

SOES

School Of Environmental Studies

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Newsletter

Message from the Director

Welcome to another edition of the SOES Newsletter. In this issue, you'll find our students, faculty and alumni to be keeping themselves quite busy in a wide variety of activities in the U.S. and around the world. The scope of our environmental work is even reaching out to other planets, as you can see in the article featuring PSM-Environmental Informatics student Natalie Robbins. We also have an entertaining interview with two of our adjunct faculty, Luran Sturm and Stephanie Moran, who offer graduate and undergraduate courses in environmental law. Special thanks to Natalie Robbins, Irene Mauk and Jessica Davis for their work on this issue. As always, stay in touch and keep up the good work.



Hayden Mattingly

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BACHELOR OF SCIENCE

Environmental & Sustainability Studies

Student Internships



During summer 2018, Alyson Chin interned with **Marine Research Foundation (MRF)** in Sabah, Borneo. In Sabah alone, around 2,000 to 3,000 turtles a year are accidentally captured and drowned by shrimp trawl nets. Alyson worked on the **Turtle Excluder Device (TED)** project where she was part of a team that conducted TED workshops in fishing villages along the coast of Sabah.



Turtle successfully escaping a shrimp trawl

On-Campus Involvement

Connie Robbins is an ESS-Environmental Science-Biology major with a different path than most students. Her background is in the food service industry. She was hired as a dishwasher and then moved up to a server in a small family-owned restaurant in Crossville. When **Cracker Barrel** came to town, she started as a server and worked her way up to be a senior associate manager for 27 years. Connie decided to retire from her career with Cracker Barrel to pursue a new career as a public health inspector. She needed a degree in environmental science, which led her to Tennessee Tech. Connie spoke with the faculty and staff of the School of Environmental Studies and found that she could earn her degree in two years. She will graduate in May 2019. After graduation she plans to seek employment with the State of Tennessee as a health inspector; however, Connie is open to any other opportunities that may arise. Her time spent at Tennessee Tech has been a great experience and Connie has no regrets in returning to school to further her education. Connie is also the current president of the **Tennessee Tech Evergreen Society**.



Students in this year's capstone course prepared recommendations to address the more than 180 illegal dumpsites in the 14 counties of the Upper Cumberland region. Chuck Sutherland, director of informatics for the **Upper Cumberland Development District (UCDD)** provided the coordinates for known sites and a list of desired goods. In the fall semester, students completed a white paper with best practices for education, dumpsite cleanup, finding and applying for cleanup grants and techniques for deterring future dumping. Students are conducting site visits in the spring semester and plan to present their findings and recommendations to UCDD in April.



PROFESSIONAL SCIENCE MASTER'S Concentration in Environmental Informatics

Researchers at Tennessee Tech University have named a Martian crater as part of their work on a **NASA**-funded project to map a geological structure on Mars unlike any found on Earth. Jeannette Wolak, associate professor of earth sciences at Tech, is working on a Mars mapping project which will produce the first-ever published map of a terraced fan. A terraced fan is a specific Martian structure unlike any fan formation seen on Earth because of their superb symmetry, leaving researchers to explore how they are formed. The fan is located in what will now be known as Garu Crater, a name Wolak submitted to the International Astronomical Union and recorded in the Gazetteer of Planetary Nomenclature. The IAU allows the naming of features in the solar system based on a set of guidelines. First, there has to be scientific significance to the naming. Wolak's mapping project checked that box. The fan is located inside a crater that was previously unnamed. The IAU also requires that craters less than 60 kilometers in diameter be named after a small town of less than 10,000 people. "IAU keeps a database of all the names that have been submitted and they try to make sure that an equal number of names are submitted from different countries," Wolak explained. "They asked us to pick a name from an underrepresented country, a country that didn't have a lot of names already recorded, and I looked at the list and one of the countries on there was Ghana."

Wolak has been working with an interdisciplinary group of Tech students on the project. Amber Patterson, a recent computer science graduate, helped process digital images gathered by Mars orbiters. Earth sciences graduate Hannah Blaylock, along with Earth science students Benjamin Holladay and Allison Bohanon, have focused on the mapping and logging of features on the surface of Mars. **Natalie Robbins** is a PSM-EI student who has served as the GIS lead for the project. "This has been a fascinating project, one that I could have never imagined I would get involved with during my time at Tech, but I am so glad Dr. Wolak brought me on," said Robbins. "The project challenged my GIS skills and led me to learn new processes and tools that have added to my GIS knowledge."

Joseph Asante is also an associate professor of earth sciences at Tech and is from Ghana. Wolak discussed her project and the crater naming process with Asante who recommended the name Garu, a small farming town on the edge of the Sahara Desert that struggles with water during Ghana's dry season. "I thought it was perfect because Joseph is a hydrogeologist who studies water, and Mars doesn't have a lot of water," Wolak said. With the town of Garu's water struggles, it seemed fitting that its sister location on Mars be a crater that is home to a structure believed to have been formed by water as well. "They don't have water year-round," Asante said. "When we have winter here, it is dry season in Ghana. Water is a big issue in northern Ghana." Wolak submitted an application to have the name officially recorded, and it was approved and recorded in the Gazetteer of Planetary Nomenclature earlier this month. Garu Crater is located near the Gale Crater, which is currently being explored by NASA's Mars rover Curiosity.



Students on the project including Natalie, created a map of a different terraced fan feature on Mars. Natalie helped students of all GIS-experience levels create their terraced fan maps. She also created a map of a fan feature in the Shalbatana Vallis region of Mars. Natalie presented preliminary findings from these mapping efforts at **The Geological Society of America's** annual meeting in Indianapolis, Indiana in November 2018. *Article modified from an original by Bailey Phonsnasinh. Used with permission.*

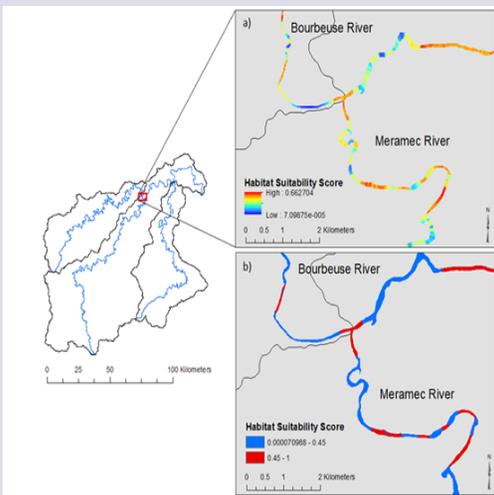
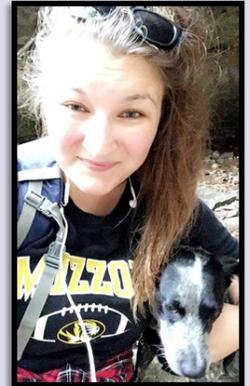


DOCTOR OF PHILOSOPHY

Environmental Sciences

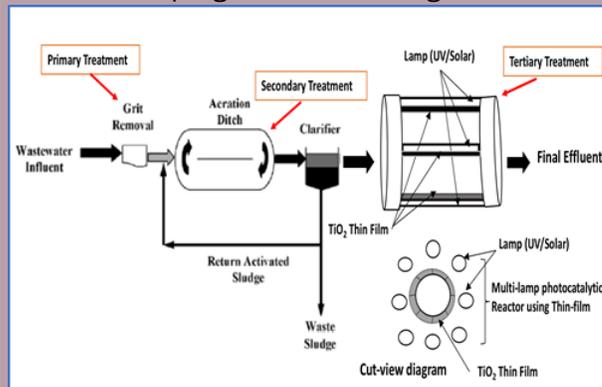
Concentrations in Agriculture, Biology, Chemistry, Geosciences, and Integrated Research

Kayla Key is an environmental sciences–biology student studying landscape scale threats to mussel assemblages in Ozark rivers in Missouri. Her goal is to develop a spatial assessment of the status and risks to mussel assemblages in the Meramec River Drainage. Developing conservation and monitoring plans for freshwater mussels has proven a difficult task for resource managers. In Missouri, most species of freshwater mussels are found in mixed-species, high-density concentrations, loosely termed “mussel beds,” suggesting that physical factors may pose a common limitation to multiple species. Through her research, she has narrowed down fundamental characteristics of habitat that support the establishment of dense mussel assemblages (mussel beds) by using high species richness beds as a conservation unit. Some of the most promising studies have used geomorphic and hydrologic characteristics of streams, providing insight to where freshwater mussels can fundamentally persist in the absence of other limiting factors, such as water quality or lack of hosts. Given the focus on minimum factors required for mussel bed establishment, niche modeling was used to delineate reaches that meet these requirements and to build a sampling design to investigate threats to mussel species richness. This results in a “Hot and Cold” map of the entire river system that identifies areas that are suitable (red) and areas that are fundamentally unsuitable (blue) (Figure). The past few summers, Kayla and her field crews have been floating the Meramec Basin conducting field surveys to support the model and to collect data to identify threats to those assemblages within suitable habitat via occupancy modeling. This work will guide management and restoration efforts in the drainage. Kayla’s advisor is Amanda Rosenberger.



Map (a) shows a 'Hot and Cold' map of the Bourbeuse and Meramec River systems. The legend indicates a 'Habitat Suitability Score' with a scale from 0 to 1. The map shows red areas (suitable) and blue areas (unsuitable). Map (b) shows a different suitability score scale, with a legend indicating a 'Habitat Suitability Score' with a scale from 0 to 1. The map shows red areas (suitable) and blue areas (unsuitable). Both maps include a scale bar and a legend for 'Habitat Suitability Score'.

Sunil Rawal is an environmental sciences-chemistry student developing and testing a new approach for the degradation of bio-health contaminants in water. His research is based on the use of titanium dioxide (TiO_2) thin films to replace the current costly use of nanoparticles in batch-designed waste water systems. These systems require the elimination of nanoparticles by filtration as a tertiary method of treatment. Sunil’s first step was finding the favorable conditions for TiO_2 suspension as a preliminary testing of the degradation of acetaminophen. After understanding the optimal chemical and photocatalytic conditions as indicated above, TiO_2 thin film will be prepared and deposited on a microscopic glass slide via sol-gel method. The deposited TiO_2 thin film on substrate



will be characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and UV-Visible spectrophotometer to learn about thin-film characteristics and investigate their effect on degradation of acetaminophen. One key goal of the research is to determine reaction rates to promote understanding of the acetaminophen degradation under a variety of conditions to possibly guide the design and scale-up experimental treatment reactors. Sunil has presented parts of his work at the national meeting of the AIChE (Minneapolis, MN 2017) as well as in Tennessee Tech ORNL meetings and Tech’s Research and Creative Inquiry Day. His advisor is Pedro E. Arce.





PARTNERSHIPS

SOES International Engagement

EVS Students Abroad

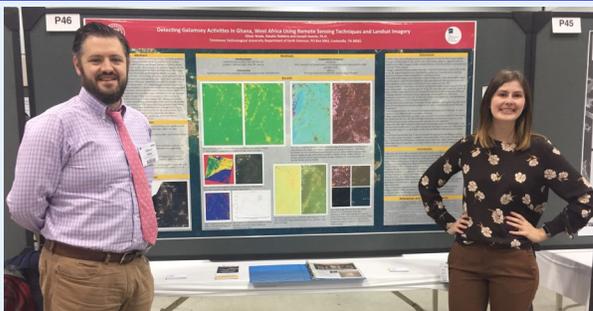
Thanks to support from the School of Environmental Studies, **Aubree Hill** was able to present her research to an international audience for the first time, at the **11th Annual International Mycological Congress** in San Juan, Puerto Rico. Her talk, titled “*Batrachochytrium* species and cutaneous microbiota: an amphibian arms race,” focused on her dissertation research related to deadly chytrid fungi, which are currently impacting hundreds of amphibian species. Her work pinpoints probiotic treatments through microbial isolation from skin swabs and molecular characterization of the cutaneous microbiome. As a result of her attendance at the conference, she met many potential collaborators from countries such as Brazil, Indonesia, and the United Kingdom, who had similar research interests and helpful suggestions. She also met world-renowned microbiologists whom she has admired (and cited!) for years. During her stay in San Juan, Aubree visited historic castillos built in the 1600s, snorkeled, and hiked El Toro - the highest peak on the island in El Yunque National Forest.



Cody Godwin is an environmental sciences - biology student mentored by Christopher Murray. He studies snake fungal disease in Tennessee. In the winter months, when Tennessee snakes are not active, Cody works with a research team in the outback of **Australia**. He and his team are studying the spatial and reproductive ecology of the perentie (*Varanus giganteus*). The perentie is the largest lizard in Australia and ranges from Western Australia through the central interior. While the perentie is an icon of the outback, little is known about its natural history (home range, preferred habitat and diet). Using radio telemetry and game cameras, Cody and his team identified key habitat components and active periods for the perentie. While his team focuses on perentie ecology, they had the opportunity to report a number of novel observations and collect data on a whole host of Australian reptiles. Cody plans to continue his work in central Australia and develop future projects in the red center. If you'd like to volunteer with Cody, contact him at cdgodwin42@students.tntech.edu.



PSM Research Goes Global



PSM-EI students **Oliver Wade** and **Natalie Robbins** are conducting remote sensing research with Joseph Asante in the earth sciences department. Their research tests whether remote sensing tools, such as ArcGIS Pro, ENVI and Google Earth Pro can be used to identify areas of illegal gold mines, locally known as gamamseys in Ghana. By exploiting the spectral differences of these gamamseys, image analysis techniques such as Normalized Difference Vegetative Index (NDVI) and Tassled Cap were found to effectively identify gamamseys. In November 2018, Natalie and Oliver traveled to **The Geological Society of America's** annual meeting in Indianapolis, Indiana, to present their findings.

Environmental & Sustainability Studies

ALUMNI UPDATES

Mark Green (Ph.D. '12) is a biology faculty member at **Volunteer State Community College** in Cookeville, Tennessee. He recently co-authored a featured article in the **Journal of Plant Disease** entitled "The Trentepohliales (Ulvophyceae, Chlorophyta): An Unusual Algal Order and its Novel Plant Pathogen—Cephaleuros." This spring, Mark will be a part of hosting the Earth Day event at Vol State, which was a rousing success in 2018. He invites everyone to come out on April 27 to celebrate Earth Day 2019 at Vol State.

Joe Martin (P.S.M. '14) is currently living in Denver, Colorado with his wife, son and dog, Strider. He is working for an oil and gas brokerage company using ESRI's ArcGIS Suite. Joe has found it interesting learning about the oil and gas industry and the PLSS system for land division. In his free time, Joe enjoys playing with his son and dog, trail running and being an active member in their church in downtown Denver.



Russel Skoglund (Ph.D. '15) has been working with **TWRA** for nearly 35 years. **TWRA** has been proactive in preventing CWD (chronic wasting disease) from entering this state. Unfortunately, this hunting season has seen the disease appear in at least 13 white-tailed deer in Hardeman and Fayette counties. He and his colleagues are actively attempting to determine the extent of its occurrence and to prevent its

spread any further into the state. This will be an ongoing effort for the duration of his career and the careers of all who succeed him. This holiday season, he and his wife were able to visit their son at Ft. Buchanan, Puerto Rico. They hiked into the **El Yunque** rain forest and he had plenty of opportunity to add to his birding life list.

Steven Hewett (P.S.M. '16) is still working for the **City of Clovis**, New Mexico and had an article published in **Geospatial World** about his work. This past fall, he took a black and white film photography course. He has traveled from Amarillo, Texas to Santa Fe, New Mexico following as much of the pre-1937 alignment of Route 66 as he could, taking photos along the way. He is hoping to create a story map using the photos and mapping his trek across New Mexico and the panhandle of Texas along the historic roadway.



Chuck Sutherland (P.S.M. '16) is working on publishing the guidebook for the **National Speleological Society** (NSS) convention, which will be held in Cookeville in 2019. He is now the preserve manager at Secret Cave, in Cookeville, Tennessee. He was awarded the **NSS's South Eastern Regional Association's Francis McKinney Award** which recognizes cavers who have made meritorious contributions to caving in the Southeast. Professionally, he has been promoted to director of informatics at the **Upper Cumberland Development District**.

Recently, **Sam Dotson** (P.S.M. '16) was hired as a GIS analyst at company called **Rubicon Global**, working to improve the waste and recycling industry. He and his wife are enjoying the Atlanta area, yet they still miss Cookeville and the relatively milder traffic.

Evan Summerville (B.S.'16) celebrated his one-year anniversary with the **City of Franklin** as a water quality specialist. He leads the majority of the city's erosion prevention and sediment control (EPSC) inspections. Last October, Evan attended the **Tennessee Stormwater Association (TNSA)** conference and gave a presentation on bioretention areas, one of the most common best management practices for water quality that can be found on the majority of the sites within the city.



SOES Awards

Lacy Loggins, 5th grade science teacher at **Algood Middle School** and environmental sciences-integrated research Ph.D. student, was given the **AMS Excellence in Teaching Award** in December 2018. This award is given by the Putnam Co. Rotary Club. Mrs. Loggins said, "I am so honored to be selected as the recipient of the Excellence in Teaching Award for Algood Middle awarded by the Rotary Club. My students make me feel special every day! In addition to making me feel valued, they also keep me on my toes. I want to send a huge thank you to my AMS family. We are all in this together, and it takes a village." Loggins is planning on graduating from the Ph.D.

program in May of 2020. She hopes that her science knowledge will carry over into her middle school classroom and allow her students to have as much passion about environmental issues as she does.



Grady Wells, environmental sciences-biology Ph.D. student ran the **Chattanooga 50-miler** in December 2018. The race was held at Cloudland Canyon and Lula Lake in Georgia. Grady finished **8th overall** in the race and went on to successfully defend his dissertation later that week.

Alumni Updates

Lasantha Rathnayaka (Ph.D. '17) completed his first year with his current employer, **LBA Ware**, in Macon, Georgia, where he works as a data analyst and software developer.

Natalie (Knorp) Burger (Ph.D. '17) lives in Nashville, Tennessee, with her husband. She works for the **TDOT Environmental Mitigation Office** and was promoted to environmental manager in August 2018.

John Johansen (Ph.D. '18) finally graduated and is teaching and working at **Austin Peay State University** in Clarksville, Tennessee.

Faranak Mahmoudi (Ph.D. '18) is back in her home country of Iran, visiting family and friends while looking for job opportunities in the United States.

Lindsay Mills (B.S. '18) is currently working at the **Upper Cumberland Development District** as a community development planner. She works in all 14 counties of the upper Cumberland and collaborates with mayors and city and county officials to write grants for their communities. She enjoys being able to have a direct impact on the area where she was raised.





FACULTY INTERVIEW

Lauran Sturm & Stephanie Moran EVS 6000 & ESS 3000 Environmental Law Instructors



Why is it important for our students to understand environmental law?

Lauran Sturm (LS): It's important as a practical matter because regulatory limits for pollutants and other environmental requirements come from the major environmental statutes and implementing regulations. Generally, I think it's important for students to understand the policy and goals of environmental regulation, as well as some of the overarching requirements, so that they can better identify problems and solutions to environmental issues.

Stephanie Moran (SM): I believe everyone who is interested in protecting, preserving, enhancing and defending our natural resources – be it fighting for clean air, clean water, protecting an endangered species, supporting efforts to clean our oceans or just promoting more local park areas – should have some background in environmental laws and how they can serve these purposes. Having the tools and knowledge can put you in a better, more powerful position, to be an active, efficient and productive environmental advocate.

How or why did you first become interested in environmental law?

LS: I was an environmental sciences major and really liked my environmental law and environmental philosophy classes. I realized during my last year of college that I did not want to be a research scientist or a consultant but that I really had an interest in law. I got involved with the environmental research group in law school and had an opportunity to work on an active environmental litigation matter. I also worked on some environmental law projects when I was a summer associate after my first year of law school and ended up working in that law firm's environmental service group after graduation. I've been practicing environmental law ever since!

SM: I grew up in Houston, near one of largest petrochemical complexes in the world, where the air smelled of oil and gas, experienced chemical spills, plant explosions, and the landscape was mostly concrete! Visiting my grandparents (Allardt, Tennessee), I couldn't believe the sweet smell of the air, the amazing green, clear streams and mountains. Beautiful, UNTIL we'd see litter and dumping. Why would people trash this beauty? So, as I child, I was motivated to change that! Law school sounded like a good start! I did side track for 10 years after college and trained Extravehicular Activity astronauts at JSC NASA! Exceptional experience! After my JD, I wanted a more specialized legal education to focus on my passion, so I moved to D.C. to obtain an LL.M. in environmental law (advanced law degree). I've solely practiced environmental law ever since. I was, and am, devoted to my passion and desire to fight and protect our environment.

What has been your most interesting case, thus far?

LS: I've had the opportunity to work on several interesting environmental cases. Over the past few years, I've worked closely with our attorney general's office and several other states on a nationwide Clean Air Act case, and I got to work with the state Air Pollution Control Division on a matter involving significant public interest and the Federal Energy Regulatory Commission. I also had a very interesting underground storage tank case where a corporate manager contested individual liability and then eventually paid the company's penalties with a personal check.

SM: The most exciting environmental case was when I worked in the Environmental Enforcement Division of the Harris County District Attorney's Office. I was enforcing compliance on a CERCLA cleanup site, accompanied by the Houston Police Department. Shooting began! Taking cover in an oil and hydraulic fluid filled ditch was just another day at the office! HPD immediately deputized me. To make the story full circle, and a shout out for Tennessee Tech, my training in handgun familiarization (best P.E. class ever) came in "handy". It all turned out fine, the site was cleaned up, and I added a few more charges (attempted murder) to the company's offenses. Definitely, the most interesting environmental case, to date.

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