SEDIMENTS

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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Covering ground: Research focuses on use of PAM with groundcovers to prevent erosion and aid in establishment of grass

"Groundcover! Groundcover! Groundcover!" has become the mantra of the North Carolina Erosion and Sedimentation Control Program. As public anger about sediment pollution rises and regulatory pressure builds, state and local erosion and sedimentation control officials emphasize that the best way to keep soil in its place and avoid Notices of Violation and fines is to cover bare soil as quickly as possible.

In 1999, as part of its Plan of Action to improve erosion and sedimentation control, the N.C. Sedimentation Control Commission (SCC) adopted regulations requiring that groundcover sufficient to restrain erosion be put into place within 15 working days or 90 calendar days of completion of construction or development. The General Assembly changed the Sedimentation Pollution Control Act to require that groundcover on slopes be put into place within 15 working days or 30 calendar days of completion of any phase of grading. Research at NC State University is investigating whether adding polyacrylamide (PAM, a chemical solution) to groundcovers can help developers and contractors comply with the requirements by enhancing the ability of temporary groundcovers to keep soil on site and by aiding in establishment of grass for permanent groundcover.

What is PAM?

PAM is a generic term referring to thousands of different types of polyacryalamides, each with unique physical and chemical properties. Some PAMs are useful for erosion control because they bind soil particles together more securely, increasing soil cohesion and strengthening aggregates. This mechanism not only reduces detachment and transport of sediments but also causes fine particles to clump together so that they do not block pores and reduce infiltration of water into the soil. Thus the right kind of PAMs reduce erosion and may promote establishment of vegetation by providing moisture to emerging roots. In furrow-irrigated agricultural fields, PAMs have reduced soil loss up to 99%.

In research funded by the SCC and by the N.C. Department of Transportation (DOT), Dr. Rich McLaughlin has tested a variety of temporary groundcovers with and without PAMs at highway construction sites and at the NCSU Sediment and Erosion Control Research and Education Facility (SECREF).

SECREF experiments

At the SECREF, Dr. McLaughlin designed a research project to study the effectiveness in preventing erosion and aiding grass establishment of straw, erosion blankets, and mechanically bonded fiber matrix (MBFM) with and without PAM and of PAM on bare soil. Last fall, Dr. McLaughlin's research technicians established four replications of one-by-one-meter plots of each treatment seeded with fescue. During rainfall events in October and November 2002, they collected runoff from each plot and measured turbidity and total solids in the runoff. Following the monitoring period, they sampled each plot to determine biomass as an indicator of the success of grass establishment. Results indicated that PAM can enhance the effectiveness of temporary groundcovers in controlling erosion. After the first rainfall event that was

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May action of the North Carolina Sedimentation Control Commission

At its regular meeting on May 15, 2003, the N.C. Sedimentation Control Commission took the following action:

■ Elected Mr. Kyle Sonnenberg as vice chair of the commission.

■ Approved education projects for the next fiscal year. Subject to availability of appropriated funds, projects to be conducted next year are:
❍ Continuation of Sediments newsletter.
❍ Four workshops (two in the fall and two in the spring) to train erosion and sedimentation control design professionals.
❍ Local erosion and sedimentation control programs annual workshop and awards program.
❍ Land Quality student interns.
❍ Clear Water Contractor training program to be conducted by Land-of Sky Regional Council.
❍ Muddy Water essay contest for high school students.
❍ Reprinting of the Erosion and Sedimentation Control Planning and Design Manual and Field Manual, and reproduction of the Erosion and Sedimentation Control demonstration videos.

■ Approved a Local Program Grant of $15,680 for the Town of Holly Springs.

■ Approved an additional $400 for the Local Program Grant to Gaston County.

N.C. Division of Land Resources Land Quality Section Selected Activities

(All Regions)

July 2002 - February 2003

Erosion and Sedimentation Control Program	
Estimated Total Project Sites	7,500
New Sedimentation Control Projects	1,971
Sedimentation Plan Reviews	2,708
Plan Disapprovals	502
Site Inspections	10,015
Notices of Violation	374
Cases Referred to Enforcement	56
Mining Program	
Estimated total	930
Mine permits reviewed	226
Mine Inspections	380
Dam Safety Program	
Estimated total	4,950
Dam Safety Plans reviewed (total)	103
Dam Inspections	1,165

NCDENR
North Carolina Department of Environment and Natural Resources

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Send comments to Janet Paith, NCDENR-Land Quality, 1612 Mail Service Center, Raleigh, NC 27699-1612. Email: Janet.Paith@ncmail.net. Send change of address to WRRI, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 (919/515-2815; water_resources @ncsu.edu). Fifty-nine hundred copies of this newsletter were printed at a cost of $861.12 or 15 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 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 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:

W. T. "Buzz" Bryson
Cary
Rep. N.C. Public Utilities

Hugh J. Franklin
Marion
Rep. N.C. Mining Com.

Phillip Ray Gibson
Cullowhee
Non-governmental conservation representative

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

Gregory D. Jennings
Raleigh
Rep. N.C. Environmental Management Com.

Grover McPherson
Winston-Salem
Rep. N.C. Soil and Water Conservation Com.

Joseph Rudek
Hillsborough
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

Mark A. Taylor
Greensboro
Rep. Professional Engineers of N.C.

F. Roger Watson
Asheville
Rep. N.C. Home Builders Association

Governor makes appointments, reappointments to Sedimentation Control Commission

Governor Mike Easley recently reappointed five members of the N.C. Sedimentation Control Commission and appointed five new members.

Those reappointed were: **Mr. Roger Watson**, representing the N.C. Home Builders Association; **Mr. Ralph Stout**, Jr., representing the Carolinas Associated General Contractors; **Dr. J. Wendell Gilliam**, representing the NC State University Department of Soil Science; **Mr. Phillip Gibson**, representing the conservation community; and **Mr. Kyle Sonnenberg**, representing local government.

The five new members are:

- **Mr. Grover McPherson**, representing the N.C. Soil and Water Conservation Commission. Mr. McPherson retired from the (former) USDA Soil Conservation Service in 1990 after 32 years of service. He and his wife have interests in farms in Columbus and Yadkin counties. In addition to serving on the Soil and Water Conservation Commission, Mr. McPherson is a supervisor with the Forsyth Soil and Water Conservation District and first vice president of the State Association of Soil and Water Conservation Districts.

- **Mr. William T. "Buzz" Bryson**, representing North Carolina public utilities. Mr. Bryson is Lead Environmental Specialist with Progress Energy. He previously served two terms (1995-2001) on the SCC in a conservationist position. An avid fisherman, he is active in Trout Unlimited and is a contributing editor of *Fly Rod & Reel* magazine (see his column at http://www.flyrodreel.com/buzz.html) and *Salt Waters* magazine.

- **Dr. Joseph Rudek**, representing the conservation community. Dr. Rudek is Senior Scientist with North Carolina Environmental Defense. He has served on the SCC's Technical Advisory Committee and on the N.C. Division of Forest Resources' Technical Advisory Committee. He is coauthor of the study "Soiled Streams: Cleaning Up Sediment Pollution in N.C. Waters" published by Environmental Defense in 1998.

- **Mr. Hugh J. Franklin**, representing the N.C. Mining Commission. Mr. Franklin is an attorney practicing real estate law in Marion, NC. In addition to serving as Chairman of the N.C. Mining Commission, he has served as Chairman of the Smart Start Board in Marion for four years. He is also involved in a new organization, Muddy Creek Partners, formed to address sedimentation problems in Muddy Creek. [According to the Catawba River Basinwide Water Quality plan, Muddy Creek experiences significant sediment loads due to eroding streambanks and stream blockages and contributes about 14,000 - 23,000 tons per year of sediment to the Catawba River.]

- **Mr. Mark A. Taylor**, P.E., CPESC, representing Professional Engineers of North Carolina (PENC). Mr. Taylor is President of EcoLogic, a design/build firm specializing in natural resource and geo-engineering and construction in Greensboro, NC. He serves on the Greensboro Advisory Commission on Trees, which oversees implementation of the city's tree preservation ordinance. He also serves on the PENC Environmental Committee.

At the NCSU Sediment and Erosion Control Research Facility, Dr. Rich McLaughlin designed a research project to determine if PAMs can increase the effectiveness of ground covers and aid in grass establishment. Thirty-two plots were monitored for runoff, turbidity and biomass.

PAM Research
continued

monitored, turbidity in samples from the plots using MBFM with PAM averaged 85 NTU. MBFM plots without PAM averaged 400 NTU. Treatment with PAM reduced turbidity of runoff from straw and erosion blanket. Plots using no groundcover had little benefit from PAM after the first storm.

Results also indicated that PAM aids establishment of grass. Plots treated with PAM produced approximately 20% more biomass than plots without PAM.

Further studies with warm season grasses (centipede and Bermuda) are underway.

DOT field studies

At three DOT construction sites, Dr. McLaughlin installed research projects to compare soil loss from plots of bare soil, bare soil with two PAMs at two rates, straw mulch and seeding, and straw mulch and seeding with two PAMs at two rates. The main lesson from these tests is that straw mulch and seeding—even without PAM—is very effective at reducing soil loss.

At site one with loam soil and a 2:1 cut slope, bare soil plots lost 10 to 20 times as much soil as the mulch/seed plots. At this site, runoff volume, turbidity and sediment eroded were not appreciably affected by the PAM treatments.

At site two with loam soil and a 4:1 fill slope, PAM treatments produced varying effects with different rainfall events. One of the PAMs applied to bare soil at the highest application rate (10 lb/acre) did produce some runoff and turbidity reduction that decreased over time. Once again, the mulch/seed treatment reduced runoff volume significantly and reduced turbidity and soil loss by 90% over bare soil. One PAM treatment did reduce total sediment losses from mulch/seed plots as compared to the untreated mulch/seed plots.

At site three with loamy sand and a 4:1 fill slope, runoff, turbidity and sediment losses were lower than at the other two sites, due to the relatively sandy soil and high infiltration rates. Here, differences between the bare soil and mulch/seed treatments were not as dramatic as at the other sites. One PAM treatment of mulch/seed plots did seem to produce less runoff, but neither PAM showed the ability to decrease turbidity.

The investigator conducted further studies using a rainfall simulator and measuring the time between rainfall and first runoff on bare soils and PAM treated bare soils as an indication of infiltration and longevity of PAM treatment effects. He found that the two PAM treatments delayed runoff initiation during the first simulation event but not the second, indicating that the effect of the PAM treatment was removed during the first event. Reapplication of PAM resulted in runoff delay. The PAMs reduced runoff volume during the first event, but not the second. Reapplication of one PAM reduced runoff volume, but reapplication of the other did not.

Recommendations

The investigator concludes that mulching and seeding is extremely effective in stopping erosion and that mulch and seed should be applied as quickly after soil disturbance as possible. He says that his studies show that while adding PAM to groundcovers may provide some water quality benefits, PAM used in conjunc-

continued next page

Research technicians examine grass establishment in research plots.

tion with groundcovers does not reduce turbidity to the 50 NTU range (the N.C. water quality standard) until stand establishment.

Using PAM for erosion control on bare soils has potential, the investigator says, but appears to be limited by the steepness of the slope and lack of longevity of treatment effects. While some PAMs are useful for a wide array of soils, PAMs will need to be selected for site-specific conditions.

Dr. McLaughlin's report on the DOT research can be downloaded in pdf at: http://www.itre.ncsu.edu/cte/rip_waterqlty.html#mclaughlin

Personnel Changes

Richard Allred is the new Environmental Technician in the Asheville Regional Office.

Wendy Dunaway is the new Environmental Technician in the Fayetteville Regional Office.

Elsie James and **Kevin Rowland** are new Environmental Technicians in the Wilmington Regional Office.

William Hart is the new Environmental Technician in the Washington Regional Office.

Lewis is new Sediment Education Intern

NC State University junior Ryan Lewis is the new Sediment Education Intern in the Raleigh Land Quality office. Mr. Lewis is pursuing a BS in environmental engineering with a minor in environmental science. In addition to taking environmental engineering and water quality courses, Mr. Lewis has considerable experience with Geographic Information Systems. In a water quality class he analyzed contaminants in the Rocky Branch Creek on the NCSU campus and integrated the results into a GIS map of the campus. During the summer of 2002, he volunteered with the Wake County Parks and Recreation Department, gathering data about Yates Mill Pond and helping to set the foundation for future GIS monitoring of the site.

Mr. Lewis is working with Sediment Education Specialist Janet Paith on various education programs.

In Memoriam: Joseph A. Phillips

Dr. Joseph A. Phillips, one of the founders of North Carolina's erosion and sedimentation control program and its most persistent supporter, died March 10.

A member of the NCSU Soil Science Department for 21 years, Dr. Phillips also served as assistant director of the N.C. Cooperative Extension Service, retiring in 1989. His work focused on developing North Carolina agriculture and improving the quality of the state's natural resources. He oversaw programs that cleaned waterways, provided clean water for municipalities, and improved lives and livelihood for citizens of rural North Carolina. During his academic career, he received many honors, including the USDA Superior Service Award, the Extension Leadership Award, and the Outstanding Teacher Award. He was elected a Fellow of the Soil Conservation Society and a Public Service Fellow by the Board of Governors of The University of North Carolina.

Dr. Phillips had a leading role in drafting and passage of the Sedimentation Pollution Control Act of 1973, and he served on the committee that wrote the rules for the N.C. Erosion and Sedimentation Control Program.

Dr. Phillips served a total of 27 years on the N.C. Sedimentation Control Commission, 17 years as chairman. In recognition of his dedicated public service, former Governor James B. Hunt, Jr. awarded Dr. Phillips the Order of the Long Leaf Pine, one of the state's highest civilian awards.

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)

Erosion and Sedimentation Control Basic Planning and Design Workshops

Tentative Schedule

October 15 - 16, 2003
Holiday Inn Select
Hickory, NC

October 29 - 30, 2003
Sheraton Grand
New Bern, NC

Purpose: These workshops are 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. Twelve (12) 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 October 1, 2003, for the Hickory workshop, and October 15, 2003, for the New Bern workshop.

Details and any changes to the schedule will be posted at the following web address:
http://www2.ncsu.edu/ncsu/CIL/WRRI/erosionseminars.html

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