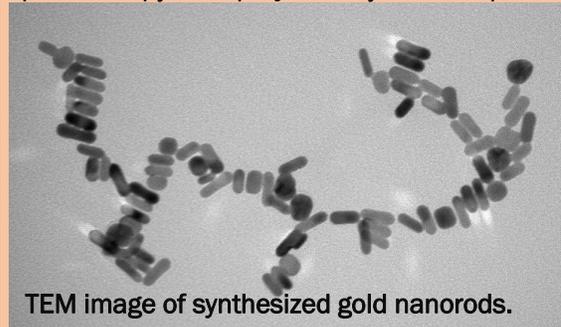
DOCTOR OF PHILOSOPHY

Environmental Sciences Concentrations in Biology or Chemistry

Uttam Sharma Phuyal is an environmental sciences-chemistry student. His research involves detecting and measuring hydrophilic pollutants in water using filter paper loaded with gold nanoparticles. Hydrophilic pollutants are ubiquitous in aquatic systems and may pose significant



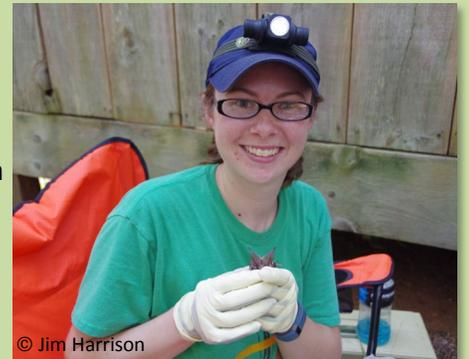
ecological risks. However, these pollutants are difficult to analyze and well-developed techniques like LC-MS are not ideal for a number of reasons. When molecules are adsorbed on gold nanoparticles, Raman scattering signals of the adsorbed molecules can be significantly amplified due to an increase in the local electromagnetic field. This effect is called Surface Enhanced Raman Scattering (SERS) and may provide a useful vibrational fingerprinting of pollutants in a complex environmental sample. Uttam synthesized gold nanoparticles using a variety of reducing agents (potato starch, hydroquinone, humic acid, sodium borohydride, etc.) and deposited the nanoparticles into filter paper by a simple dipping method to prepare convenient "SERS substrates" suitable for environmental analysis. These paper-based substrates can then be dipped in samples of surface water before being analyzed by Raman spectroscopy. The project may usher rapid and low-cost



TEM image of synthesized gold nanorods.

detection of a number hydrophilic pollutants in water. Uttam's advisor is Andrew Callender.

Jessi West is an environmental sciences-biology student studying the range-wide population genetic structure of two bat species.



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Corynorhinus rafinesquii, or Rafinesque's Big-eared Bat, and *Myotis austroriparius*, or Southeastern Myotis, are two uncommon bat species with overlapping ranges across much of the southeastern United States. At the state level, both species are regarded as threatened, endangered, or of greatest conservation need across nearly all of their range.



© Robert B. Clontz

As urbanization, fragmentation and habitat loss continue, it is of the utmost importance to understand the population genetic structure and population connectivity of these two species in order to properly manage and conserve their populations. It is important to determine if there is sufficient gene flow to maintain a high level of genetic diversity among populations. Jessi, along with the help of many other collectors, has gathered more than 500 tissue punches over the past two years to be used for genetic analyses. This project will allow managers to determine the most efficient way to manage and conserve populations of these two species across their range. Jessi recently presented on this research at the Tennessee Bat Working Group meeting, the Alabama Bat Working Group Meeting, and the Southeastern Bat Diversity Network Meeting. Jessi's advisor is Brian Carver.

PARTNERSHIPS

Industrial Advisory Board

The School of Environmental Studies has a unique partnership with environmental professionals that helps serve the professional science master's with a concentration in environmental informatics (PSM-EI). Known as the Industrial Advisory Board, the board was established alongside the PSM-EI program in Fall 2013. The PSM Industrial Advisory Board is staffed by environmental professionals in government and industry with working knowledge of the environmental informatics profession. Currently, there are nine sitting board members. Each board member is appointed by the dean of the College of Interdisciplinary Studies. The board meets at least once a year to provide guidance on current and new activities within the PSM-EI program. As board members, appointees are given a certain set of duties. These duties include attending board meetings, providing input to help refine PSM-EI programs as development within the discipline occurs, reviewing the current program curriculum and providing suggestions to improve and maintain the curriculum offerings, and assisting in identifying internship opportunities for PSM-EI students as well as helping students obtain internships.

Meet the Board



Larry Bowers is the group environmental compliance director for McWane, Inc.

Berny Ilgner is the vice president at Arcadis-U.S., Inc.



Anna Fisher is a waste specialist at the Tennessee Valley Authority.

Jibonananda Sanyal is the team lead for scalable and high performance geocomputation in the GIST group at Oak Ridge National Laboratory.



Scott Gain is the center director for the Lower Mississippi-Gulf Water Science Center at the U.S. Geological Survey.

Mary Jennings is the field supervisor at the U.S. Fish and Wildlife Service's Tennessee Ecological Office in Cookeville.



Rob Hench is the chief information officer at GRW, Inc.

Sherry Wang is the environmental technicians fellow in the Division of Water Resources at the Tennessee Department of Environment and Conservation.



Sam Huddleston is the assistant city engineer and flood plain administrator in the City of Murfreesboro's Engineering Department.





ALUMNI UPDATES

After previously working at Jack Daniels Distillery, **Jeff Norman** (Ph.D. '03) has transitioned into a position as a professional health care representative for **Pfizer Pharmaceuticals**. He has been employed there for just over two years. He and his wife, Nicole, reside in Lynchburg, Tennessee, with their two children, Harrison and Hollis.

Carolyn Huppmann (B.S. '16) is working for **Harrison Construction** in Knoxville, Tennessee, as a part of their environmental and engineering department. Harrison Construction focuses on asphalt and concrete plants as well as quarry sites. Carolyn works to make sure these locations are in compliance with county, state and federal guidelines, and loves her position there.

In August 2016, **Brianna Zuber** (Ph.D. '14) moved to Ukiah, California, to teach at **Mendocino College**. She teaches zoology, botany and marine biology. She also takes her students to the **Mendocino College Coastal Field Station** in Point Arena, California.



Pictured here are Brianna and her students conducting tide pool transects while attending a Summer Science Institute at the Mendocino College Coastal Field Station.

Evan Summerville (B.S. '16) has been working at the **Williamson County Government's** Sewage Disposal Department for a little over three months. As an onsite wastewater inspector, Evan inspects every aspect of the construction and repair processes on all septic systems in Williamson County. He is also working with the directors to implement GIS alongside the AutoCAD work the department already does.

Chuck Sutherland (P.S.M '16) is still working at the **Upper Cumberland Development District**. He recently discovered several new caves using LiDAR, a GIS remote sensing tool, which uses a laser to detect data points and create a 3-D rendering of the cave.

Steven Hewett (P.S.M. '16) is settling in to Clovis, New Mexico, where he accepted a position as a GIS technician for the **City of Clovis**. He is enjoying exploring what his new home has to offer, on and off the job.



Spring graduate **Brent Walker** (B.S. '17) moved to Tampa, Florida in July to begin a career as a staff environmental scientist at **Professional Services Industries, Inc. (PSI)**, an environmental consulting and engineering firm that is a subsidiary of **Intertek**.

Ian Jasitt (P.S.M. '16) is looking for new opportunities, searching for a full-time, entry-level state job, while holding down part-time employment in Cookeville, Tennessee.

This summer, recent graduate **Amy Stafford** (P.S.M. '17) worked for the **College of Graduate Studies** at **Tennessee Tech University** as an administrative associate. In September, she relocated back to her hometown of Knoxville, Tennessee. In the long term, she is pursuing opportunities to aid with sustainable development in Sub-Saharan Africa. In the near future, she is hoping to gain more internship experience in the GIS field.



Graduates & Internships

2016-2017 Graduates



Bachelor of Science

Andrew Corder
Rafael Diaz
Rachel Gambrell
Carolyn Huppmann
Sara Kenney
Kate Moffitt
Evan Summerville
Zackary Taylor
Kevin Turner
Brent Walker
Emily Warren
Daphne Wilson

Professional Science Master's

David Bailey
Samuel Dotson
Justin Medley
Amy Stafford
Chuck Sutherland

Doctor of Philosophy

Mieko Camp

Undergraduate Internships

Tully Watson interned with the **City of Rockwood**, Tennessee, in their Parks and Recreation Department. In the department, he functioned as a mentor to children working in summer positions, who otherwise might not have role models. Tully also assisted with a multitude of other recreational activities such as lifeguarding and park upkeep.



This summer, **Kristin Willis** interned with the **U.S. Forest Service**. She was stationed in the Big Piney Ranger District within the Ozark National Forest in Arkansas. Her internship allowed her to explore many facets of forestry,

including marking timber for timber sales, collecting recreation fees, and spraying for invasive plant species.



Kara Young worked at **Logan Aluminum**, a recycling plant in Russellville, Kentucky, as an environmental specialist. Kara worked with the remelt process of the plant, where aluminum is melted down into a liquid and recast into ingots. She also learned about the environmental considerations of new construction, as Logan was expanding its offices during her time there.

A USED ALUMINUM CAN

IS RECYCLED AND BACK ON THE GROCERY SHELF AS A NEW CAN, IN AS LITTLE AS 60 DAYS.



FACULTY INTERVIEW

Sarah DiFurio, M.S.
Environmental Health & Safety Coordinator
SOES Adjunct Faculty



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

I began my college career by majoring in chemistry, and during my junior year I changed my major to plant pathology. During my time as a chemistry major, I completed the co-op program with Engelhard Corporation. I was an analytical chemist during my co-op working with research and development. During my time as an undergraduate plant pathology major, I was offered the coveted Armstrong Fellowship to complete a research project. I decided to attend Clemson University to obtain an M.S. degree in genetics. While using tobacco as my model plant, I was able to characterize the microbial community in tobacco and its interaction with the plant pathogen *Ralstonia solanacearum*. After graduating from Clemson University, I found my way to the University of Tennessee in Knoxville. I was a lab manager for the UT Center for Biomarker Analysis (CBA and later known as the Center for Environmental Biotechnology). I was offered the biosafety specialist position and a career change with my new path. I assisted in the development, monitoring and maintenance of the biosafety program for the Knoxville campus, Forensic Anthropology Center (Body Farm), Institute of Agriculture campus including the statewide Research and Education Centers, College of Veterinary Medicine, and Graduate School of Medicine. I enjoyed my work with UTK, but a few years later a position opened here at TTU. In July 2012, I became the university's Environmental Health and Safety Coordinator. In my current role, I develop, implement, coordinate, audit and update a wide range of safety and environmental programs, policies and procedures including general occupational and laboratory safety, hazardous materials, hazardous waste management and disposal, industrial hygiene, chemical safety, biological safety, ergonomics, and indoor air quality issues.

What course do you teach for the School of Environmental Studies as an adjunct faculty member?

I teach ESS 4300 Environmental Management Systems.

What exactly is an Environmental Management System?

An environmental management system (EMS) refers to how an organization will manage environmental compliance programs. An EMS describes the methods used to manage compliance. The course primarily focuses around the Plan-Do-Check-Act (PDCA) model. The EMS includes the managerial structure, documentation, planning, implementing and maintenance of the organizational policy for environmental protection.

What aspects of teaching ESS 4300 do you most enjoy?

There is a level of accountability in every lecture, and you have to be creative. In this particular topic, you have to stay up-to-date on the technologies and current events. I use current events as a way to relate the material to the students. In the beginning of the class I ask the students what their current employment is and what their career plans are after graduation. I use this information to find current events in their areas and apply the EMS to those professions.

For students that are entering graduate school or the professional workforce, what advice do you have?

Get off the phone, computer, digital media, etc., and spend time with people and build lasting relationships. Employers hire you, not your Instagram profile. Whether you choose to enter the workforce after graduation, or go to graduate school, the ultimate goal is to be employable in your desired field. Be a lifelong learner and connect with others in your desired field. One last piece of advice: travel as much as you can.

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