



# SEDIMENTS

*Newsletter of the North Carolina Sedimentation Control Commission*

STATE OF NORTH CAROLINA, DEPARTMENT  
OF ENVIRONMENT AND NATURAL RESOURCES  
William G. Ross, Jr. Secretary

Land Quality Section  
Division of Land Resources  
James D. Simons, Director and State Geologist

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## Monitoring the Effects of Highway Construction on the Little River and Crane Creek

*by Dan Line*

The potential for sediment loss from the hundreds of miles of highways under construction in North Carolina is high. To minimize the sediment loss, the NC Department of Transportation maintains an active erosion and sediment control program within its Roadside Environmental Unit. The Unit reviews sediment and erosion control plans and regularly inspects construction projects to insure that control practices are constructed and maintained according to the plan and are functioning properly. Increasingly, with reports of muddy water downstream of construction sites, the implementation of an approved erosion and sediment control plan does not allay the public's concern over the effects of construction on the quality of water resources. Hence, monitoring data is needed to evaluate the effectiveness of erosion and sediment control plans designed to limit sediment export from highway construction projects. This study was designed to monitor the water quality of two water resources, Crane Creek and Little River in Moore County, during the construction of the Highway 1 bypass south of Sanford, NC.

At both Crane Creek and Little River, monitoring stations were installed upstream and downstream of the highway corridor. The drainage area of the upstream station at Crane

Creek was 35,460 acres and included several miles of the new highway corridor. For Little River, the drainage area to the upstream station was 62,600 acres. The relatively large upstream areas and the fact that the construction of the highway began prior to the start of monitoring reduced the sensitivity of the monitoring program in being able to detect significant sediment influx between the stations.

For Little River, automated water samplers were programmed to collect samples every six hours. The six-hour interval was reasonable given that water quality in a river this size usually changes relatively slowly. Individual samples collected by the machine were then combined into a composite sample for each week. For Crane Creek, discharge was monitored continuously enabling samples to be collected on a flow-proportional basis. A compos-

ite sample of the individual samples collected during the 2-weeks between sample recovery was made and analyzed. All samples were analyzed for total suspended solids (TSS), total solids (TS), and turbidity using standard methods. Selected samples were analyzed for TSS by two labs to assess the repeatability of the results.

Additionally, a recording raingage was installed near the downstream monitoring station along Crane Creek. This gage recorded rainfall accumulation for 15-minute time intervals. Due to freezing conditions and problems with equipment, there were several gaps in the rainfall data.

Summary statistics for the Crane Creek monitoring data are shown in Table 1. The total was computed as the sum for the entire period of monitor-

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## August, November, February, April and May Actions of the North Carolina Sedimentation Control Commission

At its meeting on August 17, 2005, the NC Sedimentation Control Commission (SCC) took the following action:

- Elected Mr. Donnie Brewer as vice-chairman of the Sedimentation Control Commission.
- Deferred approval of delegation of erosion and sedimentation control local ordinance for the Town of Lake Lure until the November meeting.
- Approved changes to the Local Program Assistance Contract Application.
- Approved continued delegation of the Avery County local program.
- Approved continued delegation of the Grandfather Village local program.
- Approved the revised and new practice standards for the Erosion and Sedimentation Control Planning and Design Manual. The three revised existing practice standards presented included the sediment basin, rock dam and temporary sediment trap. The three new standards that will be added include flocculants, skimmer sediment basin, and baffles. They will bring public comments received to the Technical Advisory Committee in October.

At its meeting on November 17, 2005, the SCC took the following action:

- Approved continued delegation of the erosion and sedimentation control program to the NC Department of Transportation, Division of Highways.
- Delegated local program authority to implement the Sedimentation Pollution Control Act to the Town of Lake Lure.
- Approved continued delegation of the City of Greensboro local program.
- Approved to place the City of Asheville local program on probation until

February 15, 2006. Mr. Gray Hauser mentioned that many sites had violations and no action had been taken to correct the problem. There was a need to adopt a stringent ordinance and staff a part-time position.

- Approved taking the City of Winston-Salem local program off probation and continue delegation. The City of Winston-Salem had completed seven of the eight recommendations to make the program effective, including amending the ordinance and hiring an additional inspector.
- Approved the following dates for the 2006 Commission meetings: February 15, May 18, August 16, and November 16.
- Approved the following proposals for funding that were recommended by the Sedimentation Education Committee:
  - Publication of the Erosion and Sedimentation Control Planning and Design Manual
  - Erosion and Sediment Control design aids
  - Best Management Practices for Land Disturbing Activities Pocket Guide
  - Training scholarships for the local sedimentation and erosion control programs.

At its meeting on February 15, 2006, the SCC took the following action:

- Welcomed Ms. Elaine C. Chiosso as a new member of SCC. She is the executive director of the Haw River Assembly, a nonprofit watershed protection organization.
- Approved continued delegation of the Town of Holly Springs local program.
- Approved continued delegation of the



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Send comments to Ashley Rodgers, NCDENR-Land Quality, 1612 Mail Service Center, Raleigh, NC 27699-1612. Email: [Ashley.Rodgers@ncmail.net](mailto:Ashley.Rodgers@ncmail.net). Send change of address and subscription information to WRRI, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 (919)515-2815; [water\\_resources@ncsu.edu](mailto:water_resources@ncsu.edu). Fifty-seven hundred copies of this newsletter were printed at a cost of \$3,050 or 53 cents per copy.

Personnel of the Land Quality Section of the NC Department of Environment and Natural Resources provide information and assistance for implementation of the NC Erosion and Sedimentation Control Program. For assistance, please contact the Regional Engineer or the Raleigh headquarters listed below:

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The North Carolina  
Sedimentation Control Commission

The Sedimentation Control Commission (SCC) was created to administer the Sedimentation Control Program pursuant to the NC Sedimentation Pollution Control Act of 1973 (SPCA). It is charged with adopting rules, setting standards, and providing guidance for implementation of the Act. The composition of the Commission is set by statute to encompass a broad range of perspectives and expertise in areas related to construction, industry, government, and natural resource conservation and quality. All members are appointed by the Governor and serve three-year terms, except for the Director of the Water Resources Research Institute of The University of North Carolina, who serves as long as he remains Director. The chairman of the SCC is named by the Governor. The following is a list of current members with the organizations they represent:

Chairman:  
Kyle Sonnenberg  
Fayetteville

NC League of Municipalities/  
NC Association of County Commissioners

Vice Chairman:  
Donnie W. Brewer  
Greenville

NC Environmental Management Commission

Commissioners:

W. T. "Buzz" Bryson  
Raleigh  
NC Public Utilities

Elaine C. Chiosso  
Bynum  
Non-governmental Conservation

Hugh J. Franklin  
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NC Mining Commission

Joseph H. Kleiss  
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Grover McPherson  
Winston-Salem  
NC Soil and Water Conservation Commission

David H. Moreau  
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The University of North Carolina

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Non-governmental Conservation

Mark A. Taylor  
Greensboro  
Professional Engineers of NC

Richard Vick  
Wilson  
Carolinas Associated General Contractors

F. Roger Watson  
Asheville  
NC Home Builders Association

SCC continued

- Orange County local program.
- Approved continued delegation of the City of Henderson local program.
- Approved continued delegation of the Town of Apex local program with a follow-up review by the Raleigh Regional Office in March 2006.
- Approved giving a 30-day notice to rescind the local program delegation of the City of Asheboro. The city attorney and city manager do not want to keep the local program delegation to enforce the ordinance.
- Approved giving a 30-day notice to rescind the local program delegation of the Town of Banner Elk. Land Quality assumed concurrent jurisdiction of the sites in Banner Elk.
- Approved the Jackson County local program to assume jurisdiction within the Town of Sylva, Village of Forest Hills, Town of Dillsboro, and Town of Webster. Jackson County will be increasing the size of its staff.
- Approved funding the Town of Lake Lure local program. The requested \$15,823 will assist with the start-up of a local erosion and sedimentation control program.
- Approved funding the Town of Wake Forest local program. The requested \$23,948 will assist with the start-up of a local erosion and sedimentation control program, contingent on the Town requesting and receiving delegation of a local program from the SCC and providing the Commission with updated job descriptions by the May meeting.
- Disapproved funding the Chatham County local program request for expansion of its program as the county has not expanded the program to cover incorporated areas. The application did not meet the requirements for an existing program requesting funds for enhancements due to expansion. In the past, the Commission has not funded raises for existing positions.
- Approved partially funding the Jackson County local program due to expansion of its program. The \$47,035 will assist with two new employees, a vehicle, and field and office equipment.
- Approved funding the Durham County local program for program enhancement. The requested \$1000 will be used to purchase a portable turbidity meter and three laser range-finders that will assist in quantifying stream impacts.
- Approved funding the Gaston County local program for program enhancement. The approved amount of \$11,351 will be used to educate and train on single-family lot construction and other operational expenses.
- Approved funding the City of Greenville local program for program enhancement. The requested \$2,200 will be used to enhance education, monitoring and enforcement of their local program.
- Heard NC DOT Action Plan for Stabilizing Steep Slopes. DOT presented its proposal for standards for providing ground cover on steep slopes on maintenance projects. There is a concern that the additional mulch application is not sufficient because it would slide off. It is routine to have 1.5:1 slope angles in mountainous areas. DOT has issued a review of counties with banks greater than 1.5:1 slopes. The Land Quality Section will put together a team to look at the action plan and come to an agreement with DOT.
- Approved the changes to the design criteria in the *Erosion and Sediment Control Planning and Design Manual* for the temporary sediment traps, temporary rock dam, temporary sediment basin, skimmer basin, and flocculants. The surface area for temporary sediment traps and rock dams will remain the same, but the volume will be doubled.

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## SCC *continued*

At a specially called meeting on April 27, 2006, the Sedimentation Control Commission took the following action:

- ❑ Approved request to use unspent funds allocated for local program contracts and sedimentation education contracts for printing revisions of the Erosion and Sediment Control Planning and Design Manual.
- ❑ Approved draft amendment language to the Sedimentation Pollution Control Act of 1973 N.C. General Statute § 113A-57 (1), the mandatory standard for buffer zones. After much discussion the Commission passed four revisions suggested by Dr. Joe Rudek. DENR General Counsel will make the language modifications.

At its regularly scheduled meeting on May 18, 2006, the Sedimentation Control Commission took the following action:

- ❑ Delegated local program authority and approved a local erosion and sedimentation control ordinance for the Town of Wake Forest.
- ❑ Approved continued delegation of the Catawba County local program with a follow-up review by Land Quality Section staff.
- ❑ Approved continued delegation of the City of Greenville local program with a follow-up review by Land Quality Section staff.

- ❑ Approved continued delegation of the Pitt County local program.
- ❑ Deferred action on the City of Rocky Mount local program until the November SCC meeting.
- ❑ Approved continued delegation of the Town of Southern Pines local program.
- ❑ Approved continued delegation of the Wake County local program with the condition that the local ordinance be amended and updates be presented at the August SCC meeting.
- ❑ Approved endorsing an amendment to the SPCA to increase the fee and create seven new positions.
- ❑ The following are education proposals on which the SCC acted:
  - Approved four workshops (two in the fall and two in the spring) to train erosion and sedimentation control design professionals.
  - Approved local erosion and sedimentation control programs annual workshop and banquet to train local program staff from across the state.
  - Approved continuation of the *SEDIMENTS* newsletter to be produced by the NC State University Soil Science Department.
- ❑ Approved making the new *Erosion and Sediment Control Planning and Design Manual* effective January 1, 2007.

## Personnel Changes

**Chip Koontz**, formerly environmental technician, is the new assistant regional engineer in the Asheville Regional Office.

**Doug Jones**, formerly assistant regional engineer, is the new regional engineer in the Fayetteville Regional Office.

**Jodi Pace**, formerly environmental technician, is the new assistant regional engineer in the Fayetteville Regional Office.

**Zahid Kahn**, formerly the assistant regional engineer, is the regional engineer in the Mooresville Regional Office.

**Jonathan Creason** is the new environmental technician in the Mooresville Regional Office.

**Shannon Leonard and Clif Whitfield**, both formerly environmental technicians, are the new assistant regional engineers in the Winston-Salem Regional Office.

**Brian Lambe** is the new environmental technician in the Winston-Salem Regional Office.

**Stephanie Lane**, formerly Office Assistant III, is the new Office Assistant IV, in the Raleigh Central Office.

**Mark Baylor** is the new Office Assistant III in the Raleigh Central Office.

## Ashley Rodgers Joins LQS Staff

Ms. Ashley Rodgers joined the Land Quality Staff as the new state sediment education specialist on May 17, 2006. As the new education specialist, Ms. Rodgers replaces Ms. Janet Paith who took a position with Wal-Mart Stores, Inc. as a manager of stormwater compliance.

Ms. Rodgers attended NC State University as a Park Scholar and received a Bachelor of Science in civil engineering. She then received a Master of Science in environmental

engineering and science from Clemson University. She formerly worked for Davis & Floyd, Inc., a consulting firm in Greenwood, South Carolina.

As part of her duties, Ms. Rodgers will oversee all the educational aspects of the Sedimentation Control Program including planning the five workshops sponsored by LQS and the Sedimentation Control Commission; contributing information to the *SEDIMENTS* newsletter; helping facilitate the Sediment Education

Committee meetings; and overseeing further updates to the *Erosion and Sediment Control Planning and Design Manual*.

Ms. Rodgers may be reached at 919-733-4574 or ashley.rodgers@ncmail.net.

# Monitoring *continued from page 1*

ing while the mean, median, and range were computed from the two-week period between sample recoveries. Rainfall for the monitoring period totaled 64.5 inches or 35.4 inches per year, which is slightly less than the long-term annual rainfall for the area. The mean, median, and range for the bi-weekly discharge water flow were greater at the downstream site (Table 1 column 3). Results of a paired t-test on the bi-weekly discharge data from both sites suggested that they were statistically different at the 0.05 level of significance. This test included periods for which both sites had discharge data with no apparent problems (39 of the 46 periods). The significant increase was expected given that 260 additional acres drained to the downstream site and that most of those acres were cleared. As shown in Table 1, the biweekly discharges had a considerable range reflecting both the wet and dry conditions experienced during the project.

Summaries of the bi-weekly TS and TSS concentration data are shown in columns 4 and 5 of Table 1. The mean and median TS and TSS concentrations were greater at the upstream as compared to the downstream site; however, the difference was not statistically significant according to a paired t-test performed on the bi-weekly TSS data. The TSS concentrations were much greater than those of the Little River indicating much poorer overall water quality in Crane Creek.

The total TSS load for the duration of monitoring was slightly greater upstream as compared to downstream (Table 1, column 6). The mean and median of bi-weekly TSS loads was greater for the upstream site also. A paired t-test conducted on the bi-weekly TSS load data suggested that there was no significant difference between upstream and downstream TSS loads at the 0.05 level of significance. This result provides evidence that sediment

Table 1. Summary of Monitoring Data for Cane Creek

	Rain	Discharge	TS	TSS	TSS	TSS export
	in	Mgal	mg/L		tons	ton/ac-yr
<b>Upstream Site</b>						
total	64.5	13,743			2,846 ± 741	0.039
mean bi-weekly	1.34	292	153	48	61.8	
median bi-weekly	1.14	176	103	33	26.2	
bi-weekly range	0-6	2-1,020	17-253	5-218	0.2-437	
<b>Downstream Site</b>						
total	64.5	16,197			2,942 ± 735	0.038
mean bi-weekly	1.34	345	89	38	61.3	
median bi-weekly	1.14	235	83	22	26.7	
bi-weekly range	0-6	3-1,200	11-317	4-223	0.2-381	

Table 2. Summary of Monitoring Data for Little River.

	TS	TSS	Turbidity	Temp	Conductivity	DO	pH
	mg/L		ntu	C	mS/cm	mg/L	
<b>Upstream Site</b>							
mean	54	9	9	17.5	0.034	8.3	6.1
median	50	8	8	18.5	0.035	7.9	6.0
range	15-205	1-30	4-35	3-25	0.03-0.04	5-11	5-8
count	84	84	84	17	17	17	18
<b>Downstream Site</b>							
mean	59	10	9	17.6	0.033	7.9	6.1
median	47	8	8	18.5	0.035	7.4	5.8
range	5-345	2-48	4-24	3-25	0.02-0.04	5-15	5-8
count	89	89	89	18	18	18	18

from the highway construction occurring between the two sites had no significant effect on the TSS load in Crane Creek.

Summary statistics for the monitoring data from the Little River are shown in Table 2. As seen in the table, differences between upstream and downstream parameters are small, if any. Statistical analysis of the data using a paired t-test suggested no significant difference between upstream and downstream means for TS, TSS, and turbidity. While there were no discharge measurements conducted

at these sites, the large upstream to between station drainage area ratio strongly suggests that the upstream and downstream discharges would not be significantly different; thus, the relationship between TS and TSS loads would be similar to the one between the concentrations. These results indicate that there was no discernable effect of the highway construction on the water quality of the Little River between these two monitoring stations during the period of monitoring.

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## Monitoring *continued from page 5*

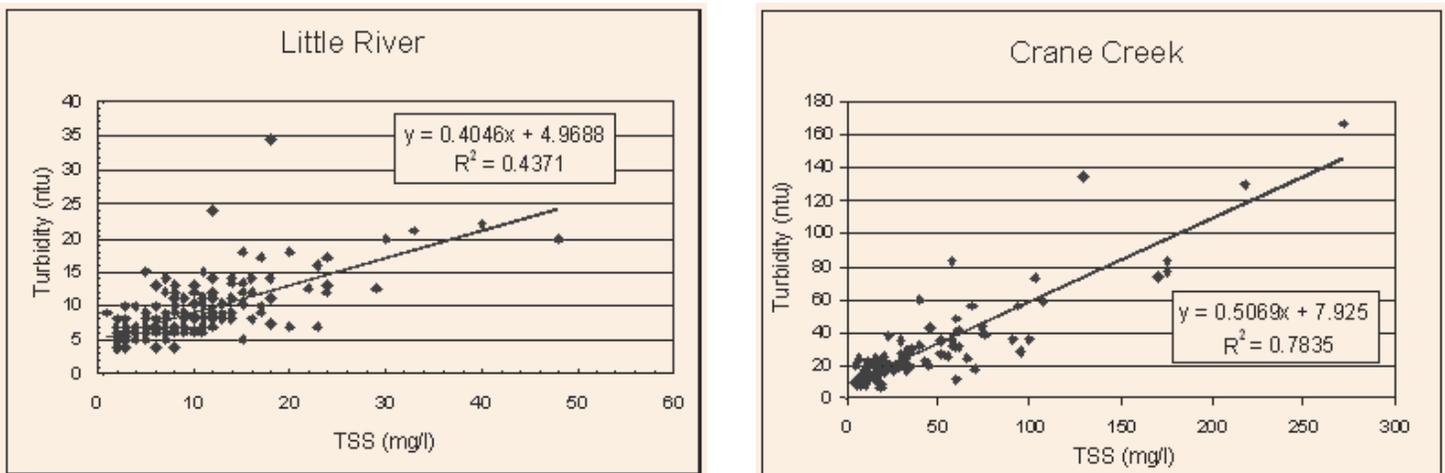


Figure 1. Graphs of TSS vs turbidity for Little River and Crane Creek.

For many surface waters of NC, turbidity is directly related to TSS concentrations. Because, in general, turbidity can be measured more quickly and inexpensively than TSS, monitoring runoff for turbidity and then converting these values to TSS concentration would be cost and time effective. With this in mind the TSS and turbidity data were plotted and the strength of the relationship was quantified using linear regression as shown in figure 1. For Little River, the  $R^2$  of 0.44 indicated a relatively weak relationship between turbidity and TSS data for the 190 samples collected from the two sites. The relatively weak relationship can be attributed to a combination of factors including the low TSS concentrations. At low TSS concentrations, substances released from decaying organic matter or the particles of organic matter itself may significantly change the turbidity of the water. At higher TSS concentrations, the subtle changes in turbidity tend to be masked by greater changes associated with varying concentrations of TSS.

The two relatively high turbidities (24 and 35 ntu) on the graph were associated with high flows following 6+ inches of rain in August, 2003. The slope of the best fit regression equation was 0.40 indicating that TSS concentrations increased much more quickly than turbidity.

For Crane Creek (figure 1, right) the turbidity to TSS re-

lationship was much stronger with an  $R^2$  of 0.78. This could be expected given that the TSS and turbidity values were generally much greater thereby masking more subtle effects of other sources of turbidity. The slope of the relationship was 0.51 indicating that, like the Little River data, the TSS concentrations increased more quickly than the turbidity. The differences between the relationships indicate that a single relationship for the predicting TSS from turbidity does not exist; however, regional or within watershed relationships may be adequate.

The results from nearly two years of monitoring upstream and downstream of the Highway 1 bypass construction over Crane Creek and the Little River show that there was no significant effect of the construction activities on the water bodies. Given the relative size of the drainage areas of the upstream sites to the area disturbed by construction and the fact that the monitoring was not started until well after construction had begun, it was likely that only a major input of sediment to the Creek or River over an extended period would have been detected by the monitoring effort and this did not occur. Sample analysis data documented that the relationship between TSS and turbidity varied between the water bodies suggesting that a single relationship would not adequately characterize the variability.

## Updated Erosion and Sediment Control Planning and Design Manual Now Available

The *Erosion and Sediment Control Planning and Design Manual* has been updated. If you already have a copy you should receive the sections that have been updated by mail. However if your office has a new address please contact the NC Division of Land Resources Land Quality Section at 919-733-4574. You may also purchase a new manual by contacting them. The manual is also available in pdf format via the Division of Land Resources web site at:

<http://www.dlr.enr.state.nc.us/pages/manualsandvideos.html>

## Towns of Boone and Holly Springs Win Local Programs Awards

The Towns of Boone and Holly Springs local programs received this year's awards of excellence in erosion and sedimentation control at the Awards Luncheon on February 1, 2006, at the Mid-Pines Inn in Southern Pines, NC. The Division of Land Resources Director and State Geologist James D. Simons delivered the keynote address and shared the importance of erosion and sedimentation control local programs. He mentioned that the state needs to do a better job at controlling sedimentation and erosion through improving compliance, technology and efficiency. He encouraged the local program staff to help the statewide sedimentation effort by doing their best job, being a model for other local governments and supporting efforts for technology and legislative improvements.

Local Program Awards are given in two categories: (1) programs devoting resources of up to three man-years of support and (2) programs devoting resources of more than three man-years of support.

The Town of Boone received the Local Programs Award of Excellence for a program of fewer than three staff members. The local program is located within the Town of Boone's Development Services and is managed by James Perry, environmental planner, and George Cole, PE, planning supervisor. Matt Gantt, regional engineer in the Winston-Salem Regional Office, nominated the Town of Boone and commented, "James Perry does an outstand-



*James Perry (center), environmental planner for the Town of Boone, receives the Local Programs Award (fewer than three staff members) from James D. Simons (left), Division of Land Resources director and state geologist, and W.T. "Buzz" Bryson (right), NC Sedimentation Control Commission member. George Cole is the planning supervisor for the Town of Boone Development Services (not pictured).*



*Heather Keefer (first row left), environmental specialist and program administrator for the Town of Holly Springs Local Program, receives the Local Program Award (more than three staff members), from W.T. "Buzz" Bryson (first row third from left), NC Sedimentation Control Commission member, and James D. Simons (second row, fourth from left), Division of Land Resources director and state geologist. Also pictured are Richard D. "Dick" Sears (first row, second from left), mayor of Holly Springs; Second row from left: Dalton Echols, development inspector; Stephanie Sudano, director of engineering; Carl G. Dean, town manager; James D. Simons; Gary Gooch, development inspector; Charles S. Simmons III, assistant town manager; and Rodney Campbell, development inspector administrator. Other staff (not pictured) include David Summers, lead development inspector; Mike Dupree, Ken Lentz, and Hookie Riley, development inspectors; Mary Henderson, Jennifer Bullock and Debbie Abbene, administrative staff.*

ing job. The Town of Boone has done a very good job enforcing the Sedimentation Pollution Control Act."

Located within the New River Basin and at an elevation of 3,333 feet above sea level, the Town of Boone local program enforcement area covers about 13 square miles. The local program ordinance requires submission of an erosion control plan for all single-family home sites with 21,780 square feet (0.5 acre) or more of land disturbing activity and for commercial sites with 2500 square feet or more of land disturbing activity. The ordinance is part of the Town's Unified Development Ordinance

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## 2006 IECA Environmental Connection Conference

The International Erosion Control Association (IECA) Conference was held in Long Beach, California on February 20-24, 2006, and had approximately 2000 people in attendance



*Ted Sherrod, NC DOT, and Joshua Vetter, graduate student at NC State University Soil Science Department, stopped for a photo at the IECA Expo. Joshua Vetter received a scholarship to attend the IECA Conference.*

speaker Tim Palmer, a national river conservationist. He recently wrote a book titled

*Lifelines*. He shared pictures of America's rivers focusing on the problems our rivers face—erosion, polluted runoff, loss of habitat due to development, and more.

The rest of the conference consisted of several concurrent technical sessions that covered the following topics: slope technology, stream restoration, vegetative establishment, stormwater management, wetlands technology, erosion and sedimentation control, and beach and shoreline stabilization. The presentations within these subject matters included a forum on the effects of Hurricane Katrina, social issues of erosion problems in third-world countries, and evaluation of

from all over the world. The first two days of the conference consisted of special educational training sessions. The general session to the conference on February 22 opened with keynote

stormwater retention and erosion and sedimentation control devices. Another highlight was the IECA Trade Exposition, where a conference participant could learn about the latest products and information from approximately 165 exhibitors of the erosion control industry's manufacturers and suppliers. Through much hard effort the Southeast Chapter of the IECA won the Chapter Challenge paddleboat race the last night of the conference.

The Southeast Chapter received a Partners of Excellence Award for the Chapter Management Award of Achievement. This award recognizes chapters that work together with the IECA for the benefit of the erosion and sediment control profession. Beth Chesson of Civil & Environmental Consultants, Inc., in Nashville, Tennessee, serves as the Southeast Chapter president.

The IECA conference provides an environment to connect and network with other people of like mind in erosion and sedimentation control from across the nation and around the world. Attendees learn from each other's successes, failures and ideas in the area of erosion and sedimentation control. Many of us that attended from North Carolina networked with other people from the Southeast Chapter of the IECA. There are many good people taking a proactive role to promote proper erosion and sedimentation control.



*Sonya Avant Tankersley, assistant state sediment specialist, and Tracy Davis, chief engineer, both with the NC Division of Land Resources, were looking at the Faircloth skimmer at the IECA Expo.*



*Duane Coen, Lowes, Inc., NC, and Robert Hayes, Land-Design, Charlotte, NC, spent time looking at various erosion control products at the Expo.*

## IECA Presentation Highlights

### Charlotte Local Program Paper Won Award

Steven Gucciardi of the Charlotte local program gave a talk titled "Charlotte's Local Program Approach to Erosion and Sedimentation Control." He stated three items that are essential for an effective local program include a strong erosion and sedimentation control ordinance, adequate staffing of qualified personnel, and educational outreach. Some of the accomplishments he shared included a high level of compliance measured by types of violations, contractors keeping inspectors informed and requesting assistance; contractors maintaining log books; and a well-informed development community. Some of the challenges the program faces are being consistent with Mecklenburg County local program as they share the same ordinance; bringing training to the development community; building trust and a positive relationship with the contractors; and small builders building single-family homes as there is always someone new in the development community. The Charlotte local program won an Environmental Achievement Award for the 15th Annual Awards of Environmental Achievement Program for the paper that Steven Gucciardi of the City of Charlotte Land Development presented. This award was based on criteria that reflects quality, skill and environmental benefits.

### Research on Slope Stability and Vegetation

Wendi Goldsmith, president of the Bioengineering Group in Salem, Massachusetts, presented a paper on "Soil Strength Reinforcement by Plants." She shared how plant roots contribute to soil shear strength. Four plant species--tussock sedge (*Carex stricta*), switch grass (*Panicum virgatum*), common cottonwood (*Populus deltoides*), and black willow (*Salix nigra*)—were used in this experiment as they are used for remediation and habitat restoration. Soil block samples filled with roots of these four species were tested for shear stress against unvegetated soil blocks with similar soil types. The results showed that shear resistance did not follow biomass. In other words, the blocks with the largest amount of biomass did not necessarily have increased shear stress. This study showed that plant roots substantially increase soil shear strength. Switchgrass and black willow were the only two species that produced significantly different shear stress results from the unvegetated soil and thus caused the largest increase in shear stress. The results of Goldsmith's research provided conservative root cohesion values that can be used to quantitatively and qualitatively assess vegetated slope stability and design vegetated riverbanks, shorelines, and landfill caps. This paper received the IECA Award for the Most Distinguished Paper of the Year.

## Local Programs *continued*

that consolidates most of the Town of Boone ordinances and regulations related to the development and use of property.

The Town of Boone local program makes sure the contractors understand all they need to do to meet erosion control requirements, especially dealing with groundcover on steep slopes. Perry also uses GIS for site assessment, plan review and specialized mapping projects for the Town. In addition, Perry does drainage review and deals with flood plain permits. You may view the Town of Boone web site at <http://www.townofboone.net/departments/development/index.html>.

The Town of Holly Springs received the Local Programs Award of Excellence for a program of more than three staff members. Established in 2000, the Town of Holly Spring local program is located within the Engineering Department. John Holley, regional engineer in the Raleigh Regional Office, nominated the Town of Holly Springs and stated, "They have worked diligently to make their rules conform to the standards of the model ordinance, and have made very appropriate adjustments in their staffing and resource allocations to address the rapid growth in their community. They have worked to make the plan review process in their jurisdiction efficient for both design professionals and landowners, while strictly enforcing the most up-to-date standards for sediment and erosion control. All their staff and leaders are to be commended for their continued exemplary efforts."

Located within the Neuse River and Cape Fear River Basins, the Town of Holly Springs local program enforcement area covers 14 square miles. The erosion and sedimentation control enforcement is included as part of the environmental plan review. This plan is part of the Town's holistic approach that covers erosion and sedimentation control and all phases of construction. This approach was developed by the Town's Director of Engineering Stephanie Sudano. Heather Keefer, who has worked with the local program for five years, administers the local program, reviews plans and solves problems that may arise. The five development inspectors become very familiar with the contractors since they are cross-trained to cover utility, road and erosion control inspections. They each have a low number of sites which allows them to visit and inspect the sites multiple times a week. Their multiple visits allow for daily questions and solutions.

After many months of development, the local program staff use new software that tracks the preliminary plan review process, fees, issuance of certificates of occupancy, water and Army Corps of Engineers permits, and the construction plan review process. This online system interfaces with the Code Enforcement Section and alerts the staff regarding the status of project inspections. The staff have the ability to place sites on hold for whole projects or by individual lots until the site is under compliance. The Town also revokes permits to bring sites into compliance. You may view the Town of Holly Springs web site at <http://www.hollyspringsnc.us/dept/engineering/index.htm>.

Congratulations to both programs for doing an outstanding

## Stream Restoration in the Southeast: Accomplishments and Opportunities

October 2-5, 2006  
The Westin Charlotte  
601 South College Street  
Charlotte, NC

Conference and Registration Information at:  
<http://www.ncsu.edu/sri/2006conference/>

NC Stream Restoration Institute and NC Sea Grant, in conjunction with our co-sponsors and partners, are hosting a 4-day conference in Charlotte on October 2-5, 2006 to learn about stream restoration planning, design, construction, financing, and monitoring in the Southeast. This biennial conference will include research presentations, restoration case studies, posters, industry exhibits, networking opportunities, and tours of local stream restoration projects. Share your knowledge and experiences, learn from and network with other experts, and become involved in shaping the future of stream restoration in the Southeast. The 2004 conference in Winston-Salem, NC attracted just under 400 attendees from 24 states with over 60 presentations and 40 commercial exhibitors.

*NC DENR Division of Land Quality, Land Quality Section is one of the partners of the conference.*

## Basic Erosion and Sedimentation Control Planning and Design Workshops

Fall 2006 workshop date and location information will be available in July at:  
<http://www.ncsu.edu/wri/erosionseminars.html>

These workshops are structured to acquaint design professionals with the:

- NC Sedimentation Pollution Control Act,
- rules implementing the Act,
- and design standards for erosion and sedimentation control BMPs.

Professional engineers and land surveyors can earn 12 PDHs, and landscape architects can earn 10 continuing education units for completion of both days.

*Sponsored by the N.C. Sedimentation Control Commission, the NC Land Quality Section, and the Water Resources Research Institute.*

To report possible violations of the NC  
Sedimentation Pollution Control Act call  
**1-866-STOPMUD**  
**(786-7683)**

ADDRESS SERVICE REQUESTED

Newsletter of the North Carolina Sedimentation Control Commission  
c/o Water Resources Research Institute  
of the University of North Carolina  
Box 7912, North Carolina State University  
Raleigh, NC 27695-7912

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