KC
Cushman

Liane B. Russell Fellow

Where and when did you earn your PhD?

I earned my PhD in 2020 from Brown University's Department of Ecology and Evolutionary Biology and the Institute at Brown for Environment and Society.

What was the subject of your dissertation?

My dissertation, titled "Predicting Carbon Dynamics in Forests Using Remote Measurements of Canopy Structure," explored the use of novel remote-sensing tools for measuring 3D structure and carbon dynamics in forests.

What was your dissertation's major contribution to your field?

My dissertation demonstrated the value of drone technology for complementing traditional field- and satellite-based measurements of forests. Using drones for targeted, landscape-scale data collection allowed me to demonstrate that optical satellite data may underestimate tropical forest disturbance frequency and to explore how new estimates of forest biomass from spaceborne light detection and ranging (LiDAR) can be made robust to seasonal patterns of leaf production.

Who is your ORNL mentor and which group and division are you working in?

My mentor is Anthony Walker, Ecosystem Processes group leader in the Environmental Sciences Division. I also work in the Ecosystem Processes Group.

What will your fellowship research focus on?

My fellowship research will focus on better understanding forest disturbance dynamics in the Southeastern United States, which has high carbon sequestration potential in natural systems, but also experiences multiple, interactive disturbance types that influence carbon dynamics. My project will use multiple cutting-edge remote-sensing platforms— including terrestrial, airborne, and satellite light detection and ranging (LiDAR) as well as satellite synthetic aperture radar (SAR)—to provide a mechanistic understanding of disturbance recovery across spatial scales in the Southeast.

What is your project's expected contribution to your field?

Our society depends on natural systems for climate regulation, energy resources, and infrastructure. Critically, ecosystems face increasing pressure from disturbances caused by direct human activity and indirect consequences of climate change. Results from this project will allow scientists to better monitor, understand, and predict the effects of disturbances on natural systems.

What are your research interests?

I am a forest ecologist broadly interested in understanding variation in forest structure and function across space and time. My research is motivated by the importance of forests for understanding and predicting global cycles of carbon, water, and nutrients. In my work, I combine remote-sensing measurements—terrestrial, airborne, and satellite LiDAR; photogrammetry; imaging spectroscopy; SAR)—and field-based observations (i.e., forest plots) to understand how organismal mechanisms affect landscape-scale processes.

What led you to science and your specific discipline?

As a local Oak Ridger, I was fortunate to have the opportunity to participate in research activities at ORNL as a high school senior. Following that experience, I initially studied engineering in college, then became increasingly interested in understanding how our world is affected by climate change, and changed my major to biology. Remote sensing allows me to use tools from engineering and math to address critical unknowns in our understanding of global ecology.

What did you do before coming to ORNL?

After finishing my PhD, I was a postdoctoral fellow at the Smithsonian Tropical Research Institute in Panama, where I used drones to study how topography and soils influence patterns of tree mortality and damage in tropical forests in connection with DOE's Next Generation Ecosystem Experiment-Tropics project. After that, I was a postdoctoral fellow at NASA's Jet Propulsion Laboratory, where I worked with the Science Team for the upcoming NASA-ISRO Synthetic Aperture Radar (NISAR) mission to support calibration/validation of the NISAR biomass algorithm.

Could you share an interesting fact or two about yourself?

In my free time, I like to run or hike outside, play with my cat Arden, read, and watch reality TV.

What nonscience topic or activity is important to you and why?

I love to cook most evenings—it's a great opportunity to take a break from screens, make something that can be shared with friends, and engage in low-stakes creativity.

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