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SEDIMENTS

Newsletter of the North Carolina Sedimentation Control Commission

Vegetation Establishment and Infiltration Rates Improved with Soil Tillage

By Virginia Brown, Grad Student; Melanie McCaleb, Extension Specialist; and Rich McLaughlin, Professor, Department of Soil Science, NC State University

When stabilizing a construction site, erosion control best management practices should strive to establish viable stands of vegetation, maximize soil infiltration, minimize storm water runoff and maximize soil health. Soils have the ability to absorb a large amount of rainfall; however, urban soils frequently have low infiltration rates. The process of constructing roads and buildings usually involves the removal of topsoil, grading, and traffic from heavy machinery and trucks handling construction activities. The result is a surface soil made up of compacted subsoils with low fertility, resulting in poor vegetation establishment, limited infiltration, and susceptibility to erosion.

Increased areas of impervious surface or compacted soils with low infiltration generate large quantities of water, which often are directed into overburdened storm water systems or stream channels. Effectively dealing with storm water runoff volumes is a challenge to many urban municipalities.

Research at NC State seeks to evaluate potential methods for restoring initial and long term perviousness of these compacted construction site soils using tillage and fertility treatments. This project is evaluating the effect of tilling compacted subsoil followed by establishing a grass cover at three sites around the state. Table 1 summarizes the 3 sites and treatments. See Table 1 on page 2.

At each site, measurement of infiltration rate (Figure 1), bulk density, and above and below ground grass growth were measured over time. At the Piedmont site, runoff quantity and quality was also measured during the establishment period. Figures 2, 3, and 4 depict site measurements at the Raleigh site.

Figure 1. Cornell Sprinkle Infiltrometer used to make infiltration measurements.

Tillage loosens the soil which increases the amount of pore space in the soil profile, providing large channels for rain water infiltration. Figure 5 illustrates the decrease in compaction due to tillage at the clay soil, Raleigh, site. Tillage caused an immediate increase in infiltration, 56 times that of the compacted soil. After soil settling, this rate decreased some; however, the tilled soil infiltrated fifteen times more water than the compacted treatment (Figure 6). Infiltration ability between grassed areas on compacted soil compared to soil tilled to six or twelve inches prior to grass planting was dramatically different for clay soils. Infiltration rates for tillage to 6 or 12

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SEDIMENTS is a newsletter published quarterly by the N.C. 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. SEDIMENTS is available in electronic form at: *http://portal.ncdenr.org/web/lr/newsletters*.

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In This Issue

State of North Carolina,
Department of Environment & Natural Resources
Dee Freeman, Secretary

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

Soil Tillage....*(continued from page 1)*

Site:	Raleigh NC	Jackson Springs, NC	Mills River, NC
Set up date	February 2011	August 2011	October 2011
Compaction	1.55 g cm^{-3}	1.9 g cm^{-3}	1.49g cm^{-3}
Soil type	Clay	Sandy loam	Sandy clay loam
Treatments			
Tillage	-Deep, 12” -Shallow, 6” -None	-Deep, 12” -Shallow, 6” -None	-Deep, 12” -Shallow, 6” -None
Lime	-None -Recommended rate -2x recommended rate on 12” till.	-None -Recommended rate -2x recommended rate on 12” till.	-No lime was needed
Compost	None	2 inches incorporated or surface applied (compacted)	2 inches incorporated or surface applied (compacted)
Polyacrylamide (cross linked)	None	None	Incorporated on tilled rate=6.5lb/1000ft^2
Grass planted	Fescue, Rye grain, Kentucky bluegrass	Fescue Bermuda grass	Fescue

Table 1: Treatments implemented at each site.

Figure 2. Storm water running off a compacted plot during a storm event.

Figure 3. Grass rooting depth, 12” deep tillage, Raleigh site.

Figure 4. Compost application prior to tilling in.

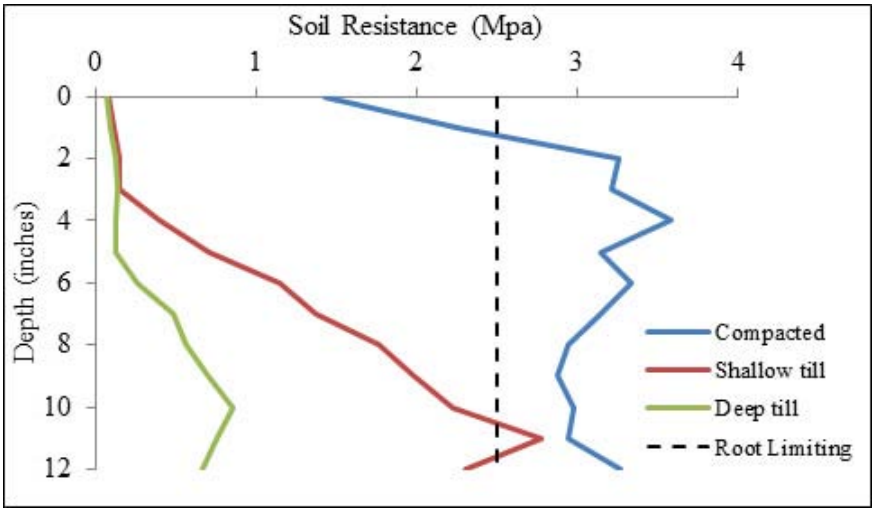

Figure 5. Soil resistance, a measurement of compaction, measurements made using a penetrometer at the Raleigh, NC sit. Clay soil at field capacity.

SEDIMENTS is published 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. Past issues are on the Land Quality Section web site: http://portal.ncdenr.org/web/lr/land-quality.

Send comments to Evangelyn Lowery-Jacobs, NCDENR-Land Quality, 1612 Mail Service Center, Raleigh, NC 27699-1612. Email: evangelyn.lowery-jacobs@ncdenr.gov.

To receive *Sediments* electronically, please see page 1 for list service instructions or contact bonnie_kurth@ncsu.edu or (919) 515-3723.

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:

Chair:
Robin Smith
Burnsville
Non-governmental Conservation

Commissioners:
Heather E. Jacobs Deck
Washington
Non-governmental Conservation

Vacant
NC Association of County Commissioners

Joseph E. Glass
Fayetteville
Professional Engineers of NC

Kevin Martin
Franklinton
NC Environmental Management Commission

Rich McLaughlin
Raleigh
NC State University, Dept. of Soil Science

Vacant
NC Mining Commission

Randy Veltri
Charlotte
NC Public Utilities

Jonathan K. Bivens
Wilson
Carolinas Associated General Contractors

Michael P. Voiland
Raleigh
Water Resources Research Institute of
The University of North Carolina

Rob Weintraub
Wake Forest
NC Home Builders Association

Manly West
Moyock
NC Soil and Water Conservation Commission

Soil Tillage

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inch depth were similar. Lime addition did not impact infiltration rates. Moreover, over the course of eleven storm events, ranging from 0.5-2inches, the deep tillage treatment (12 inches) always had less than 2% runoff. During more intense storms, as much as 80% of the rainfall ran off on compacted treatments (Figure 7).

Surprisingly, the infiltration rate on the compacted sandy soil, from the Jackson Springs Site,was very low, less than 0.2 inch/ hr. After tilling the rate increased one hundred times, the same sand soil infiltrated over 20 in/hr. Additional data will be collected from these sites in Spring of 2012.

Compacting soil reduces the natural ability of soil to infiltrate water and instead generates excessive storm water runoff.

The results from this study indicate that tilling the soil as part of the final landscaping process may be an effective tool for reducing storm water runoff. This can reduce the burden on other storm water practices such as constructed wetlands and basins, and provide other benefits such as ground water recharge and improved base flow for urban streams. ❖

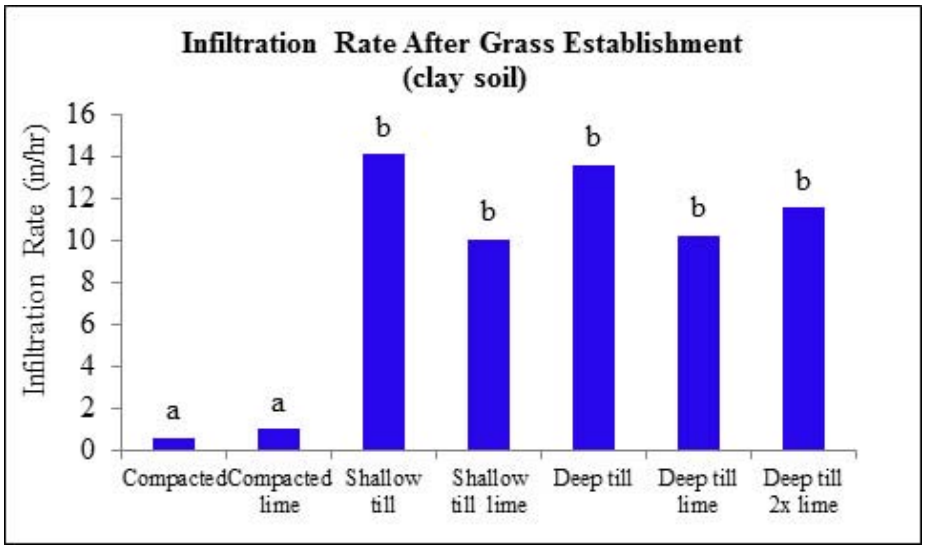

Figure 6: Infiltration rate measured with a Cornell Sprinkle Infiltrometer at the Raleigh, NC site. Collected after grass had established and some soil settling (tilled). Different letters above means correspond to significant differences at P= 0.05.

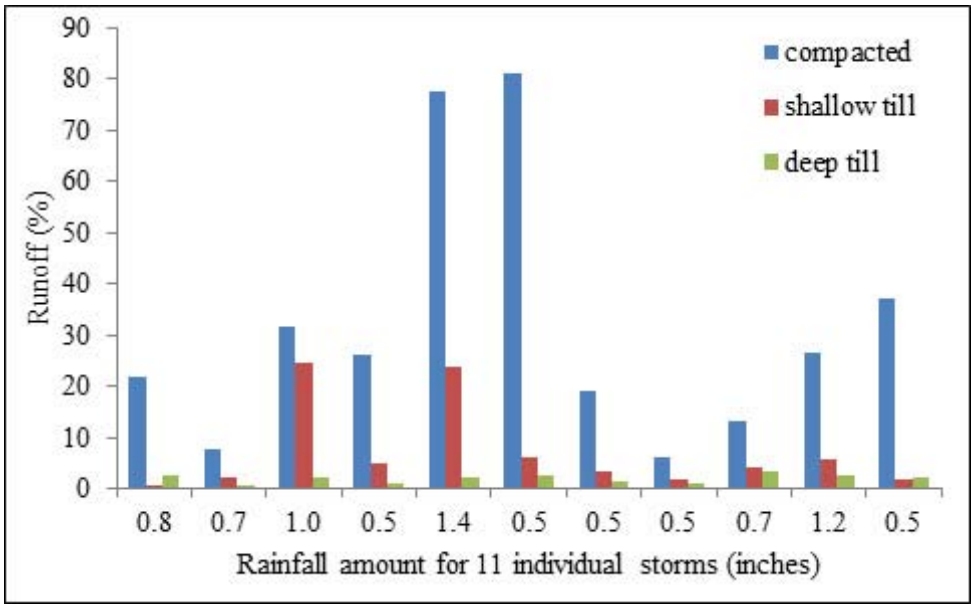

Figure 7. Percent runoff for three tillage depths (none, shallow, deep), for 11 storms at the Raleigh, NC site. Rainfall values indicated below each storm. Deep tillage produced less than 2% runoff for all storms, compacted sites generated the most runoff for all storms.

NC Sedimentation Control Commission: May Actions

At its meeting on May 17, 2011 the NC Sedimentation Control Commission (SCC) took the following actions:

Vice Chairman

- Dr. Voiland was nominated and approved to be Vice-Chairman of the SCC

Delegated Local programs:

- Jackson County: Approved the continuation of Local Delegation of erosion and sediment control (ES&C) programs with quarterly assistance from the Asheville Regional Office.
- Watauga County: Approved the continuation of Local Delegation with the expectation from the Winston-Salem Regional Office to continue to assist the program.
- City of Newton: Approved the amendment to the city's Soil Erosion and Sedimentation Control Ordinance to reflect the appeals process for civil penalties as well as the collection procedure remitting the penalties to the Civil Penalty and Forfeiture Fund.

Education Projects:

- Funded WRRI to support the NC Sediment Control Commission (SCC) and NC Department of Environment and Natural Resources - Division of Land Resources, Land Quality Section (DENR-LQS) staff by providing assistance in the continuation of workshops for Design Professionals Training. The three workshops were funded, each workshop will cover a two-day period, and one workshop each will be scheduled in three different regions of NC - western, central, and coastal ($24,628).
- Funded WRRI to continue support for the Annual workshop and Awards banquet for the Local Erosion and Control Programs, including meeting facility and attendee travel ($69,890).
- Funded North Carolina State University to continue electronic production (web-posting and listserv) of the ***Sediments*** newsletter ($17,020). The newsletter will be produced semi-annually.

Revised Rule for Falls Lake Design Standards:

- Approved a proposed rule to proceed to public comment. The proposed Rule: 15A NCAC 04B .0132 is entitled "Design Standards for the Upper Neuse River Basin" (Falls Lake Watershed) and was identical to the existing standards in Session Law 2009-486. (see November SCC Actions and article below for details).

MOA for Local Program Delegation:

- Approve a Memorandum of Agreement (MOA) for Local Program Delegation. The purpose of the MOA is to clarify the SCC's expectations of the Local Programs. Local programs need to report plan approvals and notices of violations, so that US EPA will be satisfied that sufficient information is available to monitor enforcement of the Construction Stormwater Permit. The MOA includes monthly activity reports to the SCC and providing DWQ with copies of Financial Responsibility/Ownership forms for all received draft E&SC plans, as well as copies of Notices of Violation.

NC Sedimentation Control Commission: August Actions

At its meeting on August 18, 2011 the NC Sedimentation Control Commission (SCC) took the following actions:

Delegated Local programs:

- Avery County: Approved the continuation of Local Delegation of erosion and sediment control (ES&C) programs.
- City of Jacksonville: Approved the continuation of Local Delegation.

NC Sedimentation Control Commission: November Actions

At its meeting on November 18, 2011 the NC Sedimentation Control Commission (SCC) took the following actions:

Delegated Local programs:

- NCDOT: Approved the continued delegation of erosion and sedimentation control plan approval. Issues and recommendations included: verify the skimmers used by contractors do not dewater at a rapid rate; increase ground cover on steep slopes by the use of tack over straw, matting, BFM, or FGM; blast in stream buffers only where adequate protection to vegetation is in place; verify stormwater controls adequate during the transitions from clearing to final grade; obtain sufficient right-of-way for secondary road widenings to minimize steep slopes to enable vegetative stabilization and allow for adequate sediment controls. It was noted that the NCDOT program is one of the best in the nation. NCDOT continues to work with Biological and Agricultural Engineering and Soil Science Departments to certify personnel have erosion control training to work on DOT projects. As of July 1, 2011 the number certified were Level 1 (2012 people), Level II (4260), Level III-A (617) and Level III-B (580). See Calendar at end of newsletter for future trainings.
- Mecklenburg County: Approved the continuation of Local Delegation.
- Pitt County: Approved the continuation of Local Delegation.

Falls Lake Design Standards:

- Adopted Rule: 15A NCAC 04B .0132 entitled "Design Standards for the Upper Neuse River Basin" (Falls Lake Watershed). The proposed rule includes identical language as in Section 3(h) of NC Session Law 2009-486 (Senate Bill 1020). The proposed rule will keep the current requirements (effective January 1, 2010) for land disturbing activities where grading is complete, temporary or permanent ground cover will be provided within 7 days. (see article below for details).

Needs Survey for Workshops:

- Approved funds for the Center for Urban Affairs and Community Services to conduct web-based survey for workshop and training needs for the sediment and erosion control training

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SCC Nov. Actions continued from page 4

audiences ($6,000). This will be conducted in cooperation with WRRI and NCSU's Soil Science Department.

Chair of TAC:

- Appointed Rich McLaughlin chair of the Technical Advisory Committee (TAC).

SCC 2012 Meeting Dates: 10am, Ground Floor Meeting Room, Archdale Building

- Tuesday, February 28
- Thursday, May 24
- Thursday, August 23
- Wednesday, November 14

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LQS Personnel Changes

Brian Lambe, Environmental Specialist in the Winston-Salem Regional Office, transferred to the Wilmington Regional Office.

Laura Herbert, PE, is the new Asheville Regional Engineer (she follows Janet Boyer, PE who moved to Raleigh to fill the State Mining Specialist position).

Matthew Poling, PE, Assistant Regional Engineer in the Winston-Salem Regional office, is now an Assistant Dam Safety Engineer in the Raleigh Central Office.

Robert Belvin, PE, Assistant Regional Engineer in the Washington Regional Office, is no longer with the Section.

Joel Idol, Environmental Specialist in the Raleigh Regional Office, is no longer with the Section.

Eric Pare, Environmental Specialist in the Washington Regional Office, is no longer with the Section.

Gary Beecher, Environmental Specialist in the Wilmington Regional Office, is no longer with the Section.

Katherine Marciniak, PG, Environmental Specialist in the Washington Regional Office, is no longer with the Section.

Eric Matuszewski, Environmental Specialist in the Fayetteville Regional Office, is no longer with the Section.

New SCC Members

Heather E. Jacobs Deck

Ms. Jacobs Deck will fill the role of a non-governmental conservationist on the Commission. She is employed by the Pamlico-Tar River Foundation, a non-profit organization to protect, preserve and promote the environmental quality of the Tar-Pamlico River and its watershed.

Jonathan K. Bivens

Mr. Bivens will fill the role of a person nominated by the Carolina Branch of the Associated General Contractors of America on the Commission. He is Vice President of S. T. Wooten Corporation, a construction company that is subject to the rules and regulations of the Commission.

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Legislative Update

Some new laws passed in the 2011 NC legislative session impact the Sedimentation Pollution Control Act (SPCA).

Section 3 of the G.S. 113A-54.1 (of the SPCA) was amended to include an exception to allow utility companies to submit sedimentation control plans without written consent of the land owner, so long as the owner has prior notice of the project.

Senate Bill 781 (Session Law 2011-398), Sections 150-19.1 and 150B19.2 (*http://ncleg.net/Sessions/2011/Bills/Senate/PDF/S781v6.pdf*) adds additional steps to the Rule making process before a permanent rule can be adopted by a rule-making body.

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Falls Lake Design Standard

Session Law 2009-486 established temporary standards for the design of erosion and sedimentation control measures and time limits for provisions of ground cover in the Upper Neuse River Basin (Falls Lake watershed). These have been effective since January 1, 2010. This session law further directed the Sedimentation Control Commission (SCC) to adopt permanent rules concerning these design standards and time limits for ground cover. The proposed permanent rules were identical to the existing standards in the Session Law 2009-486 and were submitted for Public hearing and public comments. No comments were received and the SCC adopted these rules in November 2011 as permanent standards for erosion and sedimentation control in the Falls Lake watershed.

The permanent standards for erosion and sedimentation control in the Falls Lake watershed keep the current requirements for the design storm, sediment basin efficiency, the slope of channels and time limits for ground cover. For land disturbing activity where grading is not yet complete temporary ground cover will be provided within 7, 10 or 14 days on steep, moderate or no (flat) slopes, respectively. For land-disturbing activities where grading is complete, temporary or permanent ground cover will be provided within 7 days.

The term "provided" is a term used in the Sediment Pollution Control Act (SPCA) and has been interpreted to mean seeding, mulching, and tacking according to the seeding specifications. The permanent rules are:

CHAPTER 04- SEDIMENTATION CONTROL

SUBCHAPTER 04B - EROSION AND SEDIMENT CONTROL

15A NCAC 04B .0132 DESIGN STANDARDS FOR THE UPPER NEUSE RIVER BASIN (FALLS LAKE WATERSHED)

In addition to any other requirements of State, federal, and local law, land-disturbing activity in the watershed of the drinking water supply reservoir that meets the applicability requirements of Session law 2009-486, Section 3.(a), shall meet all of the following design standards for sedimentation and erosion control:

(1) Erosion and sedimentation control measures, structures, and devices shall be planned, designed, and constructed to provide protection from the runoff of the 25-year storm that produces the maximum peak rate of runoff as calculated according to procedures set out in the United States Department of Agriculture Soil Conservation Service's "National Engineering Field Manual for Conservation Practices" or according to procedures adopted by any other agency of the State or the United States or any generally recognized organization or association.

(2) Sediment basins shall be planned, designed, and constructed so that the basin will have a settling efficiency of at least 70

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Falls Lake Design Standard continued from page 5

percent for the 40-micron size soil particle transported into the basin by the runoff of the two-year storm that produces the maximum peak rate of runoff as calculated according to procedures in the United States Department of Agriculture Soil Conservation Service's "National Engineering Field Manual for Conservation Practices" or according to procedures adopted by any other agency of the State or the United States or any generally recognized organization or association.

(3) Newly constructed open channels shall be planned, designed, and constructed with side slopes no steeper than two horizontal to one vertical if the vegetative cover is used for stabilization unless soil conditions permit steeper side slopes or where the side slopes are stabilized by using mechanical devices, structural devices, or other acceptable ditch liners. In any event, the angle for side slops shall be sufficient to restrain accelerated erosion.

(4) For an area of land-disturbing activity where grading activities have been completed, temporary or permanent ground cover sufficient to restrain erosion shall be provided as soon as practicable, but in no case later than seven days after completion of grading. For an area of land-disturbing activity where grading activities have not been completed, temporary ground cover shall be provided as follows:

(a) For an area with no slope, temporary ground cover shall be provided for the area if it has not been disturbed for a period of 14 days.

(b) For an area of moderate slope, temporary ground cover shall be provided for the area if it has not been disturbed for a period of 10 days. For purposes of this Item, "moderate slope" means an inclined area, the inclination of which is less than or equal to three units of horizontal distance to one unit of vertical distance.

(c) For an area of steep slope, temporary ground cover shall be provided for the area if it has not yet been disturbed for a period of seven days. For purposes of this item, "steep slopes" means an inclined area, the inclination of which is greater than three units of horizontal distance to one unit of vertical distance.

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NC Construction General Permit Changes (NCG01)

Boyd Devane, Wetlands and Stormwater Branch, NC Department of Environment and Natural Resources

Effective August 3, 2011, the North Carolina Division of Water Quality (DWQ) issued a new NPDES General Stormwater Permit for Construction Activities (NCG010000). A copy of the permit can be found at: http://portal.ncdenr.org/web/wq/ws/su/construction/. Also on that web page, DWQ has provided a summary entitled "Major Elements of DWQ Construction General Permit." There are some significant changes in what is required at a construction site to comply with the NPDES Construction General Permit, including:

1. Ground stabilization in 7 days on perimeter areas and slopes greater than 3:1,

2. Ground stabilization in 14 days on other areas,

3. Basin outlet structures withdraw water from the surface.

Other provisions are described in the "Major Elements" document mentioned above.

Why did the Permit Change?

As a result of a national court case, the federal Environmental Protection Agency (EPA) was required to develop Effluent Limitations Guidelines (ELGs) that apply to construction sites. Those guidelines mandate quicker ground cover for all areas of a site with additional controls in areas of high slopes or sensitive waters. The more-stringent controls are required by EPA to be included in any state's Construction General Permit issued after February 2010.

DWQ staff worked with Division of Land Resources (DLR) staff for the past 12 months to consider what changes should be made and co-chaired a group to provide guidance. The group, called the Construction General Permit Technical Advisory Group (CTAG), was comprised of 14 members who represented a broad range of environmental, regulatory, government and development interests.

How Will the New Conditions Be Implemented?

The new permit does not modify the current state laws or rules. However, coverage under the NPDES Construction General Permit shall only become effective upon issuance of an approval for the Erosion and Sedimentation Control Plan by DLR or the delegated local program that includes the following:

1. Designation on the plans where the quicker ground stabilization requirements apply.

2. Location of basins where the surface withdrawal requirements apply.

If the approved plan does not contain these conditions, the project does not qualify for coverage under the NPDES Construction General Permit and is not permitted to discharge stormwater. In order to obtain coverage, the plan must be modified to comply with the conditions listed above or an application for an Individual NPDES Stormwater Permit must be submitted to DWQ.

DWQ recognizes that the changes in this permit will lead to significant changes in the planning, design and implementation of construction projects. We will focus our efforts towards education and consistency and work with those affected in implementing these changes. Information at:

http://portal.ncdenr.org/c/document_library/get_file?uuid=efe590fc-3239-4e24-980d-be3b3a5b1f43&groupId=38364

If you have questions about the NPDES Construction General Permit, please contact Boyd DeVane in the Division of Water Quality at 919-807-6373 or at boyd.devane@ncdenr.gov.

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Sedimentation Pollution Control Act of 1973

The link to the N.C. General Statutes is:

http://www.ncga.state.nc.us/enactedlegislation/statutes/html/byarticle/chapter_113a/article_4.html

To report possible violations of the NC Sedimentation Pollution Control Act, call

1-866-STOPMUD
786-7683

SEDIMENTS

Newsletter of the North Carolina
Sedimentation Control Commission
c/o NCSU Water Quality Group
Campus Box 7637
Raleigh, NC 27695-7619

Calendar of Events

1/11/2012	**Level II: Erosion & Sediment Control/Stormwater Site Management, Asheville, NC** *http://go.ncsu.edu/ESCLevel1-2*	4/13/2012	**Level I: Erosion & Sediment Control/ Stormwater Inspector/Installer, Mills River, NC** *http://go.ncsu.edu/ESCLevel1-2*
1/17-18/12	**Soil Science Society of NC Annual Conference, McKimmon Center, Raleigh, NC** *http://sssnc.org/*	5/20-24/12	**2012 Land Grant and Sea Grant National Water Conference, Portland, OR** *http://www.usawaterquality.org/conferences/2012*
1/19/2012	**Soil Ambassador Workshop: 4-H Erosion Control Curriculum Traiing, Raleigh, NC** *http://www.soil.ncsu.edu/programs/*	6/12/2012	**Level III: Design of Erosion & Sediment Control Plans,** Raleigh, NC *http://www.bae.ncsu.edu/workshops/dot/*
1/29-2/1/12	**2012 National Association of Conservation Districts (NACD) Annual Meeting, Las Vegas, Nevada** *http://www.nacdnet.org/events/annualmeeting/*	7/22-25/12	**67th Annual Int'l Conference for the Soil and Water Conservation Society (SWCS), Fort Worth, TX.** *http://www.swcs.org/12ac*
2/1-2/2012	**Local Programs Workshop, Clemmons, NC (Limited to Local Program staff)**	7/29-8/1/12	**2012 American Society of Agricultural & Biological Engineers (ASABE) Annual Int'l Meeting, Dallas, TX** *http://www.asabemeetings.org*
2/26-29/12	**IECA Annual Environmental Connection, Las Vegas, NV** *http://www.ieca.org/conference/annual/ec.asp*	8/14/2012	**Level I & II Recertification: Erosion & Sediment Control/Stormwater, New Bern, NC** *http://go.ncsu.edu/ESCLevel1-2*
3/27-28/12	**2012 Water Resources Research Institute's Annual Conference, Raleigh, NC** *http://www.ncsu.edu/wrri/*	8/15/2012	**Level II: Erosion & Sediment Control/ Stormwater Site Management, New Bern, NC** *http://go.ncsu.edu/ESCLevel1-2*
4/11/2012	**Level I & II Recertification: Erosion & Sediment Control/Stormwater, Mills River, NC** *http://go.ncsu.edu/ESCLevel1-2*	8/16/2012	**Level I: Erosion & Sediment Control/ Stormwater Inspector/Installer, New Bern, NC** *http://go.ncsu.edu/ESCLevel1-2*
4/12/2012	**Level II: Erosion & Sediment Control/Stormwater Site Management, Mill River, NC** *http://go.ncsu.edu/ESCLevel1-2*	10/15-18/12	**2012 Stream Restoration Conference, Wilmington, NC** *http://www.ncsu.edu/srp/*