



Mountain Lake *Echoes*

UNIVERSITY of VIRGINIA

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In This Issue

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Drones Help Create 3D View of Forest Productivity

by Paige Williams, Virginia Tech

This August and September, Paige Williams (Ph.D. Candidate in the Department of Forest Resources and Environmental Conservation (FREC) at Virginia Tech) and Daniel Cross (FREC M.S. student and Project Associate - UAS Operator/GIS at the Conservation Management Institute at Virginia Tech) conducted multiple unmanned aerial system (UAS) flight acquisitions over the forested area surrounding the MLBS NEON flux tower. They flew their SkyFish M6 drone mounted with a Headwall hyperspectral sensor and Velodyne LiDAR sensor. This combination of sensors provides a rich dataset for environmental analysis by producing 3D high-resolution images of the forest.

Paige's research investigates the dynamics of our planet's interconnected earth system functions by integrating remote sensing (drones, planes, satellites) and field observations (flux towers). Her dissertation research combines remotely sensed estimates of forest structure and function to improve the quantification of forest productivity. By combining high-resolution observations of forest structure from lidar data and function from hyperspectral data, she seeks to improve our understanding of ecosystem dynamics and the response to changing climate conditions.

Paige works with a science team at NASA Goddard Space Flight Center called Structure and Function of Forested Ecosystems (SAFE). The team is interested in developing an Earth observing system that simultaneously quantifies structure and function to assess global productivity changes in forests.



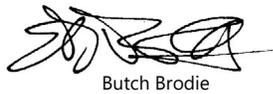
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From the Director

One of perennial challenges faced by all field stations is recruiting new long-term researchers. These people are the core of any station community and contribute so much in terms of intellectual vibrancy and energy, as well as giving back as informal mentors and sources of local expertise. Having a culturally and scientifically diverse group of researchers just makes any station a more exciting place to be.

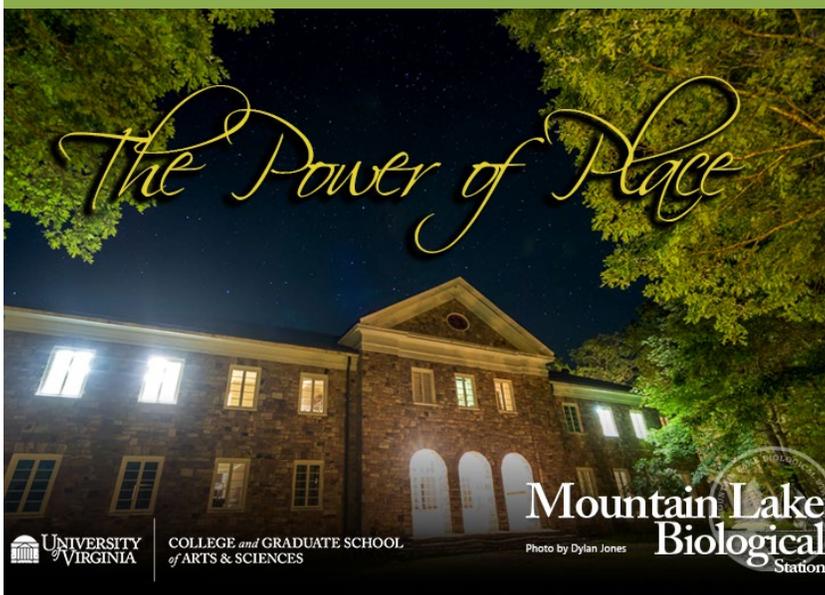
All stations hope to attract more researchers, especially those who are resident for long periods and come back multiple years; MLBS is not unique here. Conversations with other staff from other stations reveal that it is a widespread challenge with many, many factors. There are social and familial considerations for many, the professional risks associated with establishing new research systems and sites, conflicting demands of laboratory groups split between station and home, and of course the financial burden of fees for not only oneself, but families that might need to come along. I'm sure there are many other issues, so if you know of anything we can do as a station to be more welcoming and accessible please don't hesitate to share with us. If you know of any researchers who might find the facilities and environment useful, please point them our way.

One of the tangible things we can do to help new people establish research at the station is to ease the financial burden. We can offer limited "Early Career Fellowships" to new users to help them try out new research ideas or explore research opportunities. Counter to the label, these are not restricted to any particular career stage, though we expect that they will be most useful to people who are trying out something new and looking for a place to do it. The duration of the awards is flexible and might range from a few weeks to a full summer season, depending on the project and the individual's ability to support their own work. Applications are informal – send us a note and we'll help navigate the process. If you know of anyone who might benefit, please pass along the word.



Butch Brodie

Support MLBS



Click to support the programs at Mountain Lake Biological Station by donating online.

All donations are tax-deductible.

Student Corner

by Becky Williams, Univ. of Virginia



I arrived at MLBS for the Field Herpetology course not knowing what to expect. After three weeks of catching salamanders, snakes, and frogs, I can say without a doubt that herp class was one of the best

experiences of my life. It wasn't just the herps that made the experience so wonderful: my classmates and I quickly bonded over volleyball games, dinner conversations, swing dances, long van rides, and trying to memorize the scientific names of all the herps we were finding.

We started in the classroom learning about the diversity of herps and their phylogenetic relationships, and soon we were out in the woods flipping logs to find salamanders. My favorite experience at the station was going herping late at night during a storm, when hundreds of salamanders were crawling around. In addition to exploring the station, we went on several field trips to look for specific species. We found snakes (including a rattlesnake!) and lots of cool salamanders I had never seen before, despite living in Virginia my entire life.

One of the many things that set MLBS courses apart from other biology courses was living at a field station where a lot of fascinating research is taking place. We talked to REU students, grad students, and professors, and all were happy to show us first-hand what field biology research can look like. We were also fortunate to be there at the same time as the artists, so we watched them create amazing nature-inspired art pieces.

Ask any of my friends and they will tell you that I have not stopped talking about herp class since I got back. I had such an unforgettable time and loved every minute of it.



2022 Field Herpetology Class

Listening in to Bird Migration over MLBS

by Benjamin Van Doren, Cornell Lab of Ornithology

On cool autumn nights with a northerly breeze, billions of migratory birds wing their way south, bound for lower latitudes and winter warmth. As we sleep, this river of birds flows through North America, emptying into a vast delta from Florida to Tierra del Fuego, where neotropical migrants spend the winter. Although hidden from our view, these nighttime travelers are far from silent: dozens of species vocalize regularly during their trans-hemispheric flights. On the right August, September, or October night, a careful listener in a quiet area can hear the soft calls of thousands of individuals passing overhead. A trained ear can distinguish a Swainson’s Thrush from a Canada Warbler, or a Green Heron from a Savannah Sparrow, but the learning curve for identification can be steep. Fortunately, recent advances in machine learning are now making it possible for computers to detect and identify these vocalizations automatically, unlocking a new way to monitor and study the movements of birds.

Beginning this fall, MLBS hosted an autonomous microphone designed to detect the flight calls of migratory birds. The Station is part of the NightFlight Network, an array of twenty acoustic detectors listening to the night sky from New York to North Carolina. The project is run by Dr. Benjamin Van Doren at the Cornell Lab of Ornithology, and seeks to uncover the mysteries of bird migration through the Appalachians. With information from these microphones, Van Doren and colleagues will be able to

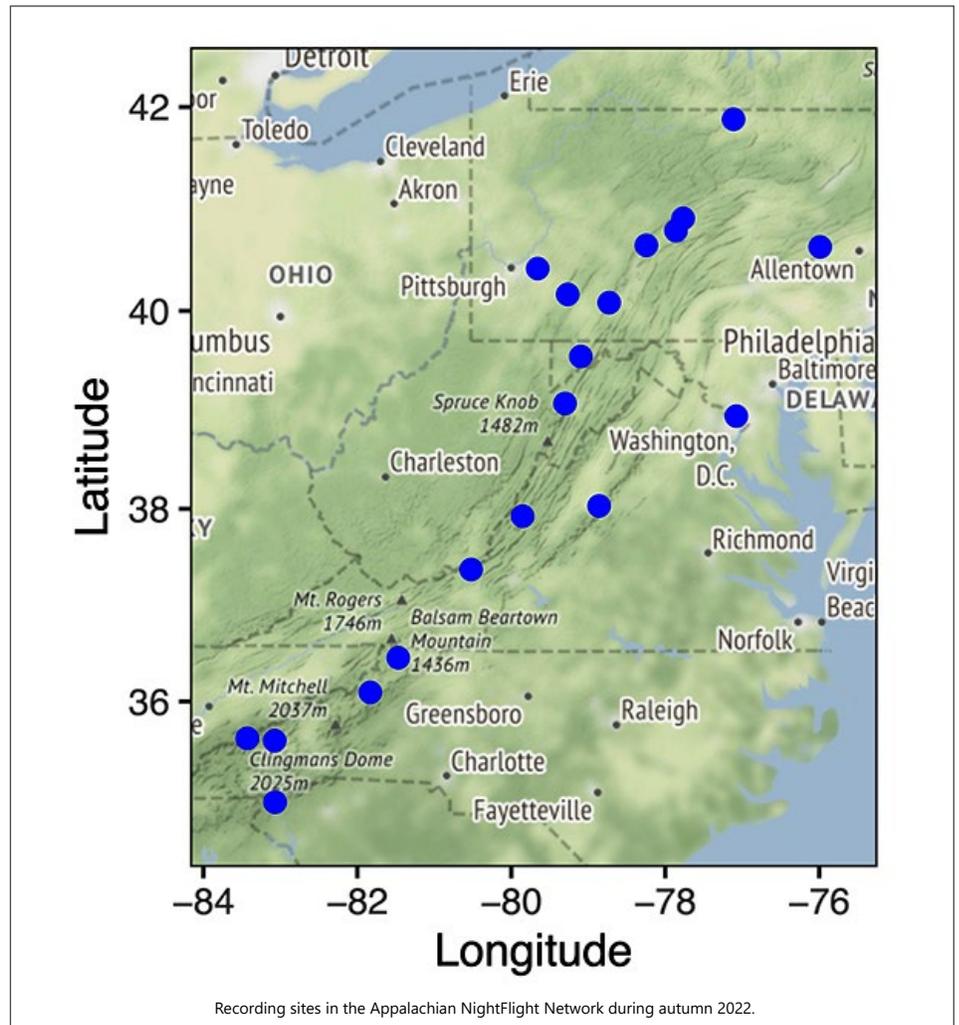
monitor migrating birds, understand how they interact with built and natural landscapes, and even shed light on their social interactions during marathon flights. The team hopes that the NightFlight Network will grow to cover the continent in the years to come, yielding new scientific insights and providing valuable information to guide conservation and policy initiatives.



A NightFlight microphone in North Carolina.



Van Doren at a microphone setup in Virginia.



News & Notes

MLBS Hosts VDOF Academy

This fall, MLBS hosted the Virginia Department of Forestry's Forest Management Academy for the state's western regions. Over the course of several days, 60-70 forestry professionals from the VDOF and USFS spent time on Station grounds and in the field to learn from experts at the top of their field, and forge meaningful partnerships both inside and outside the agency.



New Educational Trail Installs Wolf Sculpture

When the MLBS interpretive trail (currently under construction) opens, it will feature a red wolf sculpture created by one of our 2022 ArtLab artists, Edward Miller. Its surface consists of a mixture of clay sourced on site, concrete, and a splash of red paint. Red wolves used to be found on Salt Pond Mountain, but have been extirpated.



MLBS Welcomes New Station Facilities Superintendent in 2022

Chris Moyer joined MLBS this year as the new Station Facilities Superintendent.



Chris oversees the entire "buildings and grounds" of the station. This is a huge job! He is responsible for running and maintaining the station's physical infrastructure – everything from building operations and maintenance, to power and water systems, to mowing the grass. Chris comes to us with a lot of experience under his belt. He worked at Virginia Tech with their facilities and engineering departments. He worked for FEMA in Puerto Rico after Hurricane Maria. And he has lived and worked in the New River Valley for many years. He brings a lot of expertise, wisdom, and local knowledge. Chris hit the ground running just days before high season this year and has not let up since. The Station is thrilled to have him on board!

Wilderness First Aid

SOLO held its Wilderness First Aid class at MLBS over Labor Day weekend. The final simulated emergency scenario, which occurred outdoors, was ultra-realistic this year as rain moved in and temperatures dropped. Participants came away with an even greater appreciation of what emergency medicine can be like when it happens in the field!



WeatherSTEM

Curious about the weather at MLBS? Our new WeatherSTEM station has an app for that! Visit giles.weatherstem.com/uvamlbs for weather data, lightning information, forecasts, and a view of the sky from a "cloud cam" mounted on Wilbur Lab. The site also includes a link to download an app for your mobile device. Be sure to follow @UVAMLBSWxSTEM on Twitter for time lapse videos, daily almanacs, lifestyle forecasts, and more. Many thanks to UVA's Office of Emergency Management for helping make this new resource available!

	TODAY	TOMORROW
 Aches/Pains	Moderate	Minimal
 Dry Skin	Moderate Concern	Moderate Concern
 Frizzy Hair	Moderate Concern	Moderate Concern
 Golf Conditions	Excellent	Very Good
 Mosquito Activity	Limited Activity	Limited Activity
 Pollen	None	None
 Running Conditions	Very Good	Good
 Sunburn Risk	Moderate	Moderate



How Things Work at MLBS

A Periodic Feature for Those Mountain Lakers Who Always Wanted to Know

by MLBS Staff

MLBS is a remote, full-service, residential field station that provides the infrastructure of an academic science department. The Station supplies utilities, communications, residential, transportation, research, instructional, and public support. Here is how we do it!

PART 2: Water Supply

MLBS has two independent water supply systems – one potable and one non-potable. Our potable water system feeds the entire station except for a few spigots in Wilbur Laboratory and the greenhouse.

Water for our potable system (what you drink, wash in, etc.) is pumped from two 160ft wells [editor’s note: while it offends our scientific sensibilities, we will use English units in this piece to honor the conventions of the plumbing trade in the U.S.]. One well is under the well house (see map). The other is 325ft south of the well house, adjacent to the main parking lot.

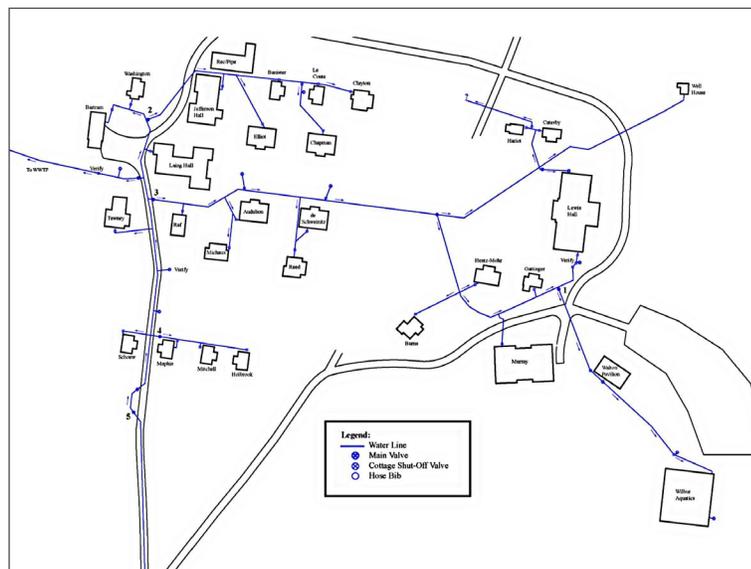
Water from both wells is combined and passes through a potable water treatment plant in the well house. The treatment plant takes the raw well water and chlorinates it (Cl₂) to kill bacteria, buffers the pH to near neutral with soda ash, and adds potassium permanganate (KMnO₄), an antioxidant and another disinfectant. It then sends the treated water underground outside the building for 180 linear feet in what is called a detention loop. This ensures complete mixing of the chemicals into the water before it returns to the well house and passes through what is known as a green sand filter to reduce natural iron and excess treatment manganese (see photo). At this point, the water is “potable,” meaning safe to drink. The Virginia Department of Health tests and monitors the treated water daily.



Green sand filters.

Water then leaves the well house again at 15gpm and 54psi and feeds all of our buildings. After traversing the entire Station, the main water line runs up Spring Road to the water storage tanks. The tanks are a pair of underground cisterns that can store 3,040 gallons, enough to supply the Station’s average summertime demand for one day. Water pressure is maintained by the 125 vertical-foot elevation gain between the Station grounds and the tanks. This gravity feed system is why we do not lose water right away during a power outage. A radio link to the well house turns the well pumps on and off to keep the water storage tanks full.

The system described above is fairly new. Until the mid-1980s, all the Station’s water came from the spring at the top of Spring Road. That water flowed the short distance to the two smaller older cisterns that can be found right next to the newer ones. Spring water was abandoned as a primary water source when the Virginia Department of Health banned untreated “surface water” for potable use. But we still use the spring water – it feeds the “non-potable” spigots in Wilbur Laboratory and in the greenhouse.



Who We Are

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A Look Back at the 2022 Season

October 1, 2021 - September 30, 2022

Snapshot

3 summer courses
4 internship and professional program
7 REU program participants
448 station users
51 institutions represented
9 visiting courses/programs
6 station activities
7 facility projects
\$31,851 in fellowships awarded
\$6,519 in donations received
40 research programs
44 journal publications



Station Users

- 5,147 user days
- 448 individuals from 51 institutions:
 - 78 faculty/staff
 - 8 postdocs
 - 103 undergraduate students
 - 38 graduate students
 - 2 K-12 students
 - 22 guest/family
 - 7 artists
 - 190 visiting course/program participants

Station Activities

- July 4th festivities
- Volleyball tournament
- Gourmet S'more Cookoff
- ArtLab Lucile Walton Fellow lecture
- Movie nights
- Swing dance lessons

REU Participants

- Darby Tassell
- Ella Halbert
- Keely Pattisall
- Victoria Feist
- M. Scott Brueshaber
- Esme Macpherson
- Gerardo Bencosme

Financial

- Fellowships Awarded \$31,851:
- 8 summer course students \$20,478
 - 5 researchers \$9,843
 - 3 workshop attendees \$1,530
- Donations Received \$6,519:
- Undergrad Students \$2,400
 - Walton Lecture \$500
 - Friend of MLBS \$3,619

Facility Projects

- Construction of 0.25 mile interpretive trail (signage to come in 2023)
- Construction of bridge from pond berm to Pipeline Trail
- Installation of WeatherSTEM weather station and livestream Cloud Cam
- Invasive plant removal
- Burns Garden improvements
- New herbarium cabinets in Wilbur
- Removal of hazard trees

Summer Courses

- Field Herpetology
- Field Biology of Fishes
- Field Behavioral Ecology

Internship and Professional Programs

- Research Experiences for Undergraduates program
- Evolutionary Biology Graduate Student Workshop
- Evolution Education Teacher Workshop
- ArtLab Artists-in-Residence

Visiting Courses and Programs

- Phylogeographic data aggregation and repurposing (phylogatR) workshop, Radford University
- Forest Management Academy, Virginia Department of Forestry
- Forsyth Audubon birding visit, Forsyth Audubon Bird Club
- Wilderness First Aid class, MEDIC SOLO
- CNRE Leadership Institute retreat, Virginia Tech
- Virginia Society of Ornithology birding visit, Virginia Society of Ornithology
- Herpetology Class, Hanover College
- Ichthyology Class, William and Mary's Virginia Institute of Marine Science
- The Wildlife Society, Virginia Tech



Research Programs

- Violets of northeastern North America
- The influence of climatic dipoles on plant and animal populations at continental scales
- Collection of type series for blackbelly species description
- Automated behavioral tracking of mating interactions in Mid-Atlantic Opiliones
- Understanding mechanisms of co-occurrence of North American *Lobelia*
- Combining NEON and remotely sensed habitats to determine climate impacts of community dynamics
- American chestnut restoration
- Fitness consequences of age structure in forked fungus beetles
- Wing-mediated pollination in *Rhododendron* and *Lilium*: Investigating an overlooked mode of pollination in Virginia's flora
- Role of disturbance and abiotic factors in carbon sink in eastern oak-dominated forests
- Evolution of social behavior in forked fungus beetle
- Breed early, breed late? Molecular, neuroendocrine, and developmental mechanisms regulating timing of reproduction
- Metagenomic survey of the wild *Dictyostelium discoideum* microbiome
- SARS-CoV-2 prevalence in wildlife along an urbanization gradient
- Litter decomposition across scales
- Camera trapping in and around Mountain Lake Biological Station
- Annual *Junco* census
- Frugivory and seed dispersal of painted trilliums
- Host-seeking, feeding habits, and pathogen transmission in *Culex territans*
- Genetic factors of range expansion in *Campanula americana*
- The role of mating systems in colonization
- Pine bark adelgid on red spruce and white pine
- Landscapes, life histories, and anuran population genetics: Can traits predict connectivity of a regional species pool?
- Coevolutionary arms races driven by conflict: A test in social amoeba
- The ecology of parental care behavior
- Raccoon roundworm at Bear Cliff
- Worker evolution in termites
- National Ecological Observatory Network
- Sampling Dark-eyed juncos to understand the seasonal divergence in the reproductive timing
- Environment as a selective force on plant reproductive traits
- Investigating color vision in Ruby-throated hummingbirds
- *Silene* census
- Remote sensing of forest structure and function
- Habitat requirements and population genetics of fungus-inhabiting beetles in old-growth forests
- Passive acoustic monitoring of bird migration in the Appalachians
- Allopolyploid speciation in *Isoetes appalachiana*
- Flora of Mountain Lake Biological Station
- Evolutionary ecology of root-knot nematodes
- How do parasites affect natural selection on nutritional mutualisms?
- The effect of host and symbiont thermal adaptation on mutualism traits



A list of publications related to MLBS are housed in a searchable [Zotero database](#).