

Hancock Biological Station



On Kentucky Lake



CONFLUENCE

Director's Overflow by Michael Flinn

Autumn is my favorite season of the year, even if days grow shorter and outdoor temperatures require more layers. Recently, while sitting quietly in the woods, I was reminded by the general behavior of squirrels that I should have a heightened sense of urgency. The shift in day length and thermal regime triggers many animals to prepare for an extended period of time with fewer resources and an increased demand to modify energy use. And, for many of us, it triggers changes in behavior to enter a human version of hibernation. With increased time spent indoors, it is important to remember the effect that artificial light has on our own biological clock. Recent research shows that extended periods of time spent indoors with artificial light has a profound effect on our own circadian rhythms, often leading to disruption of our sleep cycle, diet, immunity and stress responses. Further, studies have even shown that light pollution negatively influences biodiversity. Interestingly, light pollution extends to our night sky as well. Did you know that 99% of the United States population (except Alaska and Hawaii) live in areas where the night sky is brighter than the threshold for light-polluted status! If you haven't seen the Milky Way in a while, I suggest you make a thermos of hot-chocolate and take a nighttime drive to Land-Between-the-Lakes for an evening of stargazing.

For humans, the solutions to these issues require simple modifications of our own behaviors: limiting high-intensity lights (phones, computers, T.V.'s) before bedtime and limiting artificial light in your bedroom.

However, this might be more challenging for the animals that live in your neighborhood. For more information, see these links:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/>
<https://www.lightpollutionmap.info>



FALL 2023

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Featured Faculty: Dr. Katharine Loughney

As a geologist and paleontologist, I am interested in the environmental conditions that contribute to the accumulation and preservation of fossils. These conditions may exist at very local scales, such as a particular point on a floodplain, but they may also exist over broader scales, such as within a drainage basin. The geographic and temporal scales of favorable or unfavorable conditions for preservation determine broad patterns of occurrence in the fossil record and influence our ability to reconstruct evolution and extinction.

Growing up, I thought that I would become a paleontologist in a traditional sense (focusing on taxonomic- and systematics-based investigations). As an undergraduate at Beloit College in Wisconsin, I decided to major in Geology in order to learn more about the lithological context in which fossils occur, and I ended up with a good background in geology and Earth history. After graduating from college, I enrolled in the Master's program in the Department of Geosciences at the University of Rhode Island to get more experience studying the geologic context of fossils. For my thesis project, I studied how rare Triassic vertebrate taxa from the Petrified Forest National Park, Arizona, are mostly preserved in uncommon depositional settings. The restriction of rare taxa to such settings makes it difficult to determine when these taxa were truly present on Triassic landscapes, making them unreliable as index fossils for age determinations. Through this work, I became interested in the influence of depositional environments on the preservation of fossils and how preservation affects the fossil record. I realized that this blend of geology and paleontology was more interesting to me than the traditional paleontology path.

I continued researching the connections between fossil preservation and depositional environments during my dissertation work in the Department of Earth and Environmental Sciences at the University of Michigan. My project focused on the Barstow Formation in southern California, which has an important mammalian fossil record. I reconstructed how environments in the Barstow Basin changed from a closed lake basin to a forested fluvial system to a seasonally dry savanna through time. As environments changed, so did the conditions that preserve fossils, and the physical characteristics of the fossil assemblages tracked these changes.

After completing my PhD in 2018, I was the postdoc on a collaborative project at the University of Michigan that brought together geologists and paleontologists to investigate the regional landscape and climate drivers of mammal diversity in western North America. Large-scale changes in landscapes over the past 36 million years partly controlled the distribution of sediment over regional scales, which affected whether fossils were buried and preserved. Mammalian species richness, however, responded most strongly to changes in climate, increasing significantly during warm climate states in the past. The combined influences of changing landscapes and climate are powerful drivers of biotic diversity in the fossil record.

In 2020, I was awarded a National Science Foundation Postdoctoral Fellowship, and I went to the University of Georgia to continue my work on the geologic controls on the preservation of fossils. For this project, I modeled the expected environmental responses to tectonic changes in a basin and how those environmental shifts affect the resulting fossil record.

I started as an Assistant Professor at Murray State in August 2023. I look forward to continuing my work on the geologic, climatic, and environmental controls on the preservation of the fossil record, and I am also looking forward to studying modern environments to better understand the processes that influence preservation and decay.

The first photo is me in front of a slab of crinoids (*Uintacrinus*) at the Sternberg Museum, Hays, KS

The second photo is me in the Barstow Formation, California

The third photo is me taking notes at a fossil quarry in the Barstow Formation, California



Featured Graduate Student: Gage Barnes



Hello there! My name is Gage Barnes. Although, I have lived in Murray for the last 18 year, I was born in Colorado. Being able to call both Colorado and Kentucky home allowed me to grow up in and explore several interesting ecosystems where I saw some truly amazing species as a kid. As a result of these experiences, I developed a profound interest in conservation biology and ecology. I pursued my undergraduate degree in biology at Murray State, and I'm currently pursuing a master's degree in biology with mentor Dr. Michael Flinn. In my spare time, I enjoy long days outside looking for interesting plants, birds, insects, amphibians, reptiles, and mammals (this is the order of my favorite taxa). I also enjoy reading books on ecology and conservation as well as cultural anthropology, social psychology, sociology, and international affairs.

My graduate research is focused on how wetland plant communities respond to wetland restoration projects in western Kentucky. In the lower Mississippi Alluvial Valley, the majority of historic Bottomland Hardwood Forests (approximately 60-85.6%) have been lost primarily due to agricultural conversion. In an attempt to restore lost ecosystem services, the Wetland Reserve Program (WRP) has restored wetlands on formerly cultivated lands for the past three decades. Over the last 30 years, there has been few studies that assessed the restoration trajectory

of understory plant communities in WRP easements that were formerly under intensive cultivation in western Kentucky, USA. We sampled at total of 21 sites that varied in condition from active cultivation [n=3] to degraded wetlands adjacent to agricultural fields [n=5] to restored WRP wetlands [n=9] to our reference wetlands on wildlife management areas [n=7]. Within these various conditions, WRP wetlands ranged from 0 to 13 years since hydrologic restoration. Overall, we found that reference sites had significantly higher floristic quality when compared to cultivated, degraded, and restored wetlands. Cultivated sites had the lowest species richness when compared to all other site types. Proportions of invasive species declined over time, which is likely due to less favorable conditions for annual and sun tolerant species as canopy cover increases with maturing trees as WRP wetlands age. As most WRP easements are relatively young, long term monitoring efforts of approximately 30 years post-restoration will likely provide a better understanding of long-term restoration success. With continued threats to wetland ecosystems, optimizing wetland restoration strategies will be critical for recovering important ecosystem services.

Left: Swamp Leatherflower (*Clematis crispa*) [KY State Threatened]

Middle-Left: Oneflower False Fiddleleaf (*Hydrolea uniflora*)

Middle-Right: Floating Marsh Pennywort (*Hydrocotyle ranunculoides*) [KY State Endangered]

Right: Cardinal Flower (*Lobelia cardinalis*)



Tennessee Naturalists

September 2023



Joan Howe, Refuge Ranger Tennessee National Wildlife Refuge, brought the TN Naturalists to complete their freshwater ecology coursework that is required as part of their path to certification.



Marshall Elementary STEM day

September 2023



Angie Hayden, HBS Lab Manager went to Marshall County Elementary school for their first Plant and Animal Expo. The presentation included a discussion of the zooplankton that can be found in Kentucky Lake and talked about their importance to the health of reservoir.

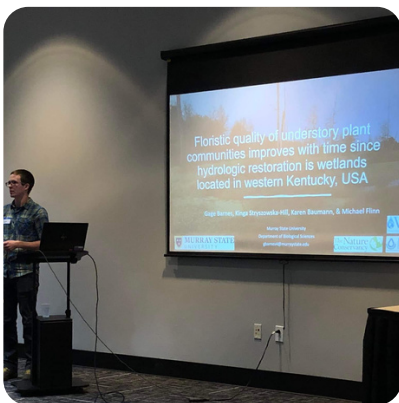


Society of Wetland Scientists

October 2023



Logan Firkins and Gage Barnes presented their research at the Society of Wetland Scientists - South Central Chapter Meeting held in Cave City, KY. Gage Barnes won first place with his presentation "Floristic quality of wetland understory plant communities improves with time since hydrologic restoration in Western Kentucky". Logan Firkins won second place with his presentation "Investigating the effectiveness of western KY WREs in retaining sediment, nutrients, and carbon".



Calloway County High School Visit



Dr. Whiteman's group learned about salamanders



Dr. Flinn's group learned about Limnology



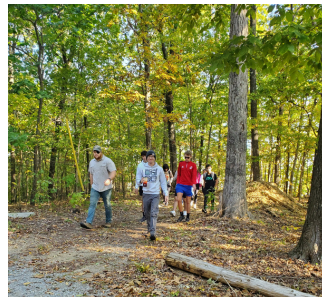
Clay Thompson and Jason Harris, took groups on the boats to experience electrofishing

Calloway County High School Visit

Continued



Michelle Weaver and Jillian Murphy's group performed a tracking exercise using Compass/GPS/Telemetry Demo



Cord Lemons and Evan Barr's group learned about camera trapping and how behaviors of wildlife change with the absence of large predators.



John Hewlett's group learned about herpetology



Rosie Carey and Isaiah Radford's group learned about the important function of how cypress trees influence greenhouse gas fluxes in wetlands.

MSU-UTM Science Symposium

October 2023



Murray State University and University of Tennessee at Martin joined together for a Science Symposium at the end of October. There was two sessions of oral presentations that included 8 speakers and 12 poster presentations. Refreshments courtesy of MSU Jones College of Science, Engineering, and Technology.



Additional Events

Fall 2023

Most activities listed are open to public participation and volunteers are appreciated. Please contact us if you would like to be emailed or notified of upcoming events.



Science Cafe: In September the second Science Cafe (Community Conversation about Science) was held at Tap 216. Dr. Bikram Subedi, Asst. Professor within the Chemistry Department spoke on the topic “Illegal Drug Detection”.



Seed Collection Day: In September Gage Barnes and volunteers held a Native Seed Harvesting Day at HBS. The seeds collected will be used in the new Native Botanical Teaching Garden at Murray State University.



Movie Night at HBS: In September, the Backcountry Hunters and Anglers (BHA) hosted movie night at HBS showing “The Public Trust” film on our large outdoor movie screen.



Homecoming Parade: HBS pulled one of the original Calhoun “Stumpjumper” Boats in this year’s MSU homecoming Parade. This was a gift from Captain Bob Cherry.



Dr. Flinn was invited to speak about Carp: In September and October, Dr. Flinn presented about invasive carp in Paducah at “Seniors learning for Fun” and again at the Great Rivers chapter meeting of the Sierra Club on Murray State campus.



October: HBS hosted the Four Rivers Watershed Watch Annual meeting and Dinner

Improvements

Fall 2023



Recent improvements to our Campus include the sidewalks and railings to the researchers cabins and Jason Harris, our Operations Supervisor, improved the stairway to the dock.



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:



CONTACT US

📍 561 Emma Drive, Murray, KY

📞 270-809-2272

🌐 murraystate.edu/hbs

