

An Analysis of Erosion and Sedimentation Control Programs in North Carolina

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May, 2010

Masters project submitted in partial fulfillment of the
requirements for the Master of Environmental Management degree in
the Nicholas School of the Environment of
Duke University

2010

INTRODUCTION

Sedimentation and Erosion

Sedimentation occurs when soil particles that are transported by water and wind are deposited on the landscape or in water. This occurs when the runoff carrying the suspended particles has a slow enough velocity to allow the particles to settle out. The velocity of the runoff determines the characteristics of the material being transported and the amount of time the particle remains in the runoff increases as the particle size decrease. For example, gravel and sand, which are heavier particles, settle out sooner than finer particles, such as clay. Clays remain suspended for long periods of time and contribute significantly to water turbidity. (NCDLR 2009a)

Erosion occurs naturally and is a process by which soil and rock material are loosened and removed. Natural erosion, which occurs on a geologic time scale, can be greatly altered when human activities, such as construction sites, and dramatically accelerates this process. Construction site erosion causes serious and costly problems, both on-site and off-site. For example, the erosion rate at a construction site is estimated to occur at a rate nearly 1,000 times greater than the natural erosion. The removal of vegetation and topsoil and the alteration of slopes increase the rate of erosion, which increases the amount of runoff and thus the amount of sedimentation reaching water bodies (NCDLR 2009a).

Sedimentation has been considered to be the number one pollutant of NC waters (Sutherland et al. 2002). Increased water turbidity can destroy filter-feeders in the receiving waters by burying them once the particles settle out (Sutherland et al. 2002). Sediment accrual can drastically change the natural structure of smaller streams and rivers, and thus greatly affect the species distribution of the ecosystem. Sedimentation from agricultural lands can carry fertilizers and other pollutants with the particles. This changes the chemical characteristics of the

water and can have deleterious consequences on the aquatic species. In order to reduce the amount of sediment pollution in NC, the Sedimentation and Pollution Control Act was created in 1972.

Sedimentation and Pollution Control Act

The Sedimentation and Pollution Control Act (SPCA) was created to combat excessive sediment pollution as a result of land development. It prohibits visible sedimentation from construction sites, however it allows the owner and developer to determine the most effective methods for E&SC (Erosion and Sediment Control) (Kleiss 1995). This flexibility allows the developer to utilize innovative techniques and adapt for the uniqueness of each site. It also requires extensive planning in regards to the erosion potential of each site (Kleiss 1995). In order to be in compliance with the law, the developer is responsible for the use of erosion and sedimentation control measures and management techniques. Successful methods are based on a general understanding of the processes of sedimentation and erosion. This is in the form of an erosion and sedimentation control plan (E&SC Plan). Prior to beginning certain land-disturbing activities, the developer must submit an E&SC Plan for review by the DLR or local government E&SC program, which must either approve, approve with modifications, or disapprove the plan within thirty days of receipt. The SPCA sets out mandatory standards to guide the development and implementation of an E&SC Plan. The mandatory standards are described below.

- *Buffers:* All land-disturbing activities conducted in proximity to a lake or natural watercourse must be separated from the water by a stream buffer zone “of sufficient width to confine visible siltation within the twenty-five percent of the buffer zone nearest the land-disturbing activity.” (N.C. Gen. Stat. § 113A-57(1).) Classified trout waters shall have a buffer zone of this width or of twenty-five feet, whichever is greater.

Additionally, the SCC may only approve plans which include development along trout waters “when the duration of said disturbance would be temporary and the extent of said disturbance would be minimal.” (Id.)

- *Vegetated Slopes:* “[T]he angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion-control devices or structures” (N.C. Gen. Stat. § 113A-57(2).) Within twenty-one calendar days of completion of any phase of grading, exposed slopes must be provided with temporary or permanent ground cover sufficient to restrain erosion.
- *Sediment must be contained:* The person conducting the activity must install erosion and sedimentation control devices sufficient to retain on-site the sediment generated during construction, and must plant or otherwise provide a permanent ground cover within a specified time following completion of construction (N.C. Gen. Stat. § 113A-57(3)).
- *E & SC Plan Filed:* It is unlawful to disturb more than one acre unless, thirty or more days prior to the disturbance, the person conducting the activity files an erosion and sedimentation control plan with the agency having jurisdiction, which must also approve the plan before construction. Such a plan may be filed less than thirty days prior to initiation only if submitted under an approved express permit program (N.C. Gen. Stat. § 113A-57(4)).
- *Design Storm:* The regulations also stipulate that control measures should be designed and constructed to provide protection from the runoff produced by a “ten year storm” (15A N.C.A.C. 04B .0108). A “ten year storm” is defined as a rainfall of an intensity expected to be equaled or exceeded, on the average, once in ten years, and of a duration which will produce the maximum peak rate of runoff (15A N.C.A.C. 04A .0105(20)).

- *Additional Measures for High Quality Waters:* Additional restrictions apply to control measures within High Quality Water (HQP) zones (15A N.C.A.C. 04B .0124). These measures must provide protection from the runoff of a “twenty-five year storm” (15A N.C.A.C. 04B .0124(b)). Furthermore, they add more stringent restrictions to sediment basins in HQW zones (15A N.C.A.C. 04B .0125(c)), channel slopes (15A N.C.A.C. 04B.0125(d)), and ground cover. (15A N.C.A.C. 04B .0125(e).)

Sedimentation Control Commission and Local Programs

The Sedimentation Control Commission (SCC), which is part of the Department of Environment, Health, and Natural Resources (DENR), was created under the SPCA. The SCC is responsible for adopting rules, setting standards, and providing guidance for implementation of the Act (NCDLR 2009b). It has exclusive jurisdiction of land-disturbing activities conducted by the State, U.S., or by local governments, or funded at least in part by public monies and has concurrent jurisdiction with local governments over all other activities (NCDLR 2009b). The Land Quality Section (LQS) of the DENR, which is a state agency, has the authority to administer the program, under the SCC’s direction (NCDLR 2009b). LQS approves erosion and sedimentation control plans, inspects land-disturbing activities, and takes enforcement actions and also reports to the SCC on the status of the program (NCDLR 2009b).

A local government (city or county) may submit an erosion and sedimentation control program for its jurisdiction to the SCC for approval. Within 90 days, the SCC must review the delegation request and notify the local government if the program has been approved, approved with modifications, or disapproved. LQS periodically monitors the local program to ensure uniform enforcement of the SPCA and then reports the status to the SCC. If the local government is shown to be inadequately administering or enforcing the approved program, the

SCC will send notification in writing describing the programs deficiencies. Within 30 days of receiving the notification, the local program must take corrective actions or the SCC will assume enforcement of the program. (Paith 2005)

After a local government has received delegation and approval of an E&SC program, they are authorized to adopt ordinances and necessary regulations to establish and enforce the program. This includes the authority to create or designate agencies or subdivisions of local government in order to administer and enforce the program. An ordinance adopted by the program may establish a fee for the review of an erosion and sedimentation control plan and is related activities. Local governments are also responsible for reviewing E&SC Plans. The plans are approved if they are determined to be in compliance with all applicable state and local regulations for erosion and sedimentation control. E&SC Plan approval is conditional upon the applicant's compliance with federal and state water quality laws. If the state or a local government determines that "significant" erosion and sedimentation continue despite protective practices, local governments and DNR have the option to require additional measures. (NCDLR 2009a)

Local governmental units wishing to establish a local erosion and sedimentation control program must develop a local ordinance; the ordinance adopted by a local government must at least meet, and may exceed, the minimum requirements of NCGS 113A Article 4 and the rules adopted pursuant to the Article (N.C. Gen. Stat. § 113A-60). The SCC has adopted a model ordinance to provide guidance regarding these minimum requirements, as required under 15A NCAC 04D.0102. Local programs often incorporate more stringent measures, such as requiring larger buffers, more inspections, or a lower permit threshold to capture more construction projects. Whenever conflict exists between federal, state, or local laws, ordinances, or rules, the

more restrictive provision shall apply. Currently 53 local governments (cities or counties) in North Carolina have been delegated the authority to approve and enforce erosion and sedimentation control plans for construction activities within their own jurisdictional boundaries (See figure 1). Each locally delegated program is unique, and many programs have stronger ordinance language than the state model ordinance requires. (NCDLR 2009b)

Riparian Buffers

E&SC Programs aim to reduce the amount of soil runoff that reaches NC waters. A critical aspect of erosion prevention is the establishment of buffers around rivers, lakes and streams. Buffer areas have the potential to filter sediment and other pollution from construction site runoff before it reaches water bodies. The amount of pollution reaching the river can be significantly decreased by having adequate amounts of buffering land. For example, vegetation, forested areas and wetlands remove sediment from runoff, while land types such as agriculture and impervious surfaces tend to add to the amount of pollution (Baker et al. 2006). An example of the importance of riparian buffers is seen in the French Broad River.

Being the third oldest river in the world, it holds tremendous cultural and historical value. It is home to a variety of unique animals, some of which are only found in the French Broad Basin. According to the North Carolina Wildlife Action Plan, the watershed supports numerous species that are found “virtually nowhere else in the Blue Ridge.” The French Broad contains several rare fish, notably almost the entire state population of sharphead darters (*Etheostoma acuticeps*), striped shiners (*Notropis mekistocholas*), stonecats (*Noturus flavus*) and dusky darters (*Percina sciera*) (Jenkins and Burkhead 1975). It is also prime habitat for the federally endangered freshwater mussel, the Appalachian Elktoe (*Alasmidonta raveneliana*) (2003). In addition to the enormous natural resources, it also has significant economic value. The river

provides revenue from white water rafting, fishing, and bird watchers. (Blue Ridge National Heritage, updated 2009)

The French Broad River flows through Western NC, through downtown Asheville in Buncombe County (Figure 2). Asheville is the largest city in Western NC and the eleventh largest city in NC. It is the regional center for economical production, which includes manufacturing, transportation, and health care. From 1992 to 2001, there has been almost a fourteen percent increase in the city's population (NCDENR, updated 2009). The increase in volume of polluted runoff due to increased development, coupled with sediment carried by stormwater runoff from construction sites is the leading source of non-point source pollution in NC. The result is severe water quality degradation in rivers and streams, which impacts the health of rivers, estuaries, fisheries, economy, and communities.

OBJECTIVES

I have evaluated the effectiveness of Sedimentation and Erosion programs across NC. My objectives are as follows: (i) organize and analyze local program data that was collected from 24 programs through a survey as part of the Muddy Waters Watch Program, an EPA Section 319 grant project; (ii) conduct an assessment of the E&SC ordinances by extracting regulations and requirements and comparing them with the model ordinance; (iii) create a comprehensive document with the electronic locations of E&SC forms/documents to serve as a reference for cities/ counties who are interested in creating a local program and (iv) demonstrate the importance of E&SC regulations by conducting a riparian buffer analysis on the French Broad River.

METHODS

Local Program Assessment

In order to assess the effectiveness of E&SC local programs in NC, a survey was distributed to 24 programs across NC. The survey was designed to obtain data on the amount of staff, their training, the number of active sites, the frequency at which these sites are inspected, and the number of violations issued per year. A copy of the survey and the programs that participated in the survey are presented Appendix A. The data obtained from the survey were entered into excel spreadsheets for evaluation.

In order to determine if there was connection between the number of inspectors, the notices of violations and the number of active sites, the three categories were averaged by river basin (French Broad, Catawba, Cape Fear, Neuse and Tar-Pamlico River Basins). The data was then normalized on a 1 to 5 scale, where 1 represented the least possible number and 5 represented the most. In addition, the percent compliance per watershed was also determined. This was calculated by subtracting the NOV's for one year minus the number of active sites for the same year and then dividing the difference by the number of active sites.

E&SC Ordinances were obtained through the program contacts, and county/city websites. Ordinance language and the electronic location on the following sections were extracted and compiled into tables: bonding, borrow and waste, buffers, exposure, graded slopes and fills, and high quality water zones. The same sections were extracted from the model ordinance for comparison. Any other relevant E&SC documents or forms available electronically were located and compiled into a separate document. The buffer requirements for each program were summarized by averaging the minimum buffer widths by watershed.

After completion of the various tables and documents, they were emailed to the local programs for verification. Comments and suggestions from the program contacts were included in the report and then resubmitted for final validation.

Buffer analysis

The changes in land use/ land cover types from 1992 to 2001 were assessed using the National Land Cover Dataset change product from Region 14 (LULCs), which is the eastern United States. Vector data was obtained from NC One Map. This data included hydrologic and transportation data of NC as well as a polygon shape file of NC counties.

In ArcGis I extracted a 3 km area around downtown Asheville NC from the NLCD as well as hydrologic data of the same area. I then created 30m and 50m buffers around French Broad River and the smaller streams that lead into the river. These buffers were then used to extract the LULC data from change dataset. The LULCs were summarized into three categories: unchanged, buffer to pollutant, and pollutant to buffer. Buffering LULCs included forests and wetlands, while the pollution LULCs included pasture/hay, cultivated crops, and development. Unchanged land types were those identified to have remained the same from 1992 to 2001. The buffer to pollutant LULCs consisted of forest to urban, forest to agriculture and open water to agriculture. Pollutant to buffer LULCs were urban to forest, urban to grasslands, agriculture to grasslands, and agriculture to forest. These groups were developed based on a similar study conducted by Sutherland et al, (2002) which analyzed the effects of different LULCs on sediment regimes in North Carolina Streams.

RESULTS

A map showing counties with local programs and the locations of the DLR Regional offices is presented in Figure 1. Results from the survey were compiled in tables and summarized by watershed. A summary of the staffing data received from the survey presented in Table 1 and Figure 2. A complete table of the number of full time employees and their qualifications is available in Appendix B. The percent compliance for each watershed is presented in Figure 3.

The local program ordinances were assessed by extracting out specific requirements and regulations. The following tables were created: Buffer requirements (Table 2 and Figure 4), Graded Slopes and Fills (Table 3), Exposure Time Requirements (Table 4), High Water Quality Zones (Table 5), Borrow and Waste Areas (Table 6). The comprehensive web-link table, which consists of the electronic location of local program documents/forms, is presented in Table 7. The French Broad River buffer analysis study area is shown in Figure 5. The results of the analysis are shown in Figures 6 (30 meter buffer) and 7 (50 meter buffer). The LULC percents are available in Table 8.

TABLE 1: LOCAL PROGRAM STAFF

Program	Basin	# of Active Sites		Site Inspectors		NOVS	
		Local Program	Average	Local Program	Average	Local Program	Average
Apex	Cape Fear	54	116	1	1	3	33
Chatham County		52		1		28	
Greensboro		243		2		68	
Catawba County	Catawba	37	274	3	4	59	34
Charlotte		606		8		54	
Gaston County		132		2		29	
Lincoln County		411		2.5		43	
Mecklenburg County		450		5		20	
Newton		5		1		0	
Asheville	French Broad	NA	624	6	5	149	91
Buncombe County		624		5		75	
Haywood County		NA		3		48	
Cary	Neuse	116	205	4	5	108	50
Durham City/County		169		4		52	
Holly Springs		70		2		5	
Orange County		105		4		3	
Raleigh		NA		9		89	
Wake County		642		7		91	
Wake Forest		129		3		5	
Greenville	Tar-Pamlico	38	30	1	2	10	9
Pitt County		41		2		3	
Rocky Mount		12		2.75		14	

TABLE 2: BUFFER WIDTH REQUIREMENTS

Local Program	Reference	Water body		Buffer	
NC Division of Water Quality Riparian Buffer Rules	NC Buffer Rules	Catawba River Basin	Main-stem of the Catawba River below and including Lake James, plus all main-stem lakes of the River, to the NC/SC border	Total = 50 ft Zone 1 (30 ft) + Zone 2 (20 ft)	Zone 1 Undisturbed
		Neuse River Basin	Intermittent and perennial streams, and perennial water bodies (ponds, lakes) and estuaries		
		Randleman Lake	Intermittent streams, perennial streams, lakes and ponds, modified streams. Also ditches that are connected to a surface water		
		Tar-Pamlico River	Intermittent and perennial		

		Basin	streams, and perennial water bodies (ponds, lakes) and estuaries		
Town of Apex	Unified Development Ordinance : Sec. 6.1	Neuse & Cape Fear River Basin	Perennial streams	100 ft	Undisturbed
			Intermittent streams, lakes, ponds	50 ft	Undisturbed
City of Asheville	Aquatic Buffers Sec. 7-12-2	French Broad River Basin	Perennial and intermittent streams	30 ft	Disturbed
Buncombe County	Mandatory Standards Division 3; Sec. 26-246	French Broad River Basin	Perennial streams	30 ft	Disturbed
Catawba County	Unified Development Ordinance : Article V - Sec. 44-151	Catawba River Basin	Perennial streams	30 ft	Disturbed
City of Charlotte (Mecklenburg County)	SWIM Buffers Post Construction Stormwater Ordinance Sec. 302	Catawba River & Yadkin River Basins	≥ 640 acre drainage basin	100 ft	Undisturbed
			≥ 300 acre drainage basin	50 ft	Undisturbed
			≥ 100 acre drainage basin	35 ft	Undisturbed
			≥ 50 acre drainage basin	30 ft	Undisturbed
	Watershed Buffer Guidelines	Mountain Island Lake	Critical Areas (perennial streams)	100 ft	Undisturbed
			Protected Areas (perennial streams)	50 ft	Undisturbed
		Upper Lake Wylie	Critical Areas (perennial streams)	100 ft	Undisturbed
			Protected Areas (perennial streams)	40 ft	Undisturbed
		Lower Lake Wylie	Critical Areas (perennial streams)	50 ft	Undisturbed
			Protected Areas (perennial streams)	40 ft	Undisturbed
Town of Davidson (Mecklenburg County)	Post Construction Storm Water Ordinance : Sec. 303	Catawba River Basin	Intermittent and perennial streams draining <50 acres	30 ft	Disturbed
			Intermittent and perennial streams draining ≥50 acres	100 ft	Disturbed
	Post Construction Storm Water Ordinance : Sec. 304	Yadkin River Basin	All intermittent and perennial streams draining <50 acres	50 ft	Disturbed
			Intermittent and perennial streams draining ≥50 acres	100 ft	Disturbed
Town of Matthews (Mecklenburg County)	Post Construction Stormwater Ordinance Sec. 303	Catawba River Basin	≥ 640 acres	100 ft	Disturbed
			≥ 300 acres	50 ft	Disturbed
			≥ 100 acres	35 ft	Disturbed
			≥ 50 acres	30 ft	Disturbed
	Post Construction Stormwater Ordinance	Yadkin River Basin	Intermittent and perennial streams draining <50 acres	50 ft	Undisturbed
			All intermittent and perennial streams draining ≥50 acres	100 ft	Undisturbed

	Sec. 304				
Town of Mint Hill (Mecklenburg County)	Post Construction Stormwater Ordinance Sec. 303	Catawba River Basin & Clear Creek	≥ 640 acres	100 ft	Disturbed
			≥ 300 acres	50 ft	Disturbed
			≥ 100 acres	35 ft	Disturbed
			≥ 50 acres	30 ft	Disturbed
	Post Construction Stormwater Ordinance Sec. 305	Goose Creek	Intermittent streams	100 ft	Undisturbed
			Perennial streams	200 ft	Undisturbed
Chatham County	Watershed Protection Ordinance : Sec. 304	Cape Fear River Basin	Perennial steams	100 ft	First 30 ft Undisturbed
			Intermittent streams and wetlands	50 ft	
			Ephemeral streams, seeps and springs	30 ft	
City of Newton	City Code of Ordinances Sec. 102-678	Catawba River Basin	Perennial streams – low density development	30 ft	Disturbed
			Perennial streams – high density development	100 ft	
City of Raleigh	Stormwater Ordinance Sec. 1.2.7	Neuse River Basin	Perennial streams – high development	50 ft	Disturbed
Durham City/County	Unified Development Ordinance : Sec. 8.7.2	Neuse River Basin	Intermittent and perennial streams, lakes, ponds	50 ft	Disturbed
			Perennial streams within Watershed water supply	100 ft	Disturbed
Gaston County	Catawba River Practice Standards Sec. 6.74 NC Buffer Rules	Catawba River Basin	Intermittent and perennial streams	50 ft	First 30 ft Undisturbed
			All natural waters outside the Catawba River Basin	10 ft	Disturbed
City of Greenville	Protecting Riparian Areas Sec. 2-B	Tar-Pamlico & Neuse River Basins	All other perennial streams	50 ft	First 30 ft Undisturbed
Haywood County	Watershed Protection Sec. 151.34	French-Broad River Basin	Intermittent and perennial streams, lakes, ponds, reservoirs and estuaries	30 ft	Disturbed
Iredell County	Required Watershed Buffers : Sec. 304	Catawba River Basin	Perennial streams	30 ft	Disturbed
			Development along perennial streams that exceeds low density	100 ft	Disturbed
Lincoln County	Buffers Required Sec. 7.5.2	Catawba River Basin	Perennial and Intermittent streams	Zone 1 = 30 ft Zone 2 = 20 ft 50 ft total	Undisturbed in zone 1
Orange County	Neuse Buffer Rules	Neuse River Basin	Perennial and intermittent waters (Top of bank or edge of FEMA floodplain, if present) Eno, Flat River, Little River	50 ft + slope ¹ factor, 65 ft to 80 ft	Undisturbed
			Town of Hillsborough (Lower Eno River)	50 ft	Undisturbed

¹ Slope Factor is defined in the [Soil Erosion and Sedimentation Control Ordinance](#) : Section 8.1

	Non-Neuse River Buffer Rules	Roanoke River Basin	Hycro Creek, and South Hycro Creek (Top of bank or edge of FEMA floodplain, if present)	50 ft + slope factor, 65 ft to 80 ft	Undisturbed
		Cape Fear River Basin	Back Creek, Haw Creek, Cane Creek, Haw River (protected and unprotected) University Lake, Jordan Lake (protected and unprotected) (Top of bank or edge of FEMA floodplain, if present)		Undisturbed
Pitt County	Buffer Ordinance	Tar-Pamlico & Neuse River Basins	Intermittent and perennial streams, lakes, ponds	50 ft	30 ft Undisturbed
City of Rocky Mount	Land Development Code Sec. 802.D	Tar-Pamlico River Basin	Intermittent and perennial streams, lakes, ponds, reservoirs and estuaries	50 ft	Disturbed
Town of Southern Pines	Unified Ordinance Sec. 108.2	Cape Fear River Basin	Intermittent and perennial streams	30 ft	Disturbed
Town of Cary	Land Development Standards: Sec. 7.2	Cape Fear River Basin	Perennial and intermittent streams that are shown on the most recent version of the USGS Quadrangle maps	100 ft	Undisturbed
			All other surface waters shown on the most recent soil survey maps	50 ft	Undisturbed
		Neuse River Basin	An additional buffer of fifty feet on Perennial and intermittent streams that are located on the most recent version of the USGS Quadrangle maps	50 ft	Undisturbed
Town of Holly Springs	Neuse River Ordinance	Neuse River Basin	Perennial & Intermittent streams mapped on the most recent version of the USDA Soil Survey of Wake County & USGS 1:24,000 scale (7.5 minutes) quadrangle topographic maps	50 ft	Disturbed
		Neuse River Basin	Perennial streams mapped on the most recent version of the USDA Soil Survey of Wake County & USGS 1:24,000 scale (7.5 minutes) quadrangle topographic maps	100 ft	Disturbed
	Neuse River Ordinance & Unified Development Ordinance Sec. 7.06	Neuse River Basin , Tributary to Bass Lake	Perennial streams mapped on the most recent version of the USDA Soil Survey of Wake County & USGS 1:24,000 scale (7.5 minutes) quadrangle topographic maps	100 ft	Undisturbed
		Cape Fear River Basin	Perennial & Intermittent streams mapped on the most recent version of the USDA	30 ft	Disturbed
	Unified Development Ordinance Sec.				

	7.06		Soil Survey of Wake County & USGS 1:24,000 scale (7.5 minutes) quadrangle topographic maps		
Town of Wake Forest	Neuse River Ordinance Zoning Ordinance : Sec. 31-C	Neuse River Basin	Intermittent and perennial streams	50 ft	Disturbed
			All new non-residential development activities that utilize the high density option	100 ft	Disturbed
	Zoning Ordinance : Sec. 36	Richland Creek Watershed	Perennial and intermittent streams - Low density (0-24% impervious surface)	50 ft	Disturbed
			Ephemeral channels draining more than 5 acres - Low density (0-24% impervious surface)	25 ft	Disturbed
			Perennial and intermittent streams -High density (24-70% impervious surface)	100 ft	Disturbed
			Ephemeral channels draining more than 5 acres -High density (24-70% impervious surface)	25 ft	Disturbed
	Zoning Ordinance : Sec. 31	Falls Lake Watershed	Perennial and intermittent streams - Low density (12% impervious surface without water and sewer; 24% impervious surface with water and sewer)	50 ft	Disturbed
			Ephemeral channels draining more than 5 acres - Low density (12% impervious surface without water and sewer; 24% impervious surface with water and sewer)	25 ft	Disturbed
			Perennial and intermittent streams - High density (maximum of 70% impervious surface)	100 ft	Disturbed
			Ephemeral channels draining more than 5 acres - High density (maximum of 70% impervious surface)	25 ft	Disturbed
Wake County	Neuse River Basin Nutrient Sensitive Waters Management Strategy Unified Development Ordinance : Sec 11-21	Neuse River Basin	Intermittent and perennial streams	50 ft	Disturbed
			All water supply impoundments with a drainage area of 25 acres or more that are located inside the water supply watershed draining into the water supply water impoundment (Water supply	100 ft (20 ft building setback from buffer)	Undisturbed

		watersheds)		
		All water impoundments with a drainage area of at least 5 acres, but less than 25 acres, located inside the watershed draining into the water supply impoundment (Water supply watersheds)	30 ft (20 ft building setback from buffer)	Undisturbed
		All non-water supply impoundments with a drainage area of 25 acres or more that are located inside the watershed draining into the non-water supply impoundment (Water supply watersheds)	50 ft (20 ft building setback from buffer)	Undisturbed
		Perennial streams (Water supply watersheds)	100 ft	Undisturbed
		Non-perennial watercourses, channels, ditches or similar physiographic features with a drainage area of 25 acres or more that are located inside the watershed draining into the stream (Water supply watersheds)	50 ft (20 ft building setback from buffer)	Undisturbed
		Watercourse, channel, ditch, or similar physiographic feature with a drainage area of at least 5 acres, but less than 25 acres, located inside the drainage area of the drainageway (Water supply watersheds)	30 ft (20 ft building setback from buffer)	Undisturbed

TABLE 3: GRADED SLOPES AND FILLS

(All information presented in Table 5 was verified by the local programs except for Holly Springs and Iredell County.)

Program	Source	Graded slopes and fills
Model Ordinance	Section 5: Mandatory Standards	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints
Apex	Article X: Erosion and Sedimentation Control - Sec. 5-147. Mandatory standards for land-disturbing activity.	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 15 working days or 30 calendar days of completion of any phase of grading, whichever period is shorter, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion

Archdale	Chapter 16: An Ordinance to Provide for the Control of Soil Erosion and Sedimentation - 16-5 Mandatory Standards for Land-Disturbing Activity	Refer to Model Ordinance
Asheville	Chapter 7: Development - Sec. 7-12-2. Stormwater, soil erosion and sedimentation control, illicit discharge and connection ordinance	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 14 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints. The use of gunite or similar materials is not allowed as a method for slope stabilization
Buncombe County	Article V: Soil Erosion and Sedimentation Control - Sec. 26-246. Mandatory standards.	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures and shall not have fill-slopes steeper than 2 H:1V, nor cut slopes steeper than 1.5H:1V at a maximum of 20 feet in height unless designed by a geotechnical engineer. In any event, slopes left exposed will, within 21 calendar days after completion of any phase of grading be planted or otherwise provided with temporary or permanent ground cover, devices or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints. In order to provide stabilization and maintenance of graded slopes and fills, a sufficient setback, as determined by the county erosion control officer, must be provided between all property lines and the top of graded slopes (cuts) and the toe of fills.
Cary	Appendix A: Land Development Ordinance - 7.4 Soil Erosion and Sedimentation Control	Slopes left exposed shall be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion within 15 working days (exclusive of days where seed bed preparation is not possible due to weather as determined by the Planning Director) or 30 calendar days after completion of any phase of grading whichever period is less.
Catawba County	Chapter 31: Soil Erosion and Sedimentation Control - Sec. 31-5. Mandatory standards for land-disturbing activity.	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 15 working days or 30 calendar days of completion of any phase of grading, whichever period is shorter, be planted or planted or otherwise provided with ground cover, devices , or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints
Charlotte	Chapter 17: Soil Erosion and Sedimentation Control - Sec. 17-33. Mandatory standards for land disturbing activity.	Refer to Model Ordinance

Chatham County	Soil Erosion and Sedimentation Control Section 5 Mandatory Standards; Section 6 Slope Standards	The angle for graded slopes and fills shall be no greater than two horizontal to one vertical (2:1). In any event, all slopes will be planted or otherwise provided with ground cover, devices, or structures sufficient to control erosion within 15 calendar days of completion of any phase of grading or any period of inactivity, unless a shorter timeframe is applicable pursuant to Section 6 of this ordinance. Erosion control matting, of sufficient design, shall be used for stabilization on all fill slopes and slopes greater than three horizontal to one vertical (3:1). All graded slopes must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without structural restraints or devices. Steep Slopes (7 calendar days), Moderate Slopes (10 calendar days), Gradual Slopes (15 calendar days)
Durham City/County	UDO Chapter 12: Sedimentation and Erosion Control - 12.10.6 Mandatory Standards for Land-Disturbing Activity	Refer to Model Ordinance
Gaston County	Soil Erosion and Sedimentation Control Ordinance - Section 8 Mandatory Standards for Land-disturbing Activity	Refer to Model Ordinance
Greensboro	Chapter 30: Soil Erosion and Sedimentation Control - 30-7-4.3. Mandatory standards for land-disturbing activity	The angle for graded slopes and fills shall be no steeper than two (2) to one (1) slope if they are to be stabilized with vegetative cover. Slopes or fills steeper than two (2) to one (1) slope must be protected by structures. In any event, slopes left exposed shall, within fifteen (15) days of completion of any phase of grading, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion.
Greenville	Chapter 8: Soil Erosion and Sedimentation Control - Section 9-8-7. Mandatory standards for land-disturbing activity	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within fifteen (15) working days or thirty (30) calendar days of completion of any phase of grading, whichever period is shorter, be planted or otherwise provided with ground cover, devices or structures sufficient to restrain erosion.
Haywood County	Chapter 154: Erosion and Sedimentation Control - 154.20 General Requirements	Refer to Model Ordinance
High Point	Chapter 7: Environmental Regulations Article B Erosion and Sedimentation Control	The angle for graded slopes and fills shall be no greater than two (2) horizontal to one (1) slope if they are to be stabilized with vegetative cover. Slopes or fills steeper than two (2) to one (1) vertical slope if they are to be stabilized with vegetative cover. Slopes or fills steeper than two (2) to one (1) slope must be protected by structures. In any event, slopes left exposed will, within twenty-one (21) calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion
Holly Springs	Part 9 Chapter 5: Erosion and Sedimentation Control - Section 9-	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within fifteen (15) working days or thirty (30) colanders days of completion of any phase of

	5008 Mandatory standards for land disturbing activity	grading, whichever period is shorter, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion.
Iredell County	Soil Erosion and Sedimentation Control Ordinance Section 202 Mandatory Standards for Land-Disturbing Activity	Refer to Model Ordinance
Lincoln County	Soil Erosion and Sedimentation Control Ordinance - Section 7. Mandatory Standards for Land-disturbing Activity	Refer to Model Ordinance
Mecklenburg County	Chapter 17: Soil Erosion and Sedimentation Control - Sec. 17-33. Mandatory standards for land disturbing activity.	Refer to Model Ordinance
Newton	Soil Erosion and Sedimentation Control Sec. 82-7. Mandatory standards for land disturbing activity	Refer to Model Ordinance
Orange County	Soil Erosion and Sedimentation Control Ordinance - Section 8 Mandatory design and performance standards for land disturbing activity	Refer to Model Ordinance
Pitt County	Soil Erosion and Sedimentation Control Ordinance - Sec. 4-119. Mandatory Standards for Land-disturbing Activity	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 15 working days or 30 calendar days, whichever is shorter, of completion of any phase of grading, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion
Raleigh	Part 10 Chapter 5: Soil Erosion and Sedimentation - Section 10-5006 Mandatory standards for land disturbing activity	Refer to Model Ordinance
Rocky Mount	Appendix A Chapter 8: Stormwater Management - Sec.	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within fifteen (15)

	801. Soil erosion and sedimentation control.	working days or thirty (30) calendar days of completion of any phase of grading, whichever period is shorter, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where soil remains in its original configuration, with or without mechanical constraints
Southern Pines	Land Usage Chapter 154: Soil Erosion and Sedimentation - 154.05 Mandatory standards for land disturbing activity	The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures, generally not to exceed a 3:1 slope. In any event, slopes greater than 10% (or 10:1) left exposed must, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints
Wake County	Article 10: Soil Erosion and Sedimentation - 10-20-9 Grade	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. Slopes left exposed must be planted or otherwise provided ground cover, devices or structures sufficient to restrain erosion within 21 calendar days of completion of any phase of grading, or when grading equipment leaves the site. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints.

TABLE 4: EXPOSURE TIME

(All information presented in Table 6 was verified by the local programs except for Holly Springs and Iredell County.)

Program	Source	Limit time of exposure	Disturbed Area Requiring Permit
Model Ordinance	Section 5: Mandatory Standards	The person conducting the land-disturbing activity shall install erosion and sedimentation control devices and practices that are sufficient to retain the sediment generated by the land disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in Section 8(b)(5) of this ordinance, provisions for a ground cover sufficient to restrain erosion must be accomplished within 15 working days or 90 calendar days following completion of construction or development, whichever period is shorter.	One acre
Apex	Article X: Erosion and Sedimentation Control - Sec. 5-147 Mandatory standards for land-disturbing activity	All land-disturbing activity is to be planned and conducted to limit exposure to the shortest feasible time In any event, areas left exposed will, within 15 working days or 30 calendar days of completion of any phase of grading, whichever period is shorter, be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion	20,000 square feet

Archdale	Chapter 16: An Ordinance to Provide for the Control of Soil Erosion and Sedimentation - Sec. 16-5 Mandatory Standards for Land-Disturbing Activity	Refer to Model Ordinance	10,000 square feet
Asheville	Chapter 7: Development - Sec. 7-12-2. Stormwater, soil erosion and sedimentation control, illicit discharge and connection ordinance	Whenever land-disturbing activity is undertaken on a tract, the person conducting the land-disturbing activity shall install erosion and sedimentation control devices and practices that are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Provisions for a ground cover sufficient to restrain erosion must be accomplished within 14 calendar days following completion of construction or development.	< 1000 square feet require a grading waiver, 1000-10000 square feet requires a sketch plan > 10000 square feet requires a formal set of plans.
Buncombe County	Article V: Soil Erosion and Sedimentation Control Sec. 26-246. Mandatory standards.	The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures and shall not have fill-slopes steeper than 2 H:1V, nor cut slopes steeper than 1.5H:1V at a maximum of 20 feet in height unless designed by a geotechnical engineer. In any event, slopes left exposed will, within 21 calendar days after completion of any phase of grading be planted or otherwise provided with temporary or permanent ground cover, devices or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints. In order to provide stabilization and maintenance of graded slopes and fills, a sufficient setback, as determined by the county erosion control officer, must be provided between all property lines and the top of graded slopes (cuts) and the toe of fills.	1 acre
Cary	Appendix A: Land Development Ordinance - 7.4.4 Basic Control Objectives for Erosion Control Plans.	All uncovered areas shall be provided with protective cover unless the Planning Director has granted an extension of time, for good cause shown, upon written request of the developer or landowner. This cover shall be installed within 15 working days (exclusive of days where seedbed preparation is not possible due to weather as determined by the Planning Director) or 90 calendar days following completion of any phase of grading, whichever period is shorter. Ground cover is not required on cleared land forming the future basin of a planned reservoir.	12,000 square feet
Catawba County	Chapter 31: Soil Erosion and Sedimentation Control - Sec. 31-5. Mandatory standards for land-disturbing activity.	Refer to Model Ordinance	

Charlotte	Chapter 17: Soil Erosion and Sedimentation Control - Sec. 17-33. Mandatory standards for land disturbing activity.	The person conducting the land-disturbing activity shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development provisions for a permanent ground cover sufficient to restrain erosion must be accomplished within 21 calendar days following completion of construction or development. For an area of a site that is inactive for a period of 21 calendar days or longer, temporary ground cover is required	1 or more acres (43,560 square feet)
Chatham County	Soil Erosion & Sedimentation Control Section 7 Basic Control Objectives	All land-disturbing activities are to be planned and conducted to limit exposure to the shortest feasible time. This is a maximum of 15 days if not active and graduates lower for slope categories and a maximum of 7 days for temporary devices.	20,000 square feet
Durham City/County	UDO Chapter 12: Sedimentation and Erosion Control - Section 12.10 Sedimentation and Erosion Control	The person conducting the land-disturbing activity shall install such sedimentation and erosion control devices and practices as are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of such tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in paragraph 12.10.7B.5 of this Article, provisions for a ground cover sufficient to restrain erosion must be accomplished within 15 working days or 30 calendar days following completion of construction or development, whichever is shorter	more than one acre, if more than one acre is to be uncovered; or on a tract comprising 12,000 SF
Gaston County	Soil Erosion and Sedimentation Control Ordinance - Section 8 Mandatory Standards for Land-disturbing Activity	Refer to Model Ordinance	
Greensboro	Chapter 30: Soil Erosion and Sedimentation Control - 30-7-4.3. Mandatory standards for land-disturbing activity	The person conducting the land-disturbing activity shall install such sedimentation and erosion control devices and practices as are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of said tract; and he shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in section 30-7-4.4(B)(5) of this article, provisions for a ground cover sufficient to restrain erosion must be accomplished within fifteen (15) working days or thirty (30) calendar days following completion, whichever period is shorter.	one or more acres
Greenville	Chapter 8: Soil Erosion and Sedimentation Control - Section 9-8-7. Mandatory standards for land-disturbing activity	the person conducting the land-disturbing activity shall install such sedimentation and erosion control devices and practices as are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in Section 9-8(b)(5), provisions for ground cover sufficient to restrain erosion must be accomplished within	5,000 square feet

		twenty-one (21) calendar days following completion of any phase of grading.	
Haywood County	Chapter 154: Erosion and Sedimentation Control - 154.20 general requirements	It is the responsibility of the person conducting the land-disturbing activity to apply to the Inspector or his or her agent for any permit required and receive the permit contingent upon an approved sediment control plan, before beginning any land-disturbing activity which uncovers one-half or greater acres; or any house site subject to a permit from the Haywood County Building Inspections Office (construction or placement) which are less than one-half acre in disturbed area; or commercial sites subject to a permit from the Building Inspections Office which are less than one-half acre in disturbed area.	one-half (21,780 square feet) or greater acres
High Point	Chapter 7: Environmental Regulations Article B Erosion and Sedimentation Control	the person conducting the land-disturbing activity shall install such sedimentation and erosion control devices and practices as are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in Subsection 9-7-11(d)(2)e. of this Ordinance, provisions for a ground cover sufficient to restrain erosion must be accomplished within fifteen (15) working days or thirty (30) calendar days following completion, whichever period is shorter;	one (1) acre
Holly Springs	Part 9 Chapter 5: Erosion and Sedimentation Control - Section 9-5008 Mandatory standards for land disturbing activity	Refer to Model Ordinance	20,000 square feet
Iredell County	Soil Erosion and Sedimentation Control Ordinance - Section 202 Mandatory Standards for Land-Disturbing Activity	Refer to Model Ordinance	
Lincoln County	Soil Erosion and Sedimentation Control Ordinance - Section 7. Mandatory Standards for Land-disturbing Activity	the person conducting the land-disturbing activity shall install erosion and sedimentation control devices and practices that are sufficient to retain the sediment generated by the land disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Provisions for a permanent ground cover sufficient to restrain erosion must be accomplished within 15 working days or 21 calendar days following completion of construction or development whichever period is shorter. When construction activity has ceased in a particular area of the Tract, permanent ground cover must be accomplished within 15 working days or 21 calendar days from	one (1) acre

		the date of last land-disturbing activity, whichever period is shorter.	
Mecklenburg County	Chapter 17: Soil Erosion and Sedimentation Control - Sec. 17-33. Mandatory standards for land disturbing activity.	The person conducting the land-disturbing activity shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development provisions for a permanent ground cover sufficient to restrain erosion must be accomplished within 21 calendar days following completion of construction or development. For an area of a site that is inactive for a period of 21 calendar days or longer, temporary ground cover is required	1 acre
Newton	Soil Erosion and Sedimentation Control - Sec. 82-7. Mandatory standards for land disturbing activity	the person conducting the land disturbing activity shall install such sedimentation and erosion control devices and practices as are sufficient to retain the sediment generated by the land disturbing activity within the boundaries of the tract during construction upon and development of said tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in section 82-8(b)(5), provisions for a ground cover sufficient to restrain erosion must be accomplished within 21 calendar days following completion of construction or development, whichever period is shorter.	one (1) acre
Orange County	Soil Erosion and Sedimentation Control Ordinance - Section 8 Mandatory design and performance standards for land disturbing activity	Refer to Model Ordinance	20,000 square feet 10,000 Square feet in Cane Creek, University Lake & Upper Eno watersheds
Pitt County	Soil Erosion and Sedimentation Control Ordinance - Sec. 4-119. Mandatory Standards for Land-disturbing Activity	Refer to Model Ordinance	
Raleigh	Part 10 Chapter 5: Soil Erosion and Sedimentation - Section 10-5006 Mandatory standards for land disturbing activity	Whenever a land-disturbing activity occurs, the person undertaking the activity shall install such permanent ground cover , devices, or structures sufficient to restrain erosion and retain sediment within the boundaries of the tract . Any portion of a site upon which further land-disturbing activity is not being undertaken shall be provided with permanent ground cover sufficient to restrain erosion within twenty-one (21) calendar days following completion of construction except in a high-quality-water zone	one acre
Rocky Mount	Appendix A Chapter 8: Stormwater	Disturbed areas or phases of construction which will not be under active construction or disturbance for periods of more than fifteen (15) working days or thirty (30) calendar days shall be stabilized	one acre

	Management - Sec. 801. Soil erosion and sedimentation control.	with temporary or permanent vegetation or approved stabilization methods such as surface roughening and/or placement of mulch and tack or rolled erosion control matting.	
Southern Pines	Land Usage Chapter 154: Soil Erosion and Sedimentation - 54.05 Mandatory standards for land disturbing activity	Whenever land-disturbing activity is undertaken, the person conducting the land-disturbing activity shall install erosion and sedimentation control devices and practices that are sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction upon and development of the tract, and shall plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development. Except as provided in § 154.05 (B) above and § 154.09 (B)(5), provisions for a ground cover sufficient to restrain erosion must be accomplished within 15 working days or 90 calendar days following completion of construction or development, whichever period is shorter.	30,000 square feet
Wake County	Article 10: Soil Erosion and Sedimentation - 10-20-5 Standards for Erosion and Sedimentation Control Devices	Must plant or otherwise provide a permanent ground cover sufficient to restrain erosion after completion of construction or development within 15 working days or 21 calendar days following completion of construction or development, whichever period is shorter, except as provided in 15A NCAC 4B .0124(e).	one acre

TABLE 5: HIGH QUALITY WATER ZONES

(All information presented in Table 7 was verified by the local programs except for Holly Springs and Iredell County.)

Programs	Reference	Slope	Cover
Model Ordinance	Section 8: Design and Performance Standards	Newly constructed open channels in HQW zones shall be designed and constructed with side slopes no steeper than two horizontal to one vertical if a vegetative cover is used for stabilization unless soil conditions permit a steeper slope or where the slopes are stabilized by using mechanical devices, structural devices or other acceptable ditch liners. In any event, the angle for side slopes shall be sufficient to restrain accelerated erosion.	Ground cover sufficient to restrain erosion must be provided for any portion of a land-disturbing activity in a HQW zone within 15 working days or 60 calendar days following completion of construction or development, whichever period is shorter
Apex	Article X: Erosion and Sedimentation Control Sec. 5-148. Design and performance standards	Refer to Model Ordinance	
Archdale	Chapter 16: An Ordinance to Provide for the Control of Soil Erosion and Sedimentation Sec. 16-8. Design and Performance Standards	Refer to Model Ordinance	

Asheville	Chapter 7: Development Sec. 7-12-2. Stormwater, soil erosion and sedimentation control, illicit discharge and connection ordinance	Refer to Model Ordinance	Ground cover sufficient to restrain erosion must be provided for any portion of a land-disturbing activity in a HQW zone within 14 calendar days following completion of construction. When construction activity has ceased in a particular tract of a larger development, permanent ground cover must be accomplished within 14 calendar days from the date of the last land-disturbing activity
Buncombe County	Article V: Soil Erosion and Sedimentation Control Sec. 26-247. Design and performance standards.	Refer to Model Ordinance	
Catawba County	Chapter 31: Soil Erosion and Sedimentation Control Sec. 31-8. Design and Performance Standards	Refer to Model Ordinance	
Charlotte	Chapter 17: Soil Erosion and Sedimentation Control Section 16 Design and Performance Standards	The Design and Performance Standards specified in this Section of the Ordinance shall also apply as the minimum standards for land-disturbing activity in designated High-Quality Water Zones	Refer to Model Ordinance
Chatham County	Soil Erosion & Sedimentation Control Section 8 Design and Performance Standards	Refer to Model Ordinance	
Durham City/County	UDO Article 12: Infrastructure and Public Improvements 12.10.7 Design and Performance Standards	Refer to Model Ordinance	Ground cover sufficient to restrain erosion must be provided for any portion of land-disturbing activity in a HQW zone within 15 working days or 30 calendar days following completion of construction or development, whichever period is shorter.
Gaston County	Soil Erosion and Sedimentation Control Ordinance Section 9 Design and Performance Standards	Refer to Model Ordinance	
Greensboro	Chapter 30: Soil Erosion and Sedimentation Control 30-7-4.4. Design and performance standards	Refer to Model Ordinance	
Greenville	Chapter 8: Soil Erosion and Sedimentation Control Section 9-8-8. Design	Refer to Model Ordinance	

	and performance standards		
Haywood County	Chapter 154: Erosion and Sedimentation Control 154.23 Design and performance standards	Refer to Model Ordinance	
High Point	Chapter 7: Environmental Regulations Article B Erosion and Sedimentation Control	Refer to Model Ordinance	
Holly Springs	Part 9 Chapter 5: Erosion and Sedimentation Control Chapter 8 Environment	Refer to Model Ordinance	
Iredell County	Soil Erosion and Sedimentation Control Ordinance Section 205 Design and Performance Standards	Refer to Model Ordinance	
Lincoln County	Soil Erosion and Sedimentation Control Ordinance Section 8. Design and Performance Standards	Refer to Model Ordinance	Ground cover sufficient to restrain erosion must be provided for any portion of a land-disturbing activity in a HQW zone within 15 working days or 21 calendar days following completion of construction or development, whichever period is shorter.
Mecklenburg County	Chapter 17: Soil Erosion and Sedimentation Control Section 16 Design and Performance Standards	The Design and Performance Standards specified in this Section of the Ordinance shall also apply as the minimum standards for land-disturbing activity in designated High-Quality Water Zones	Refer to Model Ordinance
Newton	Soil Erosion and Sedimentation Control Sec. 82-8. Design and performance standards	Refer to Model Ordinance	
Orange County	Soil Erosion and Sedimentation Control Ordinance Section 8 Mandatory design and performance standards for land disturbing activity	Refer to Model Ordinance	
Pitt County	Soil Erosion and Sedimentation Control Ordinance Sec. 4-120. Design and Performance Standards	Refer to Model Ordinance	
Raleigh	Part 10 Chapter 5: Soil Erosion and Sedimentation	Refer to Model Ordinance	

	Section 10-5006 Mandatory standards for land disturbing activity		
Rocky Mount	Land Development Code Sec. 803 Water Supply Watershed Regulations	Refer to Model Ordinance	
Southern Pines	Land Usage Chapter 154: Soil Erosion and Sedimentation 154.09 Design and Performance Standards	Refer to Model Ordinance	
Wake County	Article 10: Soil Erosion and Sedimentation 10-20-10 Standards for High Quality Water (HQW) Zones	Refer to Model Ordinance	Ground cover sufficient to restrain erosion must be provided for any portion of a land-disturbing activity in a HQW zone within 15 working days or 21 calendar days, whichever period is shorter, following completion of any phase or grading, or when grading equipment leaves the site.

TABLE 8: BORROW AND WASTE AREAS

(All information presented in Table 8 was verified by the local programs except for Holly Springs and Iredell County.)

Program	Location	Borrow and Waste Area
Model Ordinance	Section 10: Borrow and Waste Areas	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, areas from which borrow is obtained and which are not regulated by the provisions of the Mining Act of 1971, and waste areas for surplus materials other than landfills regulated by the Department's Division of Waste Management shall be considered as part of the land-disturbing activity where the borrow material is being used or from which the waste material originated. When the person conducting the land-disturbing activity is not the person obtaining the borrow and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity
Apex	Article X: Erosion and Sedimentation Control Sec. 5-150. Borrow and waste areas	Refer to Model Ordinance
Archdale	Chapter 16: An Ordinance to Provide for the Control of Soil Erosion and Sedimentation Sec. 16-10. Borrow and Waste Areas	Refer to Model Ordinance
Asheville	Chapter 7: Development Sec. 7-12-2. Stormwater, soil erosion and sedimentation control, illicit discharge and connection ordinance	Refer to Model Ordinance

Buncombe County	Article V: Soil Erosion and Sedimentation Control Sec. 26-249. Borrow and waste areas	Refer to Model Ordinance
Cary	Appendix A: Land Development Ordinance 7.4.5 Borrow and Waste Areas	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, areas from which borrow is obtained and which are not regulated by the Mining Act of 1971 (G.S. 74-46 et seq., as amended), and waste areas for surplus materials other than landfills regulated by the N. C. Department of Human, Environment, and Natural Resources, Division of Solid Waste Management, shall be considered as part of the land-disturbing activity from where the borrow material is being used or from which the waste material originated. When the person conducting the land-disturbing activity is not the person obtaining the borrow and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity.
Catawba County	Chapter 31: Soil Erosion and Sedimentation Control Sec. 31-10. Borrow and waste areas.	Refer to Model Ordinance
Charlotte	Chapter 17: Soil Erosion and Sedimentation Control Sec. 17-34. Design and performance standards	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, the following areas are considered as part of the land-disturbing activity: (1) Areas from which borrow is obtained that are not regulated by the provisions of the Mining Act of 1971, G.S. 74-46 et seq.; or (2) Waste areas for surplus materials other than landfills regulated by the department's division of solid waste management.
Chatham County	Soil Erosion & Sedimentation Control Section 10 Borrow and Waste Areas	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, the borrow or waste disposal site shall be considered as part of the land-disturbing activity. When the person conducting the land-disturbing activity is not the person obtaining borrow and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity. It is the responsibility of the Financially Responsible Person(s) to inform the County Erosion and Sedimentation Control program of the location and ownership of all offsite borrow and waste sites when required.
Durham City/County	UDO Chapter 12: Sedimentation and Erosion Control 12.10.9 Borrow and Waste Areas	Refer to Model Ordinance
Gaston County	Soil Erosion and Sedimentation Control Ordinance Section 11 Borrow and Waste Areas	Refer to Model Ordinance
Greensboro	Chapter 30: Soil Erosion and Sedimentation Control 30-7-4.6. Borrow and waste areas	Refer to Model Ordinance
Greenville	Chapter 8: Soil Erosion and Sedimentation Control Section 9-8-10. Borrow and waste areas.	Refer to Model Ordinance

Haywood County	Chapter 154: Erosion and Sedimentation Control Section 154.43 Borrow and Waste Areas	When the person conducting the land-disturbing activities is also the person conducting the borrow and waste disposal activities, areas from which borrow is obtained and which are not regulated by the Mining Act of 1971, being G.S. §§ 74-46 through 74-68, and waste areas for surplus materials other than landfills regulated by the Department's Division of Solid Waste Management, shall be considered as part of the land-disturbing activity where the borrow material is being used or from which the waste material originated. When the person conducting the land disturbing activity is not the person obtaining the borrow and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity.
High Point	Chapter 7: Environmental Regulations Article B Erosion and Sedimentation Control	Refer to Model Ordinance
HollySprings	Part 9 Chapter 5: Erosion and Sedimentation Control Sec. 8-41 Borrow and waste areas	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, areas from which borrow is obtained (and which are not regulated by the provisions of the Mining Act of 1971), and waste areas for surplus materials (other than landfills regulated by the department's division of solid waste management) shall be considered as part of the land-disturbing activity where the borrow material is being used or from which the waste material originated. When the person conducting the land-disturbing activity is not the person obtaining the borrow and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity.
Iredell County	Soil Erosion and Sedimentation Control Ordinance Section 207 Borrow and Waste Areas	Refer to Model Ordinance
Lincoln County	Soil Erosion and Sedimentation Control Ordinance Section 8. Design and Performance Standard	When the Person conducting the land-disturbing activity is also the Person conducting the borrow or waste disposal activity, the following areas are considered as part of the land-disturbing activity.
Newton	Soil Erosion and Sedimentation Control Sec. 82-10. Borrow and waste areas	When the person conducting the land disturbing activity is also the person conducting the borrow or waste disposal activity, areas from which borrow is obtained and which are not regulated by the provisions of the Mining Act of 1971, G.S. 74-46 et seq., and waste areas for surplus materials other than landfills regulated by the department's division of solid waste management shall be considered as part of the land disturbing activity where the borrow material is being used or from which the waste material originated. When the person conducting the land disturbing activity is not the person obtaining the borrow and/or disposing of the waste, these areas shall be considered a separate land disturbing activity
Mecklenburg County	Chapter 17: Soil Erosion and Sedimentation Control Sec. 17-34. Design and performance standards	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, the following areas are considered as part of the land-disturbing activity: (1) Areas from which borrow is obtained that are not regulated by the provisions of the Mining Act of 1971, G.S. 74-46 et seq.; or (2) Waste areas for surplus materials other than landfills regulated by the department's division of solid waste management.

Orange County	Soil Erosion and Sedimentation Control Ordinance Sec. 10. Borrow and waste areas	Refer to Model Ordinance
Pitt County	Soil Erosion and Sedimentation Control Ordinance Sec. 4-122. Borrow and Waste Areas	Refer to Model Ordinance
Rocky Mount	Appendix A Chapter 8: Stormwater Management Sec. 801. Soil erosion and sedimentation control.	When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, areas from which borrow is obtained and which are not regulated by the provisions of the Mining Act of 1971, and waste areas for surplus materials other than landfills regulated by the department of environment and natural resources, division of solid waste management shall be considered as part of the land-disturbing activity where the borrow material is being used or from which the waste material originated. When the person conducting the land-disturbing activity is not the person obtaining the borrow permit and/or disposing of the waste, these areas shall be considered a separate land-disturbing activity
Southern Pines	Land Usage Chapter 154: Soil Erosion and Sedimentation 154.11 Borrow and waste areas	Refer to Model Ordinance
Wake County	Article 10: Soil Erosion and Sedimentation 10-13-1 Applicability	When the person conducting the land-disturbing activity is not the person obtaining borrow and/or disposing of the waste, these areas are considered a separate land-disturbing activity. When the person conducting the land-disturbing activity is also the person conducting the borrow or waste disposal activity, the borrow or waste area must be considered part of the land-disturbing activity when: (1) areas from which borrow is obtained are not regulated by the provisions of the Mining Act of 1971; (2) waste areas for surplus materials that are not landfills regulated by the North Carolina Department of Environment and Natural Resources' Division of Waste Management; or (3) waste areas for surplus materials that are not landfills regulated by Wake County under its Solid Waste Ordinance.

TABLE 7: ELECTRONIC DOCUMENT LOCATIONS

Form/ Document	Link	Form/ Document	Link
Checklist	Apex	Financial Responsibility	Apex
	Asheville		Cary
	Buncombe County		Catawba County
	Town of Cary		Charlotte
	Catawba County		Chatham County
	Charlotte		Durham
	Chatham County		Gaston County
	Durham		Haywood County
	Gaston County		Iredell County

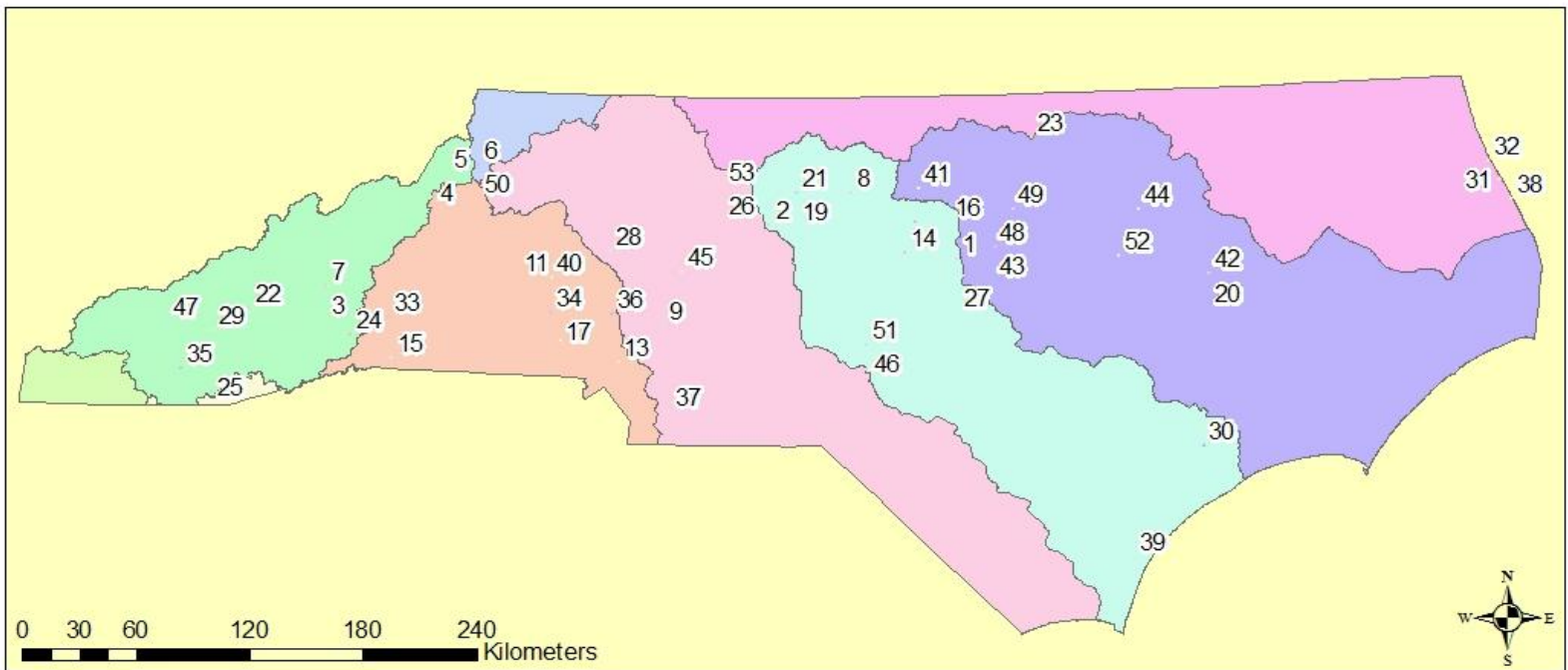
	Haywood		Lincoln County
	Iredell County		Pitt County
	Lincoln County		Greenville
	Raleigh		Raleigh
Construction Sequence	Apex		Southern Pines
	Apex		Wake County
	Durham		Wake Forest
SE&SC Ordinance	Apex	Request for plan approval	Apex
	Asheville		Buncombe County
	Cary		Cary
	Catawba County		Chatham County
	Charlotte		Greenville
	Chatham County		Orange County
	Durham		Pitt County
	Gaston County		Southern Pines
	Haywood County		Wake County
	Holly Springs		Wake Forest
	Iredell County		Raleigh
	Lincoln County		Catawba County
	Orange County	Inspection report	Charlotte
	Southern Pines	Erosion Control Fees Waiver	Orange County
	Wake County	Performance Bond	Durham
	Buncombe County	Surety Bond	Haywood County
Guidelines	Gaston County	Letter of Credit	Durham
	Lincoln County	Residential Affidavit	Catawba County
	Orange County	Performance Guarantee	Durham
	Southern Pines		
	Charlotte		
	Buncombe County		

Table 8: French Broad River Buffer Analysis

Buffer Area	Unchanged	Buffer to Pollutant	Pollutant to Buffer
30 meter	94%	5%	1%
50 meter	95%	4%	1%

FIGURE 1: NC E&SC LOCAL PROGRAMS

NC Erosion & Sedimentation Control Local Programs



1	Town of Apex	12	Town of Chapel Hill	23	City of Henderson	34	Lincoln County	45	Rowan County
2	City of Archdale	13	City of Charlotte	24	Henderson County	35	Macon County	46	Town of Southern Pines
3	City of Asheville	14	Chatham County	25	City of Highlands	36	Mecklenburg County	47	Swain County
4	Avery County	15	Town of Columbus	26	City of High Point	37	City of Monroe	48	City of Raleigh
5	Town of Beech Mountain	16	Durham City/County	27	Town of Holly Springs	38	Town of Nags Head	49	Town of Wake Forest
6	Town of Boone	17	Gaston County	28	Iredell County	39	New Hanover County	50	Town of Boone
7	Buncombe County	18	Grandfather Village	29	Jackson County	40	Catawba County	51	Village of Whispering Pines
8	City of Burlington	19	City of Greensboro	30	City of Jacksonville	41	Orange County	52	City of Wilson
9	Cabarrus County	20	City of Greenville	31	Town of Kill Devil Hills	42	City of Greenville	53	Winston-Salem/Forsyth County
10	Town of Cary	21	City of Greensboro	32	Town of Kitty Hawk	43	City of Raleigh		
11	Catawba County	22	Haywood County	33	Town of Lake Lure	44	City of Rocky Mount		

River Basins

- Cape Fear
- Chowan-Roanoke
- Edisto-Santee
- Kanawha
- Middle Tennessee-Hiwassee
- Neuse-Pamlico
- Ogeechee-Savannah
- Pee Dee
- Upper Tennessee

FIGURE 2: LOCAL PROGRAM STAFF, ACTIVE SITES, AND NOV'S

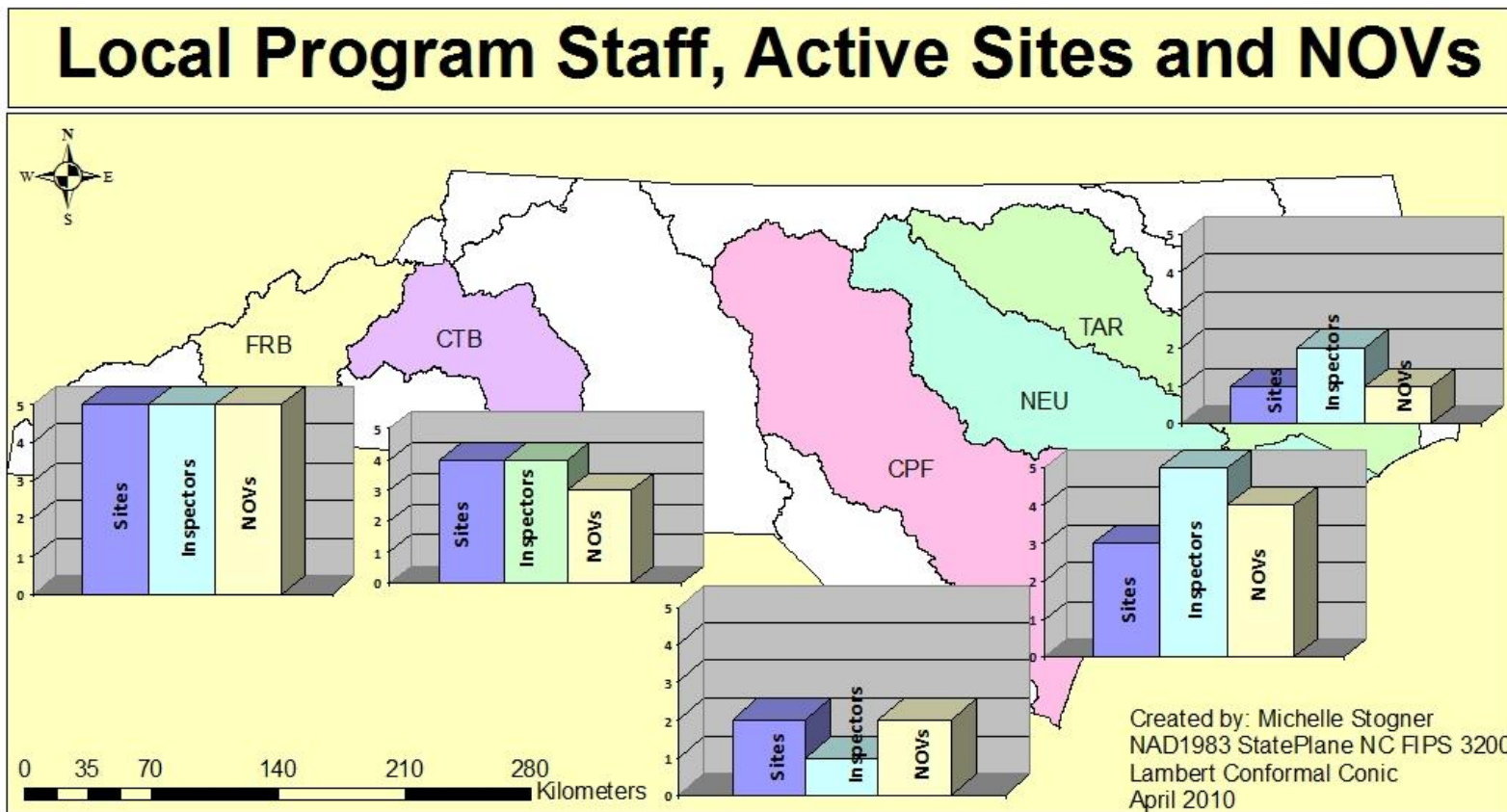


FIGURE 3: WATERSHED PERCENT COMPLIANCE

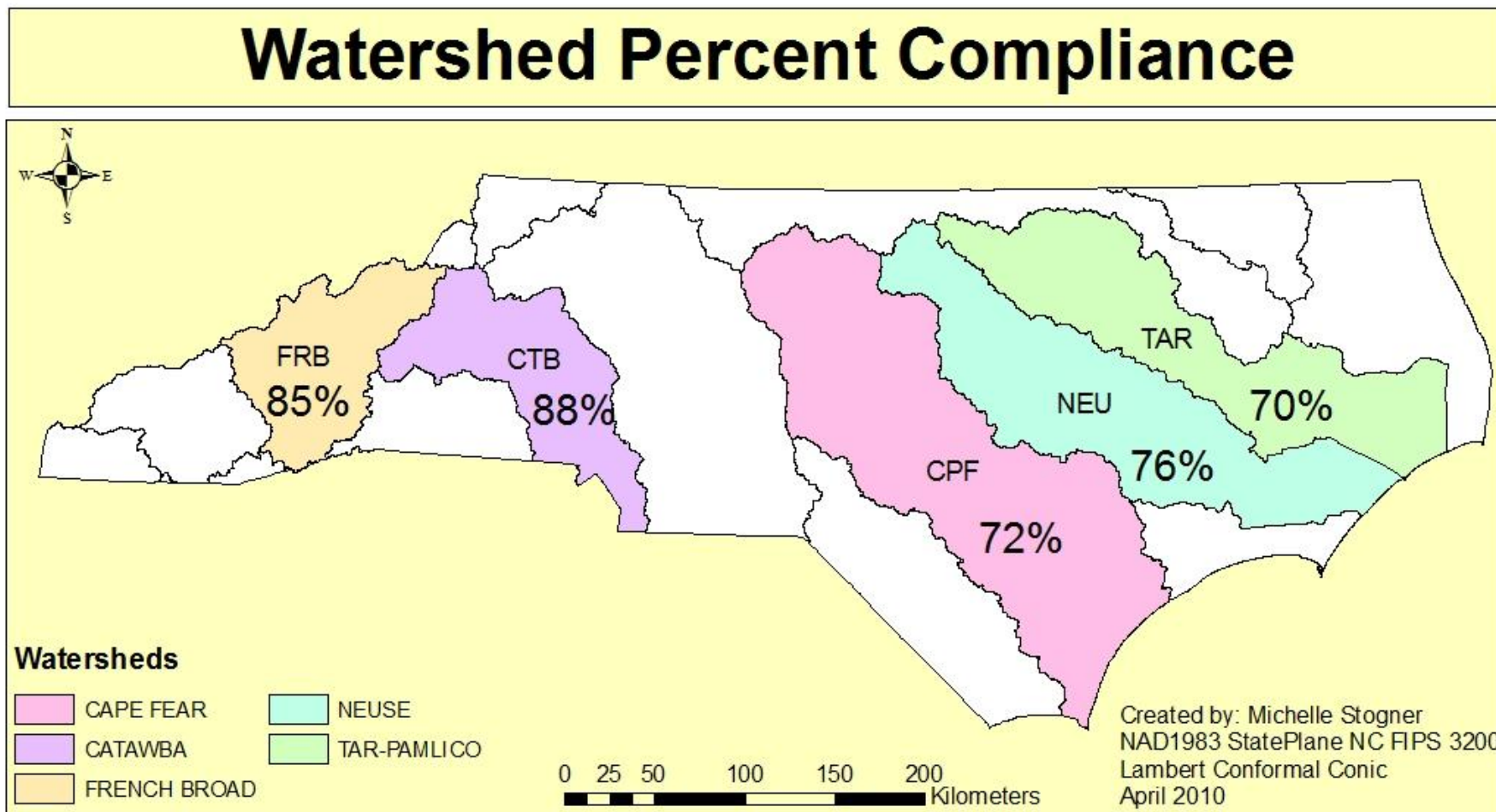


FIGURE 4: WATERSHED AVERAGE MINIMUM BUFFER REQUIREMENTS

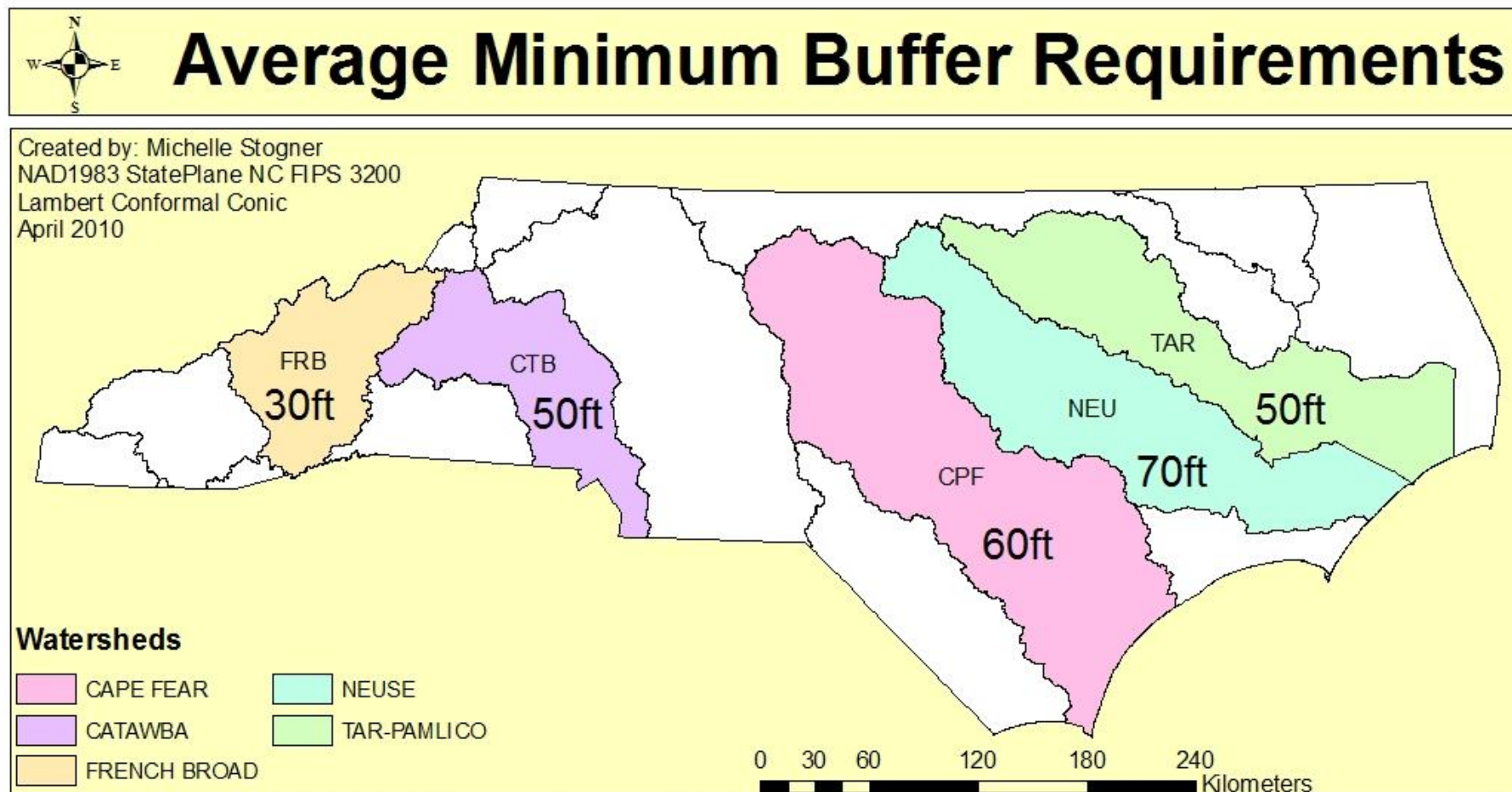


FIGURE 5: BUFFER ANALYSIS STUDY AREA

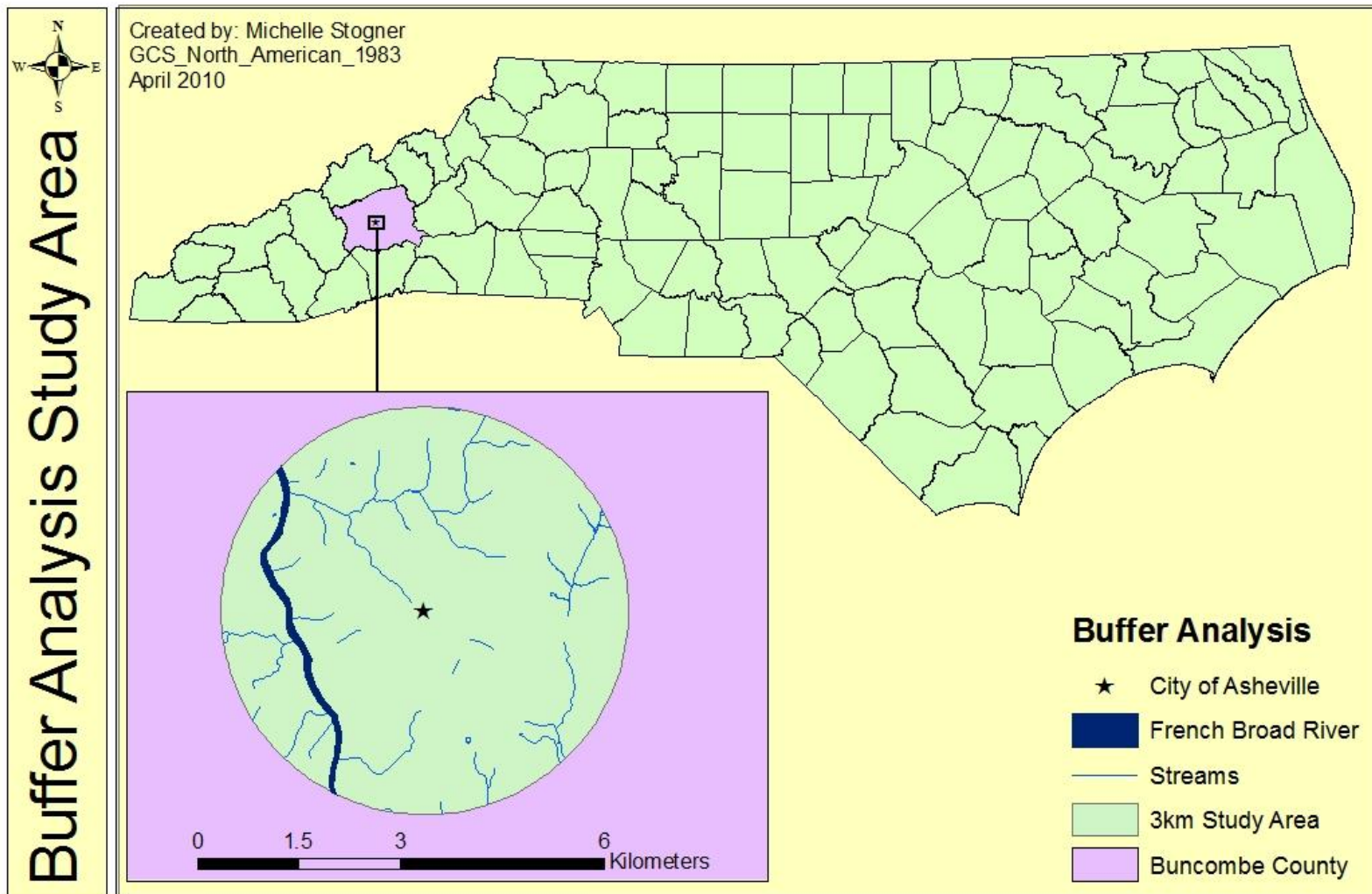


FIGURE 6: 30 METER BUFFER ANALYSIS RESULTS

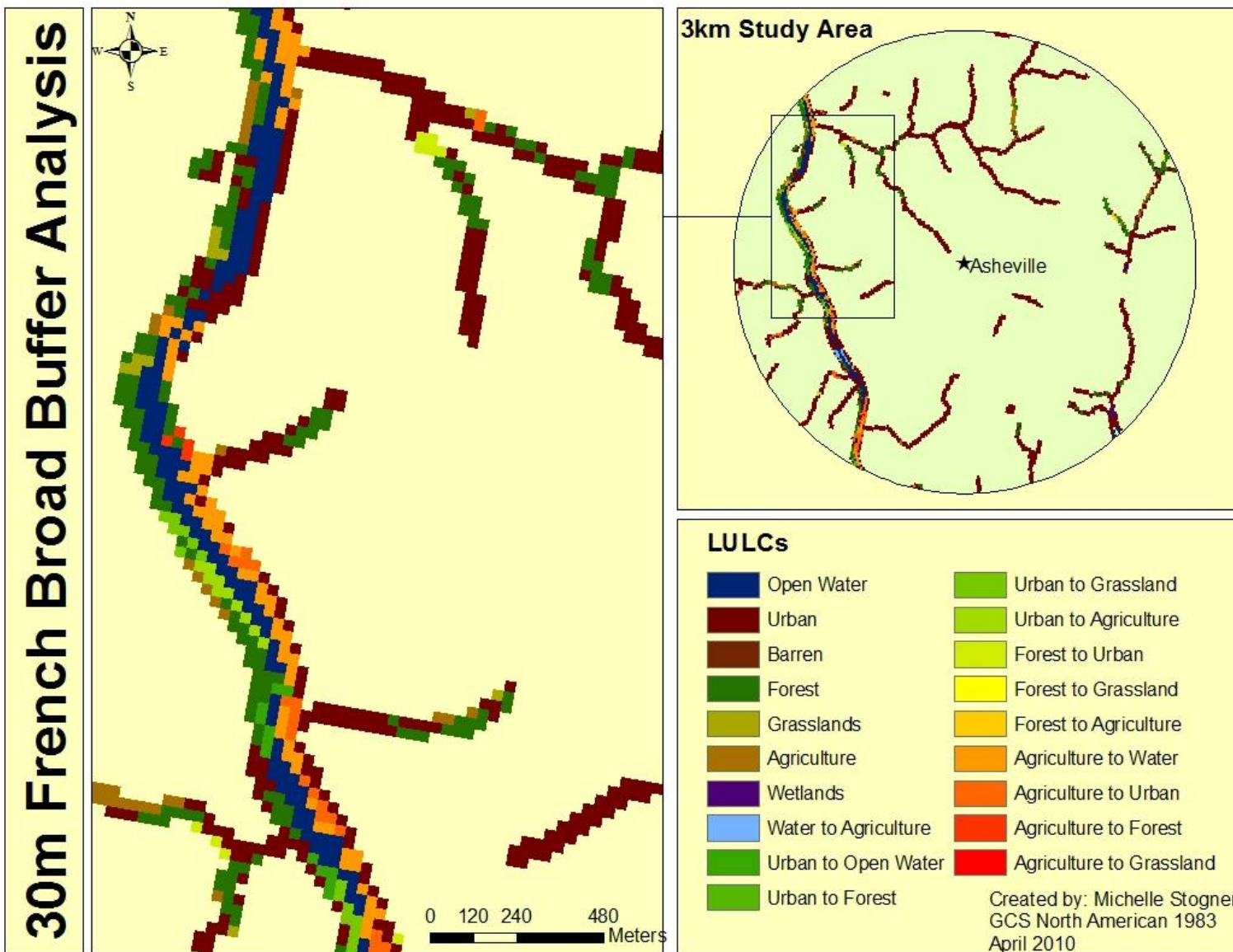
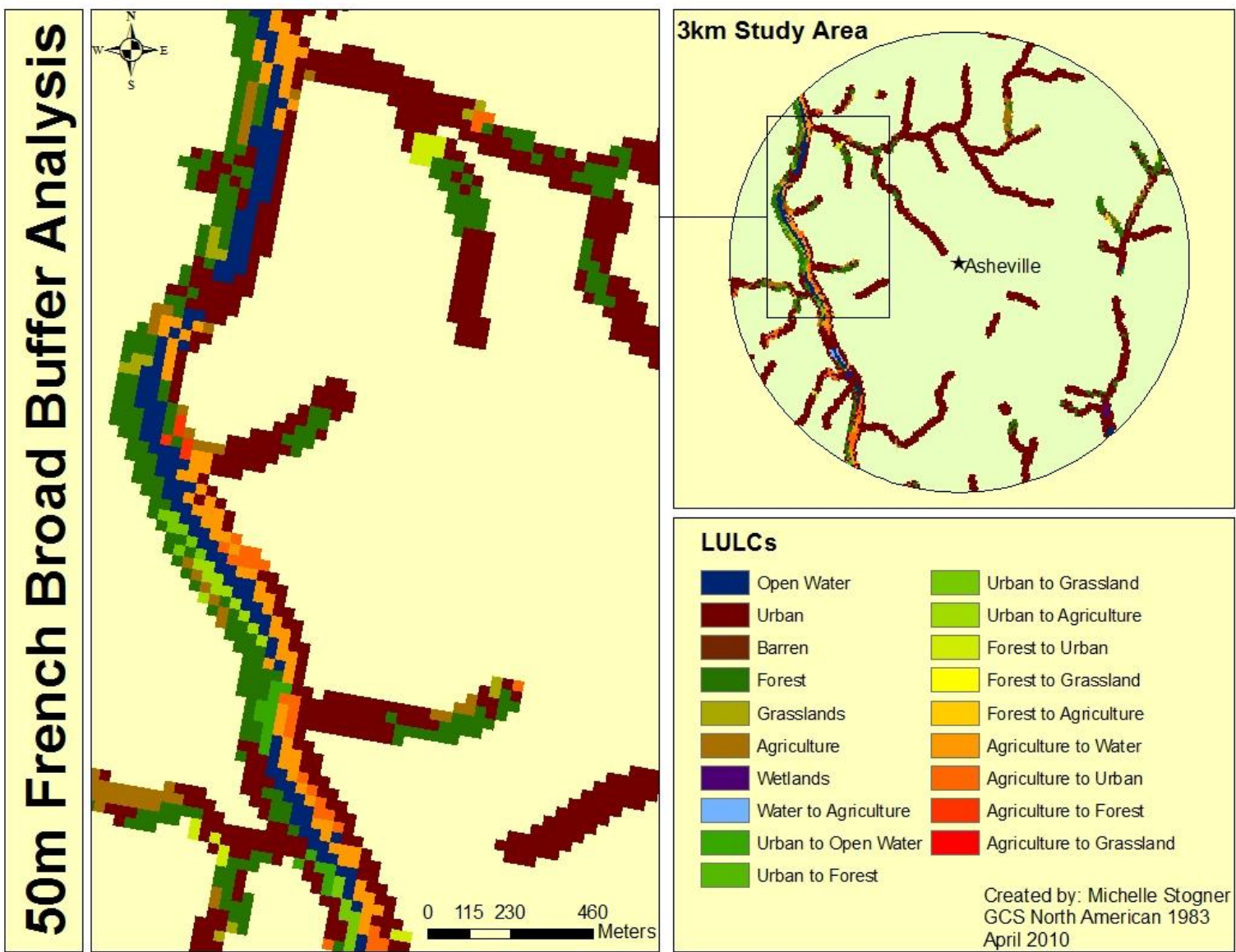


FIGURE 7: 50 METER BUFFER ANALYSIS RESULTS



DISCUSSION

Local Program Assessment

The number of staff and their qualifications varied greatly among the programs (Table 1 and Figure 2). Most senior programs recommended a minimum of 3 staff to implement an adequate erosion and sedimentation program. This number would be higher for those programs with larger numbers of active sites. Currently, of the programs surveyed, the average number of active sites per inspector is 59. The minimum number of staff needed to implement a program might also be based on how frequently a site is inspected, with the minimum being at least once a month. The results indicate that the French Broad River Basin had the most active construction sites as well as the most number of site inspectors and the most Notices of Violation (Figure 2). This was followed by the Catawba River basin and the Neuse River basin which both had the second most active construction sites, inspectors and NOVs. There is a clear connection between the number of inspectors and the amount of NOVs filed. If more inspectors are available to the local program, then more NOVs are filed. This also correlates to the number of active construction sites. The more active sites, the more E&SC inspectors are needed. Geographically, there is more development in Western NC, with the French Broad having 624 active sites and the Catawba having 274. This is compared to eastern NC which had 205 in the Neuse, 116 in the Cape Fear and only 30 in the Tar-Pamlico.

For each watershed, the percent compliance was calculated. This was determined based on the number of active sites and the number of violations (Figure 3). Western NC has a higher percent compliance compared to the eastern watersheds. This is possibly due to the number of full time site inspectors. The watersheds with the highest compliance had either 4 or 5 full time site inspectors. The watersheds with the lowest, such as the Tar Pamlico and Cape Fear, only

have 1 to 2 full time inspectors. According to the survey data, most active sites are inspected weekly, however, depending on the number of active sites and the available staff, this could be extended to once every 2 weeks. In addition, the less stringent the regulations, the easier they are to comply with and thus the less likely they are to be violated.

The minimum buffer widths for local programs range from 25 ft to 100 ft (Table 2 and Figure 4). The NC Division of Water Quality has a minimum buffer width of 50 ft for Catawba, Neuse and Tar-Pamlico (Table 2 and Figure 4). However, there are no such requirements for the French Broad River Basin. Several cities/counties have less strict regulations, more specifically they require 30 ft buffers (Asheville, Buncombe, Haywood and Catawba County, and Southern Pines). Others, such as Mecklenburg County, Holly Springs and Cary require more strict buffers of 100 feet. The inconsistency is alarming considering that areas in western NC with steep slopes that are more prone to erosion should have larger buffer widths than required. Areas in eastern NC, which are characterized by flat landscapes, have sandy soils that erode differently than the clays of western NC.

The difference in soil types and landscape characteristics across NC do not appear to be considered since the ordinances for different counties have the same requirements for graded slopes and fills and limit of exposure (Tables 3 and 4). Most programs require that the site be stabilized within 15 working days or 90 calendar days. This should be dependent on factors such as location, extent of slope and soil type instead of a state standard. The regulations for high quality water zones (Table 5) and borrow and waste areas (Table 6) for the local programs are all generally consistent with the model ordinance requirements.

The results of the buffer analysis indicate the area remained relatively unchanged from 1992 to 2001 (Table 8, Figures 6 and 7). Within a 3 km area of downtown Asheville, 30 m

around streams and the French Broad River, 94% of the area remained the same, 5% changed from buffering land types to pollutant types, while 1% changed from pollutant to buffers. Within a 50 m area of the streams, 95% of the area remained the same, 4% changed from buffer to pollutant and 1% changed from pollutant to buffer.

According to the NC census, the majority of growth occurred in Asheville before 1980. This development occurred along waterways. The amount of unchanged land within 50 m was expected since the development occurred before 1992. The 4% to 5% increase in pollutant land types is associated with new development. This would be clearing forests or grasslands and replacing them with industrial or residential areas. The increase in development, coupled with a decrease in the forested land in the same area has the potential to result in increased amount of runoff and pollution in the French Broad River.

Recommendations

Based on the survey data and the local program ordinances, there are two main areas of concern. First, is the lack of full time site inspectors. There are simply too many active sites and not enough people to inspect them on a regular basis. As mentioned before, most sites are inspected weekly, however, is this enough? During a heavy rain event, silt fences can fail and result in sediments entering the stormwater drains. If the site was inspected the day following the storm event, a NOV would be issued and the silt fences would have to be replaced. However, if the site was not inspected for a week or longer, significant sedimentation pollution would occur.

Another staffing issue that goes beyond the ratio of active sites to inspectors is travel time between sites. For example, in urban areas, an inspector can visit 10 sites in one day, however in more rural areas, such as in western NC, it may take the inspector several hours to get from one

site to the next. Therefore, the distance between sites should be considered when determining how many inspectors are needed for adequate monitoring.

Another issue was seen with the French Broad River buffer widths. Being an area with some of the steepest slopes in NC, there should be larger buffers than 30 feet. The other watersheds have wider buffers and are not characterized by the steep slopes. In addition, the French Broad River has the most active construction sites. With the limited number of staff, wider buffers would reduce the amount of potential pollution even if the sites cannot be inspected on a weekly basis.

CONCLUSIONS

The effect of excessive sedimentation on NC waters has been well documented. It is still the leading cause of pollution in our state. This is why the SPCA was enacted and why 53 counties/cities across NC have created E&SC Programs to regulate urban development. While each program has the model ordinance as a reference, each is unique to their area. However, certain aspects of the model ordinance, such as exposure and slopes, should be modified for different NC regions. Perhaps one of the most critical regulations of E&SC is buffer requirements. Buffer areas have the potential to filter sediment and other pollution from construction site runoff before it reaches water bodies. The amount of pollution reaching the river can be significantly decreased by having adequate amounts of buffering land. For example, vegetation, forested areas and wetlands remove sediment from runoff, while land types such as agriculture and impervious surfaces tend to add to the amount of pollution. Adequate buffering LULCs are critical in preventing sedimentation from entering the streams

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APPENDIX A**LOCAL PROGRAM SURVEY**

Local Program
County
River Basin
Contact Person
Who is the Administrator of the program
Who is the Enforcing Agency
E-mail
Address
Phone Number
website
Date of interview
Date of last DLR program review/was follow-up report completed if so get copy
Date Local Program was established
Copy of Inspector contact info and territory
City/County Manager
Who approves operating budget and staffing
Current Fee
Total number of permit fee dollars generated in past year
How are fee dollars spent (% on plan reviews, enforcement, staff, other)
What portion of those fees does your program keep?
House district
Senate district
Date the local ordinance was last updated
Total Number of Staff
Staff Vacancies
Number of Full Time Equivalents (FTE)
Number of FTE's doing enforcement
Qualifications of Staff doing enforcement
Number of FTE's doing plan review
Qualifications of Staff doing plan review
Do you feel you have adequate staff?
Date of last staff increase
Who are Plans submitted to
What is the average plan review time
Are approval /disapproval letters sent within a 30 day period
Number of Plans Submitted for Review (in 2008) > 1 acre
Number of Plans Reviewed (past year)
Number of Plans Approved (past year)
Number of Plans Approved by default (lack of timely review)
Number of Plan Disapproved
Is there a fee for plans that must be resubmitted

Has there been an increase in amount of plans over past two years , how much
Has their been any corresponding staff increases
Total Number of Disturbed Acres (past year)
Number of permitted sites/active (past year)
Number of non-permitted sites (sites found operating w/out a permit)
Number of Inspections (past year)
Average number of site inspections per active site (how often are you inspecting a site)
Are inspection reports filed for each inspection
Who does monitoring of inspections (city or county engineer, building inspector, etc.)
Number of NOV's issued in past year
Do inspectors carry the sedimentation and erosion control plan with them to the site during the inspection?
Are deadlines for compliance set when NOV's are issued, if so how is this tracked
Number of actual violations in the past year (one NOV may contain several violations)
Number of Civil Penalties in past year
Number of Stop Work Orders/Building permit suspension in past year
Have Civil Penalty Assessment Guidelines been adopted? If so get a copy.
On Average how many NOV's are issued before a Penalty Assessment is given
Are penalties an effective deterrent? Other things you've found to be effective derrents?
If a turbidity standard is visibly in violation but plan is being followed how do local programs handle this? Do they contact DWQ?
If site is following plan, but still experiencing runoff can NOV's be issued, and what is the process to help bring site into compliance?
How is penalty assessment collection handled?
How many penalty assessments have been given for lack of approved plan (i.e. not having a permit)?
What is the documentation process for site inspections?
Is Enforcement data tracked electronically?
On average how many times is a site inspected / do you conduct inspections based on risk factors if so explain.
Trend (past 3 years) for number of inspections
Trend (past 3 years) for number of penalty assessment
Trend (past 3 years) for dollar amount of assessed penalties
Total dollar amount of Penalty Assessed in past year
Average dollar amount of Penalty assessment in past year
Minimum penalty amount
How are penalty assessments determined and what is the process for appeal
Number of time maximum penalty was assessed
Number of times a stop work order was issued
Number of complaints (past year)
Process for complaint follow up
How can this complaint process be improved?
Most common complaint
Number of repeat violators

Most Common Violation
What do you think could improve the current program?
Is more training needed, if so what?
How much training do inspectors receive?
How can Muddy Water Watch best compliment your program?
If you could educate the public about 3 things what would they be?
If you could educate city council/county commissioners about 3 things what would they be?
If you could educate developer about 3 things what would that be?
Do you feel the current SPCA needs to be changed? If so how?
Are there other legal or administrative draw backs that could be improved?
Do politics play a row in your ability to enforce or implement your program?
Three things you'd like elected officials to know.
Who in DWQ Regional office do you work with? Do you get an adequate response from DWQ?
What is your process for handling turbidity violations (contact with DWQ)?
Who in the DLR Regional office do you work with?
What could DLR do to better assist your program?
What could city council/county commissioners do to better support your program?
What is the best way for MWW to get feedback from Local Programs on the status of citizen complaints?
How can MWW volunteers help you best?
What other things could DLR do the help your program? (Training, Info exchange, etc)
Any advice or accomplishments of your program you'd like to share with other local programs?
How is your local ordinance stronger than the state ordinance (larger buffers, higher fees, etc.)
what can we do to improve this interview process?

Local Program	River Basin	Contact	Interview Date	LQS Program Review Date
Apex	Neuse	Rocky Ross: (919) 249 3397 rocky.ross@apexnc.org	9/18/2008	2/5/2009
Asheville	French Broad	McCray Coates: (828) 232-4567 mcoates@ashevillenc.gov	4/12/2007 (Chard Pierce)	5/23/2006
Buncombe County	French Broad	Doug Sharp: 828 250-4848 Doug.sharp@buncombecounty.org Michael Brookshire: 828 250-4848 michael.brookshire@buncombecounty.org	08/27/2009	8/5/2004
Cary	Neuse	Matt Flynn: (919) 469-4347 Matt.flynn@townofcary.org Tom Horstman: (919) 462-3932 Tom.horstman@townofcary.org Charles Brown: (919) 469-4038 Charley.Brown@townofcary.org	11/2007	8/28/2007
Catawba County	Catawba	Toni Norton: (828) 465-8161 tnorton@catawbacountync.gov	1/16/2009	
Charlotte	Catawba	Steve Gucciardi: (704) 336-3632	1/14/2009	3/24/2008

Local Program	River Basin	Contact	Interview Date	LQS Program Review Date
		sgucciardi@ci.charlotte.nc.us		
Chatham County	Cape Fear	Jim Willis: 919-545-8343 jim.willis@chathamnc.org	11/19/2008	7/10/2007
Durham City/County	Neuse	Chris Roberts: (919) 560-0739 croberts@durhamcountync.gov	5/20/2009	5/23/2007
Gaston County	Catawba	Joseph Alm: 704 922-2157 jdalm@co.gaston.nc.us	1/15/2009	5/20/2009
Greensboro	Cape Fear	Ken cook: 336 373 2158 Ken.cook@greensboro-nc.gov	6/10/2009	4/14/2009
Greenville	Tar-Pamlico	Chris Kelly: (252) 329-4682 CKelly@greenvillenc.gov Tim Corley:(252) 329-4477 TCorley@greenvillenc.gov	2/19/2009	8/18/2009
Haywood County	French Broad	Marc Pruett: (828) 452-6706 mpruett@haywoodnc.net	8/28/2008	7/10/2001
Holly Springs	Neuse	Heather Keefer: (919) 557-2909 heather.keefe@hollyspringsnc.us	8/7/2008	12/19/2005
Lincoln County	Catawba	Rick McSwain: (704) 736-8501 rncswain@lincolncounty.org	1/15/2009	9/17/2008
Mecklenburg County	Catawba	Michael Burkhard: (704) 336-5463 (left agency) Michael.Burkhard@mecklenburgcountync.gov Corey Priddy 980.721.9058 Corey.Pridy@mecklenburgcountync.gov Heather Davis 980.721.3571 Heather.Davis@mecklenburgcountync.gov	1/12/2009 (Michael Burkhard)	3/11/2008
Newton	Catawba	Glenn Pattishall: (828) 465-7400 gpattishall@newtonnc.gov Ben McCrary 828.695.4277 bmccrary@newtonnc.gov	1/16/2009	10/24/2007
Orange County	Neuse	Reynolds Ivins: (919) 245-2586 rivins@co.orange.nc.us	7/16/2008	2/09/2009
Pitt County	Tar-Pamlico	Jonas Hill: (252) 902-3250 jnhill@pittcountync.gov	2/19/2009	7/21/2009
Raleigh	Neuse	Jeanette Powell: (919) 890-3931 Jeanette.Powell@ci.raleigh.nc.us	1/15/2009	1/21/2004
Rocky Mount	Tar-Pamlico	Karen Callaway: (252) 972-1340 karen.callaway@rockymountnc.gov	3/25/2009	7/15/2009
Wake County	Neuse	Melinda Clark: (919) 856-5531 melinda.clark@co.wake.nc.us	4/15/2008	5/13/2009
Wake Forest	Neuse	Holly Spring: (919) 554-3158 hspring@wakeforestnc.gov	1/9/2008	6/25/2007

Local Program	River Basin	Contact	Interview Date	LQS Program Review Date
		Charley Yokley: (919) 570-7999		

APPENDIX B

Local Program	Number of Staff (FTE)		Enforcement Data		Inspection Frequency			NOVs
	Total Staff	Site Inspectors	Num. of Inspections	Num. of Active Sites	Active sites per inspector	Inspections completed per inspector	Inspections per site	
Apex	1	1	300	54	54	300	6	3
Asheville	12	6	9277					149
Buncombe County	6	5	3966	624	125	793	6	75
Cary	4	4	1800	116	29	450	16	108
Catawba County	4	3	1529	37	12	510	41	59
Charlotte	8	8	2184	606	76	273	4	54
Chatham County	2.5	1	565	52	52	565	11	28
Durham City/County	5	4	2289	169	42	572	14	52
Gaston County	3	2	782	132	66	391	6	29
Greensboro	4	2	2381	243	122	1191	10	68
Greenville	1	1	400	38	38	400	11	10
Haywood County	3	3						48
Holly Springs	2.5	2	2415	70	35	1208	35	5
Lincoln County	2.5	2.5	1680	411	164	672	4	43
Mecklenburg County	7	5	2521	450	90	504	6	20
Newton	1	1	79	5	5	79	16	3
Orange County	4	4	1800	105	26	450	17	3
Pitt County	2	2	1200	41	21	600	29	3
Raleigh	10	9	6244					89
Rocky Mount	2.75	2.75		12				14
Wake County	8	7	7523	642	92	1075	12	91
Wake Forest	4.5	3	539	129	43	180	4	5
Averages	4	4	2474	207	61	567	14	44

LOCAL PROGRAM STAFF QUALIFICATIONS			
Local Program	How frequently is a site inspected (2x a month, once a month, etc)	Qualifications of Staff doing enforcement	Qualifications of Staff doing plan review
Apex			
Asheville	Once every 2 weeks	Must be C.E.S.S.W.I. certified or attain	4 year degree or 2 year degree with additional experience

LOCAL PROGRAM STAFF QUALIFICATIONS			
Local Program	How frequently is a site inspected (2x a month, once a month, etc)	Qualifications of Staff doing enforcement	Qualifications of Staff doing plan review
		certification within 6 months. Prefer inspectors have minimum 5 years experience and/or Associates degree in Construction or Engineering.	
Buncombe County	Depends on size/weather and how long the permit is open.	In house and state sponsored workshops and college - CPESC (final review)	
Cary	Weekly	4 year degree minimum;	Undergrad / Grad degrees; DWQ certified; Stream ID certified; Passed CPESC; 11 years experience, NCDENR-DWQ background
Catawba County	7.4 times per year	Trained at NC State workshops, in-house training, DLR workshops	Professional Engineer, NC State workshops, DLR workshops
Charlotte	Varies on the size, past performance and risk factors.	4 year in Environmental or Engineering Degree	4 yr in Environmental Science or Engineering + CPECS with in one year of hire.
Chatham County	Active sites about once every two weeks. Site that are not active or paused for whatever reason about once every 4-6 weeks.	CPESC, 10+ years experience	CPESC, 10+ years experience
Durham City/County	1.3 times per month	1 inspector with CESSWI, 1 inspector with 30+ years at NCDENR-DLR	Division Manager with PE, 1 inspector with a Civil BS
Gaston County	Every 30 days for an active site unless issues require a follow-up inspection. Larger site may be inspected weekly.	4 year degree in related work field. Then CPESC is required after they become an employee. Attend state design workshop. CPSWQ is recommended after CPESC.	4 year degree in related work field. Then CPESC is required after they become an employee. There is a PE on staff – director of program. Some are also CPSWQ.
Greensboro			
Greenville	Min of once a month. More frequent inspections are done on sites that have erosion problems or have potential problems. Some sites are inspected during rain events to study how erosion control measures are functioning.	Bachelor of Science in Civil Engineering	
Haywood County	Varies on site performance record	Director = 4 year BS Degree in Geology/Biology + 16 years in E & SC and engineering + is a CPESC / Erosion Control Specialist = 4	

LOCAL PROGRAM STAFF QUALIFICATIONS			
Local Program	How frequently is a site inspected (2x a month, once a month, etc)	Qualifications of Staff doing enforcement	Qualifications of Staff doing plan review
	(repeat offender), size of site and risk factors.	years BS Degree in Environmental Science + 10 years of environmental work before HC + 3 years at HC in current position / Technician = High School degree + field experience...all are experienced in people skills	
Holly Springs	Weekly, more if rainfall occurs-for each event.	varies high school to 4 year degree & PE when needed	4 year degree & PE when needed
Lincoln County	Every 2 months (low risk) and every 2 weeks to 1 month (higher risk)	Minimum of 2 year degree in related field	Minimum of 4 year degree in related field
Mecklenburg County	Min of twice per month but critical sites are inspected on a more frequent bases.	Minimum 4-year college degree. One Certified Professional in Erosion and Sediment Control	All plan review staff are either a PE or a RLA
Newton	All sites are inspected on a rotating basis, regardless of extenuating factors	College Degree and additional SESC Training	
Orange County	Varies		
Pitt County	Every 2 weeks unless a complaint is received	Professional Engineer, Planner	Engineer
Raleigh	Risk based: we strive to inspect high priority sites weekly, medium priority sites every 2 weeks and low priority sites monthly		
Rocky Mount	Daily	Stormwater Engineer: BA Environmental Design (High Honors); BS Civil Engineering (Magna cum laude); NC Professional Engineer; 5 years in private practice preparing plans; numerous DENR workshops; Construction Inspectors: Numerous DENR workshops; numerous ITRE workshops & certifications; Senior Inspector: ITRE Road Scholar & Advanced Road Scholar Certifications	
Wake County	high priority site-once a week, medium priority sites- once every 2 weeks, low priority-once a month	Requires minimum 4 year degree and 4 years experience	
Wake Forest	Min of once a month	CPESC-IT, 1 EI, NCDOT Level I, II, III A/B erosion, NCBAE BMP	2 PE, 1 EI, NCDOT Level I, II, III, BMP