

TENNESSEE TECH UNIVERSITY | WINTER 2017-2018

SOES

School Of Environmental Studies

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Newsletter

Message from the Director

Welcome to the latest edition of the *SOES Newsletter*. In this issue you'll find our students working on campus sustainability, completing internships with local agencies, conducting research on greenhouse gases and endangered species, and even studying abroad in New Zealand. In collaboration with Vanderbilt University, our school recently implemented a new dual-enrollment program with Metro Nashville Public Schools where high school students can earn college credit at Tennessee Tech for interdisciplinary science and research classes. Also, we are proud to announce the addition of three new concentrations to the Environmental Sciences doctoral program, as well as a fully online option for the Environmental Informatics master's program. You can also catch up on the latest news from SOES alumni and read an entertaining interview with Earth Sciences faculty member Peter Li. Special thanks to Natalie Robbins and Irene Mauk for their writing and design work on this issue. I hope you enjoy the newsletter and please do stay in touch with us!

Hayden Mattingly



Table of Contents

Bachelor of Science	2
Professional Science	
Master's	3
Doctor of Philosophy	4
Partnerships:	
Dual Enrollment	5
Alumni Updates	6
SOES & Alumni Updates	7
Faculty Interview:	
Peter Li	8

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BACHELOR OF SCIENCE

Environmental & Sustainability Studies

On-Campus Involvement

Lindsay Mills, an ESS-Natural Resources student, is approaching two years working in the **TTU Office of Sustainability**. In Spring 2018, she will be working as a sustainability intern, assisting sustainability manager



DeLayne Miller through various tasks including gathering data from all areas of campus for the AASHE STARS program with the goal of TTU being internationally

ranked on sustainability, disseminating surveys to the campus community to gauge interest and awareness of sustainability topics, scheduling "Think Tanks" to gain feedback from students about green initiatives on campus, and managing and tracking projects funded through the Sustainable Campus Fee. For spring semester, one of her main projects will be creating an on-campus composting system. Lindsay is also the chairwoman of the **Sustainable Campus Committee**. In this role, she leads and coordinates the committee as well as follows up with students who have submitted campus green project proposals.



ESS-Biology student **Currie Nowell** spent Summer 2017 in New Zealand as a part of the **New Zealand Environmental Expedition and Internship** program through the TTU Study Abroad Office. Currie spent time

outdoors hiking to waterfalls, geothermal hotspots and along the Tongariro Path. She also attended lectures with the New Zealand Department of Conservation. Currie interned in the sales and logistics office of **Mr. Apple**, a grower, packer and distributor of apples in New Zealand. Starting in Fall 2017, Currie began serving as the president of the **Evergreen Society**, a TTU club interested in promoting sustainability and environmental improvement on campus and in the community. The Evergreen Society partners with local businesses and other clubs such as the Sustainable Campus



Student Internships



Sampling invertebrates at Indian Creek

Emily Samples, an ESS-Biology student, completed her internship with the **Tennessee Department of Environment and Conservation (TDEC)** during the Fall 2017 semester. During her time at TDEC, Emily gained experience in water sampling, invertebrate sampling, invertebrate identification and professionalism within a state department. Working at TDEC provided her with a great opportunity to learn more about state-funded work positions and gain valuable experience in the field.

During the Fall 2017 semester, ESS-Environmental Technology student **Elias Vaden** worked with the **Keep Putnam County Beautiful Clean Commission**.

With the Clean Commission, Elias participated in area clean-ups, planted



trees, and attended Clean Commission meetings and educational presentations. He also created a Styrofoam informational packet, which outlined the dangers of Styrofoam, how it is made and alternatives to Styrofoam for restaurants.

PROFESSIONAL SCIENCE MASTER'S

Concentration in Environmental Informatics



Tisha Calabrese works as the director of the Division of Water Resources at **Tennessee Department of Conservation (TDEC)**. She is also one of many TDEC employees concurrently working on her P.S.M in Environmental Informatics (PSM-EI) at TTU. At TDEC, Tisha works with a team across the state to sample Tennessee waters, inspect facilities and write permits, among other tasks to protect our water resources. One of their biggest needs moving into the future is the ability to collect, organize, understand and share quality

data. Being a student in the PSM-EI program gets to the heart of that need. Tisha was first introduced to the PSM-EI program through her colleague Sherry Wang, a PSM-EI Industrial Advisory Board member. She was drawn to the interdisciplinary nature of the program. The flexibility of the online PSM-EI program format provided her the perfect opportunity to take the leap to go back to school that she had been wanting to take for awhile. Having the online option gives Tisha the ability to juggle a full-time job, a young family and graduate school. For any students considering going back to school, but who are not sure how they will make it work, Tisha's advice is to "go for it."



Oliver Wade is a first year PSM-EI student. Originally from Sheffield, England, Oliver graduated from **Keele University** with a bachelor's degree in business administration and American Studies. Oliver has lived in the United States since 2008 and spent the past six years working as a senior campaign manager raising money for **The Leukemia & Lymphoma Society**. Looking for a new career, Oliver moved here from Nashville in November 2017 to pursue the PSM-EI degree program fulltime. Oliver has a new graduate assistant position helping to promote the School of Environmental Studies, in



particular the new 100 percent online P.S.M. option, to people interested in pursuing or furthering their environmental career. Oliver will be visiting businesses, government agencies and universities to speak with prospective students and introduce them to the degree programs at Tech. There are also a number of environmental conferences that Oliver plans to attend to represent the school.

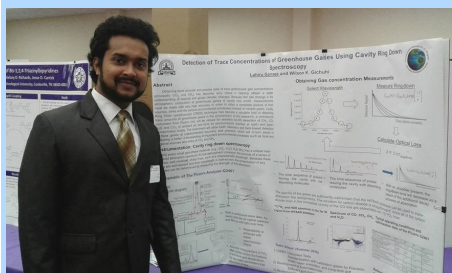
The School of Environmental Studies is happy to announce that the Professional Science Master's-Environmental Informatics program is now available **fully online!** All of the business, statistics and geospatial analysis and environmental science concentration courses can be taken in a fully online format through the **iLearn** platform. Students completing the PSM-EI fully online may see some different options for certain courses, such as the substitution of Environmental Law as an online alternative to Environmental Social Policy. Online students will also have the choice of two online elective courses: Web-Based Database Systems or Data Resources Management. Data Mining may also be available online as an elective by special request.



DOCTOR OF PHILOSOPHY

Environmental Sciences

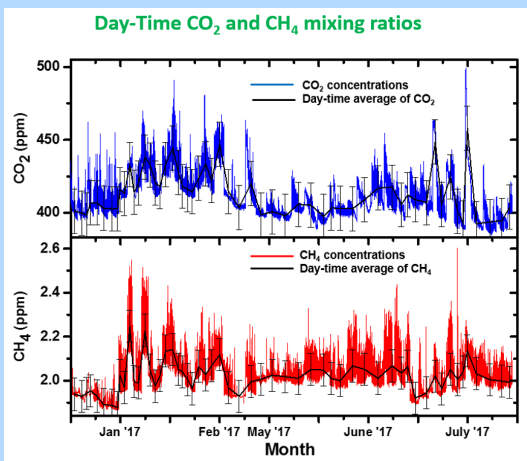
Concentrations in Agriculture, Biology, Chemistry, Geosciences, or Integrated Research



Lahiru Gamage is an environmental sciences-chemistry student. His research uses a wavelength-scanned cavity ring down spectroscopic

(CRDS) technique to study seasonal mixing ratio profiles of atmospheric carbon dioxide (CO_2), methane (CH_4) and carbon monoxide (CO) in the Eastern Highland Rim. These measurements are taken within a shallow planetary boundary layer ~ 15 m above the ground to obtain seasonal and diurnal characteristics of CO_2 , CH_4 , and CO under non-uniform vertical mixing conditions that represents an urban environment. From his studies, average concentrations of 420.8 ppm, 2076 ppb and 187 ppb have been observed for the respective gases since August 2016. His measurements have revealed a strong seasonal and diurnal cycle of these trace gases that follows the Highland Rim's weather pattern, which is consistent with what is termed as 'atmospheric rectifier effect'. To understand more about CH_4 sources, he has used his technique to measure enteric CH_4 from ruminants using livestock from the Hyder-Burks Pavilion. He has presented his work at national and regional meetings such as the National ACS conference and the Tennessee Academy of Science, where he has won prizes in both poster and oral presentations. His work on enteric CH_4 is under review in the ACS Journal of Earth and Space

Chemistry. Lahiru's advisor is Wilson Gichuhi.



While some of the largest fish in Tennessee waters are catfish, there is a species of the whiskered fish smaller than a pen cap. The pygmy madtom is an endangered fish so rare it has only ever been found in Tennessee. Small populations of the fish have been found in the Clinch



River in Hancock County and the Duck River in Hickman and Humphreys counties but nowhere else in the world. Two EVS-Biology graduate students at TTU have put their focus on understanding the fish and developing techniques that could change the way scientists study not only the pygmy madtom but other endangered fishes as well. "As far as we know, it is the smallest madtom species," said **Grady Wells** who is studying the fish. The pygmy madtom could grow to be as large as 50 millimeters, but most adult fish are 30-40 millimeters in length. "So, the biggest one would be like the size of a pen cap, and this is a catfish, with the whiskers



and all of those structures," Wells said. "Unlike the big, forked-tail channel catfish, the pygmy madtom is on a much different scale." With the distinct coloration of a dark brown upper portion of the body

and a nearly white belly, it is easy to identify the fish, Wells said, but finding a specimen is not as simple. The pygmy madtom was federally listed as endangered in 1993. Wells' research seeks to understand the biology and habitat of this species to form conclusions that could help preserve the population. "Even at sites where we reliably can find them, sometime it is still hit or miss," Wells said. There have only been about 100 of these fish ever recovered and in his field work, Wells has made more than 1,000 seine net efforts and only recovered six of these fish. (continued on p. 5)

PARTNERSHIPS

Dual Enrollment



Beginning last year, the School of Environmental Studies partnered with **Vanderbilt University's Center for Science Outreach** and **Metro Nashville Public Schools (MNPS)** to offer dual-enrollment courses for students at MNPS who are taking Interdisciplinary Science and Research (ISR) courses. Through this program, students at MNPS are able to gain concurrent high school and college credit for their ISR courses. The dual credit program through SOES started in the Fall 2017 semester with 42 high school students enrolling in dual credit courses through Tennessee Tech. Enrollment for Spring 2018 is 31 students strong. Currently, four courses are being offered for dual enrollment at MNPS – Interdisciplinary Science III, Interdisciplinary Science IV, Research II and Research III. The four

courses are taken in the high school students' junior and senior semesters. Students enter the ISR program during their freshman or sophomore years of high school and in the end take five to seven science elective courses, four of which are offered for dual enrollment with Tennessee Tech. The program hopes to recruit some of these dual enrollment students into the Environmental and Sustainability Studies B.S. undergraduate degree program, should they choose to attend Tennessee Tech for their higher education. Eventually, SOES hopes to expand the dual enrollment program to include other school districts, including Putnam County high schools.



Doctoral of Philosophy Environmental Sciences-Biology

(continued from p. 4) "So, they are still a very rare species in regards not only to their population number but in regards to other fishes in the community as well," Wells said. "It is one of the best moments of your week to see one of those." The Clinch and Duck rivers are both large bodies of water, but a technique for finding this small fish in a big river is being developed by another EVS-Biology student, **Robert Paine**. Paine is working on an approach to habitat identification that looks for environmental DNA (eDNA), things like mucus or scales left behind in the environment, to determine if the rare pygmy madtom is present in a specific location. "I can scoop up water that hopefully has eDNA in it and get a better estimate whether or not that fish is actually present," Paine explained. "It is kind of a scouting mission because we are trying to see where in the water and in what type of water, like flowing or slack water, might be better for detecting it."

Environmental DNA is not necessarily a new concept, but applying the methodology to an animal that is in need of conservation is especially appealing to Paine. "Tennessee is such a biologically diverse state but there is a lot of overlap in terms of species with other states, so if Robert's tool works, it is something that our local resource managers can potentially apply in other states for other fishes and even other organisms for that matter," Wells said.

Article modified from an original by Bailey Phonsnasinh. Used with permission.





Juan Sanez (Ph.D. '10) instructs General Chemistry for Civil Engineering and Computation Engineering and Analytical Chemistry for Agronomic Engineering School at **Universidade Tecnológica Federal do Paraná**, campus Pato Branco. He is a substitute professor and is pictured with his agronomy students after their final presentation on their composting projects.



Collin King (B.S. '15) is the Safety Engineer at auto manufacturer **Sumiriko Tennessee Inc.** He is entering his second year of working there and recently accepted the Commissioner's Award, which signifies a million hours without a lost time accident.



Steven Hewett (P.S.M. '16) is enjoying working as a GIS technician for the **City of Clovis**, New Mexico. He is working on writing a drone-use policy for the city. He is also using GoPros mounted on city vehicles to map all the signs in the city, expanding his knowledge of Python programming, and setting up a disaster response survey in ESRI Survey123 to help eliminate the stacks of paper personnel used to have to carry with them to disaster situations.

After graduation, **Jessica Murillo** (Ph.D. '13) joined the **Florida Department of Agriculture and Consumer Services (FDACS)** as the first Florida Agriculture and Science Technology Fellow (FAST). As a FAST fellow she worked as a chemist in the Bureau of Chemical Residues analyzing raw agricultural commodities for pesticide residues using GC- and LC-MS/MS platforms. Following the FAST fellowship, she continues to work in the chemical residues lab doing routine analysis as well as developing and validating an analytical method to test for glyphosate residues in grains, cereals, fruits, and vegetables.



Sara Kenney (B.S. '16) accepted a position at the **Tennessee Department of Environment and Conservation (TDEC)** in Fall 2017 with the Division of Underground Storage Tanks. She is an environmental scientist working out of the Cookeville TDEC office. Her responsibilities include inspecting active and temporarily out-of-use underground storage tanks to check for leaks, seeps and drips, and to make sure they are in compliance with the state and federal rules and regulations. She also deals with remediation and clean-up, acting as a case manager.



Jasen Ickes (B.S. '15) is working for the **Department of Homeland Security (DHS)** as a Customs and Border Protection: Agriculture Specialist. Their unit specializes in preventing harmful drugs, plants, pests, animal diseases, and potential bio-terrorism from entering the United States. After completing 14 weeks of classroom and law enforcement training, he is now stationed at the Miami International Airport in Miami, Florida.

After 8 months of working for the **Williamson County Government's Department of Sewage Disposal Management**, **Evan Summerville** (B.S. '16) started a job with the City of Franklin on Jan. 8. At the **City of Franklin**, Evan will work as a water quality specialist for the Storm Water Division of the engineering department.



Announcements

SOES Active Grants

- ◆ Hayden Mattingly (PI) and John Johansen (Co-PI). Rangewide population status assessment for the rare Barrens darter, *Etheostoma forbesi*. \$40,000 awarded from U.S. Fish and Wildlife Service.
- ◆ Hayden Mattingly (PI). Determining bluemask darter ecological requirements at multiple spatial scales to support reintroductions in the Calfkiller River system. \$30,000 awarded from U.S. Fish and Wildlife Service.
- ◆ Hayden Mattingly (PI), Carla Hurt (Co-PI) and Grady Wells (Co-PI). Environmental DNA detection, population status, and habitat use of the pygmy madtom, *Noturus stanauli*. \$24,000 awarded for 2017-2018 (\$96,000 total award) from Tennessee Wildlife Resources Agency.
- ◆ Hayden Mattingly (PI) and Joshua Perkin (Co-PI). Development of a Fish Index of Biotic Integrity for West Tennessee. \$9,186 awarded from The Nature Conservancy.

Ph.D. Program Adds 3 New Concentrations!

The School of Environmental Studies is proud to announce the expansion of the Ph.D. program in Environmental Sciences with three new concentrations in **Agriculture**, **Geosciences** and **Integrated Research**, to join existing concentrations in Biology and Chemistry. For more information, contact Hayden Mattingly.

Alumni Updates

Natalie Knorp (Ph.D. '17) accepted a position with the **Tennessee Department of Transportation's Mitigation Office** in July 2017. In December, she published a paper in the journal *Aquatic Ecology* entitled "Exclusion size and material have minimal effects on stream benthic algae and macroinvertebrate colonization within submerged cages," with co-author Justin Murdock. Additionally, she and her fiancé, Ryan, a metro Nashville policeman, are planning their wedding, which is set for March 2018.

Lasantha Rathnayake (Ph.D. '17) is living in Milledgeville, Georgia and recently accepted a Software Developer and Data Analyst position with **LBA Ware**, located in Macon, Georgia. LBA Ware is a software development firm specializing in building software solutions for mortgage and retail bankers. Lasantha is grateful for the data science and IT skills he acquired during his time at TTU as they help him in his new position.

Kate Moffit (B.S. '17) moved to Mt. Juliet, Tennessee and is working as a Sample Receiving Tech with **Environmental Science Corporation**.

Since graduating in August, **Tully Watson** (B.S. '17) joined **Huber Engineered Woods** in Spring City, Tennessee, as a quality assurance laboratory technician. Tully tests materials to ensure they pass quality standards, reports product deficiencies, and recommends changes to mediate these issues. He continues to live in his hometown of Rockwood, Tennessee.

James Scott (B.S. '17) continues to work at **HEPACO**. He has transitioned from doing a majority of field work to more office work. His primary duty now is the preparation of final reports.

FACULTY INTERVIEW

Peter Li, Ph.D.
Professor of Earth Sciences
SOES Associate Faculty



Tell us a bit about your professional and educational background prior to coming to Tennessee Tech.

My dad told me he found a good store location for me so I could start my fortunetelling business after he learned that I graduated from the university with a degree in philosophy. Unfortunately, I didn't listen to his advice; otherwise, I could have been a millionaire twenty years ago (ha-ha). I received a master's degree in geography and an environmental monitoring Ph.D. degree from the University of Iowa. Later, I worked for Tetra Tech, Inc., in San Francisco, and a tech company in silicon valley before I moved to Cookeville.

What courses do you teach here at TTU?

Other than teaching Cultural Geography (GEOG 1012), a general-education class, I mostly teach GIS courses, such as Environmental Applications of GIS, Advanced GIS and Programming GIS. I am also advising students from the P.S.M. program and GIS concentration in the Department of Earth Sciences about their class selection, senior thesis and internship arrangements and reports.

Could you tell us about your role in assisting with coordination of the P.S.M. – Environmental Informatics degree program?

I spent time visiting agencies like Tennessee Department of Environment and Conservation (TDEC), and conferences where I have the chance to interact with potential students and introduce the wonderful P.S.M. program to them. I also communicate with students who inquire about the program and provide them with detailed information about the program.

You teach several GIS courses at TTU. Why do you think it is important for students to have GIS experience?

GIS is a very useful spatial tool for anyone who is interested in finding out what happened or what would happen in a given space, one-, two- or three-dimensionally. With GIS skills, students would improve their stock in the job market in any field. In today's professional market, a student with GIS skills would definitely have a higher chance of being hired compared to others without the skills. It is also fun to use GIS to solve spatial problems, improve visual presentation and provide insightful information for analyses involving locations. Applications of GIS are everywhere; for example, environmental studies, agriculture, business, real estate, transportation, archaeology and even the most recent hot topic, gerrymandering. So, just come here to learn and apply GIS and you will be happier when you are with me, the Jackie Chan at TTU, and wealthier, when you've found a good job.

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8

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