## VOLUNTEERS RETURN FLOOD-RAVAGED AREA TO FORMER GLORY



Areas around the Duck Pond at the S.C. Botanical Gardens have been redesigned to better handle flooding. MYKAL MCELDOWNEY/STAFF

# NEW LIFE IN THE GARDEN

**1,000**

Number of different species of plants living along the trail, many of which washed away during the flood but have since been restored

**$225K**

Cost to restore gardens after damage from last year's flood

**102M**

Gallons of water that fell in the watershed that feeds into the Botanical Gardens

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CLEMSON — One year after a flood of epic proportions ripped through the South Carolina Botanical Gardens leaving a $225,000 path of destruction in its wake, the garden is fully operational again, thanks to design work by students and manpower and cash donations by a host of volunteers.

And if another freak storm hits again like the one that dumped eight inches of rain in four hours on July 13, 2013, the gardens will be better able to withstand the torrent, according to Clemson University officials.

Seven footbridges that washed away when the Duck Pond overflowed have been redesigned and reinforced by steel and concrete.

"Hopefully, they'll last

See GARDEN, Page 4A



**DOWN THE GARDEN PATH**

Take a look at some of the new features in the South Carolina Botanical Gardens that have been designed to withstand future flooding in a video at GreenvilleOnline.com.

# GARDEN

Continued from Page 1A

through another storm like this," said Nicole Nguyen, a graduate student in architecture who helped with the redesign.

Six million gallons of rainwater gushed into the normally placid lake and spilled over the dike holding it back from an environmentally sensitive valley below, architecture graduate student William Craig said.

The Heritage Nature Trail, which had opened only a few months before the flood, has been resurfaced with two types of stone that allow rainwater to drain. A layer of granite gravel is topped by a layer of Chapel Hill stone, which makes for an easy walking surface that can suck in water instead of washing away like the old trail, Craig said.

Berms have been built along steep embankments to slow down and disperse floodwaters, and underground drainage installed.

The trail takes hikers through ecosystems ranging from a maritime forest to Jocassee Gorges-like areas in a half-mile walk.

And once again, the rare and endangered Oconee Bell is thriving along the stream bottom.

That's one of about 1,000 different species of plants living along the trail, according to Botanical Gardens manager John Bodiford. Many of them washed away during the flood, he said.

The plants now are back and the range of habitats look like they did before, he said.

"That's what makes South Carolina so special," he said. "There's very few places in this state you can grow all this together on a half-mile trail except right here in Clemson."

Overall, more than 8,000 species of plants are thriving in the 295-acre garden.

"You'd be hard-pressed to find that kind of plant diversity that we have right here in our very own backyard," Bodiford said.

About 30 percent of those species perished in the flood but have been replanted.

Only an area of less than half an acre, just below the Duck Pond and in front of the historic Hunter Family Cabin, remains to be planted and restored.

Through the restoration process, the university learned much about the flow of water through that watershed and how to be prepared for big downpours.

A doctoral student wrote a dissertation on it, and the students involved in the restoration project analyzed data on the flood's movement across the landscape.

To commemorate the flood, the students designed a steel replica of the landscape of the garden with a bucket above it that fills with rainwater. When it's full, it tips its load onto the miniature terrain and shows where the water flowed that day.

The flood came at the height of the rainiest summer on record in the Upstate. Lake Hartwell was fuller than it had been since 1964.

It had rained 28 out of 30 days in Clemson, and the ground couldn't soak up any more water.

Heavy rain fell across the Upstate that day, but a cloud system that camped over the Clemson-Pendleton area hit particularly hard.

"So with the ground already saturated, all of that turned into sheet flow," Craig said.

All told, an estimated 102 million gallons fell in the watershed that feeds into the Botanical Gardens on the eastern edge of campus, Bodiford said.

Engineers who worked on the restoration told him that it was a "278-year event." Then, 10 days later, a "200-year flood" came along, he said.

The pond filled up by several feet and gushed over a paved road across its dike. The foundation of the Hunt cabin, built around 1826 in Oconee County and moved to Clemson in 1955, nearly washed away.

Afterward, several tons of boulders were moved by hand and a trench built to redirect the flow of the water away from the cabin in future downpours.

Seven bridges, ranging in length from 12 to 60 feet, were uprooted and washed downstream along Hunnicutt Creek.

The new bridges have concrete foundations and steel supports, with a porous fiberglass walking surface that lets water through.

"It grabs really deep but it has a really shallow footprint on the landscape," Craig said. "So if soil moves around them or it gets displaced it's still grabbing very deeply into the ground, so it hopefully won't move in another flood event."

The steel on the bridge, as well as on several new signs the students designed, rusts on the outside without weakening the structure.

"The whole idea is that this would become invisible so it wouldn't take away from the nature that you're trying to watch," Craig said.

Half of the money that went into the restoration came from private donors, matched by Clemson University, Bodiford said. That and the number of volunteers who took part in the work, about 100 on at least 10 cleanup days, give him reason to believe the garden is loved and well-supported by the community.

"It's a community garden without a doubt," he said. "That proved it."



Clemson graduate architecture students Brittany Cohen and Nicole Nguyen walk some of the trail they helped resurface to improve drainage at the South Carolina Botanical Gardens. MYKAL MCELDOWNEY/STAFF