

## Ellerbe Creek Watershed Improvement

### Project Schedule

Begin	Activities	Done
11/2007	Project Kickoff	
12/2007	Stormwater BMP and stream inventory and assessment	1/2008
1/2008	Stream inventory and assessment City Officials Briefing	3/2008
3/2008	Watershed analysis; development of project prioritization criteria; model development	9/2008
4/2008	Public meeting	
4/2008	Watershed characterization and modeling; pilot study area assessments	9/2008
4/2008	Critical area protection plan; riparian area management plan; better site design evaluation	10/2008
10/2008	Public meeting	
10/2008	Develop watershed improvement alternatives, preliminary project costs; apply criteria to proposed projects	12/2008
12/2008	Develop Watershed Improvement Plan	6/2009
5/2009	Public meeting	
5/2009	Draft Watershed Improvement Plan	6/2009
6/2009	Final Watershed Improvement Plan	6/2009

## Watershed Improvement Plan Tools

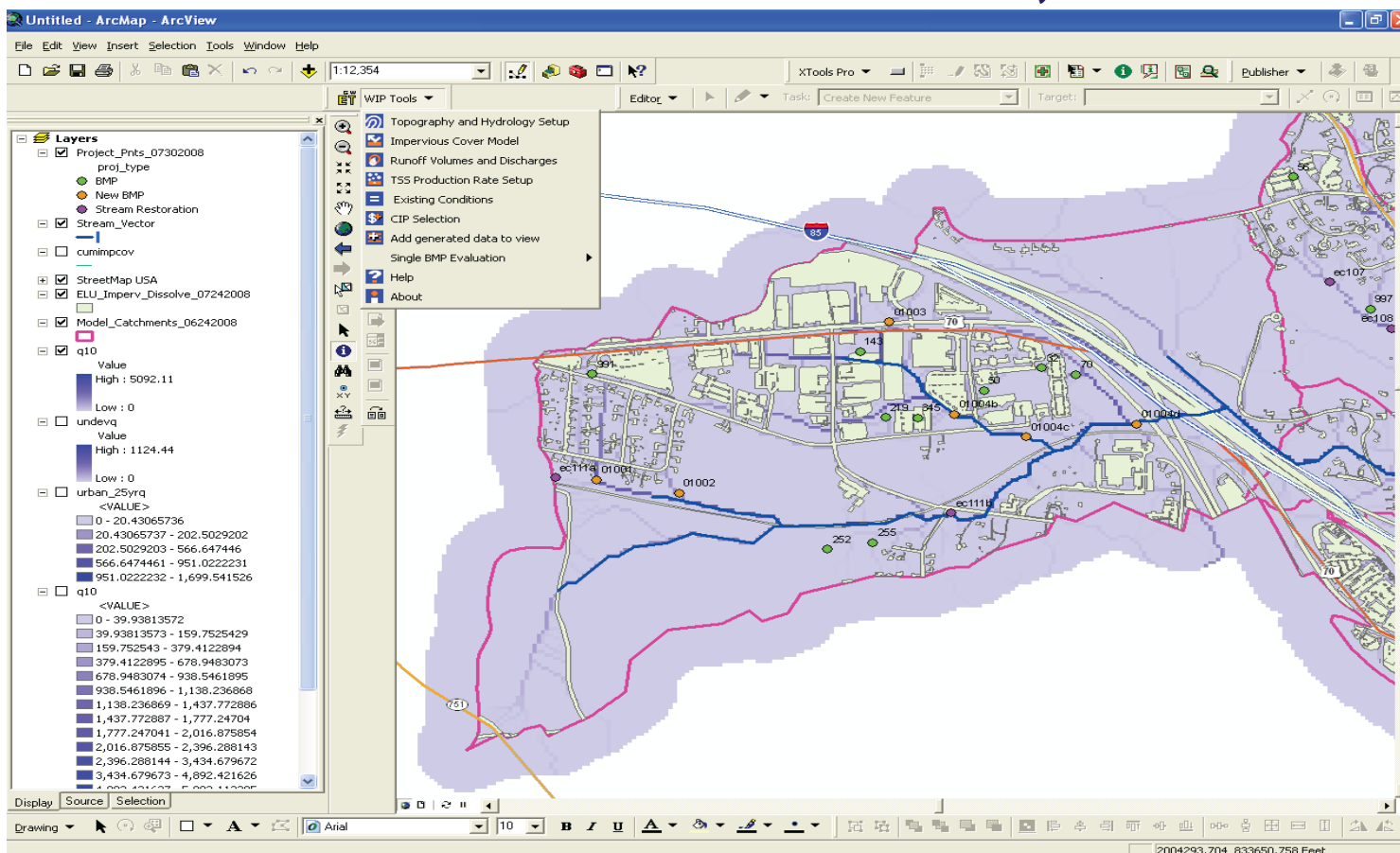
The Watershed Improvement Plan (WIP) Tools is a GIS-based water quality model used to evaluate water quality conditions and help develop watershed improvement plans for the City. The information developed using the tools will help the City to develop water quality improvement projects for the Ellerbe Creek watershed.

WIP Tools gives the City the ability to interactively review and evaluate each stream restoration and BMP project using the prioritization criteria. The Tools will also enable the City to combine individual projects into a watershed management scenario and evaluate its overall effectiveness.

- Each project can be evaluated by the amount of pollutants removed both as a standalone project and as a component of a plan.
- Plan benefits can be evaluated at any point in the watershed.

The greatest benefit is that the Tools will allow City staff to apply prioritization criteria to potential BMP and stream projects and identify projects to implement based upon their ability to have the greatest positive impact to the watershed and water quality.

## Water Quality Model



For more info about the Ellerbe Creek Watershed Improvement Project visit the web site: [www.durhamnc.gov/stormwater](http://www.durhamnc.gov/stormwater)  
Or contact City Project Manager: Sandi Wilbur – (919) 560-4326



# Ellerbe Creek Watershed Improvement Project Overview



## From your City Project Manager, Sandi Wilbur Protecting Water Through Watershed Improvement

The City of Durham realizes the importance of protecting our natural resources, and that includes the ways in which we protect and enhance our rivers. As a result of decades of growth and development, these bodies of water have been affected by a variety of natural conditions, such as flooding and erosion, as well as man-made factors that include land development and road construction, littering, landscaping and lawn care, and other activities.

To protect our rivers, lakes, and land areas, we must protect and maintain the health of our watersheds - those natural land areas and their network of creeks that contribute stormwater runoff to a common body of water. Protecting and improving the health of Ellerbe Creek is the primary goal of our Watershed Improvement Project.

### Ellerbe Creek Watershed Improvement Project Goals:

**Revitalize the health of Ellerbe Creek and comply with water quality regulations**

- Assess current stream and watershed conditions
- Identify and prioritize BMP and stream restoration projects
- Improve or prevent further deterioration of water quality conditions

## Watershed Improvement Projects are Identified and Prioritized to Ensure Maximum Positive Impact to the Environment and Residents

One of the most common goals of stream restoration and stormwater Best Management Practice (BMP) projects is to improve water quality. Water quality improvement efforts are comprehensive; they include restoration of the stream and its riparian zones (see note below), as contributors to improved water quality. They can also include retrofits to existing and construction of new stormwater BMPs and "better site design" techniques employed in new development. In order to identify the best potential projects, several benefit and cost factors must be considered to ensure each project is effective and acceptable to the public.

During the Ellerbe Creek watershed stream assessment and BMP inventory, our field crews identified many potential stream restoration and BMP opportunities. A set of criteria were developed to help evaluate and prioritize potential stream restoration and BMP projects and to assist the City in the decision-making process. These criteria consider both environmental and economic factors and are divided into six categories, including Water Quality Treatment, Habitat and Biological Integrity, Stream Bank Protection, Community Enhancement, Implementation Issues, and Public Safety and Public Property (**See next page**). And finally, we will use modeling tools to evaluate the effectiveness of BMP and stream projects in improving water quality within the watershed.

### Our Streams: So Much More than Water!

The forested land along rivers, streams, and lakes is known as the "riparian zone" or **riparian area**. Riparian comes from the Latin word ripa, which means bank. Riparian zones are areas of transition between aquatic and upland ecosystems, and they offer numerous, yet often overlooked, benefits to wildlife and people. Only within the past few decades have we come to realize the ecological value of riparian areas.

**Right:** Field crew identifies and categorizes a stormwater BMP. Retrofitting this project within this BMP can provide better water quality treatment and an opportunity to educate neighbors on the natural processes at work to filter and clean stormwater before it enters the stream.



## Additional Elements of the Watershed Improvement Project

### Critical Area Protection

Typically in or near the headwaters of a stream, critical area protection can significantly reduce or prevent pollutants from entering the stream. The critical area projection plan was developed for Ellerbe Creek using information from a number of resources, including:

- Ellerbe Creek Local Watershed Plan;
- the Durham Trails Master Plan;
- the Falls Lake Initiative Conservation Plan;
- land use data to identify vacant land that is both privately and publicly-owned, and
- supplemental information obtained during the stream field inventory.

Critical areas will be prioritized for protection based upon several evaluation criteria, including existing site conditions, water quality and ecological benefits, and connectivity to other protected natural areas.

### Riparian Area Management

A riparian area management plan for City-owned property will be developed, documenting:

- vegetation maintenance guidelines for City staff along greenway trails, sewer and water easements, streams, and parks;
- water quality and ecological benefits of the proposed riparian area management procedures; and
- invasive species management plan.

### Better Site Design or Low Impact Development (LID)

“Better site design” techniques employ a variety of methods to reduce total paved area, distribute and diffuse stormwater, and conserve natural habitats. The focus is achieving three goals:

- reduce the amount of impervious cover;
- increase natural lands set aside for conservation; and
- use pervious areas for more effective stormwater treatment.

Better Site Design or Low Impact Development (LID) practices will be reviewed to determine which LID practices are appropriate in Ellerbe Creek, given the local soil conditions. One of the pilot study areas will be evaluated for the benefits and costs of implementing LID practices. A recommended list of LID practices that could be effectively implemented in the City and an implementation guide for making the changes will be completed.

The City’s development ordinances will be compared with development ordinances from three cities that promote LID practices to identify ways to promote their use in the City of Durham.

## Prioritizing Potential Watershed Improvement Projects

Improving water quality in Ellerbe Creek and its tributaries was identified as the most important goal for the Ellerbe Creek Watershed Improvement Project. Residents, community groups, and the City recognize that focusing on cleaning up the water in Ellerbe Creek will have the overall greatest positive impact on the watershed. The project team worked with local residents and other interested groups to identify criteria that would help the City decide which projects should be implemented. The categories in the Prioritization Criteria focus on different, specific aspects of the proposed projects. This ensures that projects the City implements will provide the maximum overall benefits.

The **Water Quality Treatment** score has the greatest weight because it is the highest priority of focus for BMP and stream projects in the Ellerbe Creek watershed. Stormwater BMPs are constructed to remove some or all of the sediment, nutrients, and other pollutants before the runoff enters the stream. This criteria considers the cost of pollutant removal in its score.

Category	Maximum Score
Water Quality Treatment	35
Habitat and Biological Integrity	15
Stream Bank Protection	10
Community Enhancement	20
Implementation Issues	15
Public Safety and Public Property	5
<b>Total Possible Score</b>	<b>100</b>

Some of the Prioritization criteria for stormwater BMPs and for stream restoration projects are unique to each watershed.

The **Habitat and Biological Integrity** score determines how well a project could improve the ability of the stream and its riparian buffers to support aquatic life. A high-quality, healthy stream typically has a stable bed and banks, a mixture of pools and riffles (e.g., rocks and coarse sand), clear water, a diverse community of aquatic insects and wide forested or grassed buffers.

The **Stream Bank Protection** score assesses how effectively a BMP or stream project will reduce the amount of sediment entering the stream due to erosion of the stream banks. Reducing sediment also improves water quality and habitat conditions.

The **Community Enhancement** score is based on how well the BMP or stream project will be perceived by the community. Factors evaluated include property protection (i.e. flood prevention or reduction), neighborhood acceptance, public education, and proximity to schools, parks, and open space.

The **Implementation Issues** component focuses on four areas that contribute to the successful installation of a new or retrofit BMP project, including property ownership, City program compatibility, permitting or negative environmental impacts, and accessibility for construction, operation, and maintenance. Any component that reduces the cost of implementation, such as proximity to roadways, commercial property, ease of access and maintenance, increases the score.

The **Public Safety and Public Property** component focuses on flood detention, culvert replacements, bank stabilization and other projects which prevent street flooding or other damage to public property during infrequent but large storm events.

## Watershed and Pilot Study Area Evaluation

The development of a water quantity model and water quality model for the watershed will be completed on two levels.

**Level 1** will include a detailed model within five pilot study areas (highlighted on the map below) to evaluate the potential for implementing new BMP and stream projects and retrofitting existing BMPs in areas with various types of land uses, including industrial, commercial, and residential. The model will be used to determine preliminary sizing of new and retrofit BMPs by estimating their water quality and treatment volumes. Information derived from the model will also be used to produce preliminary cost estimates for projects within the five pilot study areas as well as other data to be utilized in the project.

**Level 2** will include a broader schematic for the remainder of the watershed, which will support the evaluation of downstream impacts of proposed BMPs.

The PCSWMM model is the tool being used to simulate water quantity and quality for the entire watershed and will be run for the water quality rainfall event (1 inch of rainfall in 24 hours) and several other rainfall events. The primary purpose of the modeling is to support conceptual design of BMPs (including street sweeping) and stream projects which will improve water quality within the watershed.

### The Purpose of the Modeling:

The modeling enables the team to evaluate the effectiveness of stream projects against future land use conditions and under different rainfall events.

### Hydrologic and Hydraulic Model

