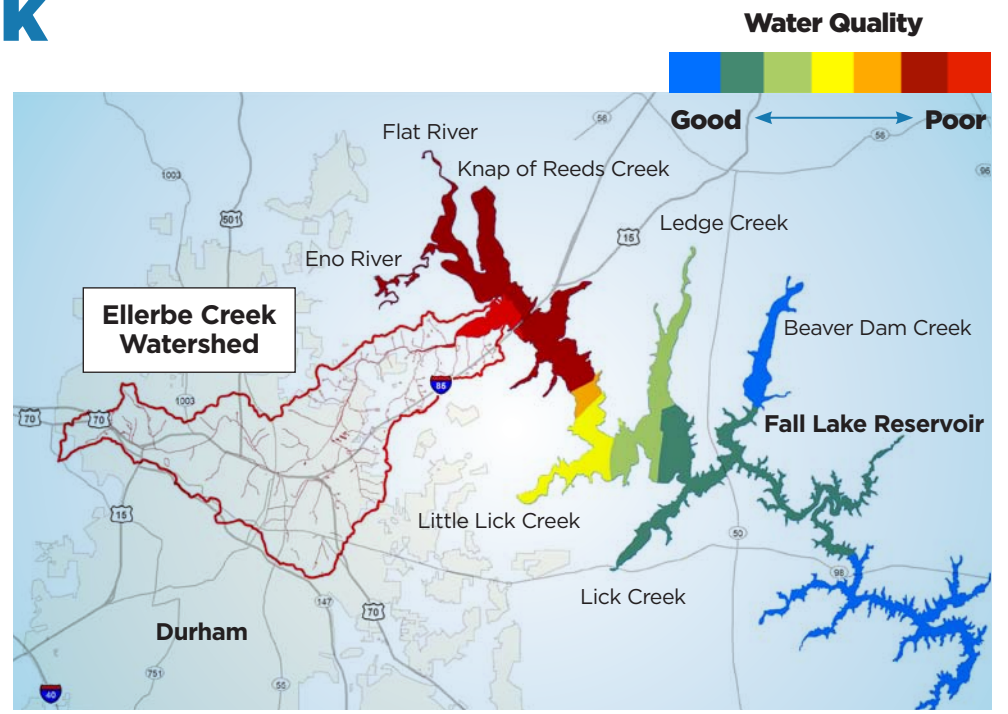
Green Infrastructure & Sustainable Stormwater Management

A New Approach to Restoring Durham's Streams and Rivers

Ellerbe Creek Green Infrastructure Partnership

Durham Five Points Green Infrastructure Makeover

Ellerbe Creek



Ellerbe Creek flows out of the heart of Durham, North Carolina to the Falls Lake Reservoir, a drinking water source for more than half a million people. The compact 37 square mile Ellerbe Creek watershed offers a refuge for people and wildlife from the stresses of city life.

The most densely developed areas of the City and County were built along and on top of the headwaters of the creek. It receives almost half of all the stormwater runoff from the City, creating a huge problem for the health of Ellerbe Creek. The 2010 Durham *State of Our Streams* Report lists numerous pollutants in the creek that are directly related to excess stormwater runoff. Ellerbe Creek has been on the list of North Carolina's most polluted water bodies since 1998, and stormwater pollution makes the creek nearly uninhabitable for aquatic life and at times dangerous for people.

Ellerbe Creek is the dirtiest stream in the Falls Lake Reservoir Watershed. High levels of nitrogen and phosphorous contribute to the pollution problem in Falls Lake, causing algae blooms and elevated bacteria levels that lead to human health hazards, fish kills, drinking water contamination, and closed recreational beaches in the lake. Clean-up goals for the reservoir are in place and call for a 40% reduction in nitrogen and a 77% reduction in phosphorus. To restore clean water to the creek, the City of Durham will need to spend hundreds of millions of dollars using traditional stormwater management practices.

The Ellerbe Creek Green Infrastructure Partnership developed a new innovative approach to address these problems that relies on integrating green infrastructure (e.g. rain gardens, green roofs, permeable pavement) into the City's urban landscape to absorb and filter polluted stormwater and slowly release the cleaned, cooled water into the creek to restore its health and make it a resource for the community.


Photo: Ellerbe Creek Watershed Association

Impact of Polluted Stormwater Runoff

When rain falls on hard surfaces such as roofs, streets, grass yards, and parking lots, the water cannot soak into the ground and it 'runs off'. The rainwater washes pollutants sitting on those surfaces into the creek, contaminating the clean water. Stormwater also moves faster across these surfaces, dumping more water in the creek in a shorter span of time, which increases floods and destroys wildlife habitat.

Evaluating the Benefits of Green Infrastructure & Sustainable Stormwater Management for Durham

Goal: Demonstrate a new approach to stormwater management by integrating green infrastructure into the urban landscape to begin the restoration of the hydrologic balance in Ellerbe Creek. These changes can make the creek an important asset for the community and add value throughout the City. An additional goal was to show that these techniques can help the City comply with regulation to clean up the Falls Lake Reservoir.

Method: The Ellerbe Creek Green Infrastructure Partnership with the support of an EPA Urban Waters Grant studied pollutant reductions and stormwater volume reductions that could be made in the Ellerbe Creek Watershed through the implementation of dispersed Green Infrastructure practices.

A 467 acre drainage area within the watershed was selected to intensively study because it contains a good mix of both residential and commercial land uses, has a high percentage of impervious area, has significant traditional stormwater infrastructure and is the headwaters of the creek. These factors combine to create an unusually high volume of polluted stormwater runoff and ability to measure impact.

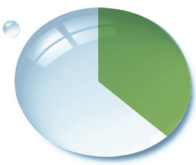
A detailed analysis of the green infrastructure opportunities included a Geographic Information Systems (GIS) analysis, field verification and additional analysis, and detailed modeling using the current regulatory tool (Jordan and Falls Lake Stormwater Nutrient Load Assessment Tool) to estimate the pollution controls.

Results: The research and analysis clearly shows that the implementation of many dispersed green infrastructure practices would result in significant pollution reductions.

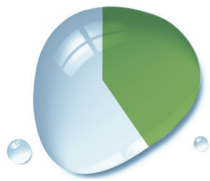
57.3 million gallons

of polluted storm water will be captured and cleaned per year

Predicted Pollution Removal



38% reduction of nitrogen pollution



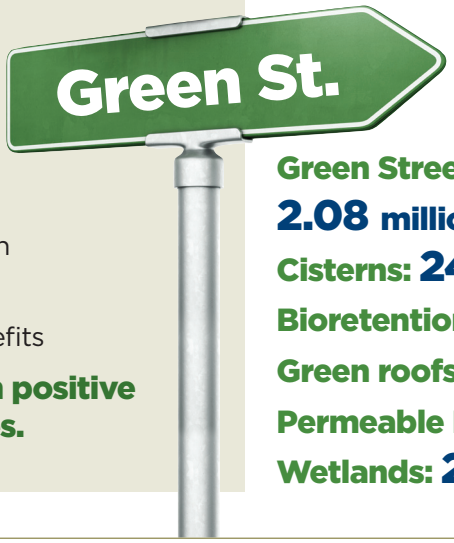
43% reduction of phosphorous

A Vision Becomes Reality:

The Ellerbe Creek Green Infrastructure Partnership has developed this vision for a new method of stormwater management. Its success depends on:

1. Public participation in advancing this vision and implementing various aspects of the project
2. The adoption of city and county policies to integrate green infrastructure into future public works projects.
3. Identifying funding sources for the implementation of green infrastructure practices
4. Additional study to increase the scope of the benefits

The results of these action will be long-term positive improvements to our local streams and lakes.



Identified Green Infrastructure Opportunities:

Green Street: 2.08 million sq ft treated

Cisterns: 246

Bioretention: 279

Green roofs: 40

Permeable Pavers: 3.7 acres

Wetlands: 2

Stormwater Management: Traditional Infrastructure vs. Green Infrastructure

Historically, a city's urban landscape has not been designed or built to manage stormwater to protect and restore water quality. Traditional stormwater management consists of a network of pipes that collect stormwater, removing it as quickly as possible from the landscape and piping it directly into nearby creeks and rivers. In contrast, Green Infrastructure mimics the natural landscape; water is cleaned through a network of stormwater management practices that capture and filter rain where it falls. Green Infrastructure reduces stormwater runoff and improves the health of surrounding waterways.

Green infrastructure brings a wide range of economic, social, and environmental benefits to the community.

- Improves Water Quality
- Improves Aesthetics
- Saves Energy
- Increases Real Estate Value
- Improves Air Quality
- Reduces Heat Island Effect
- Creates Green Jobs
- Expands Water Supplies
- Creates Habitat for Birds and Insects


Photo: Sam Roberts/Xero flor America


Photo: NC Aquarium

1 inch of rain falling on a square foot of surface area yields approximately 0.6 gallons of water. So in a 1 inch storm, a 1,500 sq ft roof produces 900 gallons of stormwater!

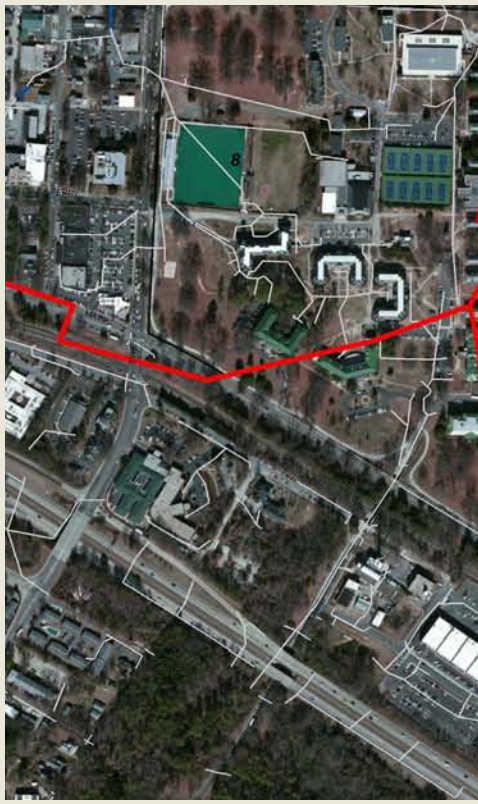

Photo: American Rivers

Rain gardens and bioretention are planted areas filled with deep rooted native plants intended to collect large amounts of stormwater while creating a beautiful addition to a landscape. Stormwater pools in these gardens and slowly drains into the soil over 1-3 days.

Cost Range: $500–$1,000 each

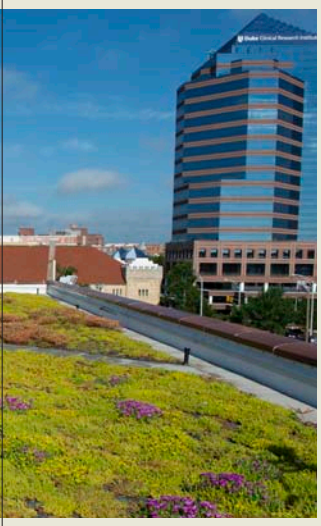
Permeable paving includes a range of materials that allow stormwater to move through a "paved" surface. Permeable pavers can be used in residential or commercial settings and are aesthetically comparable or superior to concrete, asphalt, and other impermeable surfaces.

Cost Range: $0.50–$10 per square foot



Green Infrastructure Opportunities

- Rain Gardens/ Bioretention
- Cistern
- Green Roof
- Permeable Paving



Green Roofs store and treat stormwater that falls on rooftops. A greenroof consists of a layer of vegetation and soil installed on top of an existing roof. In addition to reducing stormwater flows and nutrients, green roofs may also: reduce roofing maintenance, improve building energy efficiency, reduce urban heat island, provide habitat for wildlife, and improve air quality.

Cost Range: $10–$25 per square foot

Cisterns and other rainwater harvesting devices collect and store rainwater for later use. Rain water can be re-used for watering gardens and yards, washing cars, and other outdoor water needs. Harvesting and using rainwater from a cistern can reduce water bills and reduces the strain on the municipal water system.

Cost Range: $350–$2620 each

Photo: Ellerbe Creek Watershed Association

E. Chapel Hill St. Green Street Retrofit

A Green Street is a collection of green infrastructure implemented in the street's right-of-way. Green streets incorporate bioretention and permeable pavers in a series to multiply the beneficial impacts.

Ellerbe Creek Green Infrastructure Partners

To see the full technical report:
http://www.ellerbecreek.org/green-infrastructure

For more information on the Ellerbe Creek Green Infrastructure Partnership, or on how to install a green infrastructure practice on your property, please contact:

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