

Tennessee Tech University School of Environmental Studies



Sunrise over Spring Creek Gorge, Jackson County, Tennessee by Chuck Sutherland

SPRING 2025 NEWSLETTER

Message from the Director

Welcome to the Spring 2025 edition of the SOES Newsletter. In this issue, we feature articles about students participating in internships and the senior capstone course, PSM students working on diverse topics such as flood risk analysis and a GIS toolbox for astronauts navigating the Lunar South Pole, and EVS students conducting research on reducing environmental impacts of hydroponic tomato production and using artificial intelligence coupled with geospatial analyses. One of my favorite parts of the newsletter is reading about the activities and accomplishments of our talented SOES alumni – many thanks for sending us your updates for sharing with our readers. The newsletter concludes with a faculty profile of Lauren Harding who offers the graduate-level Environmental Social Policy course every year. As always, keep up the good work and please stay in touch.

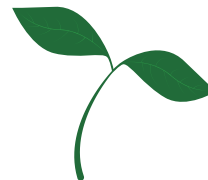


Hayden Mattingly

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Bachelor of Science Environmental & Sustainability Studies (ESS)

Colby Brewster This past summer, Colby interned at Surveying And Mapping, LLC (SAM) in their Knoxville office. SAM is the largest geospatial/land surveying company in the United States, and also does consulting, aerial mapping (LIDAR), surface utility engineering, BMI scanning, GIS and engineering inspection.

Colby worked both in the field and in the office on projects at Blackberry Mountain, with students at the University of Tennessee Knoxville, and at various solar farms. He also played a role in working with large companies like TVA, Silicon Ranch, D.R. Horton, Choate Construction and Johnson and Gaylon Construction. Colby also had the opportunity to work on a GIS storm water assessment project for the City of Knoxville, in which he helped locate, map and measure all storm water structures, including headwalls, area drains and catch basins. Colby's internship at SAM gave him the opportunity to develop experience in land surveying on a massive commercial scale, as well as learn the inner workings of how a large business operates.

At the end of Colby's internship, he was offered a post-graduation job with SAM. He loved working with the SAM team in which he felt like he was part of a big family. Colby would like to thank Julie Uden (field operations manager) and Rob Sanders (RLS & surveying department manager) in Knoxville for granting him the opportunity to intern at SAM.



Madison Kibbe is a senior in the ESS program with a concentration in natural resources and environmental technology. Madison is leading innovative research in water remediation through her capstone project.

Her research focuses on a closed coal mine site at Meadow Creek Park in Monterey, TN, that is affected by acid mine drainage (AMD), a prevalent issue that can lead to severe water contamination. As the lead and spokesperson for her capstone team, Madison has played a key role in field testing, data analysis, resource allocation and remediation planning.



Using various tools, her team has collected data about both the creek and lake at the park. Additionally, she collaborates with doctorate students Ademola Adeoye and Bryant Davis, who are conducting lab-based analysis for pesticides and heavy metals. Their findings have revealed high levels of iron and manganese as well as significant changes in dissolved oxygen between the site's lake and creek. These factors likely contribute to the limited aquatic species presence noted by another research group.

To address these challenges, Madison is spearheading the development of natural remediation strategies, including installing limestone beds, wetland plant filtration and an experimental filtration method using eggshells.

Madison is eager to carry this research into her master's studies and is strongly leaning toward a thesis track to further explore the effectiveness of these remediation techniques with hopes that her research will contribute to widespread improvements in water management.

Professional Science Master's (PSM) Concentration in Environmental Informatics

Creek Birchfield Anderson is a fellow for the National Science Foundation (NSF) 'Engendering the Spirit of Gadugi' grant, which focuses on food, energy and water related issues within rural and indigenous communities. Creek started the P.S.M. in Environmental Informatics program in the fall of 2023 and chose the new "thesis option," which has provided him the opportunity to conduct research centered on the NSF grant. Creek graduated with a bachelor's degree in political science and a minor in geography from TN Tech. He worked as a teaching assistant for the Theory of GIS courses and earned an "Outstanding Teacher's Assistant" award during that time.

Creek's thesis focuses on modeling flood risks and assessing flood events in western North Carolina. His research explores the disparities between urban, rural and indigenous communities, working in the areas of Asheville and Cherokee, N.C. Creek wants to examine how climate change-driven shifts in precipitation patterns and land use impact flooding hazards, with particular attention paid to the vulnerabilities faced by rural and indigenous communities compared to urban areas.

A key component of his research is the use of ArcGIS Pro to analyze hydrologic data, topography and historical flood events. Through spatial analysis, his research aims to provide actionable insights that can inform policy decisions, emergency response planning and sustainable land management practices.

Creek's research highlights the unique challenges faced by indigenous and rural populations such as historical land use constraints, limited access to flood mitigation resources and infrastructure deficiencies. He hopes to underscore the need for equitable adaptation strategies and work with others to bridge the gap between scientific modeling and community-based flood preparedness.



Isaac Hollingsworth is using his expertise in remote sensing, military geospatial applications and planetary mapping to support NASA's Artemis missions. While in the PSM program, Isaac developed LunarTRAV, a GIS toolbox designed to help astronauts safely navigate the Lunar South Pole. The tool produces data-driven mission planning products that improve safety and efficiency for lunar surface operations.



Isaac's work focuses on hazard mapping, traverse planning and terrain analysis to assist in mission planning for crewed lunar exploration. LunarTRAV identifies Permanently Shadowed Regions (PSRs), steep slopes and boulder fields, while also generating optimal astronaut EVA routes using a modified Tobler's Hiking Function. These tools help mission planners understand the challenges of lunar mobility and ensure astronauts can safely reach key science targets. For the Artemis III mission, Isaac applied LunarTRAV to evaluate astronaut movement within a two km range of the lander, incorporating hazard analysis and science objectives into the route planning process.

Isaac will publish LunarTRAV as an open-source geospatial tool in the coming months, making it available to the broader planetary science and aerospace communities. Future developments will include AI-driven hazard modeling, field validation and applications for robotic missions on both the Moon and Mars.

Doctor of Philosophy

Environmental Sciences (EVS)

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

Ronnie Dunn is an EVS – Agriculture student from Baxter, Tennessee, who expects to graduate this year. He has pursued multiple degrees from Tennessee Tech, receiving bachelor's degrees in journalism (2005) and agriculture (2012), followed by a master's degree in education (2019). Ronnie grew up in a family that enjoyed the outdoors, gardening and selling produce at farmer's markets. His mother's childhood experience with food insecurity also shaped his interest in food-producing plants and has given him a passion for his research. Ronnie received a research assistantship in 2022, and in 2023, was accepted into the National Science Foundation Research Traineeship Program as part of Tennessee Tech's Engendering the Spirit of Gadugi at the FEW Nexus Program.

Ronnie's research focuses on optimizing nutrient application methods for tomatoes in trough-based, drip hydroponic systems. This involves subjecting plants to various nutrient application regimes to analyze yield response along with work to develop a simplified model for transpiration that can be used in an app-based decision support tool to inform nutrient replenishment in closed and semi-closed hydroponic systems. The aim is that the decision support tool could promote the adoption of closed hydroponic systems for tomato production and encourage a shift away from open systems that discharge used nutrient solution into the environment. Such discharges lead to negative environmental impacts on surface water and groundwater, along with increased costs for producers. His dissertation title is "Optimizing and Modeling Nutrient Use in a Drip Hydroponic System for Tomato Production." In the future, it is possible that Ronnie's work could be expanded to other crops and to soil production systems.



Justin Medley, a student in the EVS – Integrated Research concentration, had the opportunity to participate in an internship at Oak Ridge National Laboratory (ORNL) this past summer, where he delved into groundbreaking research bridging machine learning and the built environment. During his time at ORNL, he gained hands-on experience with advanced data analysis techniques and engaged with leading experts who helped guide him through the various stages of his project. Through conversations with colleagues from different fields, Justin was

able to deepen his understanding of how emerging technologies can be strategically employed to address complex environmental questions.

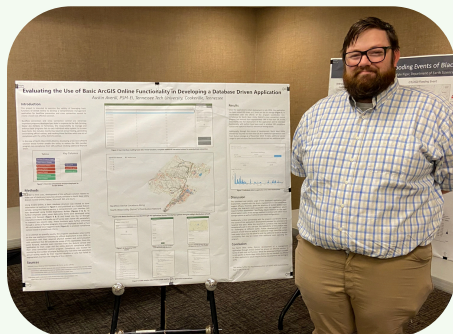
Over the course of this immersive experience, Justin dedicated his efforts to developing classification models capable of predicting building types using footprint-derived morphological features. Working closely with Peter Li from the Department of Earth Sciences, Justin leverages geospatial data in ways that not only improve research efficiency but also open up new avenues for interdisciplinary collaboration.

Looking ahead, Justin's research interests continue to focus on the dynamic intersection of geospatial technology, artificial intelligence and environmental science. He envisions applying these powerful tools to tackle environmental contamination and geospatial data conflation. By blending his newfound skills from the ORNL internship with his passion for environmental stewardship, Justin aims to forge innovative solutions that benefit both industry and society, propelling us toward a cleaner and more sustainable future.



GIS Day 2024

Students in Peter Li's *Environmental Applications of GIS* course presented their GIS projects via StoryMap and poster presentations at the Leslie Towne Center for **Fall GIS Day** on November 20, 2024. Other TN Tech professors, along with GIS staff from the City of Cookeville Planning Division, also attended in support.



SOES Partnerships

- **The Alliance for the Conservation of the Nashville Highland Rim Forest** – This is an ongoing partnership between Samantha Allen and the alliance, as well as Emily Granstaff with the Southeast Conservation Blueprint. Featured PSM graduate student, Creek Anderson, is currently working with the project to fulfill his PSM Internship requirement.
- **The Carbon Neutral Islands Project on the Isle of Raasay** – PSM graduate student Joshua Loiacono and undergraduate Earth Sciences student Anthony Lamantia will be returning to the Isle of Raasay in Scotland this summer to collect drone imagery and conduct field work with the aim of better understanding the environmental variables driving the spread of an invasive species of rhododendron.
- Steve Sharp has partnered with Monterey's cultural administrator, Rafferty Cleary, to develop plans for research and improvements at **Meadow Creek Park** as part of the ESS undergraduate Capstone Experience course.

Spring 2025 Awards



Graduate students from the School of Environmental Studies attended the **TNGIC Spring 2025 Conference** in Murfreesboro with professor Dr. Allen.

P.S.M. student Josh Loiacono and Ph.D. Student Justin Medley both won awards at TNGIC as part of the TN View competition for their remote sensing projects.



SOES Students win the Student Affairs Student Spotlight Award two months in a row!



E.S.S. student Madison Kibbe won the award for the month of March.



P.S.M. student Lauren Watson won the award for the month of April.

Alumni Updates



Joseph Martin (P.S.M. '14) formerly worked in telecom, oil and gas and currently works for LDA Engineering as the director of asset management and geospatial services in Knoxville, Tennessee. Joseph has a beautiful wife, three wonderful kids and a great dog that's also part of the family!

Danny Bryan (Ph.D. '15) has retired from Cumberland University after 33 years of service. He served as the biology program director from 2014–2021 and was awarded Cumberland University's President's Award in Teaching Excellence in 2015. Danny lives in Brush Creek, Tennessee, where he tends a farm and manages the property for northern bobwhite quail. He still does consulting for the conservation and ecology of timber rattlesnakes with Tennessee Wildlife Resources Agency and The Nature Conservancy.



Rafael Diaz (B.S. '16) works as an environmental researcher in the Mexican state of Michoacán, studying the impacts of pollution on air quality and on local populations. He also works to implement eco-friendly programs in local communities related to tourism and other revenue-generating industries.

Amy Stafford (P.S.M. '17) works in nuclear communications at the Idaho National Lab, supporting communications for INL's Materials and Fuels Complex (MFC). Her work involves storytelling through social media, video and written stories about MFC's capabilities and the people who support INL's nuclear energy mission, as well as supporting the development of internal newsletters, website content and fact sheets to help spread awareness to various audiences. One goal in her team's communications is to show that working in nuclear does not require a degree in nuclear science or engineering.



Elias Vaden (B.S. '18) After three years of petroleum remediation consulting with PM Environmental, Elias now works at the Tennessee Department of Environment & Conservation (TDEC) in the Chattanooga office, performing industrial stormwater and wastewater facility inspections. Elias also chemically and biologically samples and monitors benthic data in urban and rural streams in the surrounding 10-county region.

Roger Applegate (Ph.D. '19) is a certified wildlife biologist who teaches courses in conservation law enforcement at Husson University and at the University of Maine, Orono. Roger also works as a private consultant, focusing on the management of beavers on wetlands. He is a member of the Bangor City Council's Penjajawoc Marsh Commission, which helps to manage the impacts of development on a significant wetland complex.



Jessi Vannatta (Ph.D. '19) is an environmental scientist for California State Parks at Hungry Valley State Vehicular Recreation Area. Jessi also teaches part-time as an adjunct professor at College of the Canyons (COC) and has been co-advising COC's Hands on Earth club for over a year now. Jessi is also in the second year of participating in a National Science Foundation grant-funded opportunity to mentor STEM students and increase equity in STEM disciplines. Jessi's mentor/mentee team conducted a campus project on pollinators, and this year the project will focus on mycorrhizal fungi. Jessi is working on publishing her final paper from her graduate research at TN Tech, with two papers on bats already published in the journals *Mammalia* and *Mammal Research*.



Grady Wells (Ph.D. '19) has worked as an assistant professor of biology, field ecology and ichthyology at Sewanee since August 2021. He and others published a new paper in December 2024 titled *Preliminary Evaluation of Two Active-Sampling Methods for Crayfishes on the Southern Cumberland Plateau, Tennessee*. You can read it at <https://www.eaglehill.us/SENAonline/articles/SENA-23-4/19-Wells.shtml>



ULTIMATE, *MULTIUSE* HOME DECOR



Brittany Burke (P.S.M. '19) has lived nomadically, traveling the country to see what the states have to offer while honing her skills in various GIS roles through fully remote work. She has also started her own small business offering a multifunctional household item on Amazon. That multifunctionality also lends itself to campers and RVs alike. You can view and purchase the item at <https://www.amazon.com/MAT-STONE-KITCHEN-SINK-DRYING/dp/B0D9L3HZ8Z>.

Alumni Updates (continued)



Will Ponder (B.S. '20) works as the Mid-Atlantic field ecologist for the National Ecological Observatory Network (NEON) and is responsible for implementing small mammal, mosquito, tick and ground beetle survey protocols at three sites in Virginia and Maryland. NEON has a research sampling support program that allows external investigators to utilize existing NEON systems for their own research questions. Will and his team just finished a two-year sampling effort for the Orrock lab at University of Wisconsin that lead to the recent publication, *Climate drives geographic*

variation in individual Peromyscus leucopus immunity against zoonotic disease. Will has also been accepted into the Colorado State University online master's program in Fish, Wildlife and Conservation Biology.

Joe Cook (P.S.M. '22) will be graduating from the THP Training Academy as a state trooper assigned to Bledsoe County. Joe has also been accepted into the University of Tennessee, Chattanooga Ph.D. program in Leadership and Decision Making. The program will begin this upcoming summer.



Savannah Crabtree (B.S. '22) began working as a wastewater operator with the Harriman Utility Board in April 2024. She is currently preparing to take the Level IV Wastewater Operator Certification Exam in May 2025.

Savannah and her husband also recently bought a house in her hometown of Harriman, Tennessee.

Kyle Evans (B.S. '22) is now serving as the fire data program manager for the Tennessee State Fire Marshal's Office, where he oversees both the National Fire Incident Reporting System (NFIRS) and leads the state's transition to the National Emergency Response Information System (NERIS).

In this role, he works closely with over 687 fire departments across Tennessee, ensuring the accuracy and modernization of fire incident data that supports public safety planning, resource allocation and federal reporting. Kyle's work bridges local operations with national systems, helping shape the future of emergency response data through collaboration with the U.S. Fire Administration and various stakeholders.



Tara Pedraza (P.S.M. '23) has been promoted to director for the Division of Stakeholder Engagement at the Tennessee Dept. of Environment and Conservation (TDEC), a division united by its mission to engage and empower stakeholders to conserve and protect the environment and quality of life in Tennessee.

One of the major projects that Tara leads is creating the TDEC Annual Report. She is particularly proud of this year's report and its message: TDEC is strong, resilient and ready for the future. The image above is the report's cover, which features her son wearing a TDEC reflective vest.

KJ Mittagadapa (P.S.M. '24) currently works as a GIS data technician and appraiser in the Assessor's Office of Curry County in Clovis, New Mexico. KJ uses GIS to measure and appraise county parcels.



We are giving away two scholarships to environmental studies students through the SOES Student Scholarship Fund!

Our first two scholarship awards will be given out in fall 2025, and recipients will be announced in the fall 2025 newsletter. Since our scholarship funds have been depleted, please donate so that we can continue to support our students!

To donate, scan the QR code. Click to view the list of options and choose the College of Interdisciplinary Studies. Then, leave a comment that you'd like to donate to the School of Environmental Studies Scholarship Fund. Thank you!



www.tntech.edu/giving

Faculty Spotlight

Professor of Political Science

Dr. Lauren Harding

Dr. Harding, why do you like teaching Environmental Social Policy (EVSS 6010) for graduate students?

It's one of my favorite courses to teach. The class is special because of the synthesis of knowledge that students bring to the table from their own life experiences and interdisciplinary perspectives in biology, geology, chemistry, agriculture and more. The discussion-based seminar aspect of the class gives students the opportunity to delve into different viewpoints on environmental policy issues and allows them to share their technical expertise with one another.



Can you tell us more about your involvement in the NSF-NRT Program: Engendering the Spirit of Gadugi at the Food-Energy-Water-Nexus here at Tech?

It has been amazing to see this grant come to fruition with new graduate fellowship opportunities for students. Working with the team on developing coursework for the grant, and particularly having the chance to engage with graduate students in the program, and to connect with and learn from our grant partners in the Appalachian, Cherokee and other rural communities, especially through the cultural immersion trip, has been so rewarding. The Gadugi grant emphasis on critical thinking and innovation-driven problem-solving is geared toward creating a new holistic, interdisciplinary, collaborative approach to tackle environmental issues, and seeing where that takes us is the most exciting part.

Why is studying environmental policy important beyond developing an understanding of a specific discipline?

I believe that understanding environmental policy is key to solving the pressing environmental challenges we face. We can make incredible technological advancements and find innovative scientific solutions, but if we cannot incorporate them into policy, then measurable strides are not made. Additionally, if policy is not well-designed or well-implemented, it will never achieve the potential gains that it was intended to address. So, in my view, science and policy go hand in hand.

What are some fun facts about yourself?

My husband and I have three kids ages 10, 12 and 16, and we are on a mission to visit every U.S. National Park. This past year, we visited Zion National Park to hike the Narrows and we also visited the Grand Canyon and watched the sunset over Guano Point.

Another fun fact is that I've swum in open water with sharks that were over six feet long! My family was told that the longer you stay in the water, the more aggressive the Caribbean reef sharks can be. After being mesmerized by the dozens of sharks surrounding us, I looked up to find that my little brother and I were the last ones left snorkeling in the water after everyone else got out! Needless to say, I've never swum faster in my life.



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