Watershed Based Plan

Project Name: Del Rio Restoration Project

Lead Organization: Cocke County Soil Conservation District

The Cocke County Soil Conservation District will provide overall leadership and administration for this project. The District will coordinate and process septic system applications, provide accounting of project receipts and process for payment, conduct community meetings and outreach, and participate in field day organization.

The project manager for this program is Amanda Hill, District Clerk of the Cocke County Soil Conservation District. The Districts office number is (423) 623-8646 and is located at 451 W Broadway Street, Newport, TN 37821. Amanda's email address is Amanda.Hill@tn.nacdnet.net .

Watershed Identification:

Bakers Branch (TN06010105003_1110) and Johns Creek (TN06010105003_11000) covers 5.85 miles in the Del Rio community of Cocke County and is in the Upper French Broad watershed (HUC 06010105).

Causes & Sources of Nonpoint Source Pollution in the Watershed:

This project is in the Upper French Broad Watershed (HUC06010105) and focuses specifically on Bakers Branch (TN06010105003_1110) and Johns Creek ((TN06010105003_11000). These streams are on the 303(d) list of impaired waters published by the Tennessee Department of Environment & Conservation (TDEC) in 2018. Both water sources are listed as having Escherichia Coli due to on-site treatment systems (septic systems & similar decentralized systems). The following information is from the Tennessee Department of Environment and Conservation website and the Total Maximum Daily Load (TDML) for E. Coli in the Upper French Broad River Watershed (HUC 06010105) Cocke County, Tennessee final report approved: August 26, 2009, ((TDEC)).

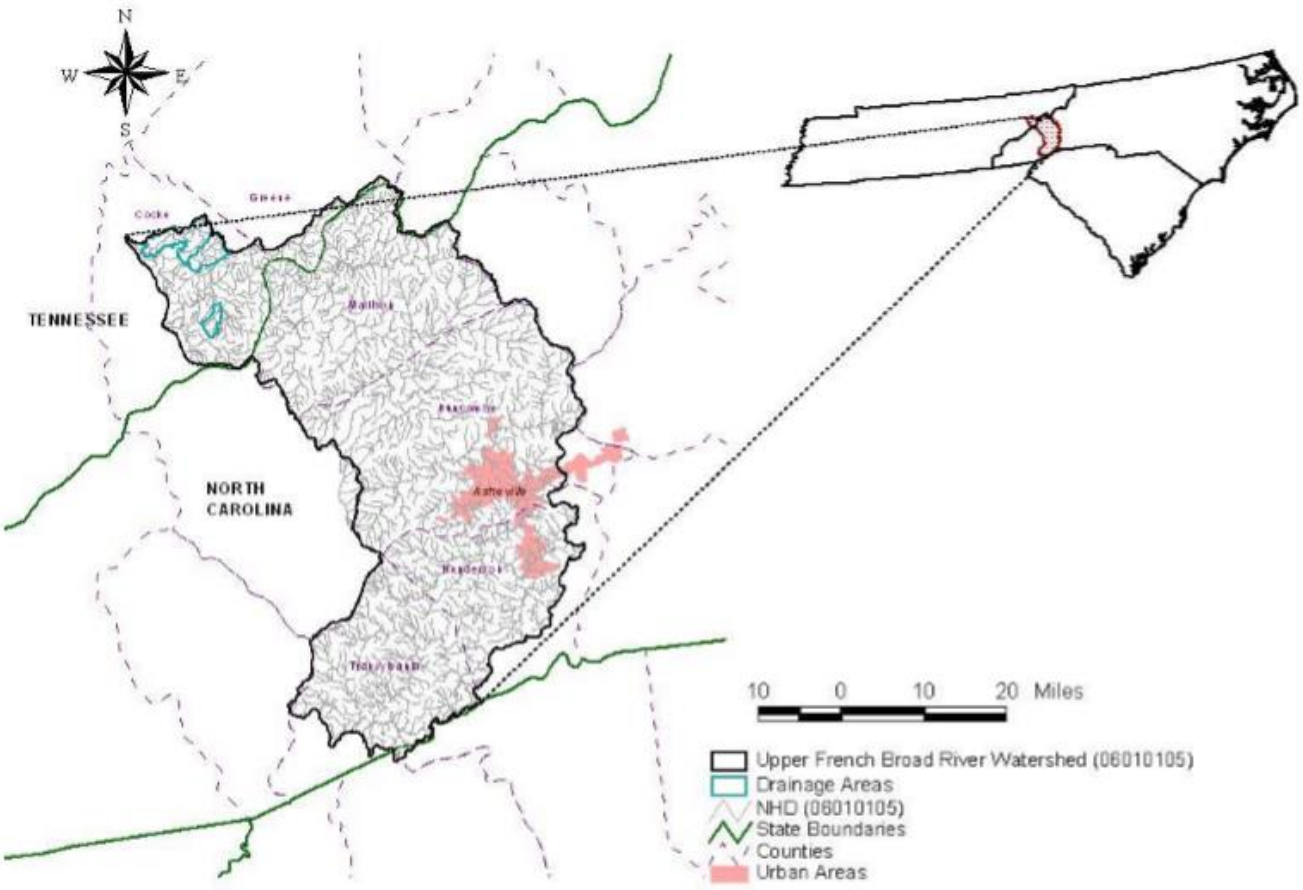


Figure 1. Location of the Upper French Broad River Watershed.

((TDEC) 13)

Impaired Waterbody Information State: Tennessee Counties: Cocke Watershed: Upper French Broad River (HUC 06010105) Constituents of Concern: E. coli		
Waterbody ID	Waterbody	Miles Impaired
TN06010105003-1100	JOHNS CREEK	1.45
TN06010105003-1110	BAKER CREEK	4.4

((TDEC) 8)

TMDL Scope:

Waterbodies identified on the Final 2008 303(d) list as impaired due to E. coli. TMDLs were developed for impaired waterbodies on a HUC-12 subwatershed or waterbody drainage area basis.

Analysis/Methodology:

The TMDLs for impaired waterbodies in the Upper French Broad River watershed were developed using a load duration curve methodology to assure compliance with the E. coli 126 CFU/100 mL geometric mean and the 487 CFU/100 mL maximum water quality criteria for lakes, reservoirs, State Scenic Rivers, or Exceptional Tennessee Waters and 941 CFU/100 mL maximum water quality criterion for all other waterbodies. A duration curve is a cumulative frequency graph that represents the percentage of time during which the value of a given parameter is equaled or exceeded. Load duration curves are developed from flow duration curves and can illustrate existing water quality conditions (as represented by loads calculated from monitoring data), how these conditions compare to desired targets, and the region of the waterbody flow zone represented by these existing loads. Load duration curves were also used to determine percent load reduction goals to meet the target maximum loading for E. coli. When sufficient data were available, load reductions were also determined based on geometric mean criterion.

Critical Conditions:

Water quality data collected over a period of up to 10 years for load duration curve analysis were used to assess the water quality standards representing a range of hydrologic and meteorological conditions.

For each impaired waterbody, critical conditions were determined by evaluating the percent load reduction goals and the percent of samples exceeding TMDL target concentrations (percent exceedance), for each hydrologic flow zone, to meet the target (TMDL) loading for E. coli. The percent load reduction goal and/or the percent exceedance of the greatest magnitude corresponds with the critical flow zone(s).

Seasonal Variation:

The 10-year period used for LSPC model simulation period for development of load duration curve analysis included all seasons and a full range of flow and meteorological conditions.

Margin of Safety (MOS):

Explicit MOS = 10% of the E. coli water quality criteria for each impaired subwatershed or drainage area.

((TDEC) 9)

The geometric mean standard for the E. coli group of 126 colony forming units per 100 ml (CFU/100 ml) and the sample maximum of 487 CFU/100 ml have been selected as the appropriate numerical targets for TMDL development for Long Creek. The geometric mean standard for the E. coli group of 126 colony forming units per 100 ml (CFU/100 ml) and the sample maximum of 941 CFU/100 ml have been selected as the appropriate numerical targets for TMDL development for the other impaired waterbodies.

Table 2 Final 2008 303(d) List for E. coli Impaired Waterbodies – Upper French Broad River Watershed

Waterbody ID	Impacted Waterbody	Miles/Acres Impaired	Cause (Pollutant)	Pollutant Source
TN06010105003 – 1100	JOHNS CREEK	1.45	Escherichia coli	Septic Tanks
TN06010105003 – 1110	BAKER CREEK	4.4	Escherichia coli	Septic Tanks

((TDEC) 17)

7.2.3 Failing Septic Systems

Some of the coliform loading in the Upper French Broad River watershed can be attributed to failure of septic systems and illicit discharges of raw sewage. Estimates from 1997 county census data of people in the Upper French Broad River watershed utilizing septic systems were compiled using the WCS and are summarized in Table 6. In middle and eastern Tennessee, it is estimated that there are approximately 2.37 people per household on septic systems, some of which can be reasonably assumed to be failing. As with livestock in streams, discharges of raw sewage provide a concentrated source of coliform bacteria directly to waterbodies.

Table 6 Estimated Population on Septic Systems in the Upper French Broad River Watershed

County	Total Population (2000 Census)	Population on Septic Systems
Cocke	33,565	5,221

((TDEC) 26)

Estimate of Load Reductions:

Load reductions for the Del Rio Restoration Project will be measured by testing water samples for Escherichia Coli upon completion of the project. Repair or replacement of landowner septic systems will eliminate e-coli contamination significantly if not completely.

Tennessee NPS Program - Pollutant Load Reduction Estimation

Practice	Amount		N Reduction Factor	lbs. N/year
Septic Improvements	24 repairs	x	119.28	2862.72
Practice	**Amount**		**P Reduction Factor**	**lbs. P/year**
Septic Improvements	24 repairs	x	12.58	301.92
Practice	**Amount**		**Sediment Reduction Factor**	**tons sediment/year**
Septic Improvements	24 repairs	x	3.564	85.536

9.1 Application of Load Duration Curves for Implementation Planning

The Load Duration Curve (LDC) methodology (Appendix C) is a form of water quality analysis and presentation of data that aids in guiding implementation by targeting management strategies for appropriate flow conditions. One of the strengths of this method is that it can be used to interpret possible delivery mechanisms of E. coli by differentiating between point and non-point source problems. The load duration curve analysis can be utilized for implementation planning. See Cleland (2003) for further information on duration curves and TMDL development, and: http://www.tmdls.net/tipstools/docs/TMDLsCleland.pdf .

((TDEC) 32)

Urban Nonpoint Sources

Septic systems: When properly installed, operated, and maintained, septic systems effectively reduce pathogen concentrations in sewage. To reduce the release of pathogens, practices can be employed to maximize the life of existing systems, identify failed systems, and replace or remove failed systems (USEPA, 2005a). Alternatively, the installation of public sewers may be appropriate.

((TDEC) 36)

Table 9. Source area types for waterbody drainage area analyses.

Waterbody NameD	Source Area Type*			
	Urban	Agricultural	Mixed	Forested
Johns Creek	Ò			
Baker Creek	Ò			

* All waterbodies potentially have significant source contributions from other source type/landuse areas.

((TDEC) 42)

Table 10. Example Urban Area Management Practice/Hydrologic Flow Zone Considerations.

Management Practice	Duration Curve Zone (Flow Zone)				
	High	Moist	Mid-Range	Dry	Low
Bacteria source reduction					
Remove illicit discharges			L	M	H
Address pet & wildlife waste		H	M	M	L
Combined sewer overflow management					
Combined sewer separation		H	M	L	
CSO prevention practices		H	M	L	
Sanitary sewer system					
Infiltration/Inflow mitigation	H	M	L	L	
Inspection, maintenance, and repair		L	M	H	H
SSO repair/abatement	H	M	L		
Illegal cross-connections					
Septic system management					
Managing private systems		L	M	H	M
Replacing failed systems		L	M	H	M
Installing public sewers		L	M	H	M

((TDEC) 42)

Urban Sources Areas: Baker Creek

E.1 Urban Source Areas

For impaired waterbodies and corresponding HUC-12 subwatersheds or drainage areas identified as predominantly urban source area types, the following example for Baker Creek provides guidance for implementation analysis:

The Baker Creek watershed, HUC-12 060101050801, lies in a rural area of the Upper French Broad River watershed. The drainage area for Baker Creek is approximately 1,416 acres (2.21 mi^2); therefore, four flow zones were used for the duration curve analysis (see Sect. 9.1.1).

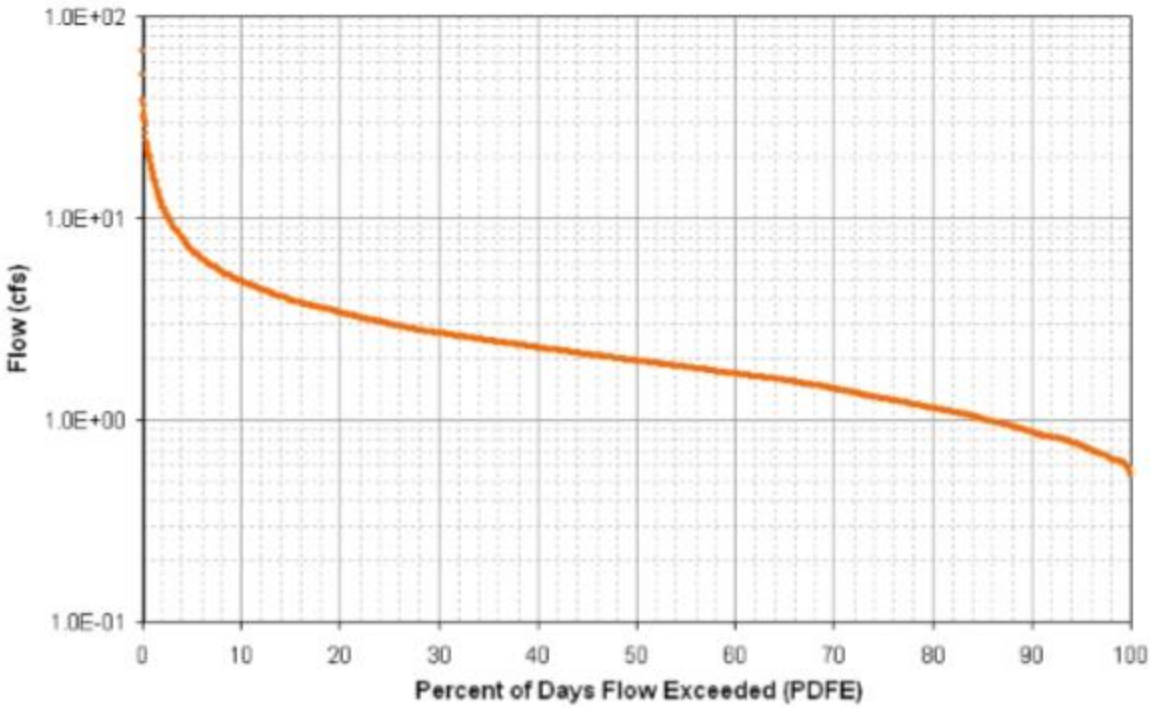
Note: The Final 2008 303(d) List includes Septic Tanks as a Pollutant Source category for Baker Creek; therefore, Baker Creek is listed in the Urban source area type in Section 9.5, Table 9.

The flow duration curve for Baker Creek at mile 0.1 was constructed using simulated daily mean flow for the period from 10/1/96 through 9/30/06 (mile 0.1 corresponds to the location of monitoring station BAKER000.1CO). This flow duration curve is shown in Figure E-1 and represents the cumulative distribution of daily discharges arranged to show percentage of time specific flows were exceeded during the period of record. Flow duration curves for other impaired waterbodies were developed using a similar procedure (Appendix C).

The E. coli LDC for Baker Creek (Figure E-2) was analyzed to determine the frequency with which observed daily water quality loads exceed the E. coli target maximum daily loading (941 CFU/100 mL x flow [cfs] x conversion factor) under four flow conditions (low, mid-range, moist, and high). Observation of the plot illustrates that exceedances occurred during all flow conditions.

The critical flow condition appears to be during moist conditions. However, additional monitoring, representative of all seasons and flow regimes is recommended. If additional monitoring confirms that the moist conditions regime is the critical condition, the implementation strategy for the Baker Creek watershed will require BMPs targeting non-point sources (dominant under high flow/runoff conditions).

((TDEC) 74)


1.0E+02
1.0E+01
1.0E+00
1.0E-01
Flow (cfs)
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Flow Exceeded (PDFE)

((TDEC) 75)

Table E-1. Load Duration Curve Summary for Implementation Strategies (Example: Baker Creek subwatershed, HUC-12 060101050801) (4 Flow Zones).

Hydrologic Condition		High	Moist	Mid-range	Low
% Time Flow Exceeded		0-10	10-40	40-70	70-100
Baker Creek (060101050801)	Number of Samples	1	5	6	0
	% > 941 CFU/100 mL[1]	100.0	40.0	33.3	0
	Load Reduction[2]	45.7%	20.1%	9.2%	NA
TMDL (CFU/day)		1.580E+11	6.877E+10	4.209E+10	2.323E+10
Margin of Safety (CFU/day)		1.580E+10	6.877E+09	4.209E+09	2.323E+09
WLA (WWTFs) (CFU/day)		NA	NA	NA	NA
WLAs (MS4s) (CFU/day/acre)[3]		NA	NA	NA	NA
LA (CFU/day/acre)[3]		1.004E+08	4.371E+07	2.675E+07	1.476E+07
Implementation Strategies[4]					
Municipal NPDES			L	M	H
Stormwater Management			H	H	
SSO Mitigation		H	M	L	
Collection System Repair			H	M	
Septic System Repair			L	M	M
Potential for source area contribution under given flow condition (H: High; M: Medium; L: Low)					

[1] Tennessee Maximum daily water quality criterion for E. coli.
[2] Reductions (percent) based on mean of observed percent load reductions in range.
[3] LAs and MS4s are expressed as daily load per unit area in order to provide for future changes in the distribution of LAs and MS4s (WLAs).
[4] Watershed-specific Best Management Practices for Urban Source reduction. Actual BMPs applied may vary and should not be limited according to this grouping.

Table E-1 presents an allocation table of LDC analysis statistics for Baker Creek E. coli and implementation strategies for each source category covering the entire range of flow (Stiles, 2003). The implementation strategies listed in Table E-1 are a subset of the categories of BMPs and implementation strategies available for application to the Upper French Broad River watershed for reduction of E. coli loading and mitigation of water quality impairment from urban sources. Targeted implementation strategies and LDC analysis statistics for other impaired waterbodies and corresponding HUC-12 subwatersheds and drainage areas identified as predominantly urban source area types can be derived from the information and results available in Tables 10 and E-11.

Table E-11 presents LDC analyses (TMDLs, WLAs, LAs, and MOS) and PLRGs for all flow zones for all E. coli impaired waterbodies in the Upper French Broad River watershed.

((TDEC) 76)

Table E-9 Calculated Load Reduction Based on Daily Loading – Baker Creek – RM0.1

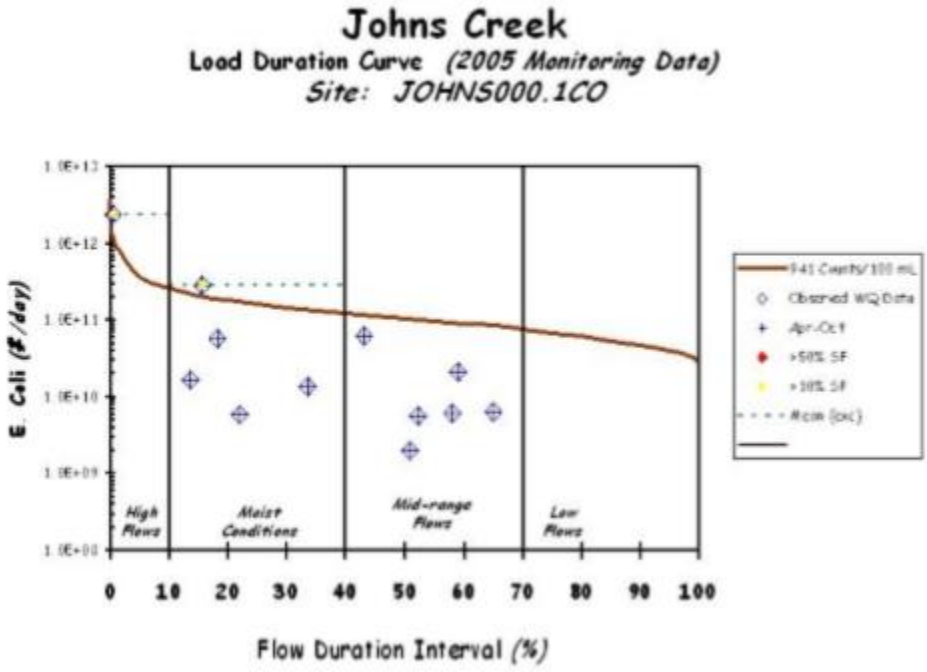
Sample Date	Flow Regime	Flow	PDFE	Concentration	Load	% Reduction to Achieve TMDL	Average of Load Reductions	% Reduction to TMDL – MOS
		[cfs]	[%]	[CFU/100 ml]	[CFU/day]	[%]	[%]	[%]
6/28/05	High Flows	24.14	0.4%	1733	1.02E+12	45.7	45.7	51.1
8/16/05	Moist Conditions	4.16	13.5%	2419	2.46E+11	61.1		
8/30/05		3.85	15.7%	1553	1.46E+11	39.4		
7/26/05		3.60	18.2%	387	3.41E+10	NR		
8/25/05		3.23	21.9%	6	4.74E+08	NR		
9/13/05		2.54	33.5%	23	1.43E+09	NR	20.1	22.1
9/20/05	Mid-Range Flows	2.18	43.1%	1414	7.53E+10	33.5		
9/27/05		1.94	50.9%	167	7.93E+09	NR		
10/11/05		1.90	52.2%	866	4.02E+10	NR		
10/4/05		1.74	58.1%	687	2.92E+10	NR		
10/18/05		1.72	59.0%	1203	5.05E+10	21.8		
10/25/05		1.57	65.0%	179	6.88E+09	NR	9.2	12.0

Note: NR = No reduction required
NA = Not applicable

((TDEC) 92)

Urban Sources Areas: Johns Creek

E. Coli Load Duration Curve for Johns Creek – RMO.1



((TDEC) 88)

Table E-7. Calculated Load Reduction Based on Daily Loading – Johns Creek – RM0.1

Sample Date	Flow Regime	Flow	PDFE	Concentration	Load	% Reduction to Achieve TMDL	Average of Load Reductions	% Reduction to TMDL – MOS
		[cfs]	[%]	[CFU/100 ml]	[CFU/day]	[%]	[%]	[%]
6/28/05	High Flows	56.29	0.4%	1733	2.39E+12	45.7	45.7	51.1
8/16/05	Moist Conditions	9.71	13.5%	71	1.69E+10	NR		
8/30/05		9.01	15.6%	1300	2.87E+11	27.6		
7/26/05		8.39	18.2%	279	5.73E+10	NR		
8/25/05		7.53	21.9%	32	5.90E+09	NR		
9/13/05		5.92	33.5%	96	1.39E+10	NR	5.5	7.0
9/20/05	Mid-Range Flows	5.08	43.2%	501	6.22E+10	NR		
9/27/05		4.52	50.9%	18	1.99E+09	NR		
10/11/05		4.43	52.2%	52	5.63E+09	NR		
10/4/05		4.05	58.1%	63	6.25E+09	NR		
10/18/05		4.00	59.0%	219	2.14E+10	NR		
10/25/05		3.66	65.0%	72	6.45E+09	NR	0.0	0.0

Note: NR = No reduction required
NA = Not applicable

((TDEC) 90)

Table E-8. Calculated Load Reduction Based on Geomean Data – Johns Creek – RM0.1

Sample Date	Flow	PDFE	Concentration	Geometric Mean	Calculated Reduction	
					to Target GM (126 CFU/100 ml)	to Target – MOS (113 CFU/100 ml)
	[cfs]	[%]	[CFU/100 ml]	[CFU/100 ml]	[%]	[%]
9/13/05	5.92	33.5%	96			
9/20/05	5.08	43.2%	501			
9/27/05	4.52	50.9%	18			
10/4/05	4.05	58.1%	63			
10/11/05	4.43	52.2%	52	77.72		
10/18/05	4.00	59.0%	219	91.66		
10/25/05	3.66	65.0%	72	62.18		

Note: Geometric Mean is calculated whenever 5 or more samples are collected over a period of not more than 30 consecutive days.

((TDEC) 91)

Table E-11 Summary of TMDLs, WLAs, & LAs expressed as daily loads for Impaired Waterbodies in the Upper French Broad River Watershed (HUC 06010105)

Waterbody Description (TN06010105__)	Hydrologic Condition			Flow[a]	PLRG	TMDL	MOS	WLAs			LAs
	Flow Regime	PDFE Range	Flow Range					WWTFs [b]	CS	CAFOs	
		[%]	[cfs]	[cfs]	[%]	[CFU/d]	[CFU/d]	[CFU/d]			[CFU/d/ac]
Clear Creek Waterbody ID: 001 – 0100 HUC-12: 0703	High Flows	0 – 10	45.0 – 168.8	69.17	84.3	1.591×10^{12}	1.591×10^{11}	1.264×10^{9}	0	0	1.050×10^{8}
	Moist	10 – 40	17.26 – 45.0	24.08		5.538×10^{11}	5.538×10^{10}				3.651×10^{7}
	Mid-Range	40 – 70	9.90 – 17.26	13.19		3.034×10^{11}	3.034×10^{10}				1.996×10^{7}
	Low Flows	70 – 100	2.03 – 9.90	6.66		1.532×10^{11}	1.532×10^{10}				1.003×10^{7}
Long Creek Waterbody ID: 002 – 0200 HUC-12: 0703	High Flows	0 – 10	22.17 – 85.7	33.77	62.2	4.052×10^{11}	4.052×10^{10}	NA	0	NA	5.145×10^{7}
	Moist	10 – 40	8.79 – 22.17	12.22		1.466×10^{11}	1.466×10^{10}				1.862×10^{7}
	Mid-Range	40 – 70	4.88 – 8.79	6.62		7.944×10^{10}	7.944×10^{9}				1.009×10^{7}
	Low Flows	70 – 100	1.02 – 4.88	3.18		3.816×10^{10}	3.816×10^{9}				4.845×10^{6}
Johns Creek Waterbody ID: 003 – 1100 HUC-12: 0801	High Flows	0 – 10	11.33 – 39.0	16.01	NR	3.682×10^{11}	3.682×10^{10}	NA	NA	NA	1.003×10^{8}
	Moist	10 – 40	5.32 – 11.33	6.96	0.7	1.601×10^{11}	1.601×10^{10}				4.362×10^{7}
	Mid-Range	40 – 70	3.33 – 5.32	4.26	14.3	9.798×10^{10}	9.798×10^{9}				2.670×10^{7}
	Low Flows	70 – 100	1.24 – 3.33	2.36	NA	5.428×10^{10}	5.428×10^{9}				1.479×10^{7}
Baker Creek Waterbody ID: 003 – 1110 HUC-12: 0801	High Flows	0 – 10	4.86 – 16.8	6.87	82.0	1.580×10^{11}	1.580×10^{10}	NA	NA	NA	1.004×10^{8}
	Moist	10 – 40	2.28 – 4.86	2.99		6.877×10^{10}	6.877×10^{9}				4.371×10^{7}
	Mid-Range	40 – 70	1.43 – 2.28	1.83		4.209×10^{10}	4.209×10^{9}				2.675×10^{7}
	Low Flows	70 – 100	0.53 – 1.43	1.01		2.323×10^{10}	2.323×10^{9}				1.476×10^{7}

Notes: NA = Not Applicable.
NR = No Reduction Required.
PLRG = Percent Load Reduction Goal to achieve TMDL.
CS = Collection Systems
Shaded Flow Zone for each waterbody represents the critical flow zone.

a. Flow applied to TMDL, MOS, and allocation (WLA[MS4] and LA) calculations. Flows represent the midpoint value in the respective hydrologic flow regime.
b. WLAs for WWTFs are expressed as E. coli loads (CFU/day). All current and future WWTFs must meet water quality standards as specified in their NPDES permit.

((TDEC) 94)

BMP List, Education Activities & Budget:

BMP Name	Quantity	Cost/ Unit	Budget Estimate
Septic System Repair	24 repairs	$5,000	$72,000

Educational Event	Quantity	Cost/Unit	Budget Estimate
Field Day	3 years	$400	$1,200

Miscellaneous	Quantity	Cost/Unit	Budget Estimate
Mileage for BMP Public Meetings & Field Day Events	3 Years	$400	$1,200
Refreshments for BMP Public Meetings	3 Years	$333.33	$1,000
Grant Announcements & Advertising	3 years	$866.66	$2,600
Office Supplies	3 Years	$333.33	$1,000

Total Budget for Project:	$79,000.00

Timeline, Task, and Assessment of Progress

The project will begin by notifying the public that the Cocke County Soil Conservation District has been awarded a grant and the grant details. The District will then arrange community meetings to discuss the nonpoint source impairment, cost share program, and will begin accepting septic repair/replacement applications. Once applications are reviewed and approved, applicants may begin contracting with septic system companies to begin work. Once repairs/replacements are finished and inspected by the health department receipts may be submitted for reimbursement. The District plans to repair at least five septic systems but not more than 8 per year over the three-year grant cycle. All aspects of this project will be completed within the three-year grant cycle, and below is a table detailing the timeline for task involved. Assessment of progress for this project will be based on the number of septic systems BMPs installed, number of attendees at public meetings, and number of attendees at Field Day events.

Years 1 - 3	
Timeline as of contract start date	**Task**
Month 1	Notice of grant award will be announced through local media outlets
Month 2	One public meeting will be held in the Del Rio community. Applications for septic system BMP will be accepted, reviewed, and presented to the District's Board of Supervisors for approval (activity completed monthly throughout grant cycle.)
Months 4-8	Participate in Field Day Events once scheduled
Month 10	Annual report due by October 15th
Month 12	At least five septic system BMPs will be completed, but no more than eight

Criteria to Assess Achievement of Load Reduction Goals

Water sample testing for Escherichia Coli may be taken at the conclusion of the three-year grant cycle to determine the load reductions caused by the repair or replacement of sewer systems. Tennessee Department of Environment and Conservation (TDEC) has two monitoring sites at the project location. The District will contact TDEC to monitor e-coli levels at the conclusion of the project to determine load reductions. The goal of the project is to significantly reduce or eliminate e-coli from the water. Below are our load reduction estimate calculations.

Tennessee NPS Program - Pollutant Load Reduction Estimation

Practice	Amount		N Reduction Factor	lbs. N/year
Septic Improvements	24 repairs	x	119.28	2862.72

Practice	Amount		P Reduction Factor	lbs. P/year
Septic Improvements	24 repairs	x	12.58	301.92

Practice	Amount		Sediment Reduction Factor	tons sediment/year
Septic Improvements	24 repairs	x	3.564	85.536

Monitoring and Documenting Success

Success of the project will be based on the number of septic systems repairs completed, number of attendees at public meetings, and number of attendees at Field Days. An outreach log or sign in sheets will be maintained to determine the number of attendees at the public meetings and Field Days. Pictures will be taken of each event except when small children are present or only after parental consent. Documentation will be maintained on all septic system repairs and will include an application, site pictures before and after repairs, copies of septic repair permits, and estimates and invoices for repair costs including materials used and services provided.

References

(TDEC), Tennessee Department of Environment and Conservation - Division of Pollution Control. *Total Maximum Daily Load (TMDL) for E. Coli in the Upper French Broad River Watershed (HUC06010105) Cocke County, Tennessee*. Nashville: Tennessee Department of Environment and Conservation, 2009. <https://tdec.tn.gov/FileNetServices/FileNetServices/downloadfile/%7B874EB30F-3243-45B7-A3B5-24139688A9EF%7D>.

Appendices

Appendix A – List of Abbreviations

LIST OF ABBREVIATIONS

ADB	Assessment Database
AFO	Animal Feeding Operation
BMP	Best Management Practices
BST	Bacteria Source Tracking
CAFO	Concentrated Animal Feeding Operation
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CFU	Colony Forming Units
DEM	Digital Elevation Model
DWPC	Division of Water Pollution Control
E. coli	Escherichia coli
EPA	Environmental Protection Agency
GIS	Geographic Information System
HSPF	Hydrological Simulation Program - Fortran
HUC	Hydrologic Unit Code
LA	Load Allocation
LDC	Load Duration Curve
LSPC	Loading Simulation Program in C**
MGD	Million Gallons per Day
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal Separate Storm Sewer System
MST	Microbial Source Tracking
NHD	National Hydrography Dataset
NMP	Nutrient Management Plan
NPS	Nonpoint Source
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PCR	Polymerase Chain Reaction
PDFE	Percent of Days Flow Exceeded
PFGE	Pulsed Field Gel Electrophoresis
Rf3	Reach File v.3
RM	River Mile
SSO	Sanitary Sewer Overflow
STP	Sewage Treatment Plant
SWMP	Storm Water Management Program
TDEC	Tennessee Department of Environment & Conservation
TDOT	Tennessee Department of Transportation
TMDL	Total Maximum Daily Load
TWRA	Tennessee Wildlife Resources Agency
USGS	United States Geological Survey
UCF	Unit Conversion Factor
WCS	Watershed Characterization System
WLA	Waste Load Allocation
WWTF	Wastewater Treatment Facility

((TDEC) 7)