



## Crabtree Creek Urban Planning Project

**Introduction:** The site is within the limits for the Town of Cary. It is planned for a neo-urban development that would create more than 80% impervious surface area within a 400-acre watershed. In addition, the soils in this watershed are part of the Triassic Basin, which are some of the most erodible in the Neuse watershed. Stormwater management techniques that will protect water quality in these areas is important issue.

**Methods:** Water quality monitoring will evaluate the effectiveness of constructed wetlands, bio-retention, storm filters and streambank restoration BMPs as well as planning techniques such as reduced pavement widths, reduced densities in sensitive areas, and buffers. The monitoring program will include rainfall and storm event monitoring before and after planning/ BMP implementation. Runoff and rainfall hydrographs as well as single and during event composite storm samples will be collected using automatic samplers for eight storms per year. Samples will be analyzed for nutrients and sediment. Hydrographs will be analyzed for changes to runoff volume, peak, and duration relative to rainfall event and land use changes. The pre- and post-BMP monitoring periods will be approximately one year.

Three watersheds will be monitored—one for background that has no development activity, one being developed but with no BMP/ planning treatments, and one that will receive BMP/planning treatments. All three streams are adjacent sub-basins within one larger basin. The background sub-watershed is forested and will be undisturbed for the 2.5 year duration of the project. It will be monitored for background water quality and runoff storm event data. A second watershed will be developed using standard methods for pavement widths, building footprints, siting, erosion control, sediment trapping and storm water management. The third watershed will be the site for BMP implementation. Planning techniques such as pavement reduction, protection of sensitive areas, buffers, and open space will be used as well as engineered approaches using bio-retention, storm filters, and constructed wetlands.

All three watersheds, which are each approximately 15 acres each, will be monitored using grab, storm event, and hydrograph sampling and calibrated prior to disturbance.

### Output:

- 1,100 linear feet of streambank will be repaired from erosion, slumping and undercut banks with buffers replaced. Planting will include both native species and adapted cultivars to encourage natural ecological response patterns. Water quality monitoring will be used to evaluate effectiveness in reducing sediment and nutrients loads.
- 2 sites within the development will be used to demonstrate the effectiveness of urban planning BMPs. Practices may include reduced water conservation, pavement widths, relocated siting, footprint minimization, curb cuts, grass swales, vegetative filters, and stream buffers.
- 1,100 linear feet of streambank will be repaired from erosion, slumping and undercut banks with buffers replaced.

<b>FY</b>	99
<b>Agency</b>	NC Cooperative Extension Service
<b>Funding:</b>	
Federal:	\$86,152
Nonfederal:	\$57,435
Total:	\$143,587
<b>Contract:</b>	EW20008
<b>Expiration:</b>	14 September 2002
<b>Project Area:</b>	Wake County, City of Cary
<b>NC Basin:</b>	NEUSE
<b>Subbasin:</b>	030402
<b>HUC-14:</b>	03020201080010
<b>NPS Category:</b>	400 – Urban Runoff
<b>Functional Category:</b>	000 – Demonstration Projects
<b>Task BMPs:</b>	
	584 – Stream Channel Stability
	906 – Filtration Basin
	907 – Grassed swale

4. 1,100 linear feet of streambank will be repaired from erosion, slumping and undercut banks with buffers replaced.
5. 2 sites within the development will be used to demonstrate the effectiveness of urban planning BMPs. Practices may include reduced water conservation, pavement widths, relocated siting, footprint minimization, curb cuts, grass swales, vegetative filters, and stream buffers.
6. 2 sites within the development will be selected to demonstrate stormwater, nutrient and sediment reduction resulting using bio-retention. Water quality monitoring will be used to evaluate effectiveness in reducing storm water, sediment, and nutrients.
7. Economic costs of BMPs will be recorded during installation. Analysis of the cost-effectiveness of various stormwater control options will provide estimates of their efficiency for use in making recommendations to developers by the town of Cary.
8. Educational pollution prevention measures will include educational workshops targeted to government officials and staff, landscape contractors, landscape architects, developers and earth moving equipment operators, businesses and industries. Workshops will promote innovative site design practices for erosion control such as curb cuts, covering stockpiles, grass swales, vegetative filters, and stream buffers. Water quality monitoring will be used to evaluate

effectiveness in reducing sediment and nutrients. BMPs required by a NPDES stormwater control permit will not be implemented with funds from Section 319 (h), but may build upon or enhance stormwater controls.

9. 2 educational meetings and/ or 2 field days will be conducted to inform approximately 50 elected officials, public works officials, local leaders, citizens, resort managers and students about the purpose and effectiveness of BMPs. These workshops will be designed specifically to educate local officials, developers and equipment operators, citizens, the Natural Resources Conservation Service and Cooperative Extension Service agents about water conservation, erosion control practices, planning practices, streambank restoration, bio-retention, wetland construction, stream buffers, nonpoint source pollution problems and BMP pollution removal and cost effectiveness.

**Expected Outcome:** Detailed records of BMP and planning costs will be kept during the installation phase. Cost information, in combination with results from before and after water monitoring, will allow for an analysis and comparison of BMP cost-effectiveness. This information will be used to support the development of local stormwater policy options with the Town of Cary staff.

Primary Project Investigator:

Nancy White  
 NCSU School of Design  
 NCSU Box 7701  
 Raleigh, NC 27695-7701  
 Phone: (919) 515-4678  
 Email: nancy\_white@ncsu.edu

Dan Line  
 NCSU Water Quality Group  
 Dept. of Biological and Agricultural Engineering  
 NCSU Box 7637  
 Raleigh, NC 27695-7637  
 Phone: (919) 515-8243  
 Email: dan\_line@ncsu.edu