

Dan River Watershed Restoration Plan For Agricultural Non-Point Sources of Pollution



Prepared for

Division of Water Quality
North Carolina Department of Agriculture

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Introduction

The Dan River Basin in North Carolina is 1,589 square miles and is located in Stokes, Rockingham and Caswell counties. The Dan River Basin is part of the larger Roanoke River Basin. The Dan River meanders across the North Carolina and Virginia state lines three times within these three counties.

The most important objective of this plan is to identify and reduce fecal coliform bacteria, turbidity, soil erosion, nitrogen, and phosphorus loading in the Dan River over the three county area of Stokes, Rockingham and Caswell counties. The Dan River is listed on the State 303(d) list of impaired waters for fecal coliform bacteria and turbidity and a Total Maximum Daily Load (TMDL) has been developed in conjunction with the State of Virginia. The overall goal is the removal of the listed streams from the 303(d) list of impaired waters. Additionally, the watershed is host to seven rare, threatened, and endangered aquatic species. This plan will serve as a catalyst to bring together conservationists in the watershed to preserve, enhance, and restore critical habitat by working with other agencies, NPOs, NGOs, private businesses, and local, state, and federal interests.

In September 2008, Stokes County Soil and Water District received an EPA section 319 grant totaling over \$399,000 (direct funds, not counting in-kind) to restore Dan River by implementing BMP's and targeting nonpoint source pollution. In January 2012, a second award of \$295,000 was made to this watershed. These funds, coupled with traditional program funds, will work toward achieving water quality improvements in this important watershed. This Watershed Restoration Plan will serve not to reproduce existing plans, such as the Basinwide Plan for the Roanoke or the Watershed Restoration Plan that was developed by the Piedmont Land Conservancy in 2006, but will serve more as a focused look at agricultural activities in this area.

This Plan is expected to serve as a starting point for continued involvement in the watershed. It will be distributed to all interested partners and collaborators, many of whom are identified within this Plan. We will take comments from partners and integrate them into this plan. Additional project cataloguing will continue and be integrated into this plan.

Identification of the Causes and Sources of Impairment:

The Dan River watershed within North Carolina consists of an area encompassing 1,589 total square miles. The following major waters are within this basin: Dan River, Hyco River, Mayo River, Smith River, Belews Creek, Belew's Lake, Big Creek, County Line Creek, Double Creek, Elk Creek, Hogan's Creek, Hyco Lake, Little Snow Creek, Peters Creek, Snow Creek, and Town Fork Creek. The population in the watershed is approximately 169,670 persons with an average population density of approximately 103 persons per square mile, well below the state average of 170 persons per square mile. Compare this to Raleigh, where the population density is 2,828 persons per square mile and Wake County where the density is 1,078 persons/sq mile and you begin to recognize the rural nature of the landscape. The Dan River Watershed is part of the larger Roanoke River Basin which meanders across the North Carolina and Virginia state lines.

The predominant land uses within the watershed are shown below:

- Forested 66%
- Grassland/Pasture/Hay 21%
- Developed 7%
- Other 6%
- Cropland <1%

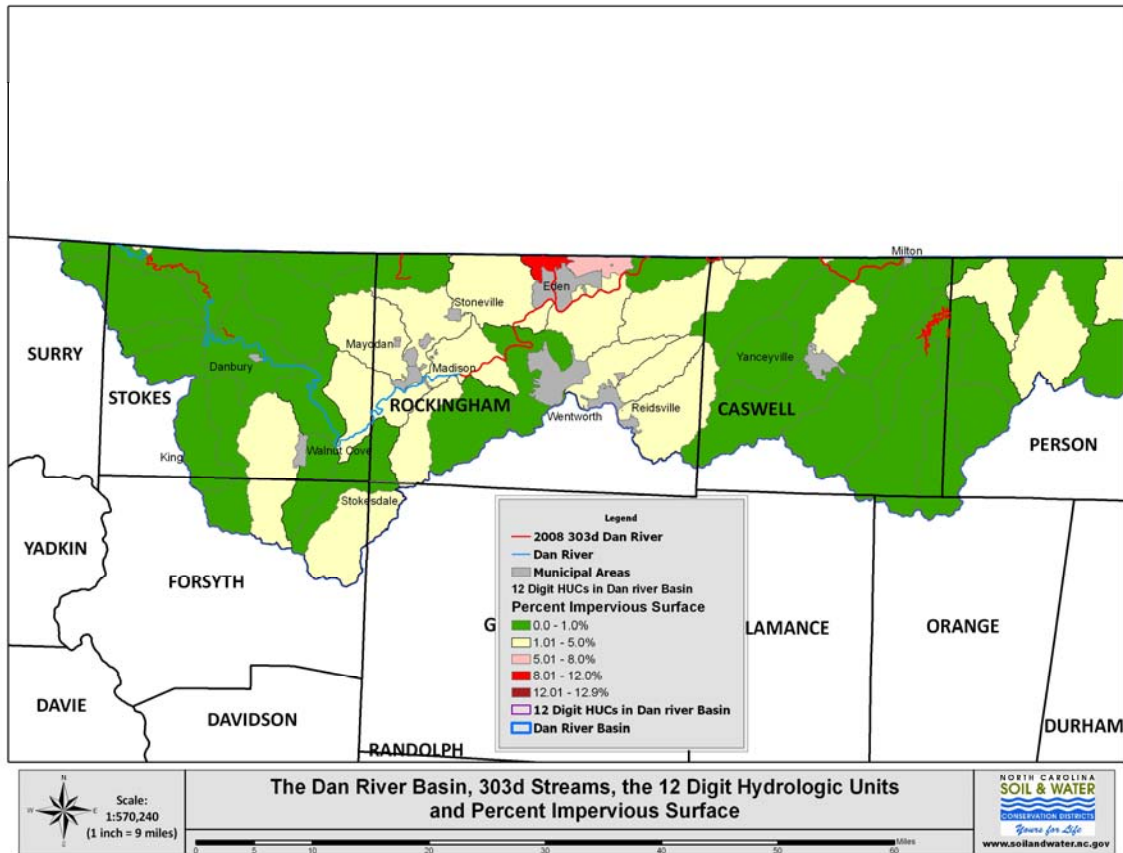
The Dan River watershed is recognized as one of the most diverse and valuable aquatic habitat regions of the state. There are seven rare, threatened, and endangered species in this watershed with one of these species, the Roanoke logperch, having been documented in this area only in the last three to four years. The importance of this aquatic system cannot be overstated.

A major concern in this watershed is non-point sources of pollution from the effects of agriculture, which constitutes a significant portion of the human activity that occurs here. A TMDL was developed for several segments of this watershed, and upstream in Virginia, in a coordinated document approved in 2005. The TMDL identifies agriculture as a potential source of fecal coliform and turbidity in the Dan and Smith rivers. While not specifically identified, generally pollutants from agriculture include the following: excess nitrogen, phosphorus, low dissolved oxygen, fecal coliform bacteria, turbidity, soil loss, and sedimentation.

Other concerns in the watershed arise from residential, commercial, and industrial development which results in increased runoff, higher velocities of that runoff, and the soil loss, increased nitrogen, and phosphorus inputs into adjacent watercourses.

There has been a shift in agricultural land uses within the watershed due to the tobacco buyout program. While a relatively low percentage of the basin is shown as cultivated cropland (<1%), this number was higher less than 10 years ago. The majority of the tobacco cropland was converted to pasture and hay lands. This shift resulted in an increase in the number of cattle operations in the watershed. Given the rural nature of the watershed, coupled with a relatively low developed area and a significant percentage of forested lands, the waters in general are rated Excellent and Good. Stream segments not meeting their classification standards are catalogued below (page 4).

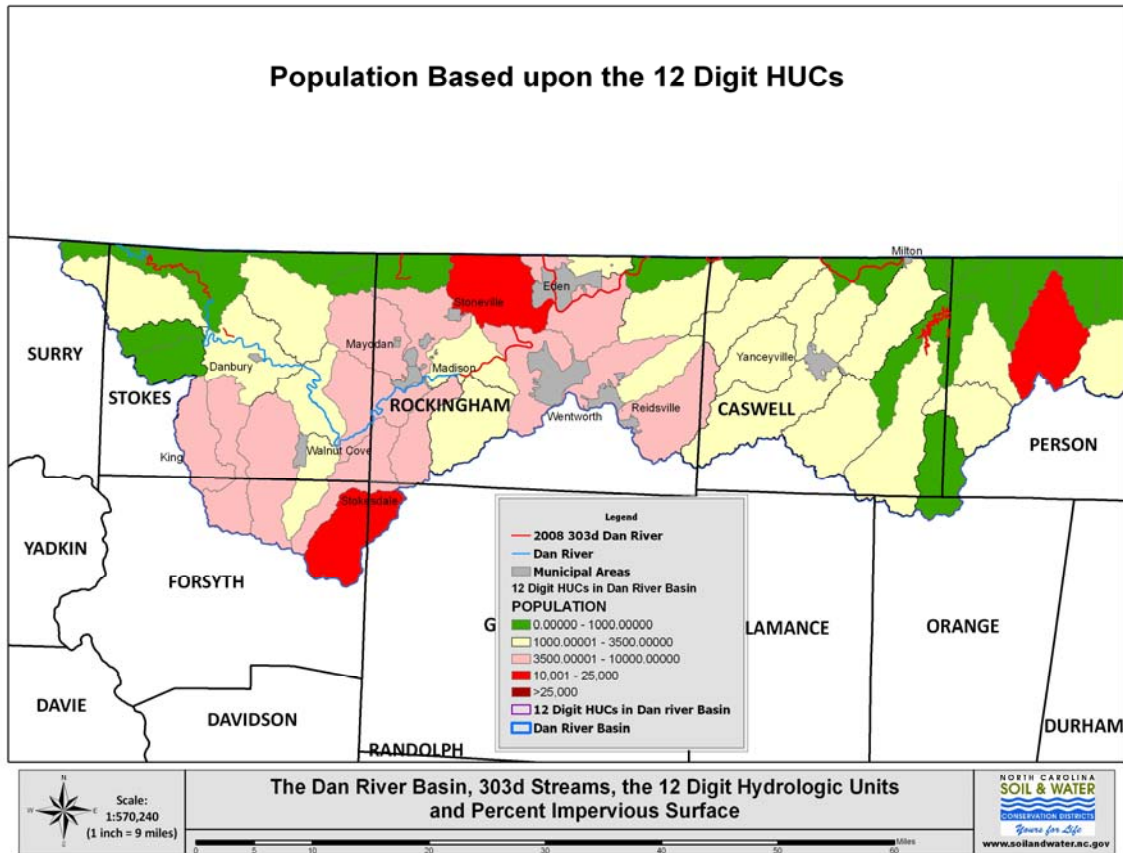
Land use changes in the past 5-10 years within the watershed include agricultural operations that have changed farming practices from conventional planting methods. Today many farmers use soil saving, high residue/no-till methods to plant their crops. Farmers are now planting less tobacco and many fields have been converted to permanent cover such as fescue and /or trees. In addition, some farmland has been sold and houses have been built on these areas. The use of bottom plowing, especially in the fall and winter, is a cultural practice that is still very evident on the landscape today in cropland fields.



The map above shows the percent impervious surfaces by 12 Digit HUC (source: 12 Digit HUC GIS datalayer). The map was created by taking the attribute table from the original GIS datalayer and using the symbology layer to represent the impervious surface areas based upon the 12 Digit HUC delineation.

The general thought is that stream degradation begins when the watershed’s impervious surface percentage reaches approximately 5%. Stream degradation becomes evident when impervious surfaces reach approximately 8%. Once a watershed reaches impervious surfaces of around 10 – 12%, the stream is usually completely degraded and full restoration of the stream becomes extremely costly.

As the map above shows, one 12 digit HUC has reached the 5% impervious surface mark and one watershed has reached 8 – 12% impervious surfaces.



The map above shows population distributions within the watershed. As stated earlier, this is a very rural landscape with some population densities increasing in the Winston Salem and Eden areas. While population increases across the watershed have been noted, they are well below the state average and are not increasing at the same rate as most of the other Piedmont region of the state.

These two maps provide a potential projection of how development has and will affect the water quality of this region. As the area continues to develop, a change in the velocity and volume of stormwater runoff will be recognized.

Streams within the project area that have been identified as not meeting their water quality standards (303d streams or streams that have had a Total Maximum Daily Load [TMDL] developed on them) since 2006 include:

- Belew’s Lake
- Seven (7) reaches of the Dan River
- Hyco River
- Marlowe Creek
- Mayo River
- Newman Branch
- Smith River
- Town Fork Creek

Assessment Unit Number	Assessment Unit Name	Assessment Unit Description	Assessment Unit Length	Units	Assessment Unit Size
2010					
22-(1)b	DAN RIVER	From Little Dan River to Peters Creek	11.6	Miles	
Totals			11.6	Miles	

2008					
22-(1)b	DAN RIVER	From Little Dan River to Peters Creek	11.6	FW Miles	
22-(31.5)a	DAN RIVER	From a point 0.7 mile upstream of Jacobs	4.8	FW Miles	
22-(31.5)b	DAN RIVER	From 03-02-02 boundary to a point 0.8 mile Matrimony	9.4	FW Miles	
22-(38.5)	DAN RIVER	Mill Branch (Town of Eden water supply intake)	0.6	FW Miles	
22-(39)a	DAN RIVER	From Mill Branch to NC/VA crossing downstream of Wolf Island Creek	13.8	FW Miles	
22-(39)b	DAN RIVER	From NC/VA crossing downstream of Wolf Island Creek	9.6	FW Miles	
22-14-1	Newman Branch	From source to Buck Island Creek	1.3	FW Miles	
22-27-10	Arm of Belews Lake	Entire Arm	326.5	FW Acres	
22-30-(1)	Mayo River	From North Carolina-Virginia State Line downstream of Hickory Creek	3.5	FW Miles	
22-58-(0.5)	Hyco River, including Hyco Lake	From source in Hyco Lake to dam, including trib below elevation 410			4297.9
Totals			381.1	Miles	4297.9

2006					
22-(31.5)	DAN RIVER	0.7 mile upstream to a point 0.8 mile ds of Matrimony Creek	9.0	Miles	
22-14-1	Newman Branch	From source to Buck Island Creek	0.5	Miles	
22-25a	Town Fork Creek	From source to Timmons Cr.	8.0	Miles	
22-27-10	Arm of Belews Lake	Entire Arm	3.1	Miles	
22-40-(1)	Smith River	From NC-VA Line to 0.8 mile ds of Rockingham County SR 1714	2.8	Miles	

22-40-(2.5)	Smith River	From 0.8 mile ds Rockingham County SR 1714 to Fieldcrest Mills WS Intake	0.5	Miles	
22-40-(3)	Smith River	From Fieldcrest Mills Water Supply Intake to Dan River	1.8	Miles	
22-58-(0.5)	Hyco River, including Hyco Lake below eleva	From source in Hyco Lake to dam, including trib below elevation 410			3750.0
22-58-12-6	Marlowe Creek	Source to Storys Creek	10.9	Miles	
Totals			36.6	Miles	3750.0

The rural landscape, high percentage of forested lands, and low population densities serve to make this watershed one that can be preserved, enhanced, and/or restored at a lower cost than virtually any other Piedmont region watershed.

Expected Load Reductions:

Expected load reductions are based upon past performance. Below are load reductions that were recognized during the timeframe of the 2008 EPA 319 Dan River project. Reductions were tracked for EPA 319 funded projects along with other program projects that were implemented from 10/1/2008 through 3/30/2012 (41 months). It should be noted that these figures represent state funded programs only. At this point in time it is difficult to readily obtain results from BMP implementation using federal funding sources such as EQIP, so the reductions realized from this and other federal programs are not included in this report.

BMP Implementation Statistics for the Dan River 319 Project

Below is a table showing the Best Management Practices (BMPs) installed using EPA 319 funds along with the units installed and the area affected by the installation of the practices. While all BMPs served to enhance, restore, or maintain water quality in this important watershed, some notable effects are described below.

Over 300 acres of cropland were converted to permanent vegetation (trees and grasslands) for this 41 month period. The cropland that was converted to other uses was, for the vast majority, land that formerly grew tobacco. The majority of these lands were eroding at a rate of >2T, or twice the “tolerable” limit. The tolerable limit is defined as the rate at which soil naturally regenerates itself. Most North Carolina soils have a “T” value of 3 to 4 tons per acre per year. This conversion resulted in significant savings of soil loss, reduced significantly the amount of nitrogen and phosphorus being applied to these lands, and will greatly improve the structure of the soil due to the lack of tillage equipment being used.

Another significant gain made by the use of EPA 319 funds includes the livestock exclusion along stream systems. Over 20,000 linear feet of fencing was installed with 319 funds (3.93 miles) which affected 530 acres of pasture lands. Much of the livestock exclusion took place

along the main stem of the Dan River. One of these projects took place on the Flippen property, which excluded livestock from the only section of the Dan River within this watershed where there are trout waters.

Just over 200 acres of crop residue and organic matter production practices were installed by implementing long-term no-till and sod-based rotation practices. These practices will serve to reduce soil loss, nitrogen, and phosphorus inputs into local waters. They will also serve to build the organic matter in the soil, resulting in further increases in efficiency in the use of fertilizers and long-term reductions in soil loss.

Nearly 30 acres of grassed waterways and field borders were installed with EPA 319 funds with this project. These practices result in the treatment of runoff from cropland fields along water conveyance routes. By installing these practices, runoff from the adjacent fields is treated prior to the water making its way to a local stream. They are almost always located at the upper ends of drainage ways, making them an important practice for treating headwater areas.

The BMPs installed using EPA 319 funds in total are found in the table below:

BMPs Installed with EPA 319 Funds				
Practice	Practice Measure	Units	Affected Area	Units
Critical Area Planting	Acre	3.50	Acres Affected	61.95
Cropland Conversion - Grass	Acre	220.10	Acres Affected	266.4
Cropland Conversion - Trees	Acre	81.45	Acres Affected	102
Diversion	Feet	6023	Acres Affected	64
Field Border	Acre	15.29	Acres Affected	367.75
Grassed Waterway	Acre	14.43	Acres Affected	435
Livestock Exclusion	Feet	20,767	Acres Affected	529.9
Long Term No-Till	Acre	166.70	Acres Affected	166.7
Sod-Based Rotation	Acre	35.42	Acres Affected	38
Stock Trail	Units	1	Acres Affected	22
Trough Or Tank	Units	31	Acres Affected	563.9
Well	Units	8	Acres Affected	486.9

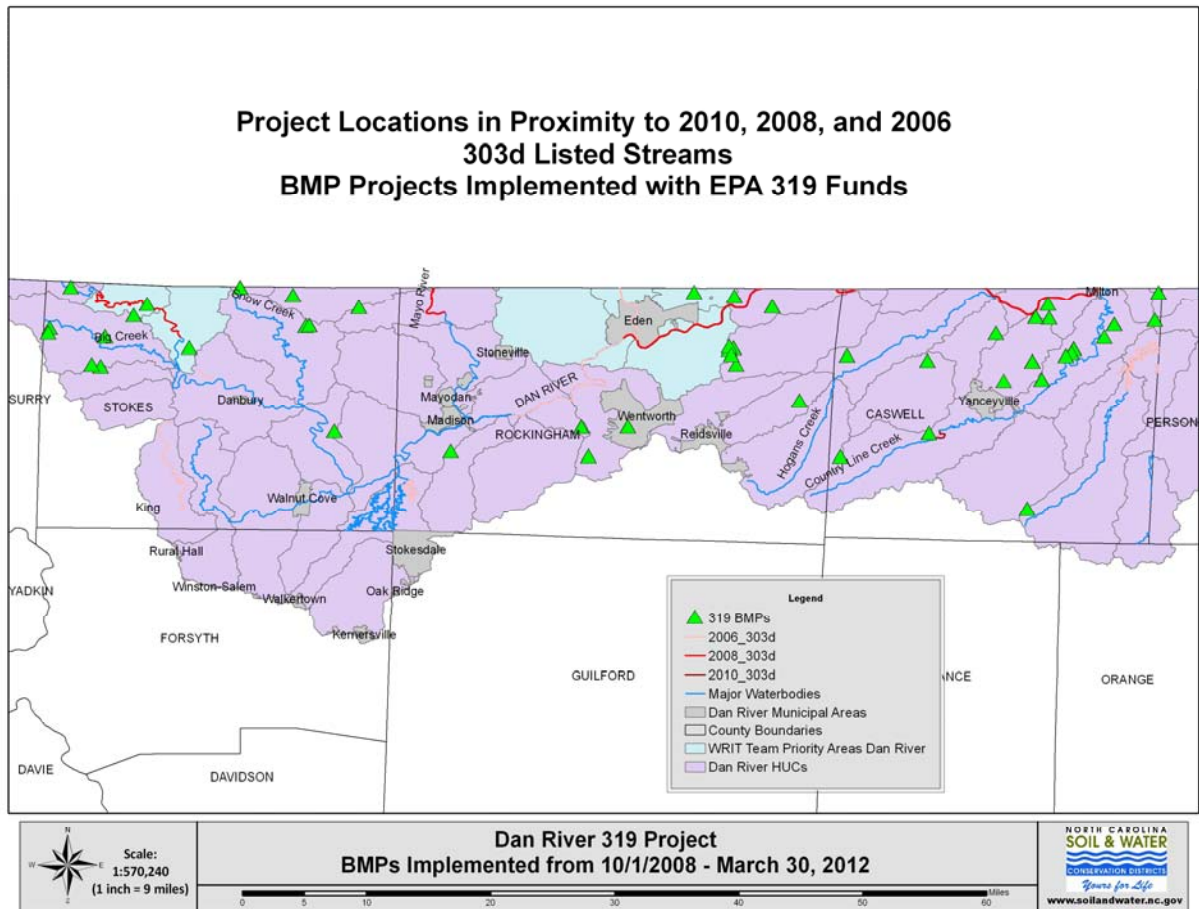
Below is a table outlining the acres affected, nitrogen reductions, phosphorus reductions, and the soil savings generated from the practices shown above using EPA 319 funds. In summary, the project realized:

2176.8 acres affected by the installation of these practices which resulted in 26,930 lbs of nitrogen reductions, 4,537 lbs of phosphorus reductions, and 9,314 tons of soil saved. These reductions are generated in the following manner:

Below is a summary of the reductions recognized from the installation of BMPs using EPA 319 funds for the Dan River project. Agri-Chemical and Animal Waste Management practices were not installed in this watershed.

319 Program Effects			
Practice Type	Measurement Tool	Units	Measurement
Erosion/Nutrient Reduction	Acres Affected	Acre	714.1
Erosion/Nutrient Reduction	Nitrogen Saved	Pounds	20,651
Erosion/Nutrient Reduction	Phosphorus Saved	Pounds	1,303
Erosion/Nutrient Reduction	Soil Saved	Tons	8,165
Sediment/Nutrient Reduction	Acres Affected	Acre	602.8
Sediment/Nutrient Reduction	Nitrogen Saved	Pounds	2,706.0
Sediment/Nutrient Reduction	Phosphorus Saved	Pounds	365.6
Sediment/Nutrient Reduction	Soil Saved	Tons	878.3
Stream Protection	Acres Affected	Acre	859.9
Stream Protection	Nitrogen Saved	Pounds	1,396.3
Stream Protection	Phosphorus Saved	Pounds	2,868.8
Stream Protection	Soil Saved	Tons	270.4

Below is a map showing the location of the BMPs installed using EPA 319 grant funds for the Dan River project:



From this map, you can see the distribution of the BMP projects in proximity to 303d and TMDL waters. Additionally you can see the targeting of BMPs within 12 digit HUCs. While it is certain that additional focus on 303d streams for project implementation would be ideal, several factors affect where projects are installed. These include the types of farming operations (row crop, livestock, specialty crop, etc), the viability of the farming operation (net income), cultural differences (wary of government help, “traditional” farming methods such as bottom plowing, etc), and/or familiarity with government programs.

In an effort to recognize programmatic effects on watershed projects such as the Dan River project, we are beginning to provide information to important stakeholders regarding all other BMP implementation projects within the project area. We have compiled information for the Dan River project for all programs and practices installed within this watershed for the time period of the grant (10/1/82008 – 3/30/2012), less the EPA 319 projects identified above. Below is a summary of that data compilation:

BMPs Installed with All Other Program Funds					
Practice	Practice Measure	Units	Affected Measure	Measuring Units	Units
Cc-Abandoned Well Closure	Units	6	Number Of People	Units	600
Cc-Cistern	Units	1	Ccap Tn	Pounds	0.06
Cc-Critical Area Planting	Square Feet	567,564	Nitrogen Saved	Pounds	190
Cc-Riparian Buffer	Square Feet	50,000	Impervious Area	Square Feet	174,240
Cc-Riparian Buffer	Square Feet	50,000	Number Of Homes	Units	25
Cc-Riparian Buffer	Square Feet	50,000	Number Of People	Units	500
Agricultural Pond Restoration/Repair	Units	10	Acres Affected	Acre	49.8
Critical Area Planting	Acre	6.80	Acres Affected	Acre	240.5
Cropland Conversion - Grass	Acre	254.85	Acres Affected	Acre	384.6
Cropland Conversion - Trees	Acre	154.62	Acres Affected	Acre	184.8
Diversion	Feet	15,922	Acres Affected	Acre	101.9
Field Border	Acre	35.60	Acres Affected	Acre	479.3
Grassed Waterway	Acre	25.20	Acres Affected	Acre	422.3
Heavy Use Area Protection	Units	2	Acres Affected	Acre	141
Irrigation Well	Units	2	Acres Affected	Acre	55
Livestock Exclusion	Feet	67,330	Acres Affected	Acre	1,403.0
Long Term No-Till	Acre	37.6	Acres Affected	Acre	37.6
Pasture Renovation	Acre	670.28	Acres Affected	Acre	885.3
Sod-Based Rotation	Acre	207.83	Acres Affected	Acre	219.4
Stock Trail	Units	82	Acres Affected	Acre	192
Stream Crossing	Units	4	Acres Affected	Acre	174
Trough Or Tank	Units	69	Acres Affected	Acre	1,653.4
Waste Application Equip	Units	1	Acres Affected	Acre	259
Well	Units	26	Acres Affected	Acre	1,252.6

Some notable BMPs implemented with Agriculture Cost Share Program, Community Conservation Assistance Program, Impaired and Impacted Stream Survey, and other grant funds (such as Clean Water Management Trust Fund) include:

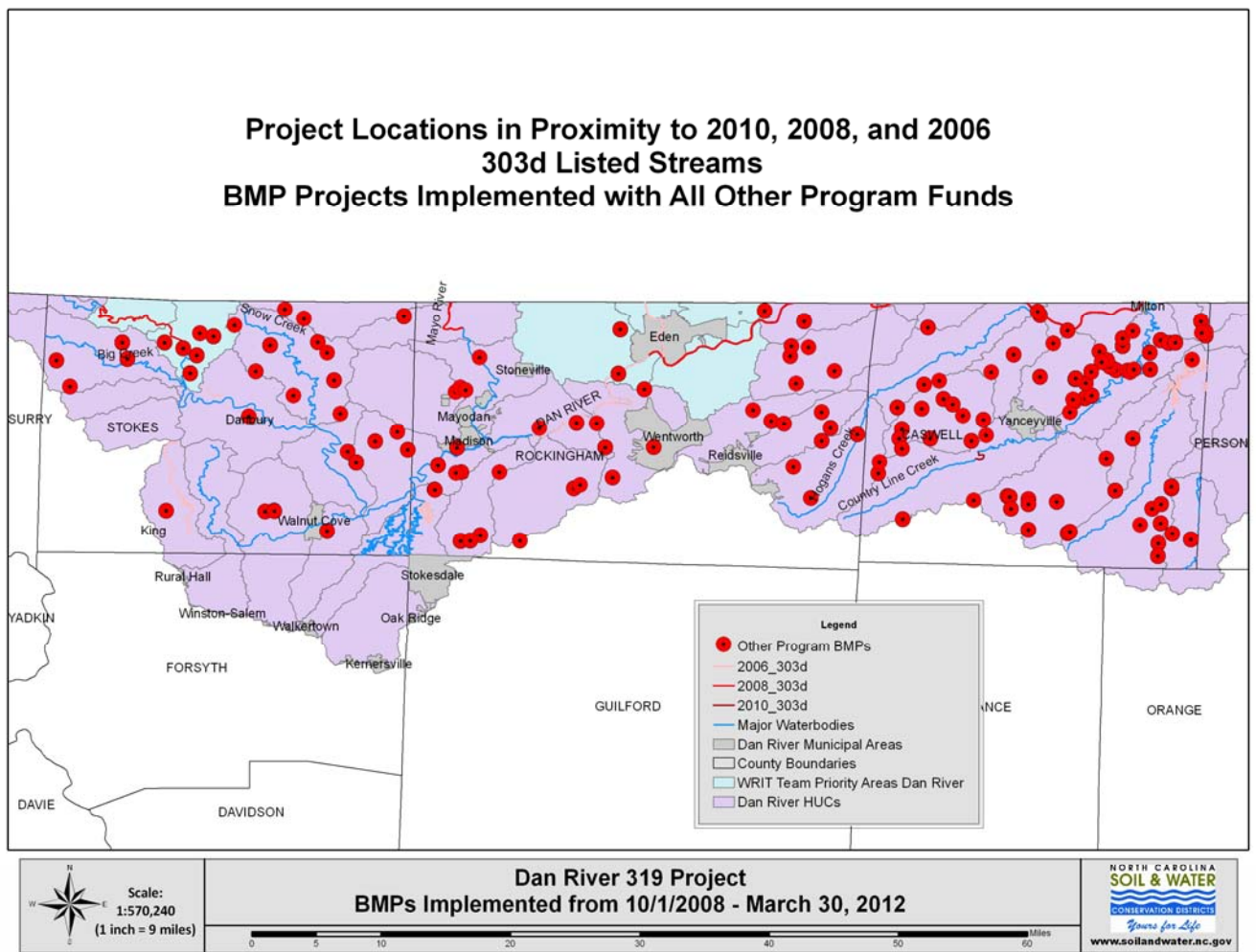
- Over 409 acres of cropland permanently converted to trees or grasslands
- 67,300 feet (12.7 miles affecting over 1,400 acres) of livestock exclusion fencing
- Over 60 acres of field borders and grassed waterways
- Over 200 acres of sod-based rotation
- Over 670 acres of pasture renovated

Other Program Effects			
Practice Type	Measurement Tool	Units	Measurement
Community Conservation	Impervious Area	Square Feet	174,240
Community Conservation	Nitrogen Saved	Pounds	190
Community Conservation	Number Of Homes	Units	26
Community Conservation	Number Of People	Units	3
Drought Response	Acres Affected	Acre	1
Erosion/Nutrient Reduction	Acres Affected	Acre	2,047.6
Erosion/Nutrient Reduction	Nitrogen Saved	Pounds	55,450.0
Erosion/Nutrient Reduction	Phosphorus Saved	Pounds	2,905.0
Erosion/Nutrient Reduction	Soil Saved	Tons	17,732.4
Sediment/Nutrient Reduction	Acres Affected	Acre	1,241.2
Sediment/Nutrient Reduction	Nitrogen Saved	Pounds	32,028.8
Sediment/Nutrient Reduction	Phosphorus Saved	Pounds	2,239.7
Sediment/Nutrient Reduction	Soil Saved	Tons	6,300.0
Stream Protection	Acres Affected	Acre	1,555.9
Stream Protection	Nitrogen Saved	Pounds	1,446.3
Stream Protection	Phosphorus Saved	Pounds	521.2
Stream Protection	Soil Saved	Tons	163.4

The effects recognized from all other programs are shown above. For the timeframe of the grant, from 10/1/2008 – 3/30/2012, the following results were recognized from the implementation of BMPs using ACSP, CCAP, CWMTF, and other funding sources:

- 4,884.6 acres effected by the implementation of BMPs
- Reductions of 88,925 pounds of nitrogen
- Reductions of 5,666 pounds of phosphorus
- 24,196 tons of soil loss reductions

The map below shows the location of BMPs implemented using all other program funds (less the EPA 319 projects) from the timeframe of the grant (10/1/2008 – 3/30/2012).

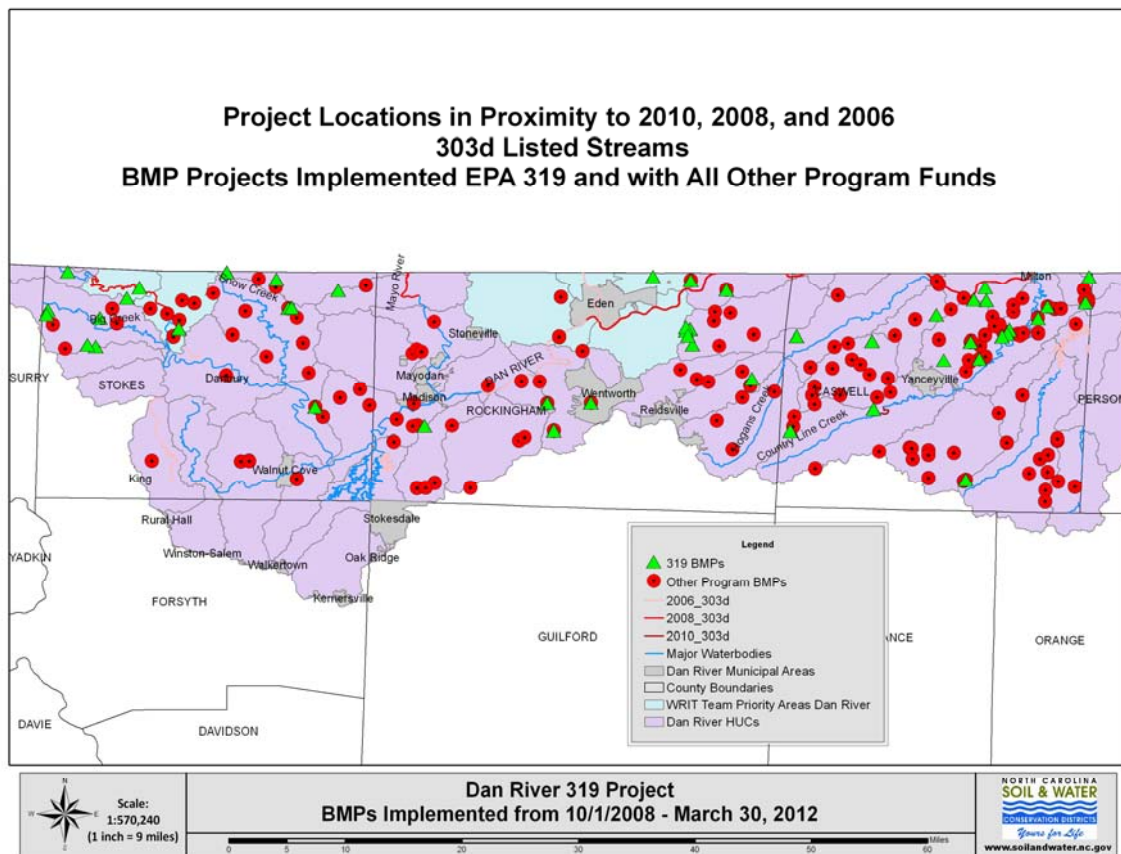


Many projects fell within the 303d and TMDL 12 digit HUCs and the WRIT priority areas.

Total effects recognized by the EPA 319 project and the “traditional” programs such as ACSP, CCAP, etc, are below:

- 7,061 acres effected
- Reductions of 115,855 pounds of nitrogen
- Reductions of 10,203 pounds of phosphorus
- 33,510 tons of soil loss reductions

The map below shows the location of all BMPs implemented with EPA 319 and all other program funds during the timeframe of the grant (10/1/2008 – 3/30/2012).



It should be noted that conservation practices vary significantly across the state, and within this watershed. The western portion of the watershed, in Stokes County, has more livestock exclusion practices and less field borders and grassed waterways whereas Caswell County, to the east, will tend to have more cropland practices such as the field borders and grassed waterways. Rockingham County, in the center of the watershed, tends to act as a meld between the eastern and western portions of the watershed.

Other Potential Load Reductions:

It should be noted that during the development of the project atlas, several potential stream stabilization and restoration opportunities became evident. At least eight projects have been identified within the project area. Significant bank erosion is present, largely attributable to livestock access issues. Some of these will be addressed using livestock exclusion fencing, a “standard” practice noted in the estimated reductions above. More of these, however, would be suited for more in-depth streambank stabilization and restoration practices using heavy equipment.

There are approximately 15,000 linear feet of streambank practices identified to date, with more anticipated to be found. Using a “rule of thumb” of 0.75 tons/linear foot of streambank erosion, there is an estimated load reduction of 11,250 tons of soil loading reductions that could be recognized in treating these areas. Funds currently do not exist for treatment of these issues but a start has been made on one severe problem found during development of this plan. A \$20,000 feasibility study has been funded by the Division of Water Resources on a project on Little Snow Creek. Local district staff, in conjunction with Wildlife Resources Commission and the Division of Soil and Water Conservation will conduct the feasibility study and another grant for actual construction is likely to ensue.

A typical process for how a BMP is implemented, and hence load reductions are recognized, follows below:

- The local conservationist will make an on-site visit to the land unit
- The conservationist will meet with the owner/operator and discuss their problems and interests with them
- The conservationist will take in-the-field measurements of land slopes, erosion areas, etc and create notes to be used for planning
- The conservationist will take this information back to the office and catalogue this information into a computer software program specifically designed for developing a conservation plan for the land treatment units
- The conservationist will create a specific plan with supporting documentation such as maps and the anticipated reductions associated with implementing the suggested BMPs
- A list of alternative BMPs may also be developed
- The plan will have a timetable for implementing the BMPs
- The conservation plan will be delivered and discussed with the landowner and any changes to the plan will be made after those discussions
- Should a request for cost shared assistance be requested, the conservationist will develop a site specific contract for the treatment units
- The BMPs will be implemented, documented, and entered into the Division’s database
- These numbers can be extracted by performing database queries based on several parameters including location

Sediment will be reduced by the use of BMP’s and this will have a direct impact on improving the impaired waters of the Dan River watershed. In addition off-site movement of fecal coliform, pesticides, phosphorus, and nitrogen will be reduced by the use of BMP’s. By improving water quality, habitat for macroinvertebrates and fish will be improved. The Dan

River is listed on the North Carolina's EPA Section 303(d) list of impaired rivers because of fecal coliform bacteria and turbidity. Sedimentation, erosion, and cattle waste have been identified as the probable source of impairment.

The load reductions will be focused based upon the annual Strategy Plan that is developed by each district for the use of allocating ACSP funds, the Priority Ranking Form that is used by each district in allocating ACSP funds, the Priority Ranking Form that was developed for the second cycle of the EPA 319 project, along with best professional judgment (BPJ). These tools address the 303d/TMDL waters heavily but also enlist the BPJ from the local staff that work and live in the watershed.

Technical and Financial Assistance Needs:

For this 41 month contract period, \$250,000 of EPA 319 funds were expended on BMPs, \$122,000 on salaries for a watershed coordinator position, and approximately \$22,000 in supplies, travel, and other necessities in program deliver. From other state program sources during this same timeframe, approximately \$450,000 was expended on BMP implementation, approximately \$285,000 on salaries for staff, and approximately \$30,000 spent on travel, supplies, and other necessities.

We will assume generally the same costs for an additional 41 month period to recognize similar reductions in soil loss, nitrogen and phosphorus reductions, and the number of acres affected.

It is generally estimated that these projects will cost approximately \$225/linear foot in this type of landscape. Given that there is approximately 15,000 linear feet identified to date (with more expected to be recognized), there is a need for an estimated \$3,375,000 that could be expended for streambank projects in this watershed with more likely to be discovered.

In North Carolina many streams have been impaired by sediment and agricultural sources and have been placed on the states 303(d) list of impaired streams. An Agricultural Sediment Initiative has been established since 2000 by the North Carolina Association of Soil and Water Conservation Districts (NCASWCD) and the Soil and Water Conservation Commission (SWCC). This initiative began with a focus on more than 50 Stream segments on the 303(d) list to install agricultural BMP's and to address water quality concerns. Today the project is known as the Impaired and Impacted Stream Survey, and 34 districts participate with an allocation of \$400,000 from the ACSP. More than \$4,500,000 has been targeted by the SWCC to improve these streams. The local districts within the project area have requested and received these ASI/IISS funds.

A total of \$345,000 will be needed in technical assistance to effectively implement this project. However, the Stokes Soil and Water District is providing services without reimbursement to complete this project. An additional \$255,000 will be needed to install best management practices on landowner's properties. A total of \$399,000 was awarded by the Section 319 grant

to provide funds for a grant coordinator and funds to install BMP's in the three county area of Stokes, Rockingham and Caswell counties beginning with FY08(October 27, 2008).

Although much work has been accomplished in Stokes, Rockingham and Caswell counties, much work remains to remove the Dan River from the 303(d) list of impaired rivers. Regular agriculture cost share funds only reach a small number of farmers each year. Section 319 funds enable additional landowners to be funded that have serious water quality concerns. We estimate that an additional allocation of \$700,000 would be necessary to extend the program that is currently in place for an additional three year cycle. If this funding was possible the framework that is already in place could be utilized to make more advances in reducing nonpoint source pollution and removing the Dan River from the 303(d) list of impaired rivers.

In January 2012 we received a second cycle of funding for the Dan River 319 project. The total amount of the award is \$295,000. The amount specifically for Best Management Practices is \$238,000 or \$79,333 per county. The second cycle work is needed to reduce fecal coliform bacteria levels and lower turbidity and sedimentation in the Dan River. Due to the success of the first cycle of this 319 project, other farmers have committed to installing Best Management Practices on their farms. We have also been able to identify many problem areas in all three counties.

Information, Education, and Public Participation Component:

Public outreach and education is a key part of the Dan River Basin initiative and includes various program delivered to interested groups. Our goal is to create community support for long term improvement and protection of the Dan River Basin.

Numerous educational opportunities will be included in the initial part of the project and will include the following objectives:

- Increase public knowledge of the importance of clean water.
- Increase public knowledge of how common activities contribute to poor water quality and nonpoint source pollution.
- Increase public knowledge about the different ways poor water quality and habitat degradation can be reduced by the use of conservation practices.
- Increase public knowledge about how environmental and economic benefits can be obtained by the protection of water quality.

Environmental education opportunities exist for the citizens within the watershed through various avenues.

Environmental Awareness Days

The Stokes Soil and Water District is committed to their annual Environmental Awareness Days in which they educated school age children on the benefits of conservation, agriculture BMP's and rural/urban BMP's. Approximately 500 students attend Environmental Awareness Days each year.

Annual Agricultural Outreach Event

A joint effort with the Farm Service Agency (FSA), the Natural Resources Conservation Service (NRCS) and the Stokes County Soil and Water District is involved in organizing this annual dinner for the agricultural community.

Ruritan Club Meetings

All local Ruritan meetings were attended in the critical area and a power-point program was given to each concerning the section 319 program and the benefits of placing BMP's on agricultural lands. Also information was given about the Dan River and the problems with fecal coliform bacteria and turbidity.

Cattleman's Association Meetings

Meetings were attended in Stokes and Caswell County. In Rockingham County two of the local Agricultural meetings were attended.

Annual Contest

The Stokes County Soil and Water District promotes Poster contests for grades 3-6; Essay contest and Public Speaking Contest for grades 7-8. Each year the NC Association of Soil and Water Conservation Districts establishes a current environmental issue as the topic.

NC Envirothon

The Stokes County Soil and Water District promotes high school teams of 5 students to participate in the NC Envirothon. This program tests the knowledge and skills of the teams on the following subjects: Forestry, Soils, Aquatics, Wildlife and Current Events. The Stokes County Soil and Water District assist the students throughout the school year in education and training their teams on these topics. The Dan River Watershed Coordinator participated in the 2010, 2011 and 2012 Envirothon by being the presenter for the Current Events Station for middle school students. This hands-on approach to learning is a great opportunity for all the students and staff.

Special efforts were made with this project to provide a comprehensive educational effort. Brochures were distributed (mailed) to all large landowners in the project area and additional outreach was provided to those within the "targeted" area (the 303d/TMDL watersheds).

Joint North Carolina and Virginia Effort to improve the Dan River for Water Quality

On November 9, 2011 at 3 p.m. a joint meeting was conducted in Franklin county Virginia with the Patrick, Blue Ridge Soil and Water Districts (Pittsylvania Soil and Water district staff where not able to attend) and the Stokes, Rockingham Soil and Water Districts(Caswell District employees where unable to be present). In addition to these district staff members, various individuals from the N.C. Division of Soil and Water and the Virginia Conservation Staff

attended. The meeting was very successful and information was exchanged concerning water sampling, TMDL, and GIS data. The North Carolina Division of Soil and Water and the Stokes County Soil and Water District are hoping to partner with the Virginia Soil and Water Conservation District to work together on the Dan River Basin. The Dan River crosses the Virginia/North Carolina boundary many times and is an important asset to both States.

On June 2012 a second VA/NC will be held in Franklin County Virginia at the Blue Ridge Soil and Water District. At this meeting we have invited the previous attendees and are also inviting agency representatives from both states including DWQ, Natural Heritage, Wildlife Resources Commission, NRCS, Parks and Recreation, Forest Service, APNEP, CWMTF, EEP, US Fish and Wildlife, and others. Additionally, NGOs such as the Piedmont Land Conservancy, the Dan River Basin Association, the Piedmont Council of Governments, and others will be invited. We will also be inviting private businesses such as canoe outfitters in the watershed. We believe that these ongoing meetings will be of great benefit to both Virginia and North Carolina as we plan to work on improving the water quality of the Dan River.

Watershed Restoration Improvement Team

The Dan River was selected as one of the four of the focal areas for the Watershed Resource Improvement Team (WRIT). The WRIT team is composed of various professional involved in water quality, including the following, Division of Soil and Water, Division of Water Quality, Division of Water Resources, etc. The purpose of the WRIT team is to bring together a group of water resource professionals to work on specific water quality problems that are of a high priority to the State of North Carolina. A total of four project areas were chosen with the Dan River as one of the selections.

Partnership with other Agencies

The second cycle 319 grant involves implementing BMP in the Stokes, Caswell and Rockingham Soil and Water Conservation Districts. The project will now expand to involve the Patrick, Henry, Franklin and Pittsburg Soil and Water Offices located in Virginia. The Natural Heritage and North Carolina Department of Wildlife Resources will also be involved with the second cycle of this 319 project, along with the agencies mentioned above. The plan is for this effort on the Dan River to expand to involve a large group of stakeholders to improve Dan River basin.

Schedule and Milestones:

Below is a table showing the project schedule and milestones. The time schedule accounts for the EPA 319 grant quarterly reports, which will serve as an important check on the milestones and achievements made in forwarding conservation in this watershed.

Time Period	Action Item	Milestone
1/15/12	EPA 319 Contract signed for second cycle	Executed contract
1/15/2012 - 6/30/2013	Information distribution and contact with potential contractees	75% of landowners contacted

4/1/2012 - 3/1/2014	Develop conservation plans and contracts with participants	25 cost share contracts
by 6/1/2012	2013 Annual Strategy Plan for ACSP	Each local district incorporates ACSP, CCAP, EPA 319, and IISS funds into Strategy Plan
by 6/30/2012	Second meeting between NC and Virginia conservation partners	Document of existing programs for both states for each partner
by 7/1/2012	Watershed Coordinator position funded at 50% level by Stokes County	Position executed at 50%/50% funding by 319 and Stokes County
by 7/15/2012	Second quarterly report for 319 due	Report shows 15% of funds obligated to contracts
6/30/12 - 5/31/13	Develop feasibility study and Conditional Letter of Map Revision for the Little Snow Creek project	Completed CLOMR, feasibility study, and 401/404 permit
by 8/31/2012	Third meeting with NC and Va partners	Successful float down the Dan!
by 9/1/2012	ACSP/CCAP/IISS funds allocated to districts	IISS funds in project area
by 10/15/2012	3rd quarterly report due	25% of all funds obligated to contracts
by 10/31/2012	Report of potential funding sources in NC and Va produced	Document distributed to partners
by 1/1/2013	DWR funds requested for stream stabilization project on Little Snow	Completed grant request submitted
by 1/15/2013	4th quarterly report due	40% of all funds obligated to contracts, 10% expended
by 3/30/2013	DWR grant awards announced	Funds received for Little Snow
by 4/15/2013	5th quarterly report due	60% of funds obligated, 20% expended
by 6/30/2013	Review of Watershed Restoration Plan	Successes documented
by 7/15/2013	6th quarterly report due	75% of funds obligated, 35% expended
by 9/1/2013	Big Creek EQIP projects completed	Request for Payments processed
by 9/1/2013	ACSP/CCAP/IISS funds allocated to districts	IISS funds in project area

by 10/15/2013	7th quarterly report due	90% of funds obligated, 50% expended
by 10/31/2013	Additional grant sources requested	Completed grant request submitted
by 12/31/2013	Review of Watershed Restoration Plan	Successes documented
by 1/15/2014	8th quarterly report due	95% of funds obligated, 75% expended
by 2/28/2014	Grant funds awarded	Additional funds awarded for Dan River watershed
by 4/15/2014	9th quarterly report due	100% of funds obligated, 80% expended
by 6/30/2014	Review of Watershed Restoration Plan	Successes documented
by 7/15/2014	10th quarterly report due	90% of funds expended
by 9/1/2014	ACSP/CCAP/ISS funds allocated to districts	ISS funds in project area
by 10/15/2014	11th quarterly report due	95% of funds expended
by 12/31/2014	Review of Watershed Restoration Plan	Successes documented
by 1/15/2015	Final Report due	100% of funds expended

Load Reduction Evaluation Criteria:

The local soil and water conservation districts have existing programs that help identify the problem areas and work with the local landowners on a site-specific remedy to resolve the problem on a voluntary basis. This EPA 319 grant, coupled with other programs such as the Agriculture Cost Share Program (ACSP), Community Conservation Assistance Program (CCAP), the Impaired/Impacted Stream Survey (IIS), The Drought Response Program, and other funding programs helped maintain, enhance, and restore the waters of this important watershed.

The NC Division of Soil and Water Conservation (DSWC) organizes the 65 different BMPs it funds into five main categories:

1. Sediment/Nutrient Delivery Reduction from Fields
2. Erosion Reduction/Nutrient Loss Reduction in Fields
3. Agricultural Chemical Pollution Prevention
4. Animal Waste Management
5. Stream Protection from Animals

As a plan is developed for the land treatment unit, the conservationists take in-the-field measurements that are inputted into two computer programs. One program, known as the North Carolina Agricultural Nutrient Assessment Tool (NCANAT) was developed (using EPA 319 funds!) specifically for estimating nutrient reductions from the installation of BMPs. The other tool, the Revised Universal Soil Loss Equation II (RUSLE II) estimates soil loss based upon user

inputs and field measurements along with other factors. The conservationists take the data generated from the field measurements and input them into the program. They then develop a conservation plan to address the specific problems noted on the land treatment unit. This is done on site specific locations and varies from land unit to land unit. After developing a site specific plan to address the noted problems, the conservationists then take the treatments and inputs these into the program to generate the reductions noted below. A contract is then developed to address the issues recognized in the planning phase. The plan requires the long-term maintenance of the practices that are cost shared in the contract.

Often times other tools are used, such as volumetric calculations for gully and streambank erosion or another computer tool for urban BMPs, to generate the reductions in soil or nutrient problems. These tools are recognized at the state and federal levels as “best uses” for determining how BMPs affect reductions.

Further, the NC Division of Soil and Water Conservation (DSWC) maintains a robust database of every contract using cost shared funds from all programs that are executed within the Division’s framework. This includes EPA 319 contracts that affect more than one district. The database, which has inputted data dating from 1985 (at the inception of the NC Agriculture Cost Share Program (ACSP), can be queried and reports generated. The location of the practices is inputted, providing a map (below) with not only locations, but of the effects of the BMPs installed spatially defined. This system has proven to be very effective in tracking soil, nutrient, and agri-chemical reductions noted from the installation of BMPs. The BMPs are categorized into 5 basic purposes: 1) Erosion/Nutrient Reduction, 2) Sediment/Nutrient Reduction, 3) Agriculture Chemical Pollution Prevention, 4) Animal Waste Management, and 5) Stream Protection from Animals. The BMPs and these five purposes are below:

**NC AGRICULTURE COST SHARE PROGRAM
WATER QUALITY IMPROVEMENT PURPOSES OF APPROVED BMPs**

Purpose: Sediment/Nutrient Delivery Reduction From Fields

BMP	Reduction of applied nutrient	Reduction of soil loss	Nutrient Interception	Facilitating BMP	Life of BMP (yrs)
Field Border	-	√	√	-	10
Filter Strip	-	√	√	-	10
Grade Stabilization Structure	-	-	-	√	10
Grassed Waterway	-	√	√	-	10
Nutrient Mgmt.	√	-	-	-	3
Riparian Buffer	-	√	√	-	10
Rock-lined Outlet	-	-	-	√	10
Sediment Control Basin	-	-	√	-	10
Water Control Structure	-	√	√	-	10
Streambank and Shoreline Protection	-	√	√	-	10
Stream Restoration		√			10
Agricultural Road Repair/Stabilization	-	√	-	-	10
Abandoned Well Closure	-	-	-	√	1
Agricultural Pond Restoration/Repair		√	√		10
Precision Nutrient Management	√			√	

Purpose: Erosion Reduction/Nutrient Loss Reduction in Fields

BMP	Reduction of applied nutrient	Reduction of soil loss	Life of BMP (yrs.)
Conservation Tillage 3-yr	√	√	3
Long Term No-till	√	√	5
Critical Area Planting	√	√	10
Cropland Conversion	√	√	10
Water Diversion	√	√	10
Land Smoothing	√	√	10
Wetlands Restoration	√	√	10
Pastureland Conversion	√	√	10
Sod-based Rotation	√	√	4 or 5
Stripcropping	√	√	5
Terraces	√	√	10
Conservation Cover	√	√	6
Nutrient Scavenger Cover Crop	√	√	10
Cover Crop	√	√	1
Pasture Renovation	√	√	10
Micro-Irrigation System	√	√	10
Rooftop Runoff Management		√	10
Prescribed Grazing	√	√	3
Crop Residue Management	√	√	3

Purpose: Agricultural Chemical Pollution Prevention

BMP	Interception of chemicals	Life of BMP (yrs.)
Agri-chemical Handling Facility	√	10
Fertigation Back Flow Prevention	√	10
Chemigation Back Flow Prevention	√	10
Portable Pesticide Mixing Station	√	5
Agrichemical Containment and Mixing Facility	√	10

Purpose: Animal Waste Management

BMP	Proper mgmt. of nutrients	Reduction of soil loss	Nutrient interception	Facilitating BMP	Life of BMP (yrs.)
Closure of Waste Impoundment	√	-	-	-	10
Constructed wetlands	√	-	√	-	10
Controlled Livestock Lounging Area	-	√	-	√	10
Dry Manure Stack	√	-	-	-	10
Feeding/Waste Storage					10
Heavy Use Area Protection	-	√	-	-	10
Insect Control	-	-	-	-	5
Odor Control	-	-	-	-	1-10
Storm Water Management	√	-	-	-	10
Waste Treatment Lagoon/Storage Pond	√	-	-	-	10
Mortality Management Systems	√	-	-	-	10
Incinerators	√	-	-	-	5
Waste Application System	√	-	-	√	10
Tank-Based Aquaculture	√	-	-	-	10
Manure/Litter Transportation Incentive	√	-	-	-	1
Manure Composting Facility	√	-	-	-	10
Lagoon Biosolids Removal Incentive	√	-	-	-	1
Concentrated Nutrient Source Management	√			√	

Purpose: Stream Protection from Animals

BMP	Reduction of applied nutrient	Reduction of soil loss	Facilitating BMP	Life of BMP (yrs.)
Heavy Use Area Protection	-	√	-	10
Livestock Exclusion System	√	√	-	10
Spring Development	-	-	-	10
Stock Trail	-	√	-	10
Stream Crossing	-	√	-	10
Trough or Tank	-	-	√	10
Well	-	-	√	10
Windmill	-	-	√	10
Livestock Feeding Area	-	-	√	10

Purpose: Drought Response

BMP	Reduction of applied nutrient	Reduction of soil loss	Nutrient interception	Facilitating BMP	Life of BMP (yrs)
Agriculture Water Supply Pond	√	√	√		10
Conservation Irrigation Conversion	√			√	10

Monitoring Component:

Traditional monitoring in this watershed will prove to be challenging due to high costs, the lack of a DWQ certified lab in close proximity, and a lack of time and training by the local soil and water conservation district staff. Some monitoring has taken place however, through the Dan River Basin Association (DRBA). The monitoring conducted by DRBA affectively consists of “grab” samples taken on no specific temporal scale. Fecal coliform and some other parameters were tested for during the timeframe of this project by DRBA staff.

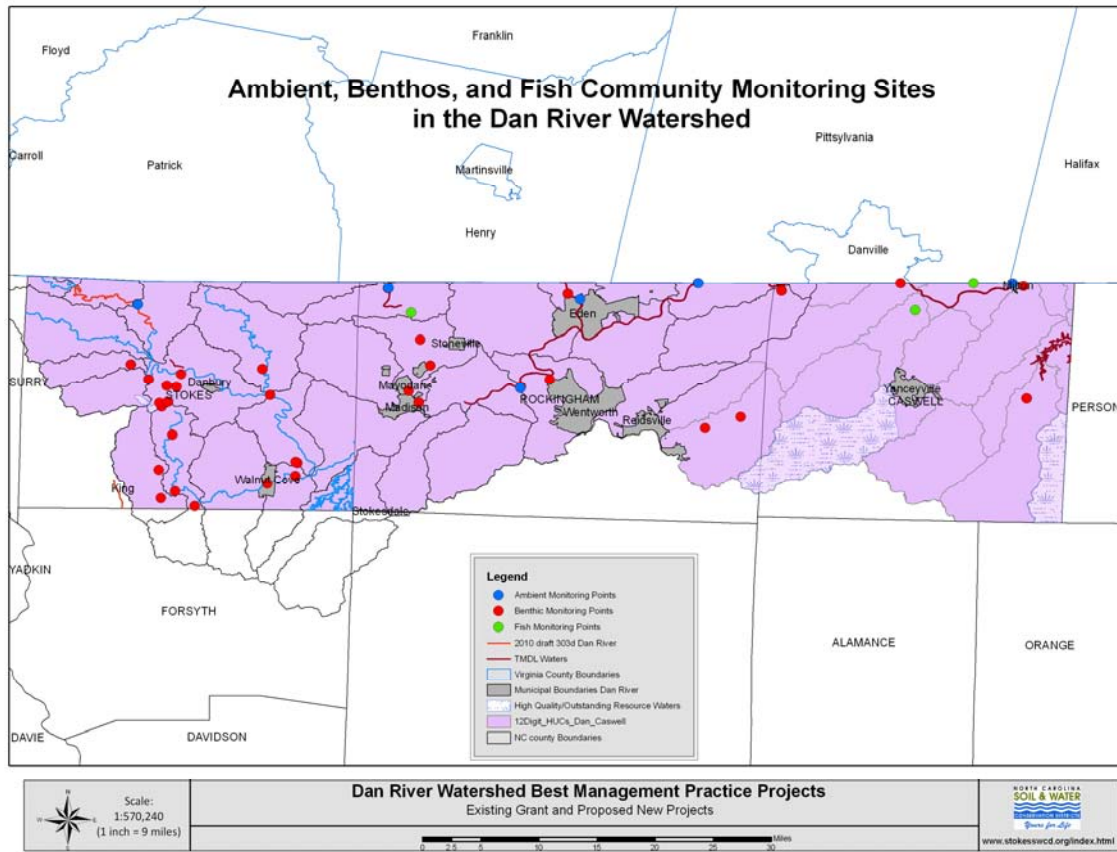
Additionally, a GIS analysis shows that of the major river basins in the state, the Roanoke (of which the Dan is a part of) has the 4th lowest number of sampling sites within the basin. The Dan River area is very rural, and there are few monitoring sites within the watershed. The conservationists made all efforts to prioritize the disbursal of funds based upon project criteria and awarded funds to the best project sites.

The Stokes County Soil and Water District will also conduct field assessments as well. These calculations will estimate the reduction in soil loss and nutrient loss using the North Carolina Agricultural Nutrient Assessment Tool and the Revised Universal Soil Loss Equation along with other such parameters.

Some discussion has taken place for monitoring to be conducted in the future by DWQ Winston Salem Regional Office staff. These discussions have not yet been completed. Staff time, proximity to the lab, and other factors will need to be resolved for monitoring to take place.

As a part of the EPA 319 grant, discussions between DWQ, Division, and district staff centered on possible alternative methods of “monitoring”. For the 319 project, before and after photographs of all projects will be performed. The “Results”, which is documented in the Division’s database, will be closely evaluated. Some discussion took place on other possible methods such as generic macro-invertebrate sampling, some fish community sampling performed by WRC staff, and other possible methods. These will be further explored.

Below is a map that shows the locations of existing water quality sampling being conducted by DWQ staff. The map displays the locations of the ambient, benthic, and fish community sampling locations that DWQ conducts.

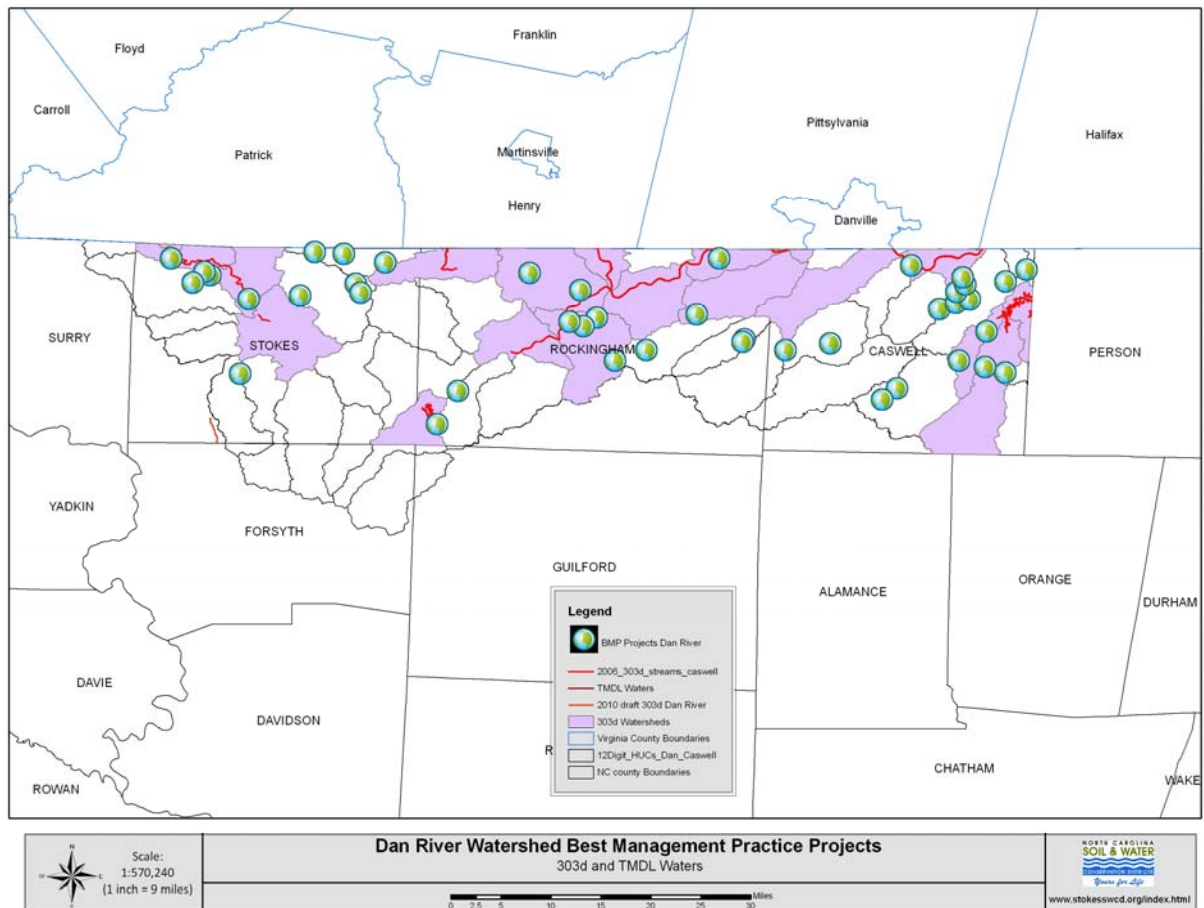


Measures of Success

Implementation of BMP's that will achieve the greatest decrease in fecal coliform bacteria and turbidity will be the primary factors during prioritization of cost share applications in Stokes, Rockingham and Caswell counties. Contract applications will be solicited with a specific deadline established. A site visit will be conducted for all applicants to evaluate the erosion problems and suggest solutions to correct the issue. Such practices that may be offered as corrective measures include but are not limited to; field borders, grassed waterways, cropland conversion, heavy use protection areas, and livestock exclusion from the streams by fencing. Cattle will be able to access water by use of a water tank that is recharged by a well that is drilled on the property. This project will also focus on promoting agronomic farm management techniques that will also decrease the sediment load into the water body. An example of some of these techniques includes the following; sod-based rotations and long term no-till. Information will be collected at each site such as slope, crop rotation, farm management practices, drainage area and size of gullies, if applicable, in order to calculate the potential soil loss before and after BMP installation. The Revised Universal Soil Loss Evaluation calculations will be utilized in this process. Each applicant will then be ranked based upon the reduction of soil loss and distance from the stream, at a minimum.

Project Atlas:

Below is a map showing the location of projects that are in need of BMPs to date. Additional projects will be added as they become evident



Below is a description of the projects identified in the map above. Additional projects will be catalogued as they become evident.

Id	County	BMPs	Cost	Stream
0	Stokes	Manly Stovall	\$0	Caldwell Creek
0	Stokes	1233 Sizemore Rd Germanton	\$0	Town Fork Creek
0	Stokes	Benny Martin	\$0	Crooked Creek
0	Stokes	Steve Jessup	\$0	Marshall Creek
0	Stokes	Steve Jessup	\$0	Marshall Creek
0	Stokes	Steve Jessup	\$0	Marshall Creek
0	Stokes	Rocco Orso	\$0	Crooked Creek
0	Stokes	Rickie Wood	\$0	Mill Creek
0	Stokes	James Collins	\$0	Beaverdam Creek
7	Rockingham	Josh Lawson	\$20,000	Little Hogan's Creek
2	Rockingham	Bobby Baker	\$12,000	Little Hogan's Creek
5	Rockingham	Craig Robertson	\$22,000	Buffalo Creek
1	Rockingham	Watt Combs	\$24,000	Matrimony Creek
3	Rockingham	Larry Lemons	\$22,000	Roach Creek
8	Rockingham	Ronald McCollum	\$10,000	Dan River
12	Rockingham	Misty Byrd	\$11,000	Dan River
6	Rockingham	Sammy Manuel	\$11,000	Rock House Creek
11	Rockingham	\$HCamp	\$90,000	Carroll Creek
4	Rockingham	Tommy Kimbro	\$12,000	Lick Fork Creek
9	Rockingham	Bobby Wharton	\$8,000	Lick Fork Creek
10	Rockingham	Ricky Lasley	\$27,000	White Oak Creek
0	Caswell		\$3,500	Rattlesnake Creek
0	Caswell	GWW, FB	\$3,000	Country Line Creek
0	Caswell	GWW< FB	\$3,500	Country Line Creek
0	Caswell	GWW, FB	\$3,500	Country Line Creek
0	Caswell	GWW, FB	\$3,000	Country Line Creek
0	Caswell	GWW, FB	\$3,500	Country Line Creek
0	Caswell	Animal Operation	\$25,000	Dan River
0	Caswell	GWW, FB	\$3,500	Kilgore Creek
0	Caswell	GWW, FB	\$3,500	Moon Creek
0	Caswell	GWW, FB	\$30,000	Rattlesnake Creek
0	Caswell	GWW, FB	\$3,500	Moon Creek
0	Caswell	CC	\$12,000	Penson Creek
0	Caswell	CC	\$14,000	Burkes Creek
0	Caswell	GWW, FB	\$3,500	Kilgore Creek
0	Caswell	CC	\$12,000	Hycy Creek
0	Caswell	CC, GWW, FB	\$8,500	Reedy Fork Creek

0	Caswell	Animal Operation	\$12,000	Reedy Fork Creek
0	Stokes	SBS, GWW, FB	\$30,000	Little Snow Creek
0	Stokes	Darryn Blaylock LTNT	\$12,000	Dan River
0	Stokes	Ralph Kiger LE, Wa	\$30,000	Mill Creek
0	Stokes	Paula Duggan	\$9,500	Dan River
0	Rockingham	GWW, FB	\$4,200	Quaqua Creek
			\$502,200	

Photographs of Needed BMPs



Cattle in the Little Snow Creek.



Cattle use this area to cross the creek on the Little Snow Creek in Stokes County.



Cattle that have access to a pond near the Dan River in the town of Asbury in Stokes County.



This site is located at the bridge crossing the Dan River at the Town of Milton in Caswell County



This area is used by cattle for drinking water and as a place to cross at a farm located at on the Little Snow Creek in Stokes County.



Example of bank erosion located at the Rattlesnake creek in Caswell County. This Stream is in need of restoration work to stabilize the banks from excessive erosion.



Photo's showing Rattlesnake Creek along Slate Road where heavy erosion is occurring in Caswell County.



Heavy Use area needed at a Farm located in Stokes County.



Heavy Use Area needed at a farm in Stokes County.



Heavy Use Area needed on a farm in Stokes County.



**Area where Cattle need to be excluded from the stream and an adequate water supply provided.
Located in Stokes County.**