THE DUKE FOREST

A bulletin from the Office of the Duke Forest

Fall 2016



Remembering Hurricane Fran

September 2016 marked the twenty-year anniversary of Hurricane Fran, the most damaging hurricane to hit the Duke Forest since its establishment in 1931. On Friday September 6, 1996, Fran crashed through the Forest, flooding stream banks, splitting tree trunks, and ripping up tree roots. Its scars are visible today in the decaying trees and tip-up mounds of upturned roots that dot the landscape. Twenty years later, the Office of the Duke Forest is remembering this historic hurricane and considering its long term effects on the Forest.

By the time the storm hit his house – 20 miles from Durham – Judd Edeburn was already anxious to assess the damage on the Duke Forest. Judd was the Forest's Resource Manager until 2014, and he considers this event one of the most overwhelming of his long career. After chain-sawing his way to Durham, Judd reached the Duke Forest and met up with his crew of employees and students. When recalling the morning after Fran, Judd remembers the shock of seeing the damage for the first time:

It was surprising how significant the damage was... When I got to Durham, there were trees down everywhere. I got to the end of Lemur Lane, and I couldn't even get to the [Duke Forest Maintenance] Shop because trees were down... The first thing to do was cut through the trees to get to the Lemur Center.

After opening up the roads to the Shop and the Lemur Center, Duke Forest staff regrouped and decided to return to the Forest the next day to fully assess the storm damage. That Saturday, Forest staff surveyed the roads and began to fully understand the breadth of Fran's damage. They counted more than 1,400 trees down across 35 miles of roads.

Fallen trees had also damaged several structures including the Bobby Ross, Jr. Memorial Picnic Shelter, signage along the Shepherd Nature Trail, and a research tower in the Blackwood Division. Intense rainfall led to flooding that overtopped the Wooden Bridge inside the Korstian Division - a bridge that normally sits 15 feet above New Hope Creek. High waters eroded "rip rap", the stabilizing gravel and rocks that reinforce the banks around bridges.

Most damage was concentrated along northeast-facing slopes in the Duke Forest's Durham and Korstian Divisions, which faced the eye of the storm. After consulting with the Duke Forest Advisory Committee and Duke University administrators, Judd and his team decided to officially close the Duke Forest. Portions of the Forest remained closed for three to six months following the storm. *(continued on next page)*



Bobby Ross Jr. Memorial Shelter

Splintered tree trunk

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 Forest is to facilitate research that addresses fundamental and applied questions concerning forested and aquatic ecosystems and to aid in the instruction of students so that they will be informed citizens and effective stewards of our natural resources. In addition to supporting education at local universities, the Forest also participates in community outreach through tours and other events.

INSIDE: Hurrican Fran Year in Review Teaching Spotlight News and Updates



www.dukeforest.duke.edu

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A special thanks to Maggie Heraty for her contributions to this edition of the LOG and her tremendous work on the Shepherd Nature Trail Project.

Fran continued...

In the months that followed, Judd and the Forest crew focused all of their efforts on storm recovery. With only 5 permanent staff members on the team (just like today), they needed reinforcements to support their efforts. The Office hired several contractor crews to remove fallen trees, regrade roads, and remove branches and leaves from road ditches. With the help of the North Carolina Forest Service, Duke Forest also conducted an aerial survey of the Forest and created hand-drawn maps of Fran damage.

One of the most notable recovery efforts after Fran was the use of a helicopter logging crew to salvage fallen trees and recoup some of the economic losses from the storm. The helicopter salvaged high-value timber in inaccessible areas of the Duke Forest, minimizing soil and habitat damage. Within just two weeks, the helicopter crew salvaged over 800,000 board feet of timber (~67,000 cubic feet) from 163 acres of forest. Timber salvage operations continued through the summer of 1998. In total, the Duke Forest salvaged a total of 2 million board feet (~167,000 cubic feet) from 540 acres, recovering approximately \$260,000 in timber value.

In addition to these recovery efforts, Duke Forest staff also developed a management plan to allow for Hurricane Fran's legacy to live on in the Forest. Downed trees were not removed from places like Natural Heritage Areas, long term study plots, and areas with scattered trees. This was intentionally done to allow for natural regeneration, as well as to create areas where researchers could study Fran's effects.

Since that time, researchers like Drs. Weimin Xi, Robert Peet, and Dean Urban have used the Duke Forest to study how large hurricanes, like Hurricane Fran, affect Piedmont forests. Much of this research shows that Fran has had lasting effects on the structure and composition of the Duke Forest. Primarily, Fran created greater variation within and between stands of Forest trees.

Microbursts of wind caused trees to fall in patches, creating a mosaic of habitat types which now vary from sunny fields to thick woodlands. The average age of many stands also decreased as old trees fell and new seedlings sprouted in their place. In addition, Fran caused a modest increase in the diversity of tree species in the Forest. An influx of young hardwood trees regenerated where old pines, oaks, and hickories had fallen. Fast-growing trees like Tuliptree and Sweetgum sprouted under the newly opened canopy. Herbaceous plants, shrubs, and exotic species, like Japanese Stiltgrass, Princess Tree, and Tree-of-Heaven, also took hold.

Though Duke Forest has recovered from the devastation, Hurricane Fran's effects will remain visible for decades. The tip-up mounds and decaying tree trunks linger, and long-time members of the Duke Forest staff still vividly recall the months after Fran. As Judd puts it, "Fran was a shock to deal with. It was new and different, and almost overwhelming in its magnitude. But we did the right set of things. Now we know what to do in the future."



For the first and only time in the Forest's history, helicopter loggers salvaged timber.

Hurricane Fran destroyed large swaths of trees (top) and made most forest roads impassable (bottom).

Teaching Spotlight

One Health Training Program

Duke University's One Health Training Program trains emerging scientific professionals in interdisciplinary approaches to health care. Students are taught "One Health" problem solving, a unique strategy that combines public, veterinary, and environmental health studies. The Training Program was created by Dr. Gregory Gray, Professor of Medicine, Environmental Health, and Global Health at Duke University, and is co-taught by several lecturers, including Dr. Michael Reiskind, Assistant Professor of Public Health Entomology at NC State University. Each year, Duke's One Health Training Program attracts and trains global health students from across the world. The 2016 Training Program included scholars from 9 countries, including China, Kenya, Pakistan, and the USA.

In an introductory course on Entomology, Zoonotic Disease, and Food Safety, Drs. Gray and Reiskind used the Duke Forest to teach One Health students about vector borne disease. During field sessions at the Duke Forest, students learned methods for collecting mosquitoes and ticks, including installing chemical lure traps and performing tick drags. The Duke Forest sessions were part of a larger training on vector biology, wild-caught insect identification, and techniques for controlling mosquito and tick-borne diseases.



~ Feedback from the Field ~

It has been wonderful having Duke Forest available for our training. The Forest is very near our classrooms and rich with teaching opportunities for our scientific scholars. A number of students commented that their field training with Dr. Reiskind in Duke Forest was a highlight of their three weeks at Duke. I love the diversity of habitats we can show the students, and for many of our students from the Middle East, Duke Forest may be the first real forest they have experienced. They are, as one can imagine, suitably impressed.

- Dr. Gregory Gray (Duke University)

- Dr. Michael Reiskind (NC State University)



All photos courtesty of Dr. Gregory Gray

Year in Review

July 2015 - June 2016

Research and Teaching

The Duke Forest fulfills its primary mission by hosting a wide variety of researchers, educators, and students. Sixteen new research projects began this year, and investigators enhanced several existing projects to further their current studies. In the Edeburn Division, collaborators from the University of North Carolina - Chapel Hill used the McGlynn Lab research site to collect data on headwater characteristics necessary to produce better models of catchment hydrology. Also at the McGlynn Lab research site, Ph.D. student Maggie Zimmer supervised the installation of new groundwater monitoring wells to support ongoing work to better understand stream flow and groundwater recharge. The Forest also hosted its usual array of graduate, undergraduate, and K-12 field trips and class exercises, including the Environmental Sciences Summer Camp. This camp is led by Nicholas School Lecturer, Dr. Nicolette Cagle, and engages Durham Public High School students in learning about environmental science.



Engagement & Outreach

Duke Forest staff offer tours, host volunteer events, and participate in group activities to provide opportunities for education and outreach about natural resources and forest management. This year, staff delivered lectures or workshops at several public and professional meetings, including the 9th Annual Student Society of American Foresters Symposium: <u>A Closer Look at Forest Certification</u> and at a workshop hosted by the Roanoke Electric Cooperative as part of its pilot <u>Sustainable Forestry</u> and African American Land Retention project. We brought the forest to the kids at a Durham Public Library event and delivered a field tour for presenters participating in Duke's Environmental Arts and Humanities <u>Narrating Nature</u> workshop.



2015 - 2016

Number of tours and activities	3 1
Number of participants	751
Total outreach hours	63
Number of volunteer events	10
Number of participants	70
Total volunteer event hours	24



Year in Review

July 2015 - June 2016

Management & Stewardship

Management of the Duke Forest is guided by a comprehensive plan that promotes the Forest's academic mission while ensuring the protection of its natural resources. 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. Duke Forest management priorities include the sustainable management of natural resources for timber production, forest health, water quality, and wildlife habitat. Staff manage hundreds of acres every year to facilitate the responsible production of wood products, the creation of diverse habitats for wildlife, and the protection of important natural resources (see Monitoring Program below). These activities directly contribute to accomplishing the Duke Forest's research and teaching mission and demonstrate what responsible use of a renewable natural resource looks like on the ground.

AT A	2015 - 2016			
е Г	Harvests	262 acres	Stand Improvements	131 acres
AN	Regeneration		1	
Ē	Clear cut	19	Pre-commercial thinning	44
	Seed tree	26	Invasive control	41
	Selection	24	Prescribed burning	29
	Shelterwood	15	Hardwood control	16
	Strips	5		
	Intermediate			
	Thinning	102	Plantings	81 acres
	Selection	29		
	Other harvests Seed tree removal	42	Road Maintenance Grading & repair Mowing	62 miles 5 57



Duke Forest Natural Heritage Monitoring Program

In 2004, the Duke Forest entered into a voluntary agreement with the State of North Carolina's Natural Heritage Program to maintain and protect 12 significant natural heritage areas (NHA). These areas, totaling over 1,220 acres, represent a variety of high quality natural communities and habitats that are an important part of North Carolina's natural heritage.

In demonstration of its lasting commitment to this agreement and its desire to protect natural resources, the Duke Forest has established a NHA Monitoring Program. This program defines general procedures for tracking ecological changes and human disturbances within each site and creates a mechanism for alerting Duke Forest management of any issues.

The goal of Duke Forest's NHA Monitoring Program is to document conditions within each natural heritage area and to assess whether the sites are maintaining the ecological integrity and natural assets for which they were deemed significant (as recorded in the 2004 agreement). The map shows the results of a 2016 monitoring effort within the Duke Forest Oak-Hickory NHA - a site identified because it contains the oldest natural oak-hickory stand in Durham County.







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THE DUKE FOREST

Staff and Event News:

It's not just trees growing in the Duke Forest; it's Duke Forest families! Unfortunately, this means we will not be able to offer our Annual Gathering and Photo Contest in November. Also, after 31 years on the Forest and 40 total at Duke, our Forest Technician, Mike Burke, is retiring in January 2017.

Shepherd Nature Trail Restoration



Among other upgrades, we are close to finalizing content and design on 10 brand new educational signs for the Shepherd Nature Trail Restoration. Each sign highlights the theme, "The Duke Forest is always changing," and explores the natural patterns and human activities that shape the forest. We expect a grand opening in the Spring of 2017.

Five-Year Strategic Plan



We are almost finished with a new strategic plan for the Duke Forest, which will guide our work and resource allocations over the next 5 years. Three major goals have emerged that focus on: stewardship for long-term sustainability; research and teaching; and community engagement. A public summary will be available upon completion.

SAVE THE DATE for our 8th Annual Pine Cone Pacer 5K: April 8, 2017

Interested in making a tax-deductible contribution to support our efforts? Please do! We rely on the generosity of individuals and corporations to complete special projects like the Shepherd Nature Trail Restoration. *Visit our website to give: <u>dukeforest.duke.edu/giving-opportunities</u>*