



# CONFLUENCE

## Director's Overflow by Dr. Howard Whiteman



As the heat of summer wanes and we look forward to cooler weather and autumn colors, change is in the air. While enjoying the changing seasons, WSI and HBS faculty, staff, and students are continuously studying environmental change, both natural and human-caused. For example,

monitoring of Kentucky Lake and surrounding environments provides us with critical baseline data, while mesocosm experiments test how climate change affects aquatic ecosystems. Studies of invasive carp have allowed us to understand their effects on Kentucky Lake, and research on chemical toxicity promotes water quality. Students are using GIS (Geographic Information Systems) to study changes from tornados, invasive species, and wildfires, and to plan native species restoration. Urban greening is providing insight into how changing our environment for the better can affect biodiversity and human health.

All of this research and student training costs money. Unfortunately, the funding world has changed as well. Federal funding for science has been cut drastically, adding to years of university budget cuts. We are currently unable to support as many research students as we could just five years ago. To weather this budgetary storm, we need your help. If you or your company would be interested in supporting the important research, education, and service that HBS and WSI do every day, please donate. Thank you for helping us navigate these financial challenges, as we continue to do what we do best, studying the environmental change that affects all of us.

## Summer 2025

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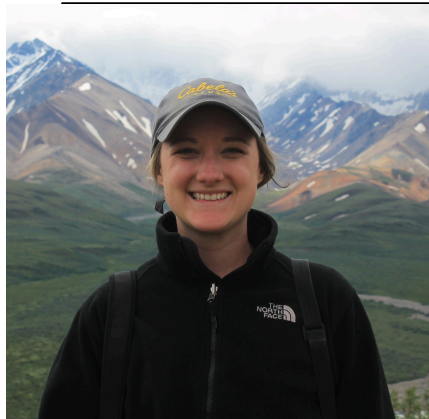
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# Featured Faculty: Dr. Rachel Carroll

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Rachel Carroll is the Project Coordinator for the Jesse D. Jones College of Science, Engineering and Technology as well as an instructor in both the Departments of Biology and Earth and Environmental Sciences. She received her B.S. in Biology from Western Kentucky University and M.S. in Natural Resource Ecology and Management (Wildlife Concentration) from Oklahoma State University. Her graduate research focused on the incubation behavior of ground-nesting birds in relation to weather conditions (i.e., temperature and precipitation).

Before her role at Murray State University, Rachel worked as the Citizen Science Project Coordinator for the University of Georgia's Center for Invasive Species and Ecosystem Health. Her primary project was Wild Spotter™, a citizen science project that engaged the public to find, map, and remove invasive species on national parks, forests, wilderness areas and refuges, recreation areas, and other public lands in the United States. In her role, she interacted with the public through training events, designed marketing materials (e.g., logos, brochures), and gave presentations at national conferences.

As an instructor in the Department of Biology, Rachel utilizes the Hancock Biological Station for her BIO 216 course, where students prepare a research proposal and carry out a research project that investigates the effects of prescribed fire on hard tick presence in Western Kentucky. Additionally, in BIO 382, Rachel enjoys introducing students to different forms of scientific communication (e.g., outreach) where students learn the process of communicating science effectively to different audiences. Over the course of her teaching, she has had students create short children's books, magazine articles, podcast clips, infographics, and YouTube/animated videos on a variety of wildlife topics.

Outside of her job, Rachel loves spending time with her family and likes being outside – birding, gardening, hunting, etc. She also enjoys being creative and has taken ART 101 at Murray State, oil painting classes at Gallery 109 & Fairbanks Studio in downtown Murray, KY, and a quilt workshop at the National Quilt Museum in Paducah, KY.

Picture 1: Rachel Carroll birding in Denali National Park, Alaska in 2018.

Picture 2: Rachel Carroll pheasant hunting in Tipton, Kansas as part of the Conservation Leaders for Tomorrow program in 2015. This program is an intensive 5-day hunting awareness and conservation education workshop for natural resource professionals.

Picture 3: Rachel Carroll and Chuck Barger (Director for University of Georgia's Center for Invasive Species and Ecosystem Health) demonstrating and explaining how to use a smartphone app designed by the center to record invasive species.





# Featured Post Doc: Dustin Owen



One of the most fundamental questions in ecology is how organisms evolve in response to environmental variation. Anthropogenic disturbances, such as climate change and invasive species, are some of the most impactful forms of environmental variation, and have been shown to affect a wide variety of organisms. My research has sought to address the potential for human-induced changes in these biological responses of reptiles and amphibians; two groups of ectothermic animals that are highly sensitive to environmental changes.

My dissertation focused on how maternal stress and stress from invasive fire ants (*Solenopsis invicta*) alter the morphology and physiology of native eastern fence lizards (*Sceloporus undulatus*). The majority of my projects focused on artificially elevating corticosterone (CORT) to simulate stress caused by fire ants, with specific objectives being: 1) determining what morphological and physiological traits were different between the offspring from CORT-dosed mothers and the offspring of control mothers, 2) evaluating whether CORT-dosing or exposure to fire ants had a more significant effect on offspring survival, and 3) determining if ancestral history of exposure to fire ants trumps the personal experience during a lizards lifetime. This work has provided ecologists and conservationists with valuable insight into the role that invasive species play in changing the ecology of native taxa.

For my postdoctoral research, I am using Dr. Howard Whiteman's 30+ year dataset to explore how variations in annual temperature affect Arizona tiger salamanders (*Ambystoma mavortium nebulosum*) from high alpine populations in Colorado. I have been exploring the extent to which longevity, body size, and age at which they first reproduce of these salamanders is explained by annual variation in climate. Additionally, I plan on putting CORT implants into our captive colony of axolotls (*Ambystoma mexicanum*) to document the effects of elevated CORT levels on axolotls. Combined, my research seeks to understand how changes in an organism's ecology result in changes in their life history.



Figure 1 (left) Paedomorph (bottom left) and metamorph (top right) Arizona tiger salamanders from the Mexican Cut.

Figure 2 (right) Eastern fence lizard from Land-Between-the-Lakes, KY.





# Featured Graduate Student: William Gooden

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My name is William Gooden. Like many others who pursue a career in natural sciences, I grew up with a strong interest in nature, which my parents readily nourished through stories, camps, and Scouting. While it took me a while to realize that I could turn that interest into a livelihood, I finally enrolled in the Natural Resources Management program at Abraham Baldwin Agricultural College (ABAC) at the age of 26, with the goal of eventually pursuing a graduate degree. ABAC was a fantastic experience for me, if absurdly difficult, and I was able to gain a wide array of field experience in areas such as heavy equipment operation, amphibian husbandry, prescribed burning, and many other hands on aspects of wildlife management. It was while a student at ABAC that I first became aware of Murray State University. In 2021, I was able to attend the annual conference of the Southeastern Association of Fish and Wildlife Agencies, where I made friends with students and faculty from MSU. Later that year, I found out that one of my professors was going to be accepting a position at Murray State. I told him to expect an email from me when I started applying to graduate programs.



So, now I am working under Dr. Matt Carroll, helping to further his research into the effects of thermal stress on quail. Specifically, I am researching how rising ground level temperatures will affect the nest success of northern bobwhite (*Colinus virginianus*) and scaled quail (*Callipepla squamata*), where the two species overlap in western Oklahoma. The biggest challenge has been learning to use statistical modelling in this project. I enjoy spending my time outside, not doing

math in front of a computer screen. But I'm enjoying the challenge, and the chance to learn a new skill. I've also had the opportunity to teach biology labs here at MSU, which has been very enjoyable, as teaching is also a passion of mine. In the long run, I wouldn't mind teaching, perhaps following in my parents footsteps and becoming a professor.

In my freetime, I enjoy hunting, fishing, hiking, and camping. Anything that gets me outside. It also allows me to travel. I've hunted in Georgia, Kentucky, Florida, Oklahoma, and South Dakota, and gone fishing in Georgia, Kentucky, West Virginia, South Carolina, Florida, and Montana. As I said, I enjoy being outside, seeing new things, getting to do things I saw on TV or read about in magazines as a kid."





# Outdoors 101

June 2025



Outdoor 101 Camp introduces incoming students to the Murray State campus and the surrounding community. Beth Acreman brought this group to our station to learn more about the types of research and educational opportunities that we have to offer.





# Cruise 716

June 2025



Pictured above is the Cruise 716 crew from left to right is Clay Thompson, Dr. Timothy Spier, Dr. Bommanna Loganathan and Dr. Michael Flinn.





# Summer Projects

## 2025



Summers are very busy at the station. Not only are the fisheries students out weekly to conduct their research, we have group visits, summer classes and use this time to clean and reset for next cohort of students. From the May storm there was damage to a student cabin that needed repair. That cabin received new insulation, drywall, trim and paint. All student cabins got cleaned out, and old unwanted items left behind got hauled off.

Pictured below is our new mole salamander tank in the lobby. Redesigned and cared for by Olivia Weaver and resident Cord Lemons.





# Riverland Alliance Summer Meeting

June 2025

A few members of the HBS team were privileged to attend the Riverland Alliance Biannual Partner Meeting was hosted by Dr. Andrea Darracq, Riverland Alliance Coordinator, and sponsored by Friends of TN National Wildlife Refuge (NWR) and Friends of Clarks River NWR. This regional collaboration group consisted of 40 attendees representing about 25 organizations. For the latest newsletter and information about becoming a partner click [here](#).



RA Coordinator Andrea Darracq kicked off the meeting with updates on recent activities, partner engagement efforts, and highlights from the past year. She introduced the day's theme — Better Together: Collaborative Solutions for Shifting Public Land Funding — and framed the importance of cross-sector collaboration for conservation and community well-being.

Speaker Blair Travis, Director of marketing & business development of Calvert City, shared how Calvert City has built vibrant, people-centered outdoor programs through intentional communication, inclusive event planning, and strategic partnerships. From paddle events to bike rides and community art, her work shows how outdoor recreation can strengthen local identity, wellness, and tourism.

Speaker Beka Burton, Economic Development Specialist from Blueprint Kentucky spoke about the role of outdoor recreation businesses and introducing Kentucky's new business roadmap. She emphasized the economic value of outdoor recreation and the powerful role of small businesses in public land stewardship. She also introduced Kentucky's new business roadmap and tools like SizeUp Kentucky to support local entrepreneurs, emphasized the importance of collaborations between agencies, nonprofits, and outdoor rec businesses.



# Maggie Morgan Award

## 2025



### Honoring Maggie Morgan's Legacy

WSI has created a new award in Honor of the late Maggie Morgan, a Murray State alum and former employee of the Jackson Purchase Foundation (JPF). Maggie was an important partner with WSI, as she accomplished so much for our watersheds as Co-Chair of the Kentucky Watershed Watch program, as the Four Rivers Basin Coordinator, and leading the Four Rivers Watershed Watch. She was also integral in the creation and development of the Four Rivers Watershed Sustainability Festival. Our region's citizens and environment have benefited tremendously from Maggie's legacy.

To honor Maggie and the many other people that have worked hard to conserve and restore our environment, WSI has established a new award, the Maggie Morgan Watershed Sustainability Award. The award will be given each spring to a champion of the environment, including volunteers, scientists, resource managers, teachers, farmers, and others. Some years the award will be regional, while others it might honor a Murray State alumnus who, like Maggie, went on to make a difference in the environment, perhaps nationally or internationally. It is our way of both honoring Maggie's legacy and those that continue to follow her lead in environmental advocacy and education.

In addition to the award, we are renaming one of the Four Rivers Watershed Sustainability Festival's most important events, the Science Cafe. Each semester the Murray State chapter of Sigma Xi, the scientific research society, and WSI join to hold a Science Café, in which we bring in a scientist to discuss their work and how it relates to daily life, as a way of helping everyone understand why science is so important. In the past, we have focused our spring Science Café on the environment, as part of the Watershed Festival that Maggie helped create.

This spring we cemented that effort, and Maggie's legacy, by renaming the event as the Maggie Morgan Memorial Science Café, and used it to present her award. Given Maggie's promotion of science, the environment, and education, the Science Café is an excellent way to remind us of her legacy every year, and help inspire all of us to do more for the environment in our daily lives.

Our first "Maggie" was awarded to Ryan Morgan, Maggie's husband, on her behalf this spring. Next year, we will begin awarding Maggie's to the other environmental heroes among us. If you know of someone that you believe is deserving of such an honor, please email Dr. Whiteman with your nomination ([hwhiteman@murraystate.edu](mailto:hwhiteman@murraystate.edu)). We hope to see you at next year's Maggie Morgan Memorial Science Café!



# EXPLORE *Giving*

**DONATIONS HELP US IN MANY WAYS! YOUR SUPPORT PROVIDES OPPORTUNITIES FOR STUDENTS IN THE FORM OF SCHOLARSHIPS AND RESEARCH SUPPLIES. YOUR DONATIONS HELP FUND PROJECTS THAT IMPROVE OUR INFRASTRUCTURE: UPDATING LABS, RENOVATING STUDENT AND GUEST HOUSING, AND PROVIDING FUNDS FOR ITEMS NOT COVERED BY GRANTS. LISTED BELOW ARE PROJECTS WE ARE WORKING ON.**

- \*Monitoring Kentucky Lake Water Quality every 16 days
- \*Native and invasive fish tracking on lake and streams
- \*eDNA research
- \*Backpack electric fishing stream surveys
- \*Threatened species tagging and population estimate
- \*Shad population age studies
- \*Methane emissions from Cypress Trees
- \*Golden mouse habitat research
- \*Monitoring Armadillo burrows
- \*Toad monitoring and tagging
- \*Native Beetle surveys
- \*Ecology, Herpetology and Wildlife management classes

For a list of Current Needs click QR code:



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