

# THE DUKE FOREST

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A bulletin from the  
Office of the Duke Forest

*Fall 2018*



## Research Spotlight: A Living Legacy

Since 1931, the Duke Forest has provided research opportunities for Duke University faculty and students in the fields of forestry, botany, zoology, and environmental science. Today the Forest is also used by local universities and institutions across the country to study subjects as far afield as nanotechnology, atmospheric chemistry, aqua-terrestrial biogeochemistry, remote sensing, forest economics, global climate change, and computer science. With hundreds of flexible research sites – from fields and towers to waterways and historic forest succession plots – the Duke Forest is a 7,050 acre living laboratory unlike any other in our region.

As recently outlined in a multimedia Duke Story [dukeforest.duke.edu/story], the Duke Forest has contributed significantly to the study of Piedmont forests and particularly to the theory of old field succession, or the established patterns of regrowth and change after an agricultural disturbance. The foresight of Clarence Korstian, the first director of the Duke Forest who established and began collecting data on a variety of field and forest plots in the 1930s, has resulted in nearly 90 years of research that continues to shape our understanding of forest succession.

The predominant theory suggests that in the Piedmont of North Carolina, land subjected to agricultural disturbance will grow back in a century or two to become a mixed hardwood forest dominated by Oaks and Hickories. But that established theory is changing before our eyes.

This summer Christopher Payne, Ph.D., defended his doctoral thesis entitled, *The Long-term Temporal Dynamics of the Duke Forest*, a monumental project lasting eight years. Chris used almost 80 years of historic data from 37 of Korstian's permanent sample plots and also collected new data from hundreds of thousands of trees. Payne discovered that more stands are transitioning to species that are more moisture tolerant than Oaks and Hickories, like Maple and Beech. He also found that secondary hardwood forests, while already surpassing the typical biomass volumes found in old-growth stands, continue to gain more biomass at a higher than expected rate.

What does this mean for the future of Oaks and Hickories in North Carolina? What will the Forest look like for your great-grandchildren? Whether these shifts are a result of rising global temperatures, changing weather patterns, overabundant deer, invasive species, and/or the effects of human activity, the future of Piedmont forests may not happen as predicted.

Further research is necessary to even begin grasping the meaning of these changes. To protect and facilitate the use of these data by future researchers, Payne and his primary investigator, Dr. Robert Peet, are working with the Duke Forest Office and the Duke Digital Repository to create a comprehensive digital record. This will be supplemented by a complete paper file housed in Duke Archives. In addition, the Duke Forest Office has worked with Duke Archives to create an official Duke Forest collection to preserve and promote the use of historic maps, photos, and other mementos from the Forest's long history at Duke.

**THE DUKE FOREST** comprises over 7,000 acres of land in Durham, Orange, and Alamance counties and has been managed for research and teaching purposes since 1931. The mission of the Duke Forest is to facilitate research that addresses fundamental and applied questions across a variety of disciplines and to aid in the instruction of all students in their pursuit of knowledge, especially regarding the stewardship of our natural resources. In addition to supporting education at local universities, the Forest also participates in community outreach through tours and other events.



[dukeforest.duke.edu](http://dukeforest.duke.edu)

### CONTACT INFORMATION:

Office of the Duke Forest  
Duke University  
Levine Science Research Center  
Ste A142  
Box 90332  
Durham, NC 27708  
**Phone:** 919-613-8013  
**Email:** [dukeforest@duke.edu](mailto:dukeforest@duke.edu)



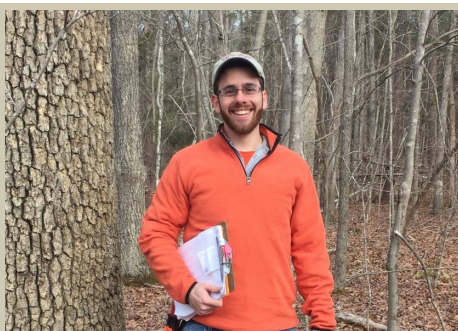
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Chris Payne visits one of his plots in the Duke Forest.



Duke Forestry students collect tree diameters in 1953.

## DUKE FOREST STAFF:

**Sara Childs**, *Director*  
**Jenna Schreiber**, *Assistant Director*  
**Tom Craven**, *Supervisor*  
**Beverly Burgess**, *Administrative Assistant*  
**Craig Hughes**, *Maintenance Tech*  
**Blake Tedder**, *Community and Engagement Coordinator*  
**Joy-Lynn Rhoton**, *Management Intern*

## ADVISORY COMMITTEE:

**Toddi Steelman**  
 Dean of the Nicholas School of the Environment, Chair

**Norm Christensen**  
 Professor Emeritus and Founding Dean of the Nicholas School

**Dan Richter**  
 Professor of Soils and Forest Ecology, Nicholas School of the Environment

**Pat Halpin**  
 Gabel Associate Professor of the Practice of Marine Geospatial Ecology, Nicholas School of the Environment

**Nicolette Cagle**  
 Lecturer in Environmental Science & Policy, Nicholas School of the Environment

**Sari Palmroth**  
 Associate Research Professor, Nicholas School of the Environment

**Neal Flanagan**  
 Assistant Professor, Duke Wetland Center, Nicholas School of the Environment

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 Professor of History and Vice Provost for Interdisciplinary Studies

**Justin Wright**  
 Associate Professor, Biology Department

**Eliza Mathew**  
 Senior Program Coordinator of Education Initiatives, Office of Durham and Regional Affairs

# Forest Greetings

## From the Director's Desk

I have the incredible privilege of working with a team that is as passionate about the mission and management of the Duke Forest as they are committed and dedicated to each other as team members. This fall, the Office of the Duke Forest was nominated for Duke's Blue Ribbon Teamwork Award. Here is a quote from the nomination package submitted by Dr. Nicolette Cagle and supported by Sarah P. Duke Gardens Executive Director Bill LeFevre and Nicholas School Professors Ram Oren and Dean Urban:

*This small staff of seven committed individuals has made a disproportionately large contribution to furthering Duke University's mission by effectively building collaborative relationships, creating a positive team environment, helping academic units meet their goals, and putting team goals first. While they manage over 7,000 acres of forestland stretched across three counties, they also scaffold student and faculty research, support Duke classes and interns, and create value-added experiences for community stakeholders.*

In the last year, we have added new capacity in the form of a Communications and Engagement Coordinator. Blake Tedder joined us in April and has quickly become a central player on our team, communicating our activities to the broader Duke and public communities via a digital newsletter, new social media feeds, the redesign of our website, and a YouTube channel. His work directly supports directions laid out in our 2017 strategic plan, specifically in the realms of community engagement and fundraising.

Toward the end of last year, Craig Hughes came on as our Maintenance Technician, which is a title that does not adequately capture the incredible capacity he provides. Craig is a master on every piece of heavy equipment we own and can weld, fabricate, fix, or build just about anything we need to steward the Forest.



Duke Forest staff (left to right): Joy-Lynn Rhoton, Beverly Burgess, Blake Tedder, Sara Childs, Jenna Schreiber, Tom Craven, and Craig Hughes.

Craig is also a perfect partner in crime for our Forest Supervisor, Tom Craven. Tom originally joined us in a temporary capacity back in 2016, but with his excellent forestry and management credentials, he quickly demonstrated the contributions he could make to our timber management program and the oversight of our maintenance shop, rental houses, equipment, and other infrastructure. This allowed Jenna Schreiber, now our Assistant Director, to assume greater responsibility in leading initiatives related to our strategic plan while still putting her forestry background to work for timber management and forest health.



[dukeforest.duke.edu/strategicplan](http://dukeforest.duke.edu/strategicplan)

This summer, Joy-Lynn Rhoton joined us as our yearlong Management Intern. Among other support roles, she is tackling the monumental task of executing our invasive species action plan. All along, Beverly Burgess has remained hard at work in her administrative role, keeping the behind the scenes work running smoothly while providing a steadfast and welcoming presence through this tremendous period of growth and change. *I truly could not be more grateful for or prouder of this team.*

Sara DiBacco Childs  
 Duke Forest Director



President Price and his wife Annette visited the Duke Forest this summer to meet the team and take a hike along New Hope Creek with Sara and Jenna.



# Project Updates

## Couch Cabin Porch Restoration

The *Duke Forest Improvement Fund* directly helps maintain our network of trails, manage and protect our significant cultural and natural areas, provide community outreach programs, and offer meaningful volunteer opportunities. One exciting project this year was the restoration of the front porch of the historic Couch family cabin, which is used for various events and programs. This spring, we salvaged a White Oak (*Quercus alba*) from a nearby location in Duke Forest and used the lumber from it to replace the weathered and rotted boards. We wish to thank Dr. Nels Anderson and his antique sawmill for help with this project.

The Couch family owned much of the land that is now the southwestern portion of the Durham Division of the Duke Forest. Maintaining this cabin, which has been on the land for at least a century, is part of our commitment to the cultural heritage of the Duke Forest.



Duke Forest staff refurbished the porch on the historic Couch Cabin with White Oak from the Forest.

## Citizen Science Launch

Citizen science, or public participation in scientific research, has become increasingly popular with researchers who need more consistent data and with amateur scientists who want to be involved in meaningful volunteer endeavors. This summer, the Duke Forest launched our first citizen science effort called *Herpetofauna of the Duke Forest*. We trained 20 community volunteers to survey established cover board transects in the Forest to identify, photograph, and document any of the amphibians and reptiles they find. Their efforts will increase our understanding of this important group of 60+ species that make their home in the Duke Forest, and ultimately will inform strategies to better protect them.

In the spring, we hope to launch another citizen science project that will focus on tree phenology, specifically the timing of flowering and leaf out. We hope to use this data to better understand the seasonal cycles for a variety of dominant tree species in the Duke Forest.

Duke Forest citizen science programming is made possible by your contributions to the *Duke Forest Improvement Fund*.



(Above) Citizen scientists examine a cover board along a transect. (Below) Bill Boyarsky, Duke Forest citizen scientist, found this Black Rat Snake (*Pantherophis obsoletus*) during his monitoring visit.

## Hurricane Florence Impacts

Since Hurricane Florence moved through the Carolinas in mid-September, our field team has been performing some superhuman tasks remediating the damage caused by flooding. Although we did not receive the storm's direct impacts, the Duke Forest experienced significant rainfall with New Hope Creek and all of its tributaries swelling well beyond their typical floodplains.

Such high, rushing water significantly damaged road culverts and undermined bridge abutments. While some trees also fell, the scale and scope of this damage was minimal compared to what we originally expected when the storm was initially forecast. Navigate to our YouTube channel from our website to see some truly remarkable footage of the high water on New Hope Creek as it tore through the Korstian Division.



(Clockwise from top left) New Hope Creek near peak flood stage; roaring water flow under the Wooden Bridge over New Hope Creek; Forest Supervisor Tom Craven rebuilding a washed out culvert; trees down over the Al Buehler Trail.

# Year in Review

July 2017 - June 2018

## Management & Stewardship

Stewarding the natural resources of the Duke Forest to accomplish our mission today and well into the future is the first of three overarching goals in our strategic plan. The management of the Forest is certified by the Rainforest Alliance to Forest Stewardship Council® guidelines, a strict set of environmental, social, and economic standards. In the past year, we operated across 300+ acres to prepare and improve timber stands, to control invasive plant species, and to restore Shortleaf Pine (*Pinus echinata*) in a relic site.

Of the southern yellow pine species, Shortleaf has the largest geographic range but its extent has declined 53% since 1980. A formal initiative was begun in 2013 to strategically restore this ecologically and commercially valuable species to the landscape. While not a formal participant of the initiative, the Duke Forest is looking at other sites in which Shortleaf restoration is viable.

We also performed road and trail maintenance along 78 miles of gravel road and dirt foot trail to prevent and minimize potential negative impacts on the surrounding environment, especially our waterways. Keeping this human-made infrastructure in tip-top shape is a major responsibility of our office.



AT A GLANCE

### 2017 - 2018

#### Stand Improvements

**267 acres**

Hardwood control	205
Invasive control	14
Mowing	14
Prescribed burning	20

#### Planting

**35 acres**

#### Road & Trail Maintenance

**78 miles**

Road grading & repair	7
Road mowing	51
Trail blazing	9
Trail hazard mitigation	2
Trail trimming	9



The mark of responsible forestry



Duke Forest Director Sara Childs and Assistant Director Jenna Schreiber are on-site at a prescribed burn in the Hillsboro Division in July 2017 to prepare the stand for planting Shortleaf Pine.

## Teaching & Research

Facilitating teaching and research use in the Duke Forest across all disciplines and for all students is a primary goal of our strategic plan. With such a diversity of sites, the Forest offers countless opportunities for outdoor research and instruction, from plant ecology investigations to engineering design projects.

Fifteen new research studies began this year, including three by Duke undergraduates conducting independent studies under the guidance of Rebecca Dalton, Ph.D. candidate, and William Morris, Professor of Biology. Two of the student projects focused on spring ephemeral plants: one on competition for pollination between two common species in the Forest and the other on Little Heartleaf (*Hexastylis minor*). The third sought to shed light on the effects of the invasive Japanese Stiltgrass (*Microstegium vimineum*) on plant herbivory. A team from Duke's Nanomaterials and Thin Films Research lab in collaboration with RTI International set-up equipment in the Duke Forest to calibrate their CAMM-ES (Coded Aperture Miniature Mass Spectrometers for Environmental Sensing). They hope that one day, this device will serve as a reliable field measurement tool for natural gas emissions associated with energy production.

As an outdoor classroom, the Forest received 96 visits from a range of K-12, undergraduate, graduate, and lifelong learning courses. The Environmental Science Summer Program (ESSP) led by Nicholas School of the Environment professor Nicolette Cagle, Ph.D., is an annual highlight. With a vision to cultivate the community's next generation of environmental leaders, ESSP brings talented high school students from the Triangle to Duke for a two-week intensive program. The students spend lots of time adventuring in and around New Hope Creek studying macroinvertebrates and taking water quality measurements.



ESSP students analyze water quality samples.



## Engagement & Outreach

Engaging the broader Duke and public community in the Forest as a stage for exploring and understanding our environment is a major goal of our strategic plan. Duke Forest staff offer tours, give presentations, host volunteer events, and participate in group activities to provide education and outreach about natural resources and forest management. This past year, we hosted two groups from the Osher Lifelong Learning Institute at Duke. Together, we hiked along the Shepherd Nature Trail while considering how natural and human factors are constantly shaping the forest around us.

We only hosted two volunteer events this year, but they provided invaluable support for management operations. They included: planting Longleaf Pine (*Pinus palustris*) seedlings in a buffer area around a research plot and performing major repairs and reroutes on the Couch Mountain Trail in the Durham Division.



Volunteers plant over 2,000 Longleaf Pines in the Durham Division in March 2018.



Volunteers work on the Couch Mountain trail near George's Road in the Durham Division in May 2018.



AT A GLANCE

### 2017 - 2018

Number of tours and activities	27
Number of participants	702
Total outreach hours	44
Number of volunteer events	2
Number of participants	13
Total volunteer event hours	8



AT A GLANCE

### 2017 - 2018

Number of research projects (15 new projects)	47
Number of primary investigators	33
Number of research affiliations	15
Total research dollars (11 of 47 reporting)	\$1,129,400
Number of teaching activities	31
Number of educators	25
Number of class visits	96
Number of participating students	870



Pratt School of Engineering graduate students set up their CAMM-ES device.



Duke undergraduates Alina Xiao, Melina Keighron, and Derek Gonzalez study plant ecology in the Duke Forest.



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## Give to the Duke Forest Improvement Fund

GIVING OPPORTUNITIES

Since 1931, the Duke Forest has served as a living laboratory for cutting edge scientific research and an outdoor classroom for thousands of K-12 and university students. The Forest is guided by a comprehensive management plan that includes demonstrating sustainable forest management, stewarding lands for the protection of biodiversity, and maintaining many miles of roads and trails for exercise enthusiasts and nature lovers.

We rely on donor support to complete special projects like the Shepherd Nature Trail Restora-

tion. Your gifts to the *Duke Forest Improvement Fund* directly help maintain our network of trails, protect our significant cultural sites and natural areas, provide community outreach programs, and offer exciting volunteer opportunities.

Please support the Duke Forest with a tax-deductible gift today.

*If you have interest in making a planned gift toward the legacy of the Duke Forest or are interested in supporting specific initiatives, please contact Blake Tedder at [blake.tedder@duke.edu](mailto:blake.tedder@duke.edu).*

### Thank you to our 2017-2018 Friends of the Duke Forest

Richard & Linda Heintzelman  
Gail Boyarsky & Dr. Walter Fowler  
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## [dukeforest.duke.edu/give](http://dukeforest.duke.edu/give)

**SAVE THE DATE for our very special 10<sup>th</sup> Annual Pine Cone Pacer 5K: April 13, 2019**