

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

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Land Quality Section  
Division of Land Resources  
Charles H. Gardner, Director

July - September 2001

## Sedimentation and Erosion Control Research and Education Facility fills need for controlled research

It's not that Rich McLaughlin is a control freak, but if a research scientist can't control conditions on the research site, then the outcome is likely to be useless, if not disastrous. McLaughlin, an Associate Professor in the NC State University Department of Soil Science, knows what it's like to try to evaluate erosion and sedimentation control devices under field conditions. Often the weather won't cooperate: You want runoff, you get drought. Sometimes equipment gets vandalized. Sometimes people with the best intentions ruin a test setup—like the time the construction supervisor routed flow from three sediment basins to one instrumented basin to make sure the investigators had enough runoff and caused a blow-out.

It was experiences like these that in 1999 sent McLaughlin to the N.C. Sedimentation Control Commission with a proposal: Help the NCSU College of Agriculture and Life Sciences (CALS) build a facility to test erosion and sedimentation control practices and products where access to and conditions on the site can be controlled.

CALS offered a site near the National Training Center for Land-Based Technology and Watershed Protection on NCSU's Lake Wheeler Road Field Laboratory, and McLaughlin asked the



*Dr. Richard A. McLaughlin, NCSU Associate Professor of Soil Science, has been evaluating sediment control devices as well as the ability of "floc logs" made of polyacrylamide to reduce turbidity in sediment basin discharge at the Sediment and Erosion Control Research and Education Facility on NCSU's Wheeler Road Field Laboratory. The N.C. Sedimentation Control Commission funded start-up of the facility and subsequent research.*

### IN THIS ISSUE

<b>August action of the N.C. Sedimentation Control Commission</b>	<b>2</b>
<b>Stewart, long-time supporter of Erosion and Sediment Control Program, dies</b>	<b>3</b>
<b>Project evaluates efficiency of sediment traps</b>	<b>4</b>

## August action of the N.C. Sedimentation Control Commission

In a telephone conference call on August 16, the N.C. Sedimentation Control Commission (SCC) took the following action:

- Heard a report from the Commission's Turbidity Subcommittee and agreed to schedule a called meeting to further discuss the Commission's role in controlling turbidity and the report of the subcommittee.
- Heard that the following appointments have been made to the Commission's Technical Advisory Committee: Mark Senior, City of Raleigh; Berry Jenkins, Associated General Contractors; Greg Jennings, Buck Engineering; Nancy White, NCSU College of Design; Mac Little, Little & Little Landscape Architects; Jim Gregory, NCSU Dept of Forestry; Kevin Martin, Soil & Environmental Consultants, Inc; Rich McLaughlin, NCSU Dept of Soil Science; Joe Rudek, Environmental Defense; Seth Reice, UNC-CH Dept of Biology; Harlan Britt, Kimley-Horn & Associates Inc. The TAC is to be chaired by Dr. Joseph A. Phillips, Vice Chairman of the SCC.

### N.C. Department of Environment and Natural Resources Division of Land Resources, Land Quality Section Erosion and Sedimentation Control Program 2000-2001 Year End Statistics

Projects requiring an erosion and sedimentation control plan: 3,277\*  
 Plan reviews: 4,442  
 Plan Disapprovals: 868  
 Plan reviews taking more than 15 days: 3  
 Plan reviews taking more than 30 days: 3  
 Site inspections: 16,706  
 Notices of violation: 700  
 Cases referred to enforcement: 109

\*Excludes local programs and Department of Transportation

## Education Committee approves research project

At a meeting on July 10, 2001, the Sedimentation Control Commission's Education Committee approved funding of a research project by Dr. Richard A. McLaughlin of NC State University titled "Sediment and Erosion Control: Evaluation of Cost and Effectiveness." Dr. McLaughlin will examine sediment basin design changes that might increase trapping efficiency, determine how effective constructed wetlands are in mitigating sediment and turbidity, and survey contractors and other professionals to determine the range of costs for most current control measures

### Notice of Public Hearing 7:00 pm Thursday, October 4, 2001 Groundfloor Hearing Room Archdale Building, Raleigh

This public hearing is being held to take comment on proposed revision to 15A NCAC 04B .0126 Plan Approval Fee. The revision will increase the fee charged by the N.C. Department of Environment and Natural Resources for reviewing erosion and sedimentation control plans from \$40 to \$50 for each disturbed acre or part thereof.



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Send comments to Caroline Medlin, NCDENR-Land Quality, 1612 Mail Service Center, Raleigh, NC 27699-1612. Email: Caroline.Medlin@ncmail.net. Send change of address to WRRI, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 (919/515-2815). Fifty-seven hundred copies of this newsletter were printed at a cost of \$1,387.00 or 24 cents per copy.

Personnel of the Land Quality Section of the N.C. Department of Environment and Natural Resources provide information and assistance for implementation of the N.C. Erosion and Sediment 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 N.C. 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.

Chairman:  
Kenneth H. Reckhow  
Durham

Director of Water Resources Research Institute

Commissioners:

Daniel V. Besse  
Winston-Salem

Rep. N.C. Environmental Management Com.

John R. Bratton  
Knightdale  
Rep. N.C. Mining Com.

Donnie W. Brewer  
Greenville  
Rep. Professional Engineers of N.C.

James Ferguson  
Clyde  
Rep. N.C. Soil and Water Conservation Com.

Phillip Ray Gibson  
Asheville

Non-governmental conservation representative

J. Wendell Gilliam  
Raleigh  
Rep. NCSU Dept. of Soil Science

Ray B. Killough  
Matthews  
Rep. N.C. public utilities

Joseph A. Phillips  
Raleigh

Non-governmental conservation representative

Kyle Sonnenberg  
Southern Pines

Rep. Association of County Commissioners/  
N.C. League of Municipalities

Ralph Stout  
Greensboro

Rep. Carolinas Associated General Contractors

F. Roger Watson  
Asheville

Rep. N.C. Home Builders Association

## Stewart, long-time supporter of Erosion and Sediment Control Program, dies

Dr. James M. Stewart, who served on the N.C. Sedimentation Control Commission's Education Committee for many years, died July 21 in Kinston.

Stewart served as Assistant, then Associate Director of the UNC Water Resources Research Institute (WRRI) for 18 years, and in that capacity developed a cooperative educational program involving WRRI and the N.C. Erosion and Sedimentation Control Program. A former N.C. Agricultural Extension Specialist in information transfer and public participation, Stewart developed and coordinated training workshops for

erosion and sedimentation control personnel. He also organized and conducted workshops to review the Erosion and Sediment Control Planning and Design Manual published in 1989, and he was instrumental in launching the *Sediments* newsletter.

Dr. Stewart retired from WRRI in 1990 and moved with his wife, Catherine, to Kinston where they restored an historic family home and farm. He remained active on the SCC Education Committee for some years following his retirement.

## Miller honored

Doug Miller, Land Quality Regional Engineer in Mooresville, was one of seven finalists for the 2001 Manager of the Year Award presented by the N.C. Chapter of the National Management Association. Miller received the honor at the organization's annual awards luncheon in Raleigh on June 6. He was nominated for the award by the regional office staff, who cited his extensive knowledge of the program and his firmness and fairness with both the public and his staff. Miller has been with the Land Quality Section for 27 years.

## Personnel changes

**Brooks Cole** has been promoted to Assistant Regional Engineer in the Winston-Salem Region.

**Scotty Beshear** is the new Environmental Technician in the Wilmington Region.

**Tim Holland** has retired from his position as Environmental Technician in the Wilmington Region.

## New Federal Mine Safety and Health Administration requirement

All stone, sand, and gravel operators nationwide are obligated to begin enforcement of a new Federal Mine Safety and Health Administration (MSHA) program titled Part 46 Training. This program requires specific training for independent contractors doing work on mine property.

The regulation says that if any contractor, customer, commercial truck driver, or construction worker comes on mine property to dig and load borrow dirt, topsoil, stone, sand or gravel, or if they provide some contractor assistance on mine property, such as stripping, they must, prior to beginning work, have an approved Mine Safety and Health Training Plan in place and on file with the operator. As of April 1, 2001, anyone performing tasks, such as those listed above, who does not have an approved training plan in place should not be allowed to work on the mine property.

For additional information contact the N.C. Aggregates Association at (919) 782-7055.

## Research and Education Facility *continued*

SCC's Education Committee for funds to develop a water source to simulate runoff and to install sediment basins and other test facilities. The Education Committee had often complained about the lack of good information from controlled investigations of BMP effectiveness and recommended that the SCC assist in funding facility start-up by committing \$50,000 from legislatively appropriated education funds.

Thus was born the Sediment and Erosion Control Research and Education Facility (SECREF). The SCC has since committed \$185,000 to fund continued research at the facility being shared with the National Training Center for Land-Based Technology and Watershed Protection.

The SECREF now has an irrigation pond to provide water for flow simulation, a shed to store equipment and supplies, three sediment basins of different sizes with multiple outlet capability, and a level spreader with associated instrumentation to collect and analyze runoff and basin discharge.

### Current research

Under his current contract with the SCC, McLaughlin has a list of questions to answer using representative North Carolina soils:

- Do basin skimmers reduce turbidity better than rock outlets?
- How do baffles in basins change the trapping efficiency?
- How does sediment basin size affect sediment trapping efficiency?
- What is the trapping efficiency of rock check dams?
- How effective is silt fence in controlling sediment and reducing turbidity?
- How effective are various inlet protection practices?

So far McLaughlin, Research Scientist Dr. Narayan Rajbhandari, and Field Technician Jamie Stansell have

completed more than 60 individual tests, collecting nearly 3,000 samples. They have analyzed these samples to determine sediment and turbidity reduction in different sediment trap/basin configurations, including rock outlets, skimmer outlets and two different baffle systems. They have also run tests using polyacrylamide. Results to date show that:

- Basin size does affect performance.
- The skimmer improves the effectiveness of basins in reducing turbidity of discharge water compared to the rock outlet.
- The addition of polyacrylamide to water flowing into the basin can reduce turbidity to less than 100 NTU in skimmer basin discharge.
- By adding a jute fiber baffle system to a skimmer basin and adding polyacrylamide (in the form of "floc logs") to the inflow water, turbidity in discharge water can be reduced to significantly less than 100 NTU.
- Level spreaders can polish discharge water even further.

McLaughlin's research with polyacrylamide (PAM) has convinced

him that PAM has promise for solving the turbidity problem but that there are many questions about its use that must be answered before it can be recommended for use on construction sites.

He points out that there is no system for measuring how much PAM is dissolved into inflow water from floc logs and therefore no way to know when overdosing is occurring. In addition, the flocculant system recommended by the vendor and tested first by the investigators was quite complex.

"There were so many variables, it was impossible to know what was working," said McLaughlin.

In the future the team will test other systems to determine the most efficient approach to using PAM. They will also complete tests of inlet protection and silt fence this summer and will repeat tests of basin systems using different soil sources.

In addition, this fall the Sediment and Erosion Control Research and Education Facility will host its first public workshop highlighting its research. See below.

## Sediment and Erosion Control Workshop Latest Information with Hands-On Demonstrations

**October 12, 2001  
Jane S. McKimmon Center  
NCSU Campus, Raleigh**

This workshop will focus on reducing sedimentation and turbidity and will present the latest research conducted at NC State University on the effectiveness of various BMPs.

The morning will be devoted to classroom presentations and product updates from industry representatives. The afternoon will be devoted to field demonstrations at the Sediment and Erosion Control Research and Education Facility.

Registration fee is \$95. Five ways to register: Call Mac at (919) 515-7154; email: soils\_training@ncsu.edu; fax: Attn Mac at (919) 515-7494; mail: Mac McKenzie, Soil Science Department, Box 7619, NCSU, Raleigh, NC 27695-7619.

# Project evaluates efficiency of sediment traps

While a good bit of research has been done on the efficiency of sediment basins (larger ponds with riser barrel or skimmer outlets) and how to improve their performance, little research has focused on the performance of sediment traps (smaller ponds with stone outlets). To help provide information on the effectiveness of sediment traps, researchers at NC State University have evaluated their performance in the Coastal Plain and Piedmont of North Carolina. The research was conducted by Daniel E. Line, Extension Specialist with the NCSU Department of Biological and Agricultural Engineering, and Nancy White, Extension Specialist with the NCSU College of Design. It was sponsored by the N.C. Sedimentation Control Commission.

The investigators monitored one sediment trap draining about 5 acres of fine sandy loam soils, two-thirds of which was cleared, at the Village of Woodsong, a development in the Shallotte River watershed of Brunswick County in the Coastal Plain. They also monitored two sediment traps at Carpenter Village in the Crabtree Creek watershed of Wake County in the Piedmont. Carpenter 1 sediment trap drained about 10 acres, all of which was cleared, graded and developed for residential housing during the period of monitoring. Carpenter 2 sediment trap was installed at the outlet of a storm drain, which drained an undefined area but was comparable to Carpenter 1. (Heavy sediment accumulation in Carpenter 2 necessitated frequent removal of sediment and prevented monitoring throughout the research period.) Soils in both Carpenter Village drainage areas are derived from Triassic Mudstone and Sandstone and are some of the most erodible in North Carolina.

For more than a year, investigators measured rainfall at each site and sampled outflow from the traps, analyzing the samples for total suspended solids

(TSS), total phosphorus (TP), and turbidity. They tracked the buildup of sediment in the traps by conducting surveys during the period of the monitoring. They also collected sediment cores from the traps and performed various analyses to determine bulk density,

sediment size and total phosphorus. They computed sediment and phosphorus loads in outflow for each significant storm event by multiplying the total outflow volume by the flow-weighted TSS and TP concentrations. They computed sediment trapping efficiency by dividing the mass of sediment deposited in the trap by the sum of the mass deposited and passing out of the trap and then multiplied by 100 to convert to a percentage. Results are



*A sediment trap is a small temporary ponding basin formed by an embankment or excavation. Water is released from a sediment trap through a washed stone outlet.*

from monitoring the other parameter in runoff from construction sites in the Piedmont.

Linear regression indicated a poor relationship between TSS and turbidity at the Woodsong site, a wooded area with a substantial amount of organic matter remaining.

The investigators point out that the efficiency of the Carpenter 1 trap was higher during the early stage or rough grading phase. Following completion of

	Woodsong	Carpenter 1	Carpenter 2
Monitoring period	11/98 - 6/2000	7/98-2/2000	9/99-10/99
No. storms sampled	21	32	10
Overall TSS efficiency	69%	59%	58%
Overall TP efficiency	9%	30%	

given in the table above.

Linear regression of the turbidity/TSS concentration data revealed a strong relationship ( $r^2=0.96$ ) for the Carpenter Village site. The investigators say their analysis and comparison of turbidity/TSS concentrations from an earlier study in the N.C. Piedmont provides evidence that TSS or turbidity can be computed

rough grading and establishment of temporary vegetation, sediment export from the site decreased dramatically. However, total TSS passing through the trap during the 1.7 years of monitoring was equal to about 4.41 tons per acre of TSS export per year.

**A toll-free hotline  
has been  
established  
statewide for  
concerned  
citizens to  
report possible  
violations of the  
North Carolina  
Sedimentation  
Pollution  
Control Act.  
To report problems  
call  
1-866-  
STOPMUD  
(786-7683)**

## **AN INTRODUCTION TO EROSION AND SEDIMENTATION CONTROL FOR CONSTRUCTION SITES**

**September 26-27, 2001**

**Holiday Inn-Select  
Hickory, NC**

**October 25-26, 2001**

**Sheraton Grand  
New Bern, NC**

**Purpose:** This seminar is presented to familiarize design professionals who develop erosion and sedimentation control plans—including engineers, landscape architects, and surveyors—with erosion and sedimentation control principles and practices. Thirteen (13) PDHs are available to professional engineers and land surveyors, and 10 continuing education units are available to landscape architects for completion of both days.

**Fee:** \$125.00. Covers materials, breaks, and lunches.

**Deadline:** Registrations will be taken on a first-come, first-served basis, but no registrations will be taken after September 7, 2001, for the Hickory seminar, and October 3, 2001, for the New Bern seminar.

For additional information and a registration form go to website:

**<http://www2.ncsu.edu/ncsu/CIL/WRRI/erosionseminars.html>**

**Sponsored by**

**N.C. Sedimentation Control Commission; Land Quality Section, Division of Land Resources, N.C. Department of Environment and Natural Resources; and Water Resources Research Institute of The University of North Carolina**

## **SEDIMENTS**

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