

# SEDIMENTS

Newsletter of the North Carolina Sedimentation Control Commission

## Improved Erosion Control BMPs for Road Construction Projects in the North Carolina Mountains

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**S**EDIMENT IS THE MOST common pollutant affecting North Carolina's waterways, impacting a range of aquatic organisms, reducing reservoir capacity, and hurting their aesthetic and economic value. Construction activity, including roadway projects, is a significant contributor of state-wide sediment loading. Current regulations have established maximum allowable discharge turbidities at just 10 NTU to trout streams, which are common in the mountains. However, this threshold has proven quite difficult to meet and new structures and practices are needed to achieve this requirement.

The objective of this study was to evaluate the effectiveness of alternative check dams, with and without polyacrylamide (PAM), as compared to standard Department of Transportation (DOT) erosion control designs in reducing both turbidity and sediment losses during road improvement projects.

This study was conducted between June 2006 and March 2007 on two DOT roadway paving projects located in the North Carolina mountains, one along Steeltown Road in Caldwell County and the second along Curley Maple Road in Watauga County. The roadway drainage ditches adjacent to the roads were partitioned into experimental sections, each one hydrologically distinct from the others by drainage culverts that ran under the road, discharging stormwater off site.

At each site one section was installed with the standard DOT Best Management

Practices (BMPs) for these projects, consisting of small sediment traps followed by rock check dams (Figure 1).



Figure 1. Standard BMPs

The experimental BMP sections consisted of a mix of stiff coir fiber logs (10' long and 12" diameter) and malleable straw wattles (10' long and 9" diameter) placed throughout the ditch channel at approximately 25' intervals (Figures 2-3, pg. 2). The concept is to adjust the spacing for the slope so that the bottom of the upper wattle or log is at the same elevation as the top of the next one down the slope. For two of these sections, 100g of granulated PAM 705 was sprinkled on the center section of each wattle to improve finer particle flocculation, and was replenished about once a month. Each of these PAM-applied sections emptied into a sediment trap before exiting the site and so avoided any direct discharge of PAM or flocculated sediment into adjacent waterways, as required by NC DENR. This system appears to provide significant benefits in sediment and turbidity

control in these sensitive watersheds, and we will continue to test variations on it in other construction site settings.

The average turbidity values (in NTU) for the stormwater runoff at the Steeltown Road site were 4,198 for the standard BMPs, 30

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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

for the fiber check dams with PAM, and 187 for the fiber check dams alone (Table 1). The Curley Maple Road site showed similar results with average turbidity values of 64 for the fiber check dams with PAM, as compared to 852 for the standard BMPs (Table 2). The sediment loading rates at both sites were similarly skewed with dramatic decreases observed for the new BMPs.

At Steeltown, the standard BMPs lost an average of 944 lbs (428 kg) of sediment per storm event as compared to just 1.93 lbs (0.88



Figure 2. Coir logs



Figure 3. Straw wattle

kg) for the fiber check dams with PAM and 6.53 lbs (2.96 kg) for the fiber check dams alone (Table 1). At Curley Maple, the standard BMPs lost an average of 8.84 lbs (3.63 kg) per storm event compared with 1.67 lbs (0.76 kg) for the fiber check dams with PAM (Table 2).

Thus, the new BMPs demonstrated tremendous improvement over the standard, with one section with PAM coming very close to achieving the strict 10 NTU limit for trout streams, while the standard sections were each several orders of magnitude higher.

The new BMPs also appear to be an economically viable alternative as the relative cost differences are very minimal. The standard BMPs at these sites cost around \$1.12 to \$1.26 per linear ft., while the new BMPs cost around \$1.10 to \$1.67 per linear ft. depending on the spacing of the wattles/logs. The newer BMPs also appear to have a lower maintenance cost.

As a result of the success of this system, both NC State University and NC Department of Transportation plan further field testing around the state, particularly in areas adjacent to sensitive habitat waters. This system of fiber check dams and PAM should be applicable to most construction sites and could lead to significant reductions in stormwater impacts on adjacent streams and lakes.



Table 1. Steeltown Road Summary			
	Standard BMPs	Fiber check dams with PAM	Fiber check dams alone (no PAM)
Turbidity Values (NTU)			
Average	4198	30	187
Median	1737	12	65
Sediment Loading Rates (kg)			
Total Sum	9,414	23	59
Average Load per Storm	427	0.88	2.96

Table 2. Curley Maple Road Summary		
	Standard BMPs	Fiber check dams with PAM
Turbidity Values (NTU)		
Average	852	64
Median	305	40
Sediment Loading Rates (kg)		
Total Sum	65	6.82
Average Load per Storm	3.63	0.76



*SEDIMENTS* is published quarterly by the NC Sedimentation Control Commission to provide information and assistance to the regulated community and to facilitate communication among personnel of state and local erosion and sedimentation control programs.

Send comments to Ashley Rodgers, NCDENR-Land Quality, 1612 Mail Service Center, Raleigh, NC 27699-1612. Email: Ashley.Rodgers@ncmail.net. Send change of address and subscription information to NCSU Water Quality Group, Campus Box 7637, Raleigh, NC 27695-7637; (919)515-3723; cathy\_smith@ncsu.edu). To receive *Sediments* electronically, please subscribe at: <http://www.dlr.enr.state.nc.us/pages/sedimentationnewsletters.html>. Five thousand copies of this newsletter were printed at a cost of \$1,490 or 30 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 Sonnenburg  
Fayetteville  
NC League of Municipalities

**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

John William Miller, Jr.  
Burnsville  
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Non-governmental Conservation

Mark A. Taylor  
Greensboro  
Professional Engineers of NC

Richard Vick  
Wilson  
Carolinas Associated General Contractors

Rob Weintraub  
Wake Forest  
NC Home Builders Association

## News from the Land Quality Section

### *Plan Review Fee Increase*

Effective August 1, 2007, the plan review fee for sedimentation and erosion control plans in North Carolina has increased to \$65.00 per acre (or part thereof). It is important that anyone submitting a Sedimentation and Erosion Control Plan include the correct review fee amount with their submittal. Failure to include the correct amount will delay review of the submittal until the appropriate fee is received.

Updated Financial Responsibility/Ownership forms and a Plan Review Checklist may be found under "Erosion and Sedimentation Control" at: <http://www.dlr.enr.state.nc.us/pages/forms.html>

### *Fall Design Workshops Scheduled*

The Fall 2007 Erosion and Sedimentation Control Planning and Design Workshops have been announced. Workshops will be held:

October 30-31, 2007  
Holiday Inn Select  
Hickory, NC

These workshops are sponsored by the N.C. Sedimentation Control Commission, the N.C. DENR Land Quality Section, and the Water Resources Research Institute. Professional engineers and land surveyors may earn 12 PDHs and landscape architects may receive 10 continuing education credits for completion of both days.

Agendas and registration information may be found online at: <http://www.ncsu.edu/wrri/erosionworkshops.html>

### *Field Manual Revisions*

The Erosion and Sediment Control Field Manual is a companion guide to the larger Planning and Design Manual. While the Planning and Design Manual is meant to be a detailed guide for the design of erosion control measures and plans, the Field Manual is a guide for contractors when installing measures. The Field Manual is currently undergoing revisions, due mostly to the need to be

consistent with the revised 2006 Planning and Design Manual.

Current Field Manual owners should contact Ashley Rodgers to confirm their address. Revision packets will be mailed free of charge to all current manual owners for whom we have confirmed contact information.

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## NC Sedimentation Control Commission: May Actions

At its meeting on May 17, 2007, the NC Sedimentation Control Commission (SCC) took the following actions:

- Delegated local program authority and approved a local erosion and sediment control ordinance for Iredell County
- Approved amendments to the local erosion and sediment control ordinance for Gaston County
- Approved the following proposals which were recommended by the Sedimentation Education Committee (SEC):
  - o Support for four workshops to train design professionals in erosion and sediment control (\$21,534)
  - o Support for annual workshop to train local program staff and present annual awards (\$66,486)
  - o Support for continuation of the Sediments newsletter for erosion and sediment control program education (\$40,250)
- Authorized the Technical Advisory Committee (SCC) of the Commission to draft rules to clarify language in NCGS 113A-54.1(e) regarding the self inspection of construction sites

Supporting documents for these actions may be found online at <http://dlr.enr.state.nc.us/scc.html>.

## Personnel Changes

- Robert Belvin is a new Assistant Regional Engineer in the Washington Regional office.
- Brad Cole is a new Assistant Regional Engineer in the Raleigh Regional Office.
- Steve Cook, formerly Assistant Regional Engineer and Express Permit Reviewer, is the new Regional Engineer in the Fayetteville Regional Office.
- Justin Harcum is a new Environmental Specialist in the Fayetteville Regional Office.
- Scott Harrell, Assistant Regional Engineer, is now the Express Permit Reviewer in the Mooresville Regional Office.
- Joyce Sandford is the new Receptionist and Secretary for the Sediment and Dam Safety Programs in the Central Office.
- Lonnie Snider is a new Environmental Specialist in the Mooresville Regional Office.
- Heather Steinbacher is a new Assistant Regional Engineer in the Washington Regional Office.
- Sandy Taylor is a new Assistant Regional Engineer in the Washington Regional Office.
- Charley Whaley, Environmental Specialist, has transferred from the Winston-Salem Regional Office to the Mooresville Regional Office.

## Erosion and Sediment Control in the Mountains

29 August 2007

THE NC STATE UNIVERSITY Water Quality Group and Department of Soil Science held a workshop at the North Carolina Arboretum Education Center. The workshop addressed local challenges and issues for erosion and sediment control in the mountains and presented some options for reducing stream impacts. Topics covered during this workshop included: updates to the state erosion and sediment control

manual, common obstacles for erosion and sediment control, sediment basin design to improve efficiency, methods for reducing turbidity using wattles and polyacrylamide (PAM), and alternatives for controlling erosion on steep slopes. Speakers included Wayne Watkins from the North Carolina Department of Environment and Natural Resources/Land Quality Section, and Dr. Rich McLaughlin and Melanie Markusic from the Department of Soil Science at North Carolina State University. Close to 80 people attended, including designers, regulators, and installers.

The workshop also had a unique hour long discussion session that allowed industry professionals in Western North Carolina to talk about erosion control trends, success

stories, challenges, and more. This discussion period helped to elevate awareness of issues concerning erosion and sediment control for inspectors, designers and regulators. One common



*Dr. Richard McLaughlin demonstrates effective methods for reducing erosion.*

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## August Action of the Sedimentation Control Commission

At its meeting on Aug. 16, the the NC Sedimentation Control Commission (SCC) took the following actions. Supporting documents for these actions may be found online at: <http://dlr.enr.state.nc.us/scc.html>.

- Approved the continued delegation of the Chatham County local program
- Approved the continued delegation of the Durham County local program
- Approved the continued delegation of the City of Rocky Mount local program
- Approved the continued delegation of the Town of Wake Forest local program
- Approved amendments to the 2008 Local Program Assistance Contracts

- Approved a request from the North Carolina Turnpike Authority to operate under the delegated NC DOT sediment and erosion control program

Acted on the following proposals recommended by the Sedimentation Education Committee:

- Approved \$38,120 to be used by the Land Quality Section for reprinting the E&SC Field Manual, which is currently being updated to reflect the 2006 revisions to the Planning and Design Manual.
- Approved funds in the amount of \$1,965.96 to reprint the E&SC Planning and Design Manual. Total printing costs will also be offset by publication

sales receipts from the Land Quality Section.

- Approved the allocation of \$26,688 to the Land Quality Section for support of the Temporary Environmental Specialist I position to assist the Sediment Program.

### Land Quality Section Summary Statistics

#### Erosion and Sedimentation Control Program, FY 2006-2007

New Projects	3,546
Sedimentation Plan Reviews	5,270
Plan Disapprovals	1,432
Site Inspections	13,189
Notice of Violations	658
Cases Referred to Enforcement	67

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issue was whether innovative erosion and sediment control plans, which might include some of the systems presented at the workshop, would be approved by local and state regulators.

There was an extensive display of E&SC products supplied by various vendors for the attendees to view and learn more about as well as an hour long demonstration period where attendees could see different field applications first hand. These demonstrations included a hydroseeding demonstration by Western Carolina Seed and a turbidity reduction demonstration using polyacrylamides by Dr. Richard McLaughlin.

For more information and to view the PowerPoint presentations from this workshop, please go to the NCSU Water Quality Group's French Broad Training Center website at:

<http://www.ncsu.edu/waterquality/frenchbroad/workshops.html>



*A display of commonly used erosion control products.*



*Hydraulically applied mulch used for erosion control.*



*Compost mulch used as a ground cover and as a fill in a check dam.*



## IECA's Environmental Connection—the world's largest soil and water event

February 18-21, 2008  
Expo: February 19-21, 2008  
Coronado Springs Resort, Orlando, Florida, USA

### *What can you expect to find at Environmental Connection?*

\* 22 Full-day training courses addressing hot topics such as wind erosion, construction site management and NPDES regulations and compliance. PHDs and CEUs are available.

\* Over 50 case studies and technical paper presentations providing original research and proven techniques to help you stay ahead in a competitive market.

\* More than 160 vendors showing the latest products and technology available in the largest expo dedicated to erosion and sediment control.

\* 2000+ attendees to network with for increased exposure, business opportunities and resources.

For more information and to register, go to: <http://www.ieca.org/conference/annual/aboutec.asp>



## New Tool for Stream Channel Assessment

A method to calculate hydrologic “flashiness” - the R-B Index – was developed by Pete Richards and David Baker of Heidelberg College in 2004. Using that methodology, the Michigan Department of Environmental Quality's NPS program staff calculated flashiness values and assessed trends for 279 USGS gages in Michigan that had at least five years of data. Some of the data sets extended back prior to 1910. An increase in flashiness, often due to changing land use, is a common cause of stream channel instability and excessive erosion, and is the focus of numerous NPS

grant proposals. The flashiness report is one tool for diagnosing the scale of a particular stream channel problem. If the R-B Index values are steady over time, channel erosion problems in the vicinity of the USGS gage may have local causes that can be addressed with local BMPs. Conversely, if the R-B Index trend indicates that flashiness is increasing over time, channel erosion problems in the vicinity of the gage station may have large-scale causes and will require a large-scale solution. The report titled Application of the Richards-Baker Flashiness Index to Gaged Michigan Rivers and Streams is available at [http://www.michigan.gov/documents/deq/lwm-hsu-rb-flashiness\\_204776\\_7.pdf](http://www.michigan.gov/documents/deq/lwm-hsu-rb-flashiness_204776_7.pdf)

For more information, contact Dave Fongers or Joe Rathbun with Michigan Department of Environmental Quality at 517-373-8868.



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



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c/o NCSU Water Quality Group  
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Raleigh, NC 27695-7619

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## Calendar of Events

10/16/07	<b>Level II Erosion &amp; Sediment Control/ Stormwater Certification for NCDOT Projects</b> Raleigh, NC <a href="http://www.bae.ncsu.edu/workshops/dot/">http://www.bae.ncsu.edu/workshops/dot/</a>	11/15/07	<b>Dirt....Cheap? (EELE Workshop)</b> , William B. Umstead State Park, Raleigh, NC. <a href="http://web.eenorthcarolina.org/net/calendar/details.aspx?c=32922&amp;s=53352.0.108.37430">http://web.eenorthcarolina.org/net/calendar/ details.aspx?c=32922&amp;s=53352.0.108.37430</a>
10/17/07	<b>Level I Erosion &amp; Sediment Control/Stormwater Certification for NCDOT Projects</b> Raleigh, NC <a href="http://www.bae.ncsu.edu/workshops/dot/">http://www.bae.ncsu.edu/workshops/dot/</a>	12/11/07	<b>Polymer Enhancement of Erosion &amp; Turbidity Control on Construction Sites</b> Raleigh, NC <a href="http://www.soil.ncsu.edu/swetc/sediment2/2007/poly2/poly.htm">http://www.soil.ncsu.edu/swetc/sediment2/2007/ poly2/poly.htm</a>
10/25/07	<b>Introduction to Stream Restoration Planting - Plan Your Plants and Plant Your Plan</b> Asheville, NC <a href="http://www.ncsu.edu/srp/veg_workshop.html">http://www.ncsu.edu/srp/veg_workshop.html</a>	12/19/07	<b>Level I Erosion &amp; Sediment Control/ Stormwater Certification for NCDOT Projects</b> Hickory, NC <a href="http://www.bae.ncsu.edu/workshops/dot/">http://www.bae.ncsu.edu/workshops/dot/</a>
10/30-31/07	<b>WRRI Fall 2007 Erosion and Sedimentation Control Planning and Design Workshops</b> Hickory, NC <a href="http://www.ncsu.edu/wrri/erosionworkshops.html">http://www.ncsu.edu/wrri/erosionworkshops.html</a>	2/18-21/08	<b>IECA's Environmental Connection</b> Coronado Springs Resort, Orlando, FL <a href="http://www.ieca.org/conference/annual/aboutec.asp">http://www.ieca.org/conference/annual/aboutec. asp</a>