

Fall 2024

GEOGRAPHY



PennState
College of Earth
and Mineral Sciences

Department of Geography

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GEOGRAPH is a publication of the Department of Geography in the College of Earth and Mineral Sciences at Penn State.

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On the cover...

Cover Photo: Beaver Stadium, June
2023, during Canadian wildfires
© Patrick Mansel

New Challenges and Opportunities



I happily write this column about new challenges and opportunities at Penn State Geography. As the following pages in our annual magazine demonstrate, we are navigating new directions that are made possible by your support and the impressive work of our faculty, students, and staff.

Our faculty are at a historic strength, with twenty-seven tenure-line faculty this academic year coupled with sixteen teaching and research faculty. This has meant some challenges, such as finding a new room for our faculty meetings! But this is also providing tremendous opportunities for our curriculum and research programs, while increasing our visibility across campus and beyond.

We recognize and celebrate the retirement of Alan Taylor as professor emeritus after a very successful career. As one of his advisees explained, "Alan made us feel he was on our side, wanted us to succeed, and would help us

along the path to the best of his ability. He did it by example, appearing to genuinely enjoy teaching classes and to find physical geography a truly fascinating discipline, one he felt privileged to pursue." In a fitting tribute to his many contributions, Alan received the James J. Parsons Distinguished Career Award from the American Association of Geographers.

This magazine highlights observations from our four first-year faculty: Zhenlong Li, Dani Aiello, Belén Noroña, and Victoria Nimmo. We welcome them into our community!

Other members of our department have received national and international recognition. Lily Houtman was a recipient of the National Science Foundation's Graduate Research Fellowship to support their work on cartography with an emphasis on data journalism. Mahsa Bahrami was awarded a NASA Earth and Space Science and Technology (FINESST) grant to fund her research on meltwater lakes at the surface of the Antarctic ice sheet. These are among the most prestigious early career awards available and we are excited to see how their research advances.

Another story in the magazine highlights Karl Zimmerer's election into the American Academy of Arts and Sciences (AAAS). Founded in 1780, the AAAS honors excellence and convenes leaders from every field of human endeavor to examine new ideas, address issues of importance to the nation and the world, and work together "to cultivate every art and science which may tend to advance the interest, honor, dignity, and happiness of a free, independent, and virtuous people." The work of the academy has helped set the direction of research and analysis in science and technology policy, global security and international affairs, social policy, education, the humanities, and the arts.

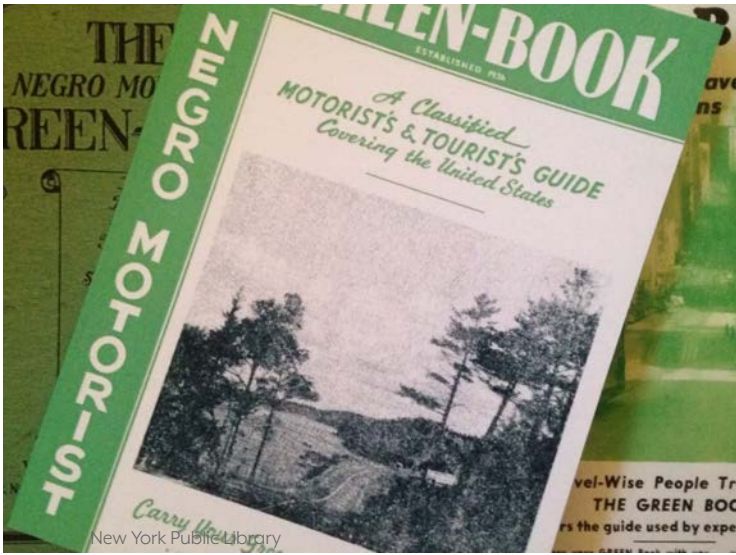
In addition to faculty and graduate students, our undergraduate students are simply amazing and accomplishing great things. Whether working on the student farm or completing an internship in Washington D.C., our majors pursue diverse experiences. My thanks to an alumnus who requested that we use this magazine to better showcase the undergraduate achievements that are announced in our May Recognition Reception. Two pages of the magazine report these awards made possible by the generous contributions from so many of you. Thank you!

Finally, you will see that our renovation project is continuing and nearly complete. I am confident that the next time you visit us in Happy Valley you will be able to see the second and third floor maps, in addition to the wall panels conveying a diversity of social and natural features. This renovation is a daily reminder that while the department continues to navigate dynamic landscapes at the university, we are grounded and energized by the new challenges and opportunities we face as a community.

Sala Kahle (Stay well),

A handwritten signature in black ink, appearing to read "Brian H. King". The signature is stylized and cursive.

Brian H. King, Professor and Head, Department of Geography



Geography professor explores historical cartography in ‘The Living Black Atlas’

Joshua Inwood, professor of geography and African American studies, co-authored “The Living Black Atlas: Learning Geospatial Ethics from the African American Freedom Struggle,” which examines how cartography has empowered African American communities. Co-written with Derek H. Alderman, professor of geography at the University of Tennessee, the article discusses mapping’s role in resistance, storytelling, and community building. The authors draw on examples like *The Green Book*, a travel guide that helped Black motorists navigate segregation-era highways, and highlight its importance as a form of counter-mapping.

The article also explores contemporary mapping efforts, including the Folded Map Project by artist Tonika Lewis Johnson, which investigates urban segregation in Chicago. Inwood and Alderman critique mainstream geospatial practices for reinforcing harmful systems, emphasizing the need for mapping to include diverse, marginalized perspectives. <https://bit.ly/4eNTUNa>

Penn State Climate Consortium awards 11 climate action workshops

Penn State’s Climate Consortium announced the awarded workshops from its Climate Solutions Accelerator program, providing funding to eleven researchers to host workshops in spring 2024 focused on climate change solutions. **Erica Smithwick**, distinguished professor of geography and director of the Climate Consortium, emphasized the importance of these workshops in fostering collaboration and creativity. “Workshops allow attendees to exchange ideas from diverse perspectives, enhancing project success,” she said.

As part of the Climate Consortium’s mission, the Climate Solutions Accelerator helps launch promising projects, engage partners, and implement place-based climate solutions. Two of the awarded workshops include “Building Capacity for Subnational Climate Action,” led by **Brandi Robinson** and “Developing Transformative Youth-Centered Research Agendas to Foster Climate Justice Solutions,” led by **Mark Ortiz**. These workshops are designed to inspire and develop real-world climate solutions.

<https://bit.ly/4duXjPB>

IEE seed grants awarded to two geography faculty members

Belén Noroña and **Guido Cervone** are among the researchers awarded funding through Penn State’s Institute of Energy and the Environment’s (IEE) 2024 Seed Grant Program, aimed at fostering innovative research.

Noroña will co-lead a project titled “Protecting the Amazon Rainforest from Oil Exploitation.” This project aims to work with Indigenous communities in the Amazon to combine their extensive knowledge with scientific methods to map oil pollution in the region’s water and soil, empowering local conservation efforts.

Cervone will co-investigate “Expectations vs. Achievements: Building Energy Use in Planning and Operation.” The study seeks to improve the accuracy of energy use predictions in homes by examining why actual usage often differs from computer models, with the goal of reducing energy inefficiencies.

<https://bit.ly/4dqZNid>





Stable profits, land preservation matter to farmers debating solar leases

Pennsylvania farmers are increasingly considering solar leases for their land, but stable profits alone aren't enough to sway them, according to a study led by Kaitlyn Spangler, assistant professor of community development and engagement in the College of Agricultural Sciences. Spangler and co-authors, including **Erica Smithwick**, Stephanie Buechler, and **Jennifer Baka**, explored the factors influencing farmers' decisions regarding solar leases. Some farmers value the ability to preserve their land for future agricultural use, while others view solar leases as a means to protect their land from industrial development. The study, published in *Energy Research & Social Science*, found that "agrivoltaics," the simultaneous use of land for agriculture and solar energy, is not yet common but holds potential for future land use strategies. The research highlights the importance of transparency and justice in renewable energy transitions in rural communities.

<https://bit.ly/47PePwK>

Youth perspectives study on sustainability funded by EMS Sustainability Council

Two geography researchers have received \$12,000 from the College of Earth and Mineral Sciences Sustainability Council for their project, "Youth Perspectives on Sustainability in the College of EMS."

Led by graduate student **Harman Singh** and assistant professor **Mark Ortiz**, the project will assess student views on sustainability through surveys and interviews with student leaders.

The researchers emphasized the goal of identifying knowledge or communication gaps on sustainability issues. They also highlighted the importance of qualitative data to help faculty understand how students think about sustainability, improving curricula. The project will involve undergraduates in research and contribute to the college's sustainability goals. <https://bit.ly/4dyaLm2>



Mitigating barriers for children walking and biking to school

Nearly twenty years ago, the Safe Routes to School (SRTS) program was launched to promote safe walking and biking for students. However, many economically disadvantaged communities have not implemented it.

Penn State researchers, including **Louisa Holmes**, associate professor of geography and demography, identified barriers such as a lack of awareness, personnel, and grant-writing skills. They interviewed thirteen SRTS representatives to understand these challenges and proposed solutions, such as proactive outreach to underrepresented schools and establishing a baseline for funding. The researchers also suggested partnerships with government agencies and community organizations to help disadvantaged communities access SRTS resources.

The study, led by Lucas Elliott and Melissa Bopp, was published in the *Journal of Transport & Health*. It highlights the importance of making the SRTS program more equitable to ensure all students benefit from active transportation options.

<https://bit.ly/3N8ccwu>



New Spatial Data Science Certificate

During the summer of 2024, the department's online geospatial education program began offering a new graduate certificate in spatial data science.

This certificate was created to complement the Master of Science in Spatial Data Science (MS-SDS), launched in 2021. More than forty students have already earned the MS-SDS degree.

The new 15-credit spatial data science certificate engages with key SDS methods, emerging GIScience research, and contemporary spatial analysis techniques.

Students in the certificate program will develop new spatial data science software, analytical methods, and cartographic products to visualize and communicate analytical results.

Students will gain expertise in Python programming to automate GIS tasks, customize GIS interfaces, and share geospatial development work. They will also enhance their abilities in scientific writing, presentation, and cartographic communication—skills highly valued in the geospatial industry.

Those who complete the new certificate are positioned to study in the master's in GIS or the Master of Science in Spatial Data Science programs.

Director of online geospatial education **Anthony Robinson** said, "This new program represents the next step in evolving our online offerings, and it speaks directly to student demand for a certificate that will complement the spatial data science degree program we launched a couple of years ago."

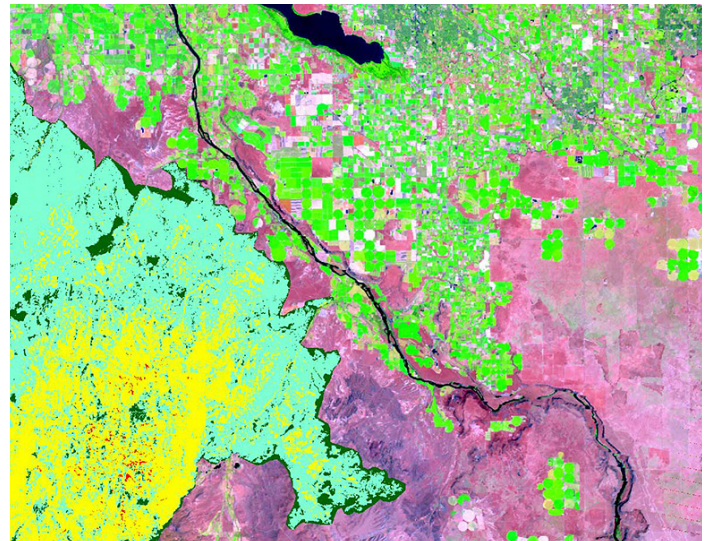
<https://bit.ly/4IhmUcC>

Online geospatial certificate program receives accreditation

Penn State's graduate certificate in geospatial intelligence analytics has earned accreditation from the U.S. Geospatial Intelligence Foundation (USGIF), highlighting the program's quality and leadership. This 15-credit online certificate, offered through Penn State World Campus in collaboration with the Penn State College of Earth and Mineral Sciences, prepares students with skills in geospatial information science and technology to enhance decision-making in geospatial intelligence.

"We are pleased that our geospatial intelligence program once again meets the rigorous requirements outlined in the USGIF accreditation standards and criteria," said **Gregory Thomas**, associate teaching professor and program director. "Students in our program can be confident that they are obtaining the necessary GEOINT competencies and skills to obtain a competitive advantage in this discipline."

The program serves current and aspiring GEOINT professionals in areas like imagery analysis, GIS data analysis, and homeland security. USGIF, a nonprofit organization dedicated to advancing the geospatial intelligence industry, has accredited the program through 2029. Penn State's program is one of twenty-one accredited programs nationwide. <https://bit.ly/4IgtTaG>



2024 Murphy Award honors Air Force veteran

Christopher Ramos, a U.S. Air Force veteran and Penn State World Campus student, was awarded the 2024 Lieutenant Michael P. Murphy Award, recognizing his outstanding contributions to the geospatial intelligence community.

Ramos, who served ten years in special operations weather forecasting, is currently pursuing a Master of Science in Spatial Data Science through Penn State.

“The program’s flexibility and comprehensive curriculum have been instrumental in my professional development,” Ramos said.

He founded Warrior’s Garden Solutions in 2023, applying geospatial skills for environmental intelligence and creating advanced weather prediction models to improve decision-making for clients.

The award, established in honor of Penn State alumnus and Medal of Honor recipient Lt. Michael P. Murphy, is given to a Penn State student with military or geospatial intelligence experience who has demonstrated exceptional leadership and contributions to the field. <https://bit.ly/4fVGDmn>



Cathryn Hunt Wins Esri Innovation Program Student of the Year Award



MGIS graduate **Cathryn Hunt** received the Esri Innovation Program 2024 Student of the Year Award.

The online geospatial education program is one of a small number of academic units around the world recognized as a participant in the Esri Innovation Program (EIP). The EIP seeks to promote GIS software and application development by providing students special access to Esri software and opportunities to be recognized for their accomplishments. Each academic program nominates a student, and Hunt received the overall award, besting all other nominees across the EIP.

Hunt’s MGIS capstone research project, “From Selfish to Selfless Routing,” addresses traffic congestion through an innovative GIS routing application. A “selfless” routing approach distributes high-volume traffic flows across multiple routes, assigning vehicle routes based on route capacity.

James O’Brien (Penn State doctoral alum '04) advised the project with Hunt. Hunt is an active-duty lieutenant in the U.S. Navy, and she holds a BA in geography from Middlebury College in addition to her newly earned master’s in GIS from Penn State. <https://bit.ly/4fRliuo>

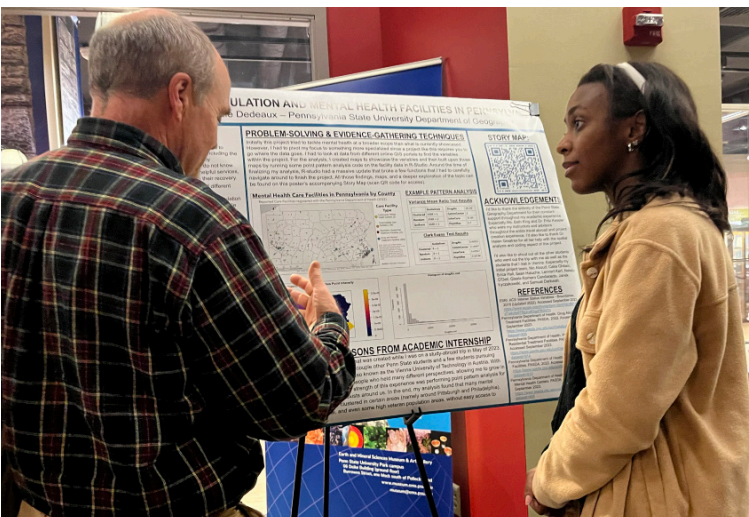


Spring 2024 EMS Commencement at Pegula Ice Arena

(From left to right, top to bottom): Clarissa Styer, Vivian Kase, Jodi Vender, Emily Shiels, Allie Lister, Chris Manukas, Jamison Burke, Cole Fiore, Brenden Franks, Finan Turnage-Barney, and Nate CheroK. Nate CheroK was selected as the Department Marshal. Brenden Franks was selected as the College of EMS Marshal. Jennifer Hesterman, alumna and retired colonel in the U.S. Air Force, delivered the commencement address.

Photo credit: Kris Pylant





Throughout the Academic Year

(From left to right, top to bottom): PhD students Mahsa Bahrami and Nasser Lassani pose with Bahrami's Haft-Seen display to celebrate Nowruz. Belén Noroña with Geovanni Siquhuah, an Indigenous Kichwa leader. Associate Dean for Undergraduate Education Yvette Richardson and Allie Lister at the EMSAGE laureates ceremony. Amelia Wycoff poses with a giant globe at the AAG conference in Hawaii. Danielle Dedeux explains her research during an EMS undergraduate research showcase at the Ryan Family Student Center.

2024 UNDERGRADUATE AWARDS

BALMAT FAMILY SCHOLARSHIP IN GEOGRAPHY

Mackenzie Bruns, Ty Kielar

DR. G. D. RICHARDSON AND KATHY LASAUCE UNDERGRADUATE SCHOLARSHIP IN GEOGRAPHY IN THE COLLEGE OF EARTH AND MINERAL SCIENCES

Jamison Burke, Ruby Chambers, Ella Clobes

JEFF GOCKLEY MEMORIAL AWARD

Michael Cattell, Ruby Chambers

MCCRORY EDUCATIONAL EQUITY SCHOLARSHIP IN GEOGRAPHY

Maxfield Evans

ERICKSON FUND IN GEOGRAPHY

Andrew Allen, Camilla Baumer, Michael Cattell, Michael Coupland, Hayoung Lee, Allie Lister, Clarissa Styer, Finan Turnage-Barney, Nathan Vincent, Mason Walker, Brady Watkins

GEOGRAPHY ALUMNI SCHOLARS (OUTSTANDING STUDENT) AWARD

Brendan Franks, Clarissa Styer

PETER R. GOULD CENTER FOR GEOGRAPHY EDUCATION AND OUTREACH STUDENT ENGAGEMENT AWARD

Rylie Adams, Nate Cherok, Allie Lister, Emily Shiels, Finan Turnage-Barney

E. WILLARD MILLER AWARD IN GEOGRAPHY

UG Paper, 1st Place: Nate Cherok
UG Paper, 2nd place: Vivian Kase

GEOGRAPHY STUDENT SCHOLARSHIP

Jennifer Chew, Allie Lister, Finan Turnage-Barney



Donor Marianne Gockley (top) presents the Jeff Gockley Memorial Award. Nate Cherok (middle) is recognized for his work on the Walker Building map floor renovations. Danielle Dedeaux (bottom) at awards ceremony.

Photo credit: David Kubarek

2024 GRADUATE STUDENT AWARDS



JAY M. AND KATHERINE DEFINIS AWARD FOR OUTSTANDING STUDENT

Harman Singh

E. WILLARD AND RUBY S. MILLER DISTINGUISHED GRADUATE FELLOWSHIP IN GEOGRAPHY

Ruth Buck

E. WILLARD MILLER AWARD IN GEOGRAPHY

Ph.D. Paper, 1st Place: Jessica Kromer
Ph.D. Paper, 2nd place: Mei-Huan Chen
Ph.D. Proposal, 1st Place: Harman Singh
Ph.D. Proposal, 2nd Place: Tiza Mfuni



WILLIAM AND MARY EASTERLING OUTSTANDING GRADUATE RESEARCH ASSISTANT AWARD

Ruth Buck

OUTSTANDING GRADUATE TEACHING ASSISTANT AWARD

Emma Cherigate, Temitope Akinboyewa

RONALD F. ABLER ENDOWMENT IN GEOGRAPHY

Sanae Hartmann, F.M. Kim

ERICKSON ENDOWMENT IN GEOGRAPHY

Nicolle Di Domenico, Maria Mugeni, Harman Singh, Billy Southern, Saumya Vaishnava, Lily Zeitler

C. GREGORY KNIGHT ENDOWMENT IN GEOGRAPHY

Zach Goldberg, Tim Prestby, Lilly Zeitler, Shiyang Zhang

RUBY S. MILLER ENDOWMENT IN GEOGRAPHY

Mahsa Bahrami, Alejandra Bonilla-Mena, Carolina Carrion-Klier, Yu-Chen Chuang, Faisal Elias, Owen Harrington, F.M. Kim, Tiza Mfuni, Norman Ornelas



Temitope Akinboyewa, Emma Cherigate and Trevor Birkenholtz. F.M. Kim, Trevor Birkenholtz and Cierra Naglowsky. Ruth Buck and Cierra Naglowsky.

Photo credit: David Kubarek

GEOGRAPHY ALUM, JAMIL BEY, RECEIVES TOP AWARD FROM GEOLOGICAL SOCIETY



Jamil Bey, who graduated with both his master's degree and doctorate in geography from Penn State, was awarded the President's Medal by the Geological Society of America (GSA) for 2023. The award is given to individuals who have significantly contributed to the field of geosciences, according to the GSA. Bey was recognized for his work in geosciences and environmental justice.

Bey is the president and founder of the UrbanKind Institute, which he described as "a Pittsburgh-based think-and-do tank." His work centers on the intersection of geosciences with urban challenges, focusing on the city of Pittsburgh and Allegheny County. His approach involves community engagement, information sharing, and policy advocacy in areas related to the environment, climate change, and quality of life. He also serves as the director of city planning for Pittsburgh.

"This was one of those recognitions that I really appreciate and am proud of," Bey said. "It was specific about recognizing the work that we were doing, connecting the earth sciences and bridging community

groups and connecting voices that wouldn't always be talking about that into this space."

Under Bey's leadership, UrbanKind Institute works toward bridging the gap between academia, community organizations, and residents, with the goal of fostering collaboration to uplift urban areas. Bey's efforts are centered around local engagement and the belief that "cities should be kind places for people."

His journey in this field began while teaching high school, where he observed and sought to address barriers faced by students and their families. This led to the establishment of UrbanKind, aimed at elevating the voices of overburdened and under-resourced residents.

One of Bey's favorite projects is the Trust Trees initiative, which involves engaging local residents in tree planting to improve urban forestry and community engagement. The event emphasizes the legacy and long-term benefits of these efforts for urban communities.

"This approach isn't just about planting trees; it's about creating a legacy and instilling pride in the community,"

Bey said. “We involve families, print photos of them planting trees, so in the future, they can return to these trees, seeing the tangible results of their work. These trees contribute to better air quality, asthma reduction, stormwater management, and cooler communities, among other benefits. It’s about empowering the community, showing them what they can achieve together, and then helping them build on this success for further improvements.”

Bey’s approach to geosciences is rooted in his experiences and education at Penn State. He credited his time at the University for exposing him to various ways of thinking and the interconnectedness of different challenges.

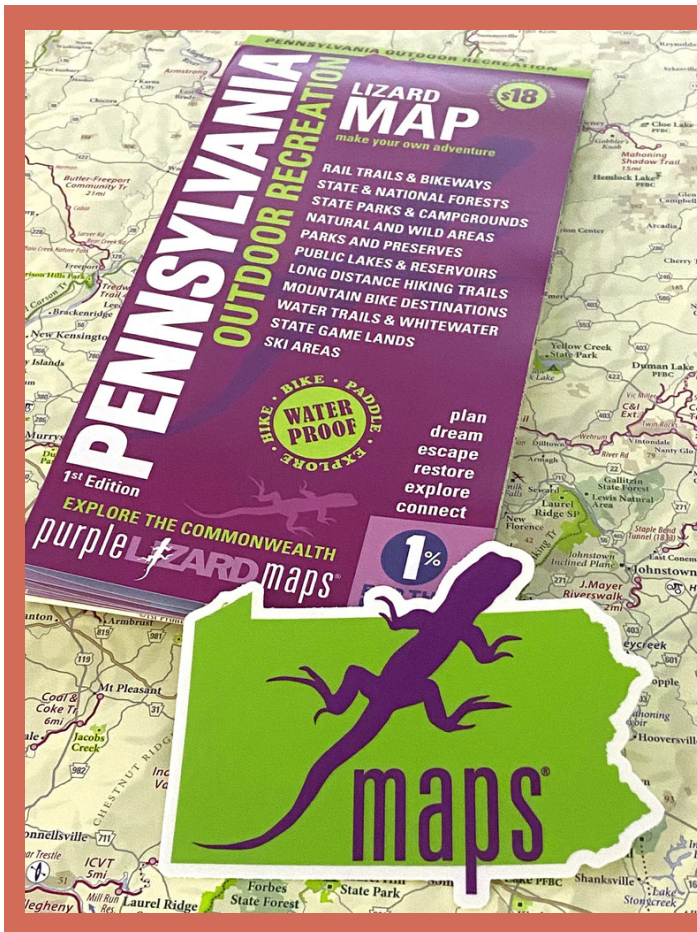
“I was exposed to so many ways of thinking about interconnections and challenges we face,” Bey said. “I remember being blown away, learning about others’ work, like Melissa Wright and Lorraine Dowler bringing excluded voices into dialogues and connecting them to issues I hadn’t considered in graduate school. This exposure, talking to professors like Karl Zimmer and Ikubolajeh Logan, discussing globalization and inclusion, really connected everything in my mind. My mentor, Lakshman Yapa, always asked thought-provoking questions, pushing us to think deeper about our work and its implications. I’m really appreciative of that experience and apply it in my work.”

Thinking about how his experiences in the Department of Geography shaped his approach to environmental challenges, Bey highlighted the importance of addressing these issues through a broader, more inclusive lens.

“Rather than thinking in isolation about challenges like climate change or water resources as problems solely for ecologists to solve, we’ve expanded those conversations to include unreconciled racial history and the economics of extraction,” Bey said. “We look for solutions that include people excluded from the economy in mitigation and remediation efforts. This means thinking about who benefits most from urban and community forests or riparian restoration, and how we can invest in these people to manage these resources and be part of the solution, thereby making amends for past harms our economy and political systems have created.”

Bey also reflected on his career trajectory and the broader implications of his work.

“It’s about connecting the researchers’ goals to the community goals,” Bey said. “When researchers come from impacted communities, they are more likely to have a personal perspective more so than an academic perspective.”



Mapping Success

Penn State geography alum and founder of Purple Lizard Maps, Michael Hermann, has launched a statewide outdoor recreation map highlighting Pennsylvania’s public land resources. The map showcases 115 rail trails, 124 state parks, 53 mountain bike destinations, and more, providing outdoor enthusiasts with a comprehensive guide to explore the state. It includes information on long-distance hiking trails, water trails, and ski areas, making it a valuable resource for navigating Pennsylvania’s diverse outdoor landscapes.



Improved wildfire smoke model identifies areas for public health intervention

“Our research can help public health officials in urban and rural areas plan targeted interventions for communities at higher risk of harmful air pollution during wildfire smoke events.”



The Canadian wildfires of June 2023 exposed a large portion of the Northeastern United States to unprecedented levels of smoke. A new model that combines wildfire smoke forecasts and data from ground-based sensors may help public health officials plan targeted interventions in areas most at risk for the negative health effects of unexpected smoke events and air pollution, according to a team led by Penn State scientists.

The researchers reported their findings in *Science of the Total Environment*.

“Statistical analyses suggest that situations like last year’s Canadian wildfires, where smoke travels long distances to affect the eastern United States, may become the norm,” said lead author **Manzhu Yu**, assistant professor of geography. “Our research can help public health officials in urban and rural areas plan targeted interventions for communities at higher risk of harmful air pollution during wildfire smoke events.”

The researchers focused on the periods between June 6–8 and June 28–30, 2023, when weather conditions and a coastal storm pushed large amounts of smoke from Canada into the Northeastern United States. They used data from ground-based sensors and a form of artificial intelligence called deep learning to improve a weather forecasting model from the National Center for Atmospheric Research. The model—the Weather Research and Forecasting model with Chemistry, or WRF-Chem—provides hourly data on surface concentrations of fine particulate matter (PM_{2.5}). Found in wildfire smoke and other forms of air pollution, these tiny particles can reach the lungs and cause health issues.

The scientists also studied anonymized mobility data from devices like smartphones to see how people changed their travel activities during the smoke events. Additionally, they conducted an environmental justice assessment using data from the U.S. Environmental Protection Agency

to see if certain environmental and demographic factors correlated with increased vulnerability to negative health outcomes from wildfire smoke. These factors included variables like the percentage of the population with less than a high school education, minority status, heart attack and asthma hospitalization rates, and existing pollution burdens from sources like heavy traffic and power plants. They studied these factors at the county level, from Pennsylvania and New Jersey up through Maine, to see if certain communities shared a larger portion of the pollution burden than others.

The team found that the refined forecasting model better estimated the magnitude and timing of PM_{2.5} spikes, measured in micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$), across the study area than the current forecasting model. When looking at how predicted data matched observed data, with 0 $\mu\text{g}/\text{m}^3$ of PM_{2.5} signifying that the model exactly matches ground

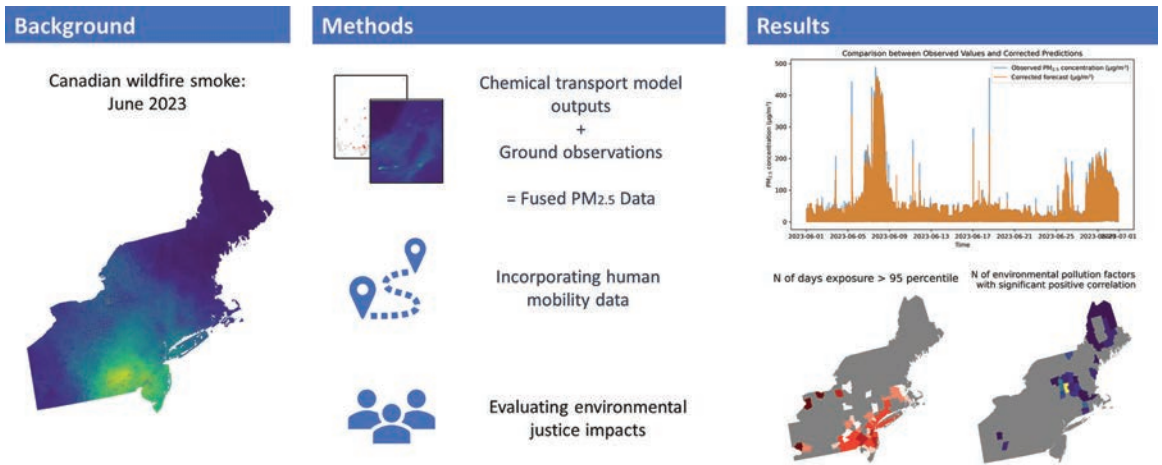
observations, the current forecasting model scored $-6.872 \mu\text{g}/\text{m}^3$, marking a large underestimation of particulate levels. The refined model scored $0.160 \mu\text{g}/\text{m}^3$, marking a slight overestimation of particulate levels that aligned much closer to what the ground sensors measured. In addition, the researchers found that urban and rural communities already burdened by existing environmental pollution face higher air pollution levels during unexpected smoke events than other areas.

“The good news, according to our findings, is that when people hear about wildfire smoke, they tend to reduce their mobility,” Yu said. “But we found that during these smoke events, New York City, Philadelphia, and the surrounding counties still showed high mobility activities. We probably need to think about

targeted interventions in urban areas because with so many people living in the area, exposure rates to unhealthy air are very high.”

Rural communities burdened by pollution from power plants and mines may have particular needs as well, she said. For example, she explained, Bennington County, Vermont, has few demographic factors that would make it more vulnerable to environmental pollution. However, it is home to multiple mines, heavy traffic, hazardous waste storage sites, and more, which all contribute to higher environmental pollution scores. Those factors amplified air pollution levels during the smoky days.

“Public health interventions are usually based on population concentrations,



(Top): Yu and fellow researchers created a graphic that provides an illustrative representation of their paper’s abstract. (Bottom): Beaver Stadium in June 2023 when smoke from Canadian wildfires blanketed skies across the northeastern United States.

which are naturally higher in urban areas,” Yu said. “Knowing these existing vulnerabilities in rural areas can help officials better serve these areas and protect the public’s health.”

In the meantime, individuals can take steps now to protect their health during the upcoming wildfire season.

“I would suggest that individuals have an air filter and indoor air pollution monitor in their homes,” Yu said.

“They can also enhance the insulation around their windows and doors if smoke levels are really high. I would recommend working from home if possible or getting a high-quality mask if you have to travel outdoors. And I think in Pennsylvania, we need to talk about standards for organizations

for how we respond to smoke days, whether that’s working from home, having a day off, or dismissing early. We’re not used to smoke events, and we need some sort of policy or standard for protecting the public’s health.”

In addition to Yu, contributors to this research from Penn State include **Zhenlong Li**, associate professor of geography, and doctoral students **Shiyan Zhang** and **Huan Ning**; and **Kai Zhang**, Empire Innovation Associate Professor at the University of Albany’s School of Public Health.

Penn State, through the Miller Faculty Fellow Award from the College of Earth and Mineral Sciences, supported this research.

GRIDIRON & GEOGRAPHY

WITH DEEP FAMILY TIES TO THE UNIVERSITY, NOLAN RUCCI TRANSFERRED TO PENN STATE FROM WISCONSIN. RUCCI IS NOW MAJORING IN GEOGRAPHY WHILE MAKING AN IMPACT BOTH ON AND OFF THE FIELD.



Nolan Rucci

Position: Offensive Lineman
Class: Redshirt Junior
Hometown: Lititz, Pa.
Height: 6'8"
Weight: 317 lbs.

2021-23 • WISCONSIN

Season: 2023: Saw action in three games. Posted a 3-yard touchdown reception as a tackle-eligible receiver in the Illinois game. 2022: Appeared in three games. 2021: Redshirt season.

HIGH SCHOOL

Played at Warwick High School. Earned an invitation to the 2021 All-American Bowl. Was a two-time all-state selection his junior and senior season. Named to the 2020 USA Today All-USA preseason first team. Rated a five-star recruit by 247 and Rivals and a four-star prospect by ESPN.

PERSONAL

Is the son of Todd and Stacy Rucci. Brother, Hayden, played tight end for Wisconsin and plays in the NFL for the Miami Dolphins. Both parents attended Penn State. Father, Todd, played for Penn State and was a second-round NFL Draft pick who went on to play eight seasons for the New England Patriots. Mother, Stacy, played field hockey at Penn State and was a first-team All-American her senior season.

WERE YOU A GEOGRAPHY MAJOR AT WISCONSIN?

I wasn't a geography major before transferring to Penn State. I started out in environmental science at Wisconsin. When I transferred in January 2024, most of my credits applied to geography, so I was really new to it and didn't know what to expect. Since I've been here, I've taken a bunch of classes, including using ArcGIS and other programs. I've really become interested in geography and GIS and hope to make a career out of it someday.

WHAT ABOUT GEOGRAPHY APPEALS TO YOU?

I'm not like a big "sit behind a cubicle" kind of guy for a job. So, if I could get outside doing some kind of land surveying, site analysis stuff, real estate, just being out in the field, I think would be a big plus for me looking for a career. That's one of the things I was looking for when I started with geography.

WHAT GEOGRAPHY CLASSES HAVE YOU TAKEN SO FAR?

One of the ones I really liked was Geography 390, which was one of the career development classes. We had a lot of cool experiences with speakers coming in and showing us what kind of career paths we could take with geography. We also learned a bunch of networking stuff such as working on LinkedIn and how to set profiles up, interviews and all that. I thought that was a very valuable experience for me in my first semester as a geography major.



ON TO FOOTBALL, HOW HAS THE COMPETITION WITH YOUR TEAMMATES DURING PRESEASON PRACTICES HELPED YOU IMPROVE YOUR GAME AND PREPARATION?

Preseason has been great, with a lot of competition. I really appreciate it. Guys like Anthony Donkoh and others have pushed me to step up my game and make sure I'm preparing in every way possible. After practice, I'm making sure I'm right in the weight room and film room. I'm focusing on fixing mistakes and doing the right things between practices.

WHAT ARE YOU LOOKING FORWARD TO MOST THIS SEASON?

I think just being with great friends and family and being closer to home. I think is one of the really cool things about it is just being able to



have like my family and friends come to games. I know my parents have appreciated only having a 2-hour drive versus a 14-hour drive. My high school buddies can come up to games as well. Obviously it's a big fall camp for me to just go out there and prove myself on the field and in the classroom too, I think it is going to be a really good experience.

YOU MENTIONED YOUR FAMILY. YOU ARE A PENNSYLVANIA NATIVE AND HAVE FAMILY TIES TO PENN STATE. TALK ABOUT WHAT IT FEELS LIKE TO BE HOME AND CLOSE TO YOUR FAMILY.

Both parents came here to Penn State and were student-athletes. My dad was a football player, and my mom played field hockey. There is definitely that legacy aspect of being a Nittany Lion in our family. I know my parents really love and appreciate this place, so I'm sure they are really happy. I think one of

the coolest things is having my dad back around the Penn State campus where he can see his old teammates and talk about war stories and stuff. Having a support system of family

and friends being close to home is super important to me, and it makes the whole experience even more special.



Top: Nolan Rucci at media day in Holuba Hall. Bottom: Members of the Penn State football team visited with patients at Penn State's Children's Hospital in Hershey on June 19, 2024. Football players pictured from left to right: Beau Pribula, Liam Clifford, Tyler Warren and Nolan Rucci.

First-Year Reflections

Our newest faculty members—Belén Noroña, Zhenlong Li, Dani Aiello, and Victoria Nimmo—have completed their first year with Penn State Geography. They discuss their most memorable experiences, new projects they are passionate about, and what makes the department special. They also share some of their hobbies outside of work and offer recommendations for hidden gems around State College. Read on to learn more about their first-year journeys.

BELÉN NOROÑA



What new initiatives or projects did you start this year that you're particularly excited about?

As soon as I arrived at the department, I was able to network with other institutes and departments across campus and move forward with initiatives that protect the Amazon rainforest, particularly in Ecuador. As a result, I enable collaborations

between Penn State and Indigenous youth and elders interested in protecting critical regions in the Amazon. I have built a relationship with the Environmental Engineering Department to combine environmental science and Indigenous traditional knowledge, empowering efforts to protect the Yasuni National Park, one of the

most biodiverse places on Earth. Being part of the department has also allowed me to build bridges between faculty working on climate change adaptation and policy at the multilateral level with Indigenous women and girls experiencing its effects near extractive frontiers.

What aspect of Penn State's Geography Department are you most proud of?

I am proud of adding to our department's efforts to make Geography a discipline that has the potential to impact policy and environmental advocacy and justice at multiple levels, including our classrooms and labs. Our current mission encourages a culture of listening, working with communities, and on-the-ground initiatives to solve timely problems. This includes bringing these skill sets and experiences into our classrooms. Many of our undergraduate students get to access fieldwork experience as early as their second year, along with an ethos that revolves around justice, equity, and compassion.

ZHENLONG LI



What was the most rewarding/memorable experience you had during your first year in the department?

The most rewarding experience during my first semester at Penn State Geography has been the incredible support I received from the department staff during my transition. Transferring a number of

grants to Penn State was a complex process, but their assistance made it seamless. They offered tremendous help to set up my office and lab, including furniture purchases, painting, and

computer configurations. Their guidance in navigating departmental policies and procedures, such as travel arrangements, was invaluable. This strong support network has made my transition smooth and has been a testament to the department's welcoming and collaborative culture.

What hobbies or interests have you pursued outside of your academic work this year?

This year, I developed a passion for biking. State College offers numerous biking trails, and Tussey Mountain Trail has become one of my favorites due to its stunning views and great ridge riding. Biking has been a fantastic way for me and my family to explore the area and stay active. It's an outdoor activity I highly recommend to newcomers looking to experience the natural beauty and recreational opportunities in and around State College!



From left to right: Zhenlong Li, Dani Aiello, Belén Noroña and Victoria Nimmo at the department's Welcome Back reception on January 17, 2024, in the Barron Innovation Hub.

DANI AIELLO



What new initiatives or projects did you start this year that you're particularly excited about?

This past October, I attended the 9th ICCG (International Conference of Critical Geography) in Mexico City—and through a small grant and some of my own research resources, I was able to begin new collaborations with housing colleagues and tenant organizers there. This allows me and several of my other collaborators in Atlanta, Los Angeles, Vancouver, and Detroit to make our housing justice network a much more continental and diverse effort—and I am really looking forward to learning from the housing justice movement there.

Have you discovered any hidden gems in State College that you'd recommend to newcomers?

Definitely the outdoors—there is so much to explore all year long, and one of my favorite times to hike is during the winter. Alan Seeger Natural Area and Wykoff Falls Run both really stand out. Also, the smash burgers at the Reedsville Creamery.

VICTORIA NIMMO



What new initiatives or projects did you start this year that you're particularly excited about?

I'm currently working on a new class for fall 2024, which will focus on field methodologies and experiment design, and I'm very excited for it! Getting to bring students outside to develop hands-on skills is something I'm very focused on.

What hobbies or interests have you pursued outside of your academic work this year?

I've tried to embrace the hilly landscape and get more into trail running this past year, I've loved how many trails are so nearby and accessible with just a short drive.

Q&A with Ida Djenontin: How definitions shape global forest conservation efforts



From providing habitats for wildlife to playing a role in carbon storage, forests are fundamental to maintaining global biodiversity and mitigating climate change. However, how forests are defined can significantly influence global conservation efforts and policy making, according to research from Ida Djenontin, assistant professor of geography.

Djenontin studies how terms used to describe forests—like old growth, ancient, or sacred—have far-reaching impacts on how forests are conserved and managed. She and her team found that such terms can influence conservation policies in significant ways and that Western terminology specifically dominates the scientific literature and shapes the discourse on forest conservation, often at the expense of Indigenous and local perspectives. Penn State Department of Geography spoke with Djenontin to learn more about her research and its implications for global forest conservation efforts.

WHAT INSPIRED YOU TO INVESTIGATE THE DEFINITIONS OF FORESTS AND THEIR IMPLICATIONS FOR CONSERVATION AND MANAGEMENT?

The motivation for this research stems from recognizing that natural and near-natural forests attract significant interest for biodiversity conservation and ecosystem restoration. These forests are often considered of high conservation value and are emphasized in biodiversity conservation policies, global restoration strategies and environmental agendas. However, most of these forests are in areas with high human population density, including many Indigenous peoples and local communities. For example, studies have shown that over 1.4 billion people live in areas identified as top priorities for

biodiversity conservation and climate change mitigation. Another study highlights that these priority areas are often in countries where restoration efforts could negatively impact livelihoods, especially in poorer, more populated, economically unequal, and food-insecure regions.

Implementing global biodiversity conservation and ecosystem restoration concepts locally without considering local and Indigenous cultures and values can be problematic. Indigenous people manage about a quarter of the world's land and protect 80% of global biodiversity, including 40% of ecologically intact landscapes.

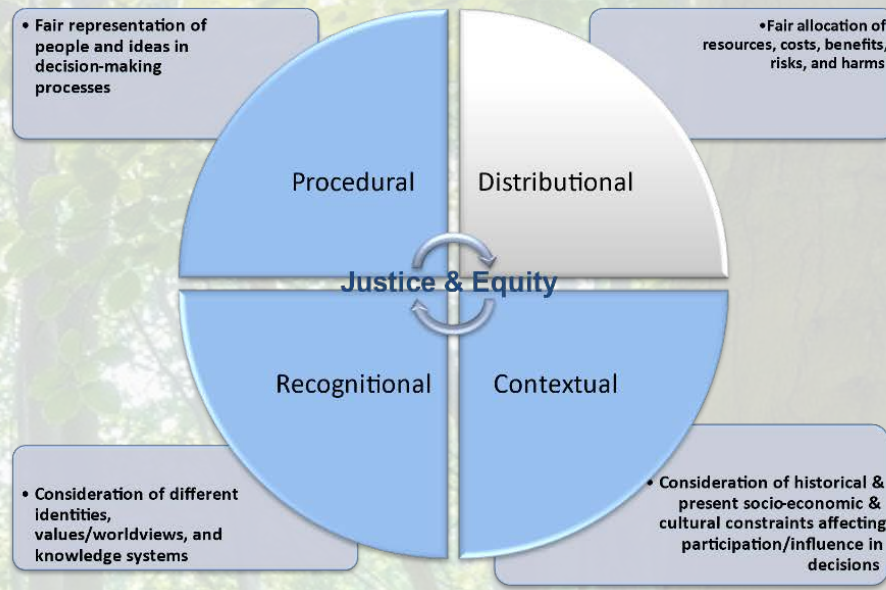
Therefore, our research explores how these high-interest forests are conceived and defined in the context of conservation

goals and priorities, and who is responsible for defining them in the first place.

HOW DO THE DOMINANT WESTERN PERSPECTIVES IN DEFINING FORESTS CONTRAST WITH INDIGENOUS AND LOCAL PERSPECTIVES, BASED ON YOUR FINDINGS?

Dominant Western perspectives in defining natural and near-natural forests rely solely on Western scientific knowledge, excluding local and Indigenous viewpoints, values and knowledge systems. This exclusion raises concerns about social equity and inclusion in discussions about high-interest forests. Often, this situation negatively impacts Indigenous peoples and local communities.

Dimensions of justice and equity?



A graphic from Djenontin's research that illustrates an environmental justice and equity framework that can help foster equitable resource sustainability management and navigate common pitfalls in the complexities around definitions and local perspectives.

WHAT ARE THE MOST SIGNIFICANT BARRIERS TO INCORPORATING DIVERSE PERSPECTIVES IN THE DEFINITIONS AND MANAGEMENT OF FORESTS?

The most significant barriers include a lack of sensitivity to local contexts, inadequate representation of diverse voices and inappropriate management of power dynamics within conservation efforts. These issues are often repeated in contemporary restoration interventions. Our study found that the value systems used in defining natural and near-natural forests are not inclusive of Indigenous peoples and local communities' perspectives.

HOW DO YOU ENVISION THE ROLE OF COLLABORATIVE EFFORTS BETWEEN SCIENTISTS, POLICYMAKERS AND LOCAL COMMUNITIES IN SHAPING MORE EQUITABLE FOREST CONSERVATION STRATEGIES?

Collaborative efforts between scientists, policymakers and local communities should focus on co-constructing knowledge and amplifying local and Indigenous voices while navigating power dynamics. By creatively adapting to specific contexts and utilizing available tools and skills, researchers can better understand and consider the socio-political contexts, challenges and opportunities in conservation prioritization decisions.

BASED ON YOUR RESEARCH, WHAT STEPS CAN BE TAKEN TO ENSURE THAT FOREST DEFINITIONS MORE INCLUSIVELY REFLECT THE VALUES AND NEEDS OF FOREST-PROXIMATE COMMUNITIES?

There is need to foster common understandings of the terms used when referring to such forest types among conservation researchers and decision makers, while encouraging reflection on the inclusiveness of their underlying perspectives as these definitions get used

to inform decision and policy making for conservation models and practices. Concrete steps could include: Fostering inclusive definitions of terms among all relevant stakeholders, adopting interdisciplinary approaches for future conservation and restoration research, incorporating social science perspectives and embracing value-based definitions, and implementing effective dialogue between relevant stakeholders as key for achieving equity in conservation.

WHAT IS YOUR HOPE FOR THE FUTURE OF FOREST CONSERVATION, CONSIDERING THE COMPLEXITIES AROUND DEFINITIONS AND LOCAL PERSPECTIVES?

My hope is that forest conservation will effectively engage with environmental justice and equity frameworks to navigate common pitfalls. Governance studies could offer insights and solutions to foster equitable resource sustainability management.



Turning Research into Action: Ortiz Paves Way for Youth Climate Engagement

His research focuses on how youth engage in climate activism within their communities and how their actions contribute to the U.N. Sustainable Development Goals, such as climate action, affordable clean energy, and peace and justice work.

“It’s long been recognized that young people are one of the communities most impacted by climate change and climate injustice,” Ortiz

said. “I believe that the kind of world we are leaving for future generations is not going to be a good one if climate action is not taken and not prioritized, and those concerns inspire my research.”

Ortiz employs qualitative methodologies and storytelling techniques to understand and describe the experiences of young individuals most affected by global issues. While youth movements have attained a larger presence in both policy spaces and the media, such as the Fridays for Future school strikes, certain voices are overlooked in the discourse, according to Ortiz.

“I think there are still a lot of voices being left out of that conversation, specifically voices from young people from regions in Global South countries that are experiencing climate impacts right now,” Ortiz said. “It’s not so much an issue for the future for these communities as it is a question for today on how to deal with day-to-day realities. It’s

important in my work to broaden the climate conversation to draw those different impacts into focus.”

Another initiative involves collaborating with leaders from the Arab Youth Climate Movement Qatar and other experienced youth researchers. They are exploring how young people from the Middle East and North Africa are engaged in the United Nations climate policy process.

Over the years, Ortiz has interviewed more than sixty youth advocates from thirty different countries, but he said one participant’s story most closely summarized his research.

“I was talking to a young person in Ghana who had worked with a lot of young people for many years but had never received much funding or media attention,” Ortiz said. “He would watch the school strikes demanding action for the climate crisis and saw certain people getting major media attention.

“That contrast between working on the issue and experiencing the impacts, versus talking about the future impacts of climate change, was striking. It summarized a lot of what I found in my research. There is a lot of inequity not only in the impact of climate change but also in terms of who’s getting attention, and that really stuck with me.”

Ortiz is involved with numerous youth and intergenerational climate justice organizations and has served as an expert panelist and consultant for international organizations

Mark Ortiz, a former Presidential Postdoctoral Scholar and now an assistant professor in Penn State’s Department of Geography, is investigating how to amplify the voices of young people around the world in the areas of climate change and sustainable development.

One of his initiatives is the Global Youth Storytelling and Research Lab (GYSRL). Launched in 2023 with the support of the United Nations Foundation and Penn State’s Institute of Energy and the Environment, GYSRL is a collaborative storytelling and research ecosystem building bridges between youth-centered academic research, multimedia storytelling, and policy work.

“Our emphasis is on translational and transformational work that elevates and amplifies the perspectives, stories, and lived experiences of young people in the most impacted communities and regions,” said Ortiz, who founded and directs the lab.

focused on youth empowerment, such as IDEO and the U.N. Foundation. He has also been a delegate to U.N. climate change and sustainable development meetings around the world.

“What I’ve been really impressed by with the youth movement and the young folks that I’ve worked with is that there’s a real spirit of building community across traditional boundaries—boundaries that they’ve kind of inherited from older decision-makers or adults—and really trying to build new alliances and solidarities, which I think is really important,” Ortiz said.

Ortiz was elected as an Emerging Leaders for Climate Action Fellow by Globally, a nonprofit organization dedicated to cultivating communities of emerging leaders who are committed to addressing the most pressing global challenges of our time. He is also part of the inaugural cohort of the American

Association of Geographers’ Elevate the Discipline program, designed to provide training opportunities and resources to help geographers connect their work to public and policy arenas.

Ortiz said there are many avenues at Penn State for students to get involved.

“One thing I’d advocate for is getting involved in community networks and organizations,” Ortiz said. “If you’re a student at Penn State, there are a variety of different organizations that are student-led and contributing to campus-wide sustainability.

“I would also recommend getting involved with Penn State researchers doing cutting-edge work on climate justice and climate impacts. I think it’s important for young people coming of age today to really be aware of the environmental dimensions of everything we do. As geographers, I think we’ve always kind of thought about the

environment and humanity as intersecting. I think being aware of the environmental climate dimensions that will define a lot of young people’s life opportunities is important.”

Ortiz earned a bachelor of arts degree in interdisciplinary and religious studies from the University of Alabama in 2015. He earned a master’s degree in 2017 and a doctoral degree in 2022, both from the University of North Carolina at Chapel Hill.

Ortiz was appointed assistant professor of geography, effective July 1, 2024. He is also a co-funded faculty member of Penn State’s Social Science Research Institute and an affiliate member of Penn State’s Institute of Energy and the Environment. He served as a Presidential Postdoctoral Fellow from July 2022 to June 30, 2024.



Mark Ortiz spoke on a panel session at the United Nations COP28 Climate Negotiations in Dubai, UAE in December 2023.

EMILY SHIELS

WASHINGTON D.C. INTERNSHIP BRIDGES POLICY & STUDY FOR GEOGRAPHY MAJOR

Alumna **Emily Shiels**, who double-majored in geography and global and international studies, completed a ten-week internship last summer in Washington, D.C., with the U.S. Global Leadership Coalition (USGLC), a nonprofit organization focused on strengthening diplomacy, development, and defense.

As part of the Government Relations team, Shiels was responsible for monitoring congressional actions and attitudes on international affairs. She said the experience equipped her with insights into legislative processes and international policy.

“I monitored statements from members of Congress, tracked relevant legislation, and took notes on hearings and congressional testimonies related to our issue sets,” Shiels said. “If anyone suggested cutting funding to critical areas, it was up to us to flag this for senior staff action.”

Her tasks extended to creating summaries for a weekly newsletter and writing a blog post about former State Department officials now serving in Congress, highlighting the complex relationship between legislative actions and international policy outcomes.

Shiels’ interest in international affairs drove her decision to participate in the USGLC internship.

“I was applying to every internship available in Washington, D.C., but specifically sought out opportunities that aligned with my interest in international affairs,” Shiels said. “USGLC provided a perfect blend of advocacy, policy, and hands-on experience.”

Shiels said the internship was a

strategic step toward her career aspirations in foreign policy and national security. She emphasized the relevance of majoring in geography and the skills developed through her academic work at Penn State, especially in research, were directly applicable to her internship tasks, enabling her to navigate legislative complexities effectively.

“Geography is interdisciplinary, allowing you to apply it to various fields,” Shiels said. “It’s particularly useful in international affairs, especially for understanding migration and power dynamics. When you think about international studies, you also have to think about how space influences everything. These are fundamentally geographical issues.”

In addition to her academic and professional pursuits, Shiels has shown considerable leadership within the College of Earth and Mineral Sciences community. As president of the EMS Student Council, she played an integral role in diversity and inclusion initiatives through the EMS ALLWE committee. She also served as a lead mentor in the Total Engagement with EMS (TEEMS) program and participated as an EMS Ambassador.

Her contributions were recognized with the Jay M. and Katherine DeFinis Award for Outstanding Student Leadership and the Ellen Steidle Achievement Award for her service to the College of Earth and Mineral Sciences.

Having recently graduated, Shiels reflects on the skills and connections she gained from her internship, which have already influenced her early professional endeavors. She looks forward to applying her experience and education in international affairs as she continues her career, starting with her upcoming studies at Johns Hopkins School of Advanced International Studies (SAIS) this fall.



JAMES SCHAFER

UNDERGRAD EXPLORES FOOD SUSTAINABILITY AT TAPROOT KITCHEN



Undergraduate student **James Schafer** is applying his geography education to address local issues, particularly around food sustainability and social empowerment, through volunteering at Taproot Kitchen.

Taproot Kitchen, founded by Schafer's mother, Sharon, and Anne Rohan, is a community-based volunteer organization in State College, Pennsylvania that uses fresh produce from local farms to provide culinary and gardening experiences to adults with autism and intellectual disabilities. Taproot Kitchen has evolved from offering cooking classes to becoming a catering company that provides food for local events.

Inspired by his mother's involvement and his brother's experience with autism, he delved into the challenges and benefits of local food initiatives.

"Having a brother with autism, you understand the value of being a part of the community," Schafer said. "My brother loves working with food, but for the longest time, he was only able to work dishwasher jobs. There's a desire to be involved. I found it not only refreshing and fun, but also meaningful, to interact with people and help them learn skills specific to working in a kitchen or garden."

As a volunteer with AmeriCorps during the summer of 2023, Schafer landed at Taproot, which provided him

with insights into community-based organizations, sustainable practices, and the intersection of geography and local food dynamics. He continues to volunteer with Taproot now.

Schafer's role at Taproot Kitchen involved managing their community garden, organizing volunteers, and helping with various catering events.

"It really got me thinking about local foods, the benefits of local food, and also the challenges of local food," Schafer said. "It made me ask how do you foster a strong community around local food, which I think is a pretty important question related to geography."

This experience made Schafer want to expand his knowledge in this area, he said.

"I'm thinking about pursuing an environment and society certificate offered by Penn State's Department of Geography," Schafer said. "The certificate focuses on how people interact with ecosystems or with the environment in terms of producing food."

Schafer's goals for the future involve leveraging his geography degree in the public sector, like in local government, state government, or nonprofits. He said that his experience at Taproot helped shape his career aspirations.

Above photo: Schafer at the Mazza Community Garden.

Research dedicated to finding ‘grounds for hope’ honored with academy membership

Decades before embarking on a career that continues to take him to some of the most biodiverse places in the world, **Karl Zimmerer** first encountered global food geographies in his grandparents’ backyard in Elizabeth, New Jersey. There, his grandparents, from the hill country of the Ukraine-Poland border who fled persecution, grew and ate the fruits of the diverse cherry trees, cabbages, wheat varieties, sunflowers, and herbs that they brought from the old country.

“I grew up in a pretty diverse setting and had immigrant grandparents with food traditions outside the mainstream conventional ones in the United States,” said Zimmerer, professor of geography and member of the ecology and rural sociology programs at Penn State. “I also had a parent with Type 2 diabetes, so we were careful about food choices and quality. It made me aware of food connections not just to geography but to health and well-being.”

The American Academy of Arts and Sciences honored Zimmerer, who has dedicated four decades and made numerous contributions to environment-society geography, biodiversity, land use, and food security—including seven books and more than 100 articles in journals like *Nature* and the *Proceedings of the National Academy of Sciences*—by electing him to the 2024 member cohort.

The honor lauds an ongoing career committed to finding what Zimmerer calls “grounds for hope” in the food systems and land use of places and societies undergoing major changes.



Zimmerer presents at the Department’s Coffee Hour on Sept. 6, 2024.

Real places, real people, real food

Zimmerer took the lessons from his family to Antioch College, Ohio, where he studied biology and physics. Undergraduate work-study internships across the country in places such as Kansas, Montana, and Tennessee started Zimmerer’s focus on environment-society interactions. He then went to graduate school at the University of California, Berkeley. He joined geographers working with environmental scientists and food specialists on global problems in the nascent field of food geographies. Graduate study and field experiences further honed his interest in how the interactions of human impacts and the capacities of nature are central to the past, present, and future of food biodiversity and sustainability.

“I had a lot of experiences working in real places with real people, real food, real landscapes, and really dynamic changes,” said Zimmerer. “I thought, ‘Wow, environment-society research is such a rich and important area to work in.’”

While Zimmerer’s research on food geographies has taken him to Vietnam, Nepal, India, China, Rwanda, and Mediterranean countries, he has spent much of his career in the Peruvian and Bolivian Andes, returning to Peru three times in 2023 alone.

Located in the tropics but having several climates due to its geography, Peru is a biodiversity hotspot, boasting more than 4,000 kinds of potatoes and similarly extraordinary diversity in other food plants. Home gardens and small fields in the Peruvian Andes—measuring less than a quarter-acre—contain, on average, 146 different crop species, such as maize, beans, squash, chiles, cereals such as quinoa, root vegetables, and herbs, according to research conducted by Zimmerer and colleagues in 2022.

The area also sits at the forefront of a rapidly changing climate, which will impact those crops and the people who depend on them. Zimmerer said his work suggests there are grounds for hope—for biodiversity and for communities—even in the face of complex, rapid changes.

“My research is about understanding this dynamic current situation and seeing how it came out of the changes of the historical past,” Zimmerer said. “How does history help us to understand the current day? And then

we project into the future to understand what the findings mean for these environments and communities five, ten, fifteen, twenty, fifty years down the road.”

He first visited the Peruvian Andes in the 1980s while researching his master’s thesis on a legume known as the popping bean. Unlike other beans that people usually boil, the popping bean is toasted or popped like popcorn, Zimmerer explained. He focused on how small-scale farmers and the Indigenous Quechua people produced, used, and consumed it, and how the bean contributed to sustainability.

“We quickly realized that these were probably some of the oldest lineages of beans in the world, because they were what people would have cooked before they had ceramics and pots to boil water,” he said, explaining that bean domestication started at least 3,000 years before ceramics were invented. “So, for a few thousand years, how are people cooking this stuff? They likely heated stone and had popping beans cooking on them. This is how the early ancestors of the Inca, one of the world’s great civilizations, would have survived.”

When the U.S. National Academy of Sciences ran a conference on “The Lost Crops of the Inca” a few years later, Zimmerer led the popping bean chapter. Credited with “discovering” the bean, though he disputes that description, Zimmerer said his first experience in the Andes—working with several highly knowledgeable communities and well-informed local scientists—showed him the importance of understanding the popping bean and, later, other foods as currently and historically crucial to people, landscapes, and knowledge systems surviving times of intense change.

Versatility as grounds for hope

The Shining Path insurgency broke out in Peru, where Zimmerer was living and working, in the 1980s and spread to much of the countryside. At the time, people in the countryside grew 80% to 90% of the food they ate, said Zimmerer. How did they manage that during war?

“When I started my work, the scientific understanding was that food biodiversity existed in micro-niches,” Zimmerer said, explaining that a single crop in a highly specific environment was thought of as limited to that area.

Zimmerer found that much food biodiversity existed not in stable, specialized micro-niches but in their versatile adaptive capacities to “non-equilibrium systems.” For instance, during the war, people took the crops they liked and valued and grew them closer to home, which he terms close-to-home cultivation, instead of farther away in the fields, where they risked getting caught in the fighting.

“I found that many human-plant interaction systems have a lot of versatility associated with them,” he said. “Even before the war, there were other kinds of intense changes, such as historic climate changes, and versatility gave these systems the capacity to adapt to intense change.” This versatility

was and is currently reinforced by the seed systems of small-scale land users and Indigenous people, which Zimmerer has studied extensively, since they occasionally rely on seeds from different micro-environments. Culture is a further source of specific positive links to this versatility, a research insight that Zimmerer has developed in scientific journals as well as ones as wide-ranging as the Proceedings of the Modern Language Association and *Allpanchis* (“Our Earth”), an Andes-based journal.

The Green Revolution in the 1990s and early 2000s provided another opportunity for Zimmerer to carefully investigate the precepts of conventional wisdom of the field. At the time, he explained, introducing irrigation projects in developing nations was predicted to homogenize crop production and “wipe out” biodiversity. Zimmerer’s research, published in *Nature*, found that an extensive irrigation system had existed in the Andes as early as 3,500 years ago.

“As irrigation influenced these food systems, people were changing what they grew, but it was often changes with adaptation in the community-based irrigation that was becoming more common,” he said. “Community irrigation projects shifted crop types but didn’t decrease diversity. It’s a very important outcome because it suggests that irrigation for climate change adaptation, if done the right way at the right scale, doesn’t necessarily destroy food biodiversity.”

Addressing global change

The honor from the American Academy of Arts and Sciences is the latest that Zimmerer has earned over his career. Others include two Fulbright fellowships, a John Simon Guggenheim Fellowship, and fellow status for the American Association for the Advancement of Science. And he’s not done.

Zimmerer is currently working on several interdisciplinary research projects with collaborators at Penn State and in communities, universities, and civil-society groups around the world. One project assesses how people in Colombia and Peru used biodiversity to navigate the COVID-19 pandemic. Another project with Ramzi Tubbeh, who earned his doctorate under Zimmerer’s mentorship, examines 600 years of people sharing resources in ways impacting food biodiversity in Andean communities from Inca times to the present. A third project analyzes 10,000 recipes to see how people adapt their cooking to climate change impacts.

“As an environment-society researcher, I’m really obsessed with how to address the biodiversity and sustainability of food systems amid the global change drivers of climate change and urbanization and associated effects such as migration,” he said. “My family influences also intersect with framing these food and biodiversity issues in the large-scale dynamics of global change. We’re talking about the most important challenges facing sustainability and society. They are right in front of us.”

Three Decades of Dedication: Todd Bacastow Celebrates Retirement



Retirement marks a new chapter in the career of **Todd Bacastow**, a current Penn State Academy Professor and an emeritus teaching professor of geospatial intelligence in Penn State's Department of Geography and the John A. Dutton Institute for Teaching and Learning Excellence. Bacastow's career has been characterized by a blend of military service and academic pursuits while always looking for the next advancement in geospatial technology.

Bacastow's academic path began at the United States Military Academy, where he graduated from West Point in 1974 with a bachelor's degree in engineering. As a cadet in the early 1970s, his interest in geography and environmental issues emerged during a student project focused on evaluating a proposed landfill's environmental impact, setting the stage for his future academic endeavors.

"When I was a cadet, I did a project for West Point's Department of Earth, Space, and Graphic Sciences," Bacastow said. "They liked it so much that in my seventh or eighth year in the Army, when I was a captain, they asked if I would go to graduate school and come back to teach at West Point."

Bacastow's twenty-year military career took him to various infantry, geospatial engineering, and academic

assignments. His first military assignment was in Berlin, Germany, which at the time was referred to by *The New York Times* as the Cold War's "Frontier of Freedom." When it came time to choose a graduate school to prepare to teach at West Point, Bacastow visited University Park and said he was most impressed by Penn State. He said the welcoming environment and strong academic program convinced him to pursue his master's degree at Penn State. After earning his master's degree in 1983, Bacastow returned to West Point as an instructor in the Department of Geography and Computer Science (D/G&CS) to teach physical geography. He describes it as "the perfect blend of what, at the time, many saw as two seemingly unrelated disciplines."

While in D/G&CS, he was the lead geographer in a computer science "skunkworks" team that developed and trained the first GIS delivered to field elements of the U.S. Army. Departing West Point in 1986, he was reassigned as a geospatial engineer in the U.S. Army Europe, responsible for delivering geographic services over a 20,000-square-mile area to 200,000 individuals. His personal mission was, in some small way, to move the organization into the digital age.

In 1988, he was asked if he wanted to return to West Point to teach in the newly established Department of Geography and Environmental Engineering. Bacastow's interest in GIS led him back to Penn State to pursue a Ph.D. in geography, which he completed in 1992. During this time, he worked closely with mentors Peter Gould, an Evan Pugh Professor Emeritus of Geography who died in 2020, and Donna Peuquet, professor emerita who retired in 2017.

Bacastow retired from the Army and joined Penn State's faculty in 1994 as a non-tenure-line faculty member in the Department of Geography. What Bacastow said was initially intended to be a "two-year gig" evolved into a 29-year professional adventure marked by achievements in teaching, research, and service. From 2000 to 2007, Bacastow served as the assistant director of the Earth and Environmental Systems Institute. He was a co-principal investigator for a \$24-million project to collect orthophotography and LiDAR data for Pennsylvania and a principal investigator for a \$10-million program using geospatial technologies for environmental management of military training lands. Returning to a primarily teaching role in the Department of Geography, he played a role in establishing the online GIS Certificate, Graduate Certificate in Geospatial Intelligence, Penn State's Master of GIS, and Master of Professional Studies in Homeland

Security programs. Over the years, he also taught courses for Penn State's College of Information Sciences and Technology and the Smeal College of Business Executive Program.

"I probably taught more than ten different courses at Penn State and thousands of students over the twenty-nine years of my Penn State career," Bacastow said. "Teaching and mentoring students has always been

impact geospatial technologies and analyst education. He recently co-authored a Penn State course titled Analytical Methods and GeoAI in Geospatial Intelligence. He is also supporting Europe's Defence Geospatial Intelligence conference by preparing thought-provoking pieces about geospatial intelligence education, space situational awareness, geospatial data fusion, and an emerging "New GEOINT."

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“ Todd Bacastow

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Throughout his career at Penn State, Bacastow has conducted research in geospatial technology governance, systems design, and geospatial education. He has collaborated with numerous businesses, government agencies, and academic consortia. Bacastow led a decade-long Cooperative Research and Development Agreement with the National Geospatial-Intelligence Agency, focusing on improving the education of geospatial analysts. He also worked with Penn State's Applied Research Laboratory. Additionally, he served on the Board of Directors for the United States Geospatial Intelligence Foundation (USGIF) and provided expert witness services in GIS patent infringement cases, including one upheld by the Supreme Court of the United States.

Bacastow takes great pride in being one of the driving forces behind Penn State being recognized as a leading example of how higher education can address the needs of the nation's armed forces, veterans, and their families.

Reflecting on what has kept him returning to Penn State for two degrees and after his military retirement, Bacastow said, "The people keep me coming back. It's the people that make Penn State such a special place. My son went to Penn State, and I believe in the product."

In retirement from Penn State, Bacastow continues to contribute to Penn State and the discipline. He is involved with the Emeritus Academy and research into the Russia-Ukraine War, focusing on the lessons being learned that

Bacastow plans to spend more time on personal interests, such as golf. "My wife retired and said she was going to start playing golf. She asked, 'Do you want to play with me?' I said, 'I'll give it a try.' And now I'm sort of hooked on it, and we play several times a week. Performing a 'terrain analysis' of the Blue Course is now one of my favorite things to do on campus."



Todd Bacastow in Tokyo with former Penn State student of his, USAF Colonel Andrew Campbell.

Taylor's research legacy shines light on California wildfires, forest ecology

All great researchers can point to a time when a key moment shaped their now-defined career. Although, for most, it likely doesn't remain as vivid as it does for **Alan Taylor**.

The recently retired and now professor emeritus of geography at Penn State recounts the moments his career focus shifted to the West Coast landscape and fire ecology.

It dates back to the early 1990s, when he was conducting research to help protect the Virunga Mountains habitat of Rwanda and the Congo's mountain gorilla population—then around 600 but now around 1,000. It was there that he received word a civil war was breaking out and armed militias would soon be heading through one of the national parks, en route to Rwanda's capital, Kigali.

Taylor was hunkered down in a Kigali stairwell for the night, awaiting evacuation, when he made the decision to shift his research focus to more stable lands.

"It was absolutely scary. It was terrifying," Taylor said. "I had my wife and my two-year-old daughter with me as we sat in a stairwell with the house guard as tracer fire went on all around us. I thought, 'Oh my god, what have I done here?' I had no idea it was going to erupt like that. We all got out safely, but it certainly was sobering."

Taylor found his start working with the mountain gorilla because it shared a common food source with China's giant panda: bamboo.

While a graduate student at the University of Colorado, he took a leave to join the first international conservation effort in China. During the mid-1980s, China was experiencing a panda die-off, partially due to a natural process that happens about once every 50 years, when bamboo crops flower and then die back.

At the time, pandas began fleeing mountains in search of food, and when they started turning up malnourished in neighborhoods, that got the government's attention. China invited the World Wildlife Fund to help form a preservation solution, and Taylor worked on understanding the then-endangered species' lone food source, bamboo.

As with the mountain gorilla, the efforts worked, and the population has rebounded. "My work focused on how human activity in the form of logging and other kinds of disturbances to the forest influenced bamboo growth, which is the only plant pandas eat," Taylor said. "And if you want to figure out how to conserve the animal, you have to understand their food source."

Again, Taylor's research allowed him to experience a unique moment in time and a culture then insulated from the outside world. He lived in a closed society and experienced the opening of China's borders.

Those research efforts continued when he joined Penn State in 1990. Taylor followed up on that initial bamboo research in

China, shaping the science of modern ecology along the way.

"We were able to understand what happens to these bamboo forests over time after the flowering events and how different logging practices influence that recovery process," Taylor said. "That research established some fundamental scientific principles on forestry practices in bamboo forests that are still being used today."

Taylor grew up in the San Francisco Bay area and was fascinated with forests. His family frequented remote areas, and he said he found a love for geography even before he knew what it was.



Alan Taylor spent decades researching West Coast landscape and fire ecology. He used ecological signals and human history to paint a picture of how forests have changed over time.

That love—and his interest in fieldwork—took him to Cal State Hayward, now Cal State East Bay, for his undergraduate studies and then to graduate school at Oregon State University and the University of Colorado, which he chose because the faculty there had the same interests in ecology and biogeography. His research focused on how natural and human disturbances affect ecosystems and how that shapes their future condition.

Today, his research addresses the unprecedented severity of fires in dry forests in the western United States, which his research says is the result of fire suppression, climate change, and other factors such as forest management. To accomplish this, he studies changes in forests over hundreds of years, factoring in the human footprint.

“It’s what you might call reading the landscape,” Taylor said. “We’re running the video back and forth, understanding how it’s changed.”

Today’s forests leave a lot of clues.

For example, using data from tree rings, pollen, and charcoal, researchers paint a picture of what California forests looked like in the 1500s, back when Native Americans used controlled burns to improve yields of plants for food, basketry, and game. These fires kept forests open with little fuel, such as grasses and shrubs, in the forest understory. Forest fires increased in extent in the 1800s, when disease brought by the Spanish decimated the Native American population, reducing Indigenous fire use and increasing fuels.

The forests tell of the gold rush in 1849, when large flocks of sheep and other livestock were introduced and grazed in the forest to provide food for the mass of settlers who came to California. Livestock consumed grasses and shrubs on the forest floor, which reduced fuel, and the extent and severity of fires.

Later came the U.S. government’s successful fire suppression policy. The lack of fire dramatically increased forest density and fuel on the forest floor. More fuels and hotter temperatures due to climate change that dry fuels, Taylor said, led to the massive wildfires we’re seeing today.

“These three things combined create a situation where you now get very severe wildfires that can shift ecosystem types from forest to grassland or shrublands, producing environmental conditions that are unrepresentative in environmental records in the last millennia, at least in California,” Taylor said.

Taylor’s work, which includes the human component when studying the Earth system, is a common approach in the Department of Geography and in the College of Earth and Mineral Sciences, where the department is housed. But it wasn’t always that way.

He was among the first wave of faculty hires of environmental geographers.

“I worked with people to try to help build that part of the department over the decades,” Taylor said. “And we were successful, through developing collaborations with key people to demonstrate the broader needs at the University level.”

Taylor’s Earth system approach to research made him the logical choice to lead the Penn State Earth and Environmental Systems Institute (EESI) when longtime director Susan Brantley stepped down in 2021. He served as interim director from July 2021 to December 2022, and in that time produced a feature-length documentary focusing on the birth of interdisciplinary research on the Earth as a system at Penn State’s Earth System Science Center, which was later renamed EESI.

Taylor officially retired in December 2023 and has been enjoying free time traveling, visiting family, and competitively trail riding horses with his wife, Kristin. He’s also finding more time to play his guitar and go camping.

He’s also tying up some loose research ends. He has more than 30 years of work on California wildfires, and it’s a chance for him to paint a larger and more accurate picture of how the state’s wildfires are changing. The research will shine a light on the possibility of more severe fires to come and also help provide solutions to the acute wildfire threat.

One of the things he enjoyed about teaching is that you never really retire; there’s always a new generation of students, armed with your findings and a fresh approach to move research forward. In retirement, he might literally get to ride his horse off into the sunset, but he’s leaving decades worth of research in the capable hands of his former undergraduate and graduate students.

“One of the things I enjoyed most is working with students in the field; I had the pleasure of taking more than 150 Penn State students on field campaigns,” Taylor said. “Working with students in a research setting is where the action is. It’s something Penn State can provide across the University, and we as faculty can really have an impact by embracing those opportunities.”

“My work focused on how human activity in the form of logging and other kinds of disturbances to the forest influenced bamboo growth, which is the only plant pandas eat. If you want to figure out how to conserve the animal, you have to understand their food source.”

 **Alan Taylor**

Doctoral student receives NSF Graduate Research Fellowship

Doctoral student **Lily Houtman** has been selected as a 2024 U.S. National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) awardee.

The GRFP “recognizes and supports outstanding graduate students who are pursuing research-based master’s and doctoral degrees in science, technology, engineering, and mathematics (STEM) at accredited United States institutions,” according to the NSF GRFP website. The fellowship includes three years of a living stipend and a cost-of-education allowance.

“I’m so excited that Lily’s hard work and creativity have been recognized by this NSF award,” said **Anthony Robinson**, associate professor of geography at Penn State and Houtman’s adviser. “Lily’s dissertation work will help us understand how people read and consume maps on their phones in the context of news media. We know very little about what works best to design thematic maps that tell stories on mobile interfaces, and this fellowship will ensure that Lily’s research has the opportunity to reach its maximum potential.”

Houtman’s research focuses on cartography with an emphasis on data journalism. As news consumption shifts toward mobile platforms, Houtman explores the design of interactive mobile maps for news

stories, gathering both qualitative and quantitative feedback from users to enhance their effectiveness and engagement.

“I’m interested in thematic maps, which include data like COVID statistics and election results, rather than just navigational maps,” Houtman said. “My master’s research involved interviews with news cartographers, and for my doctorate, I plan to conduct observational studies in newsrooms and usability studies with everyday users. This fellowship will allow me to expand this research and provide guidelines for better map design in data journalism.”

In addition to their research, Houtman plans to contribute to the geography community by revitalizing the Supporting Women in Geography club and organizing academic poster design workshops for students.

Looking ahead, Houtman aspires to become a professor and lead a cartography lab at a research university.

“My long-term goal is to be an academic, managing a cartography lab and teaching and conducting research,” Houtman said. “I love the intersection of art and science in cartography and look forward to continuing this work.”

Houtman emphasized that the application for this award was not a solo effort.

“I could not have written this proposal without support from my fellow graduate students—my officemates in particular—and my adviser, Anthony. I also want to highlight that the college hosted multiple writing workshops with former winners of the GRFP to help those of us who were applying, and they were very helpful,” they said.

Houtman graduated with their master of science degree from Penn State in May and will continue in the doctoral program in the Department of Geography. Before attending Penn State, Houtman earned a bachelor of science in cartography and geographic information systems from the University of Wisconsin–Madison.



Lily Houtman prints a poster in the GeoGraphics Lab in the Walker Building.

Bahrami secures NASA FINESST grant for ice sheet meltwater research



Mahsa Bahrami at Root Glacier in Alaska.

Doctoral student **Mahsa Bahrami** has been awarded a NASA Future Investigators in NASA Earth and Space Science and Technology (FINESST) grant to fund her research on meltwater lakes at the surface of the Antarctic ice sheet. The award, totaling \$150,000, will support Bahrami's research over the next three years, starting in January 2025.

Of the 434 proposals submitted to NASA's Earth Science Division, only 57 were selected for funding. Bahrami's proposal, titled "DeepLakes: Observing and Predicting Antarctic Supraglacial Lakes Through Deep Learning Architectures," aims to improve understanding of how these lakes influence ice sheet dynamics and contribute to global sea level rise.

"I cannot express the feelings I had when I learned my proposal was selected," Bahrami said. "It was a mix of joy, excitement, appreciation, and gratitude, along with a sense of relief and motivation. This award will support my research by covering my stipend, tuition fees, and travel to attend conferences and workshops. Access to NASA's high-end computing resources will be important for processing the large satellite datasets and running deep learning models necessary for my project."

Supraglacial lakes form from melting snow and ice at the surface of ice sheets and glaciers. Ice shelves, which

hold back Antarctica's ice, are known to be impacted by melting at their surfaces, Bahrami said. Her research will use advanced computational approaches and extensive satellite datasets to create a comprehensive record of supraglacial lakes in Antarctica.

"The Antarctic ice sheet is incredibly important when it comes to understanding global sea levels," Bahrami said. "If the entire ice sheet were to melt, it would raise global sea levels by 57 meters, yet it represents the most significant uncertainty in projections of future sea levels. Contributing a great deal to this uncertainty is the stability of ice shelves. When meltwater from supraglacial lakes and streams enters existing cracks on ice shelves, it can deepen these fractures, potentially leading to the ice shelf's breakup. My project seeks to address this uncertainty by improving our understanding of supraglacial lakes over the recent past and future."

Luke Trusel, assistant professor of geography and Bahrami's adviser, expressed his pride in her achievement.

"I'm so incredibly happy for Mahsa," Trusel said. "Mahsa's research will provide critical insights into one of the most pressing challenges of our time—how Antarctica will respond to a warming climate—and this award is a deserved recognition of her potential to drive future innovations in cryospheric science. She's an incredibly talented and motivated researcher, and I'm thrilled to be working with her on this project over the next few years."

Bahrami credited her success to the support she has received from Trusel and the Penn State Department of Geography.

"I am very lucky to have the opportunity to work with Dr. Trusel," she said. "His inspiring work and constant encouragement have motivated me greatly, and receiving the NASA FINESST award would not have been possible without his support and guidance. Additionally, the department's support has significantly contributed to my professional and academic growth by funding my travels to the annual American Geophysical Union Fall Meeting as well as to the International Summer School in Glaciology."

Looking ahead, Bahrami said she aspires to join a NASA research laboratory and continue cryospheric science, focusing on ice sheet surface hydrology. Understanding how the Antarctic ice sheet will respond to rising global temperatures is a critical challenge, given its central role in regulating global sea level change, she said.

"My long-term goal is to be part of NASA's efforts in this critical area of research," Bahrami said.

Walker Building Renovation Project



The Department of Geography began a major renovation to the second and third floors of the Walker Building this year. This phase included installing double doors for the main office and graduate student lounge. A key feature of the renovation is the redesign of the flooring, intended to engage both visitors and the department community while highlighting the connection between the region's geography and the department's work.

The floors were designed by professor **Cindy Brewer** and alumnus **Nate Cherok** to represent social and physical features of the region. The second floor depicts towns and cities (dark blue), rivers (light blue) and pathways representing human movement (light green). The third floor represents Mount Nittany (light green), rivers (light blue), and trails and ridgelines (orange) that have been vital corridors connecting the region. Both floors are representations that are accurately based on maps of the region. They will serve as baselines for future maps created by members of our community that will be overlaid and depicted in an interactive QR interface. This will allow for many stories of the region's history and contemporary patterns to show visitors to the department the importance of geography in shaping social and ecological systems.



Community Updates

Awards and Achievements

Louisa Holmes was promoted to associate professor with tenure.

Anthony Robinson was promoted to professor with tenure.

Mark Ortiz was hired as an assistant professor after serving as a Presidential Postdoctoral Scholar.

Michelle Zeiders was promoted to associate teaching professor.

Adrienne Goldsberry was promoted to associate teaching professor.

Guido Cervone was named interim director for the Institute for Computational Data Sciences.

Cindy Brewer was named associate dean for faculty affairs in the Penn State College of Information Sciences and Technology (IST).

Ryan Baxter earned a Ph.D. in Geography.

Manzhu Yu was named the E. Willard and Ruby S. Miller Faculty Fellow by the College of Earth and Mineral Sciences at Penn State.

Guido Cervone was appointed an American Geophysical Union Local Science Partner. He was also named a faculty affiliate at the Scuola Superiore Sant'Anna in Pisa, Italy.

Alan Taylor received the James J. Parsons Distinguished Career Award.

Karl Zimmerer received the Preston E. James Eminent Latin Americanist Career Award

Graduate students **Sophie Leilei** received a fellowship award from NASA Pa. space grant consortium.

Undergraduate student **Camilla Baumer** received an Erickson Discovery Grant.

Alumna ('15, '20g) **Courtney Jackson** was appointed to the Graduates of Earth and Mineral Sciences (GEMS) board of directors.

Support Geography

The Department of Geography at Penn State aims to inspire the highest levels of geographic teaching, learning, and mentoring while engaging in the scholarly pursuit of geographic knowledge, and to apply this knowledge toward understanding the ever-changing interplay of human societies and physical environments. To help support our mission, please consider donating to the department.



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This publication is available in alternative media on request.

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Undergraduates Michael Cattell, Clare Gibson, Raven Henager, and Mara Grigore receive Coffee Hour mugs after their Undergraduate Research Opportunity Connections (UROC) presentations