



Highlands Biological Foundation

FALL NEWSLETTER 2022

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*Stimulating, promoting, &
funding biological research
& education in the
southern Appalachians*



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Leaves are Falling, Autumn is Calling

JENNIE STOWERS | PRESIDENT | HBF

As I reflect on 2022, I am amazed by the positive trajectory of the Highlands Biological Foundation (HBF) and grateful to each of you for the growth you have made possible. This year, our organization expanded to better meet the needs of our community. I am pleased to announce the promotion of Winter Gary to Marketing Manager and welcome Holly Theobald as a new, full-time staff member!

This year marked another successful year of Zahner Conservation Lectures, nature camps, and daily, educational programming and outreach through Highlands Nature Center. We received overwhelming support for our “Ravenel Soirée” and “Highlands on the Half-Shell” fundraisers and welcomed more guests than ever. Community support through our fundraising efforts and grant awards continues to surpass expectations.

HBF increased education and research support significantly in 2022. For the second consecutive year, HBF invested \$100,000 in the Highlands Field Site (HFS) program through UNC-Chapel Hill’s Institute for the Environment. The Highlands Biological Station (HBS) welcomed 15 UNC students as part of the field site program this fall – more than ever before! Along with this incredibly impactful program, HBF provided research grants to several visiting scholars, continued to support HBS’s multi-year MAPS bird banding project with Blue Ridge Bird Observatory, and invested in a new pilot citizen science project aimed at studying bat populations along the Appalachian Trail.

Before I wrap up, I want to highlight one of our greatest successes this year, and that is officially welcoming our community to campus for HBF’s North Campus Dedication. Years in the making, we could not have asked for a better turn out for the celebration, complete with clear, blue skies, gorgeous pollinator garden blooms, and dozens of our wonderful supporters. I cannot thank you all enough for helping us bring the new addition to life, and I am so excited to see the space utilized for nature camps, academic courses, community gatherings, and more! Be sure to visit as the fall leaves change colors. 🍁 Our newsletter is full of information about all these exciting efforts. Keep reading to learn more!

2022 Highlands Field Site Program is in Full Swing at HBS! ³



The onset of fall brings one of the Station's most impactful annual programs to campus - the Highlands Field Site program (HFS) through UNC-Chapel Hill's Institute for the Environment. This program began at HBS in 2001 as an immersive, semester-long opportunity for students to explore real-world environmental issues through a combination of course work, field trips, group research projects, and internships.

This semester, the Station welcomed a record number of 15 students to campus. Under the leadership of HFS Director Dr. Rada Petric, the students are exploring how humans interact with their environment in the southern Appalachian region and will work to build on research that past students have conducted.

This year, HBF awarded \$100,000 of grant funding to support this program for the second consecutive year – our largest investment towards education to date. This is made possible by support from members like you, so THANK YOU!

Please see below to learn more about the students' fall internship projects and how your support is making an impact.

"HBF is thrilled to support the Institute for the Environment program at HBS. This program is creating the next generation of scientists, and Highlands is the perfect place to immerse these students in the natural world."

- Charlotte Muir | Executive Director | HBF

CAROLINA HEMLOCKS

Hallie Turner & Ken Donny-Clark

Hallie and Ken are using dendrochronology to look at the relationship between climate trends and growth of Carolina hemlocks, while also assessing the age of the trees. They are coring hemlocks around Black Rock Mountain and HBS so that they can mount, sand, and scan the cores to assess the width of each ring. These measurements will be compared between trees to develop a chronology of the area, and compared with climate data such as temperature, precipitation, and vapor pressure deficit to assess the correlation between each variable.

Mentors: Joel Scott, USDA Forest Service & Dr. Chris Oishi, Coweeta Hydrologic Lab



Follow their journey on Instagram! @highlands.ie
PLUS, see their final project presentations on 12/8!
Stay tuned to highlandsbiological.org for details.



SMALL MAMMALS

Marie Young & Cole Prezant

Marie and Cole are trapping small mammals at HBS in collaboration with a team at the University of Kentucky. You can find them in the woods around the Station tagging mammals, collecting ear tissue samples, and radio-collaring red squirrels. They are also experimenting with different trapping techniques in an effort to increase shrew survival. Shrew mortality is often more frequent than desired in typical trapping sessions. Through their experimentation and research, they hope to identify protocols that make it safer to trap small mammals while supporting shrew populations.

Mentors: Dr. Robbie Burger, University of Kentucky & Dr. Rada Petric, UNC-Chapel Hill



Mathangi Mohanarajah

Mathangi is studying the effect of the COVID-19 lockdown on the behavior of bats in Greensboro, NC. When the lockdown occurred, a research project was underway studying a phenomenon known as the 'Weekend Effect', where wildlife alter their range between the week and weekend. The tragedy of COVID-19 and resulting lockdown has given us the unprecedented opportunity to compare behavior with and without the presence of humans and human activity.

Mentor: Dr. Rada Petric, UNC-Chapel Hill



MOTUS WILDLIFE TRACKING SYSTEM

Kaitlyn Willoughby & Georgeanna Randall

Kaitlyn and Georgeanna are assessing the detectability rate of Motus towers in different environments using drones. The Motus Wildlife Tracking System (Motus) is an international collaborative research network that uses coordinated automated radio telemetry to facilitate research and education on the ecology and conservation of migratory animals. There has been little research testing the accuracy of Motus's tracking capabilities, so Kaitlyn and Georgeanna will work on filling this gap by attaching radiotags to drones and flying them by different Motus towers. By comparing the data collected from the drone and the detections from the Motus tower database, they will be able to determine the accuracy of the Motus tower's tracking capabilities.

Mentors: Troy Walton, UNC-Chapel Hill Drone Lab & Dr. Rada Petric, UNC-Chapel Hill



BATS & NOISE

Juliet Spafford & Emilie Patrick

There are thirteen bat species in and around Highlands, and some are even rare! With so many species, it's important to understand how our actions affect them. Juliet and Emilie are measuring the effects of human-created noise on bats and insects, primarily as it pertains to foraging behavior. Bats use echolocation calls to communicate as well as locate food, and sometimes noise from humans can cross their wires, making mealtime difficult. We hope to measure how much effect our noise has on bats, which could have an influence on future plans for building in their habitats!

Mentor: Dr. Rada Petric, UNC-Chapel Hill



BLUE RIDGE TWO-LINED SALAMANDERS

Leah Morrissey & Kristina Hefferle

Leah and Kristina are studying the reproductive behavior of the Blue Ridge Two-Lined Salamander using the photo mark-recapture method and DNA extraction of larvae. The goal of the project is to better understand the reproductive behavior of the male salamanders based on phenotype. They have been surveying the streams at the Station as well as the surrounding trails in order to document these salamanders, and they will also be learning to extract DNA and utilize PCR to do genetic analysis.

Mentor: Dr. Todd Pierson, Kennesaw State University





Jonas Hattman, Dalia Mouawad , & Carter Patterson

Jonas, Dalia, and Carter are surveying the red spruce population at Alarka Laurel in Swain County. This stand of spruce trees is the southernmost stand of the species *Picea rubens*. Therefore, analyzing the health of this population of trees will indicate how well *Picea rubens* can withstand the warming effects of climate change. Although this terrain is rough and at times almost impassable, the team has enjoyed working hands on and spending time immersed in a unique southern Appalachian environment.

Mentors: Dr. Beverly Collins, Western Carolina University, Dr. Paul Manos, Duke University, & Dr. Rada Petric, UNC-Chapel Hill

DRAGONFLIES & WETLANDS

Reagan Jarrett

Reagan is surveying species richness of dragonflies in wetlands near HBS. She is collecting data on adult dragonflies and dragonfly larvae, as well as comparing dragonfly species richness between degraded and intact wetlands. Dragonflies serve as an indicator for wetland health, and this research can reveal more about the health of these ecologically diverse and essential ecosystems.

Mentor: Jason Love, Highlands Biological Station



A Blast from the Past! 2021 HFS Students Return as Research Assistants

You don't need to look far to see the impact of the Highlands Field Site program! Three of last year's HFS students – Chloe Hall, Grace Kinder, and Noa Meiri – returned to the Station this summer as Research Assistants to collect additional data and expand on their fall 2021 microplastics study (lead Principal Investigators: Dr. Jerry Miller and Jason Love) with the hopes of publishing their findings. In addition to this, they assisted with HBS's MAPS bird banding in partnership with Blue Ridge Bird Observatory and contributed to a pilot citizen science project led by HFS Director Dr. Rada Petric who is working to collect bat data along the Appalachian Trail. Petric added that compared to their experience in the fall, the returning students are now taking charge of their projects.

"They're not under the constant leadership of their superiors, so they're gaining a lot more independence and confidence in being able to do their research." - DR. RADA PETRIC





Nature Center News

PAIGE ENGELBREKTSSON
LEAD EDUCATION SPECIALIST | HBF

Any given day at the Highlands Nature Center is defined by questions. Some are routine, some are entirely unexpected, and all come from a place of curiosity or compassion. What's the purple plant that's blooming right now? What should someone do for an injured bird? Would you like an armadillo? Yes, it's alive.

In answering these questions, our educational staff serves as an important resource for our communities. We also ask questions in exchange. How do we find salamanders? Why are researchers catching birds in the Botanical Garden? Through our programs and events we facilitate learning to put the Foundation's mission in action. Every question is a chance to inspire people to preserve and protect this amazing place we live in. Thanks to your support, we continue to do so in new and exciting ways.

This year, we increased our off-season weekly programs featuring the ever-changing plants and animals at the Station. We hosted new events centered on citizen science as part of the growing Science Across NC collaborative. We also worked with the MAPS researchers to interpret their ongoing work for the public while they were on-site.

In February, we partnered with the Station and Macon County Schools to host 14 middle and high school students for a three-day summit, exploring the impacts of climate change and sustainability on our county. We've also begun new partnerships with two local organizations serving children in Highlands and Cashiers during the school year, in addition to four others that are well-established. Our book club is now in its fifth season of bringing people together to discuss issues impacting the Plateau and our connections to nature.

All of this has taken place in addition to the programs we've established over the last three years and welcoming thousands of visitors to the Nature Center. Our work of answering – and asking – questions is free, thanks to the support of community grants and our generous donors. As we look to 2023, and new opportunities to serve our community, thank you for making it possible.

Up & Autumn!

You Won't Want to Miss These Programs:

Wednesdays & Saturdays in Oct.:
Autumn Amble Leaf Tours

Thursdays this Fall at 4 PM:
HBF Book Club

Oct. 18th at 1 PM:
Nature 101: Wonderful Waters

Oct. 25th at 6 PM:
Enchanted Forest

Nov. 15th at 1 PM:
Nature 101

Dec. 3rd:
Highlands Christmas Parade

For program details,
please visit highlandsbiological.org

Did you know that HBF's Nature Center staff lead educational outreach programs off-site?!

This year, our staff led "Nature on the Go!" programs for community organizations such as the Gordon Center Preschool, Methodist Church Afterschool, Boys & Girls Club of the Plateau, Highlands Community Child Development Center, The Literacy Council, The Sonshine School, and more. We're able to reach so many in our community thanks to supporters like you!

A Glimpse into 2022 Nature Camps

HOLLY THEOBALD | EDUCATION SPECIALIST | HBF

When you combine five educators, 145 campers, and 276 hours of programming, you are gifted with an extraordinary summer camp season. However, facts and figures hardly describe the wonderful experiences we shared at the Nature Center, the Botanical Garden, and beyond. Our campers witnessed first-hand how magical our planet is through experiential-based programming, like exploring our on-site creeks to find and study the animals who call them home. Campers aged ten to twelve took part in exploratory adventures highlighting special features of our mountains. From rock climbing at Looking Glass Rock, participating in a BioBlitz in our Botanical Garden, to kayaking on the Little Tennessee River, these incredible young

people proved to be enthusiastic explorers always ready to investigate the natural wonders of the Highlands-Cashiers Plateau.

I would like to thank our Naturalists, Hunter Embler, Hanne Parks, and Sophie Petriz, for their hard work and dedication this summer. Thank you to Paige Engelbrektsson for her cooperative spirit, and thank you to the Pisgah Climbing, All Species Photography, and Alarka Expedition companies for working with us this summer. Without these incredible staff and collaborators, we would not have been able to create a summer never to forget.



Each year, the Station welcomes a new cohort of seasonal staff including Naturalists, Garden Assistants, and Research Assistants to help run summer camps and daily programs at the Highlands Nature Center, care for the Highlands Botanical Garden, and assist with various ongoing research projects. They make all that we do possible. Congratulations to each of them for all they've accomplished this year! We're excited to see where they go on their next adventures.

Several of these individuals were supported by funding from the Highlands Biological Foundation. This is one of the many ways your contributions make an impact.



Member-Supported Research Grants

For over 50 years, the Foundation has provided 'Grants-in-Aid (GIA) of Scientific Research' at HBS, bringing graduate students and research scientists to Highlands from all over the country and abroad. When you give to HBF, you invest in research projects that help us better understand the incredible biodiversity of this region. This summer, you may have noticed small plastic cups or metal traps distributed around the Botanical Garden - these were part of GIA research projects! Learn about some of the 2022 research projects you contributed to below.

Bee Biodiversity at HBS: An Ecological Study

**DR. JORGE SANTIAGO-BLAY | RESEARCH ASSOCIATE
NATIONAL MUSEUM OF NATURAL HISTORY**

From the 1920s to the 1960s, Theodore Bertis Mitchell, a faculty member at North Carolina State University, studied the bees of eastern North America. When I was introduced to the possibility of collecting bees at HBS for 2.5 weeks in July 2021, I had never been in southern Appalachia. When I brought my colleague, Sam Droege (USGS), the approximately 50 bees that a WCU undergraduate and I had collected in colored, plastic cups and with a sweep net, there were 23 species! When Sam and I realized that there was a lot more to be learned, I wholeheartedly embraced the project and began planning for 2022.

During early May to late July 2022, I had the privilege of living at HBS. Besides the incommensurable peace and increased professional productivity I enjoy when I am at HBS, I am studying the bees around the campus. Why? First, we need to know what species live at HBS before beginning to think about other interesting and testable biological questions. Second, bees are vital for humans: they pollinate many plants that produce the food we eat. In simple terms, no bees, no food. Third, bees are considered health indicators in some ecosystems. And, what about the current number of species of bees at HBS? Using the same techniques, and adding canopy collecting, we have detected 58 species, with some 300 more bees to be identified. Also, I learned to prepare slides of the pollen the bees carry. Why is this important? By identifying the pollen bees carry, we can learn what plants the bees have visited.

I hope to return and perhaps collect bees that I have not seen before.

Did you notice any colorful plastic cups around the Botanical Garden this summer? Hear from Dr. Santiago-Blay - the man behind the bee cups! Below, you can see him collecting bees from one of them. The most common species collected was the bumblebee, *Bombus impatiens*.



Kyra placing a radio collar for tracking purposes on a female HBS red squirrel.



Yukon Squirrel; Appalachian Squirrel: Tale of Two Life Histories

KYRA LIEDTKE | PH.D. STUDENT | UNIVERSITY OF KENTUCKY

"Squirrels! Chipmunks! Shrews! Oh my!"

Every time the Burger Lab from the University of Kentucky checks traps around HBS, you may hear similar phrases on the trail.

My name is Kyra Liedtke, and I am a 2nd year Ph.D. student. I research a neat ecological concept called life histories in the red squirrels around HBS. Life histories are the stories of how an organism lives, reproduces, and dies. To record these stories, we use life tables to record the organism's life cycle. Through a long-term project here at HBS, we want to create life tables of red squirrels to understand how their life histories differ from other populations. The reason why we are so curious about the red squirrels here in Highlands, NC, is because they are one of the southernmost populations of red squirrels in the Eastern United States. Red squirrels' geographic range reaches up to southwest Yukon, Canada. We want to compare the life histories of HBS red squirrels to those in Canada to see if and how their life histories differ. We hope to unlock the secrets of red squirrels with this long-term project at HBS!

HBF Funds New Citizen Science Project Used to Monitor Bats Along the Appalachian Trail

DR. RADA PETRIC | HIGHLANDS FIELD SITE DIRECTOR | UNC-CHAPEL HILL

The goal of the BatPak project is to enlist the help of hikers and local outdoor outfitters to monitor bats along the southern Appalachian Trail. Those traveling overnight are provided with a miniaturized bat recorder which allows us to listen to and record bats. Long-term research provides essential information about changes of biological communities. This information is crucial for providing recommendations for management strategies that lead to good environmental decisions. As researchers who care about bats, a non-charismatic species that are most often associated with Halloween as spooky decorations, we recognize that in order to make a meaningful change in this group of animals we must educate the public and enlist their help. The BatPak project implements public participation and collaboration in order to increase scientific knowledge while engaging the local community. People from Highlands, as well as those from other regions coming to explore

the southern Appalachian Trails, contribute to data monitoring and collection. By combining forces with our community members, we are able to collect data, that will allow us to build a long-term bat monitoring project, make meaningful inferences about the results, share a more complete story about bats in the southern Appalachians, and at the same time, raise awareness about bats and the dire need to conserve these animals.



2022 MAPS Bird Banding

JASON LOVE | ASSOCIATE DIRECTOR | HBS

This year marked the third year of bird banding at HBS thanks to funding from HBF. The banding station is part of the Monitoring Avian Productivity and Survivorship (MAPS) program, which has hundreds of banding stations across North America. This year, we managed to capture and release 175 birds representing 29 different species; 121 birds received new bands, 48 were recaptures, and 6 were released without bands. Perhaps the most exciting bird that we captured was a Pileated Woodpecker, the largest woodpecker in our region. This is a bird that must be held with two hands and an arm's length away from one's face and eyes! Once again, we partnered with Blue Ridge Bird Observatory to conduct this important research that provides data on the health of bird populations across the continent, gives undergraduates valuable research experience, and allows the public and summer campers an opportunity to see and learn about our incredible diversity of birds on the Plateau.

2022 HBS MAPS BANDING RESULTS

Total birds handled: 175

Total species: 29

Neotropical migrant species: 15

Warbler species: 8

Thrush species: 3

Sparrow Species: 2

Most abundant banded bird: Dark-eyed Junco

Largest bird captured: Pileated Woodpecker

Smallest bird captured: Ruby-throated Hummingbird



2022 Snapshots!



145

youths welcomed
to nature camps

More than
300

bee specimens collected in the
Botanical Garden as part of
on-going research

2022 by the Numbers

Over **300**

DBH
(diameter at breast
height) tree
measurements taken
as part of on-going
research

72

lots of native plants
auctioned during
HBS's 2022 Native
Plant Symposium

More than
14,960

visitors explored the
Nature Center

30 adult
Blue Ridge
Two-lined
Salamanders
captured &
measured as
part of

PLUS,
tissues
samples
collected
from

200
larvae

80.09

inches of rain recorded
by HBS's weather station
(so far)!

45

small
mammals
captured &
released as
part of
on-going
research

10

Zahner Conservation
Lectures hosted by HBF

175

birds analyzed at
HBS as part of the MAPS bird
banding station funded by HBF

15

Highlands Field Site
students studying at
HBS this fall



HIGHLANDS
BIOLOGICAL FOUNDATION

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Your Contribution Supports:

Nature Center
programming &
summer camps



Research in
the southern
Appalachians



Native plant
gardens at HBS



Community outreach
& education

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- Use the enclosed envelope to send a gift
- Call our office to make a contribution
- Donate or set up a recurring donation online at highlandsbiological.org
- Send a stock gift
- Contribute through a donor-advised fund
- Choose HBF as your charity of choice when shopping through AmazonSmile
- Introduce your family & friends to the Nature Center & Botanical Garden

Leave a Legacy

that will inspire present & future generations to preserve & protect the unique environment of the Highlands Plateau. Please remember HBF in your will.

For additional giving opportunities
or more information,
please call (828) 526-2221.

Photos courtesy of:

Krystal Cohen: page 10
Paige Engelbrektsson: pages 6, 12
David Ford: pages 1, 5, 10
Winter Gary: pages 6, 7, 10, 12
HBS Summer Staff: pages 5, 6, 7, 10

HFS Students: pages 3, 4, 5
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The Highlands Biological Station is a multi-campus center of Western Carolina University. Funding for this communication is due in-part to a Tourism Grant with Visit Highlands, NC.