



Mountain Lake *Echoes*

UNIVERSITY of VIRGINIA

Produced by the University of Virginia's Mountain Lake Biological Station mlbs.org



ZooCREW!

Following the hustle and bustle of high season, the Station continues to stay busy hosting groups, conferences, and other programs. Providing a space where future scientists can get practical experience in the field is rewarding for us and a valuable experience for them. One of the groups that we were happy to have at the Station again this year was the ZooCREW (Zoo Champions for Restoring Endangered Wildlife) group from the Philadelphia Zoo.



Up close with some of our mountain's herps

The ZooCREW program allows teens to gain extensive experience working with animals while learning about conservation methods. Following an introductory summer in the ZooCREW 1 program, students age 14-18 can apply to continue in the ZooCREW 2 program for up to 4 years. Those who participate in the ZooCREW program have a 100% high school graduation rate, and a 96% college matriculation rate.

One of the vital elements of the ZooCREW 2 program

is the opportunity to participate in immersive field trips. Marcella Kelly, Professor in the Department of Fish and Wildlife Conservation at Virginia Tech, led a 3-day field experience for the ZooCREW. Participants spent an evening getting to know Kelly and her students on the Virginia Tech campus, followed by a full day of presentations and seminars about wildlife and wildlife research all over the world. On the third day, they all made their way to MLBS to spend some time in the field.

The ZooCREW learned how to set up, use, and check camera traps. In two groups, they learned about the variety of snakes and salamanders that we have here at the Station before heading out for hands-on experience. Fortunately the wildlife cooperated, and the participants were able to observe several of our favorite local species. They really packed a lot into their time at the Station!

After a long day of learning and discovering, the participants enjoyed a hike to the nearby Wind Rock overlook and worked up their appetites while exploring Riopel Pond. MLBS Facilities Manager, Tom Mc Namara, put on his chef hat and treated the ZooCREW to a special venison burger cookout. It is great to see young people getting excited about conservation science! -MLBS Staff

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For more information on the ZooCREW program, please visit their website [here](http://mlbs.org)

From the Director

If you spend much time at the Station, you know everyone becomes obsessed with weather: Is there any lightning in the forecast? Will I get soaked when I check my plots this afternoon? How much rain fell in that downpour last night? Do I need an umbrella to make it back from dinner dry?

It's no surprise that one of the most popular additions this summer is our new on-site [Wunderground weather station](#), located on the west end of the pond, providing accurate current and past readings. Through the algorithms of Wunderground, we are provided with a forecast tailored much closer to actual conditions on the mountaintop. Forecasts still aren't perfect, but we noticed that the projected temperatures last summer were within 5° F of actual, instead of 10°-15° F off.

Readings are available [online](#) and through the mobile app. Simply search for "Pembroke, VA." If necessary, click "change station" and select our station. If you click on the station name, you'll be taken to a reports page where you can access plots of past data and figure out just how fast the rain came down during that sprint from Lewis to your cottage!



Butch Brodie

Field Herpetology

by Christian Cox, Georgia Southern University

This summer, graduate student John David Curlis and I ventured north from Georgia Southern University into the mountains of southwestern Virginia to teach the Field Herpetology class at Mountain Lake Biological Station. Along with 11 talented undergraduates from UVA and two other institutions, we explored the ecology, evolution, and natural history of reptiles and amphibians.

In the classroom, students not only learned the foundations of herpetology, but also designed and conducted independent research projects. Much of the class



A brightly colored cave salamander (*Eurycea lucifuga*) found clinging to a rock face near MLBS

was spent in the field at MLBS and other locations in Virginia, South Carolina, North Carolina, and Georgia, where students gained hands-on instruction in the collection and identification of southeastern reptiles and amphibians. Together we experienced a great diversity of habitats: finding salamanders in the cool forests at the highest peaks in the eastern US and discovering legless lizards in the wetlands and piney flatwoods of the coastal plain. In total, we found 67 different species of reptiles

and amphibians during the course, including 24 salamanders, 20 frogs, 18 lizards and snakes, 4 different turtles, and the American alligator. Beyond course content and biological diversity, students told me that the best part of the class was getting to experience a side of nature that few people ever get to see. Favorite experiences included finding giant and slimy hellbender salamanders in cold montane streams, making nocturnal forays into the forest to discover salamanders climbing trees, and participating in the capture and data collection of an American alligator. I look forward to sharing more of these experiences during the next Field Herpetology class in the summer of 2017!



Students discovering the diversity of reptiles and amphibians off the coastal plain. Tour courtesy of Tony Mills of the [Lowcountry Institute](#), Spring Island, SC.



Students holding an eastern ratsnake (*Pantherophis alleghaniensis*) found crossing a busy road in Virginia

Student Corner

by Behrad Azhandeh, UVA



Signing up for Plant Diversity and Conservation, I pictured the same stale routine of going to lecture and spending hours in the library after trying to make sense of the material. As a Biology major, oftentimes it is hard to grasp the complex ideas presented in large lecture courses when there isn't an application for them on a day-to-day basis. However, all these preconceived notions were quickly dispelled once I arrived at MLBS.

Class at MLBS was hands-on as it placed us right in the heart of the forest. My ten classmates and I explored and learned about the anatomy and evolutionary history of the local plant species around the Station. Zack, our fabulous forest guru, wasted no time in the classroom, because he knew that active learning is conducive to our comprehension. Thus we were constantly out in the field gathering plant samples, discussing conservation strategies, and discussing the immense evolutionary history of the vegetative life that surrounded us.

One of my favorite times at Mountain Lake was dinner, when students, professors, and seasoned researchers gathered in the dining hall to fresh meals and discussion of their time out in the field. It was a wonderful opportunity to learn about the numerous scientific inquiries being made only inches from us. After dinner, we gathered around a warm campfire next to the lake as we watched the millions of stars previously unavailable to us in the light-polluted city.

My time at MLBS was rather surreal. Even though I was taking an intensive summer course, I felt no stress or tension as I usually do during the normal academic year. There is something about being at high elevation surrounded by dense forests and limited cell reception that makes one truly feel at peace. My experience at MLBS taught me that science is not purely pragmatic. Science is love, it's emotion, it's passion, it's the sense of unity and connectedness that we feel with all life on our planet that gives us the courage to venture forth into the unknown. MLBS taught me what it means to be a scientist and what it is like to work with a group of highly dedicated professionals. I am very grateful to have had the opportunity to spend my summer at MLBS and I encourage all students to consider an experience at MLBS.

Research Spotlight

by Mary Jane Epps, Mary Baldwin University

Anyone who visits Mountain Lake Biological Station around the start of the summer field season is likely to be struck by the abundant show of fiery azalea flowers blooming in the forests around Salt Pond Mountain. The flame azalea (*Rhododendron calendulaceum*) is an understory shrub found across much of the Appalachians and is most notable for its profusion of large, showy flowers that attract a wide range of foraging insects each spring. But which of these insects are actually pollinating the flowers during these visits? Like many of our native azaleas, flame azalea is characterized by an unusual flower structure, with the pollen-bearing anthers and receptive stigmas exerted far from the mouth of the flower, where many of the flower visitors can forage without making contact with the reproductive parts.

To determine which flower visitors actually pollinate flame azalea, I joined forces with Suzanne Allison (former MLBS student and current PhD student at the University of Georgia) and ecologist Lorne Wolfe, a longtime researcher of flame azalea at MLBS. In the summers of 2011 and 2014, we observed the behavior of potential pollinators visiting flame azalea flowers around the station. Surprisingly, although many insects foraged on the flowers and some contacted the anthers or stigmas, the only species we observed making contact with both of these reproductive organs were large butterflies, most notably the eastern tiger swallowtail (*Papilio glaucus*). To confirm that these insects were indeed the most important pollinators of flame azalea, we set up a field experiment that selectively excluded different size classes of visitors to flame azalea flowers, and recorded the number of fruits produced at the end of the summer for each exclusion

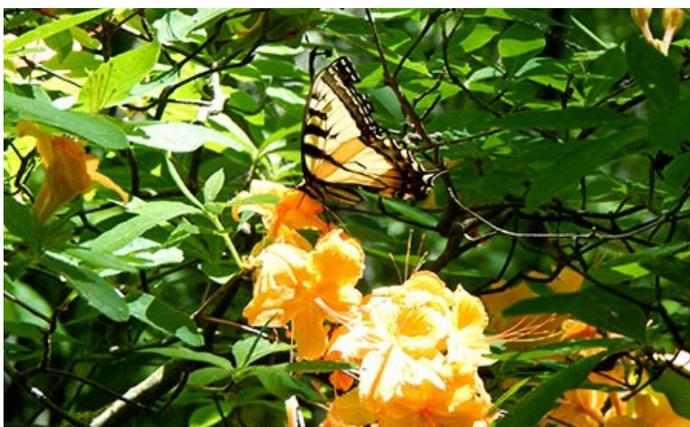
treatment. We found that flowers caged so as to exclude only the largest flower visitors (i.e. big butterflies) experienced nearly complete reproductive failure, and were no more successful than those flowers from which we excluded all potential pollinators. In contrast, nearly a third of flowers left open to visitation by large butterflies set fruit successfully, a value which did not differ significantly from the fruit set of flowers we pollinated by hand.

Together, our findings suggested that the flame azalea is almost entirely dependent on large butterflies for its reproductive success. However, our observations of these insects foraging on flame azalea indicated something else unusual about the pollination of this plant. Whereas insect bodies are the typical vector for pollen in most plant species, we found that the large butterflies foraging on flame azalea flowers were performing the bulk of their pollination services using their large, flapping wings. In fact, these insects carried over 50 times more flame azalea pollen on their wings than on their bodies. Remarkably, aside from our familiar flame azalea, pollination by animal wings is known to occur in only two other plant species globally - a leguminous tree in tropical Mexico, and a South African wildflower.

This past June I was excited to have the chance to come back to MLBS to share the flame azalea's unusual pollination story with a TV film crew from [Coneflower Studios](#). The story will air on PBS's *Nature* later this year. I look forward to returning to Mountain Lake in coming seasons to explore more questions about the reproductive biology of the flame azalea and other azalea species growing on Salt Pond Mountain.



Suzanne Allison, graduate student, researching pollination of the flame azalea at MLBS



Eastern tiger swallowtail (*Papilio glaucus*) pollinating flame azalea



Exerted pollen-bearing anthers and receptive stigmas shown on the flame azalea

Mary Jane Epps
Assistant Professor of Biology
Mary Baldwin University

Epps loves music, and plays traditional Appalachian fiddle and banjo. She also enjoys spinning and dyeing wool with wild plants, gardening, and raising heritage livestock.





News & Notes

New Trail Signs and Maps Installed



Interim Station Manager Debbie Weeks spent some time in the wood shop this summer making new signs for the MLBS trails. Several of the old signs were in need of replacement, particularly the Bear Cliff sign which had been eaten by bears. Trail maps were also added at some key locations including the Crossroads, the intersection of Bear Cliff/Maple trails, and the Bear Cliff Overlook. Facilities Manager Tom Mc Namara and Debbie spent a day securing the new signs and maps in the hope that the bears will find something else to munch on!



Open House

The MLBS annual Open House was held on June 25th. We had many return visitors, as well as some new folks from the community who were curious about what exactly it is that we do here at the Station. This year our guests were treated to nature hikes, games, crafts, face painting by a real artist, and tours of the grounds and labs. There were also several art installations provided by the ArtLab artists, as well as our own Susan Brodie.



Becky Wilbur preparing visitors for a nature hike

Virginia Master Naturalists

The Virginia Master Naturalists gathered for a weekend of service at the Station August 20th-21st. Thirty volunteers hiked the trails, clearing obstacles and overgrowth, and reported any trails that needed better signage or additional blazing. They also tackled the Japanese stiltgrass that was taking over the path to the NEON tower. The group made short work of the project, and cleared everything that they could without stepping off the plastic walkway and risking further spread of the plant. View the *Roanoke Times* article on their work [here](#).



Master Naturalists clearing invasive Japanese stiltgrass

New Addition to MLBS Family



MLBS Station Manager and husband, Jaime and Matt Jones, greeted their new baby girl, Sydney Lynn Jones, at 11:32 a.m. on June 17th. Congratulations to the proud parents! After a break from the Station over the summer, Jaime returned at the beginning of October.

Sydney Lynn Jones, 2 months old

Sanderson Awarded PhD



Congratulations to Brian Sanderson on receiving his PhD in Biology from the University of Virginia. The title of Brian's dissertation is: The role of sex ratio as a context for selection in *Silene vulgaris*. Brian has a post-doc position at Texas Tech.

NEON Phase 3 Project

NEON staff are wrapping up the final sensor installation phase at the MLBS tower, placing in-ground soil sensors. Since construction, sensors have been installed in phases on the tower and in the soil array plots. Previously installed sensors have already started streaming data to the NEON portal [here](#). Select MLBS, atmospheric data product, and time range.



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A Look Back at the 2016 Season

October 1, 2015 - September 30, 2016

Snapshot

5 summer courses
2 internship and professional programs
721 station users
52 institutions represented
18 visiting courses and programs
7 station activities
10 facility projects
\$22,902 in fellowships awarded
\$6,475 in donations received
31 research programs
35 journal publications to-date



Summer Courses

- Plant Diversity and Conservation: Bioinformatics and Systematics
- Field Herpetology
- Science Writing: Creative Approaches to Biology and Ecology
- Field Biology of Fishes
- Field Biology of Fungi

Internship and Professional Programs

- Research Experiences for Undergraduates Site program: Ecology, Evolution and Behavior Field Research at Mountain Lake Biological Station
- ArtLab

Station Users

5,362 person nights
721 individuals from 52 institutions, including
7 artists
77 faculty/staff
77 undergraduate students
27 graduate students
37 high school students
7 K-12 educators

Visiting Courses and Programs

- Western Albemarle High School Environmental Studies Academy, Crozet, VA
- Fishes of the Central Appalachians, VA Institute of Marine Science, College of William and Mary
- New River Valley Virginia Master Naturalists, Blacksburg, VA
- MEDIC Wilderness First Aid Certification Course, Charlottesville, VA
- Evolution Education Teachers Workshop, University of Virginia
- College of Natural Resources & Environment Leadership Institute Retreat, Virginia Tech
- 2016 Silene Census, University of Virginia
- Biology Department Retreat, University of Virginia
- Youth Conservation Camp, VA Association of Soil & Water Conservation Districts, Mechanicsville, VA
- Danna Cristian Lab Retreat, University of Virginia
- Wildlife Field Techniques, Virginia Tech
- Philadelphia ZooCREW Field Trip, Philadelphia, PA
- VDOT Environmental CEDAR User Advisory Committee Meeting, Richmond, VA
- Dendrology Field Trip, Davidson College
- Herpetology Class, Hanover College
- Road Scholars, Mountain Lake Lodge, Pembroke, VA
- Virginia Native Plant Society field trip
- Cystic Fibrosis Foundation Xtreme Hike, Washington, D.C.



Station Activities

- Annual Open House
- July 4th Festivities
- Triathlon
- Volleyball Tournament
- Walton Lecture and Reception
- Square Dance
- Bonfire & S'more Cook-off

Facility Projects

- Chimney repair
- Water system repair
- Expanded wi-fi and fiber optic networks
- Installation of Weather Underground station
- Renovation of Burns garden fence
- New trail signage
- Invasive plant removal and trail improvements
- New kitchen equipment
- Charlottesville office signage update

Financial

Fellowships Awarded \$22,902
13 summer course students \$12,900
4 researchers \$10,002

Donations Received \$6,475
Walton Lecture \$520
Grad Students \$545
Undergrad Students \$1,595
Friend of MLBS \$3,815

Support MLBS

You can support the programs at Mountain Lake Biological Station by donating online.

All donations are tax-deductible.

mlbs.org

Research Programs

- A comparative study of the communities of ectomycorrhizal fungi in the central Appalachians and the Ozark mountains
- Climatic limitations on the spread of the gypsy moth
- Coevolutionary arms races driven by conflict: a test in social amoeba
- Co-infection and disease tolerance
- Comparing population dynamics of red-backed salamanders across an elevation gradient
- Ecological mechanisms of social selection in *Silene vulgaris*
- Exploring empirical systems
- Flora & forest dynamics of Salt Pond Mountain
- Growth and competitiveness of artificially regenerated tree seedlings in the family Fagaceae
- Harvestmen: male strategic allocation in sperm and ejaculate in response to energetic constraints and female quality
- Infection and co-infection in *Peromyscus* mice
- Integrative and evolutionary biology of the dark-eyed junco
- Investigating the mechanisms and consequences of body size reduction in eastern red-backed salamanders
- Is canopy structural complexity a global predictor of primary production?: using NEON to transform understanding of forest structure
- Maternal behaviors as drivers of family-level response to selection
- Maternal effects and mating system evolution in American bellflower
- Mating system evolution in leiobunine harvestmen
- Phenological LAI and multitemporal forest ecosystem physiology
- Physiological effects of hemlock woolly adelgid on eastern hemlock
- Population health in red-spotted newts
- Potential influence of global warming on interaction between *Silene stellata* and its pollinating seed predator *Hadena ectypa*
- Redirecting directed dispersal in a myrmecochory hotspot
- Taxonomic studies of violets in the Appalachian mountain region
- Testing *Aphaenogaster* preference for seeds of rare and common southeastern trilliums
- The chemical ecology of multispecies interactions
- The environment as a selective force on plant reproductive traits
- The evolution of social behavior in *Bolitotherus cornutus* (the forked fungus beetle)
- Three's company: chemical and microbial components of ant seed dispersal
- Understanding local controls on wood decomposition in a regional context
- Understanding reproductive timing and mate choice in heteropatric populations
- Eastern Asia/Eastern North America floristic disjunctions, University of Florida

2016 Highlights

A Scattering Across The Leaves

A collaboration between Stephen Vitiello and Kasey Fowler-Finn, PhD. Presented at the first [Beijing Media Art Biennale](#), September 25 - October 8, 2016.

A Scattering Across The Leaves consists of recordings of substrate-borne vibrations created by insects in the fields of the Appalachian Mountains. Working with very sensitive instruments and amplifiers, specifically an accelerometer, these sounds were captured through the stems of plants and flowers, amplifying but not altering the calls and footsteps of very small insects that cannot be heard by the unaided ear. Fowler-Finn notes, "The mix opens with tiny insects called treehoppers that produce songs, sometimes in chorus with one another, to attract mates." It also includes an unidentified insect in the grasses with a rhythmic call.

What we can learn from birds about ourselves

TEDxRiga presentation by Mikus Abolins-Abols, June 17, 2016



Bacteria give bird its sexy smells

Research by Danielle Whittaker, PhD. Published by [Sciencemag.org](#), June 29, 2016.

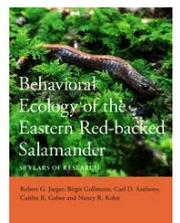
A [YouTube](#) video of Whittaker: *Microbial vs. physiological meditation of sexually selected chemical signals in a songbird* can be viewed [here](#).



The piece in [Sciencemag.org](#) piqued the interest of a children's science book author, [Ana María Rodríguez](#), who will be doing a whole children's book chapter on this work.

Behavioral Ecology of the Eastern Red-backed Salamander

Co-authored by Caitlin Gabor, PhD and Robert G. Jaeger, PhD, with many references to MLBS. Published September 1, 2016.



The weird mating habits of daddy longlegs

Research by Kasey Fowler-Finn, PhD. Published by [ScienceNews.org](#), August 22, 2016.

A [YouTube](#) video of *Leiobunum euserratipalpe* mating can be viewed [here](#).

