

Crab Creek Implementation Plan

3/13/2014

Table 1. Best Management Practices needed to meet Crab Creek Bacteria and Sediment TMDLs

	Agricultural BMPs	Residential BMPs	Technical Assistance	Total
Stage 1	\$687,495	\$5,276,600	\$120,000	\$6,084,095
Stage 2	\$507,445	\$0	\$60,000	\$567,445
Total	\$1,194,940	\$5,276,600	\$180,000	\$6,651,540

Table 2. Best Management Practices installed since 2004 TMDL

	BMP Name	Extent Installed (systems, unless otherwise noted)	Acres Benefitted
Agricultural*			
	Stream Exclusion With Grazing Land Management	10,664 feet	320.0
	Legume Cover Crop	2	247.1
Urban**			
	Bio-retention	3	9.60
	Bioretention Basin	1	4.25
	Bioretention Filter	3	10.33
	Detention	37	1,159.29
	Detention	21	TBD
	Detention & Manufactured BMP	1	0.29
	Extended Detention	6	170.91
	Infiltration	3	1.29
	Infiltration Basin	1	TBD
	Manufactured BMP	3	3.84
	Underground Detention	5	22.40

**from the DCR BMP database: installed since 2004*

***from the Town of Christiansburg*

Residential Septic System Estimates and Assumptions:

- Total Septic Systems (1,882) from 2004 TMDL, based on 2000 US Census data & estimated to 2008
- Failing septic systems estimated by category: 40% failure rate for pre-1964 houses, 20% for 1964-1984, and 5% for after 1984
 - Total houses in each category calculated using US Census demographics
- Failing septic system practices or fixes based on Government Working Group input:
 - 30% septic pump-outs
 - 70% repairs
 - 25% replacements and 5% replacement with alternative waste treatment system
 - 2% new sewer connections
- Straight pipes (4) were estimated with 1990 US Census data
- Straight Pipe practices or fixes based on Government Working Group input:
 - 60% replace with conventional septic system
 - 40% replace with alternative waste treatment system

Table 3. Residential & Urban Best Management Practices

Control Measure	BMP Code	Units	Average Unit Cost	Extent Required					
				Stage 1*	Stage 2	Total	Stage 1	Stage 2	
				#			Costs		
Failing Septic Systems									
Septic Tank Pump-out	RB-1	system	\$300	565		565	\$169,500	\$0	
Connection to Public Sewer	RB-2	system	\$2,500	7		7	\$17,500	\$0	
Septic Tank System Repair	RB-3	system	\$3,500	237		237	\$829,500	\$0	
Septic Tank System Installation/Replacement	RB-4	system	\$7,500	79		79	\$592,500	\$0	
Alternative On-site Waste Treatment System	RB-5	system	\$15,000	36		36	\$540,000	\$0	
Straight Pipes									
Septic Tank System Installation/Replacement	RB-4	system	\$7,500	2		2	\$15,000	\$0	
Alternative On-site Waste Treatment System	RB-5	system	\$15,000	2		2	\$30,000	\$0	
Pet Waste Management									
Pet Waste Education Program		program	\$4,000	1		1	\$4,000	\$0	
Urban Stormwater									
Street Sweeping		acres treated				0	\$0	\$0	
Rain Gardens		acres treated	\$8,000	45		45	\$360,000	\$0	
Bioretention Filters		acres treated	\$20,000	4		4	\$80,000	\$0	
Riparian Buffers		acres treated	\$1,000	1		1	\$1,000	\$0	
Detention		acres treated	\$2,000	220		220	\$440,000	\$0	
Extended Detention		acres treated	\$2,000	37		37	\$74,000	\$0	
Manufactured BMPs		acres treated	\$15,000	1		1	\$15,000	\$0	
Detention and Manufactured BMPs		acres treated				0	\$0	\$0	
Constructed Wetlands/Wet Ponds		acres treated				0	\$0	\$0	
Infiltration		acres treated				0	\$0	\$0	
Enhanced E & S Controls		acres treated				0	\$0	\$0	
Streambank Erosion									
Streambank Stabilization		linear ft	\$100	21,086		21,086	\$2,108,600	\$0	
Technical Assistance									
Technical Assistance			\$60,000	1		1	\$60,000	\$0	
Total Cost							\$5,336,600		

* Stage 1 also assumes 100% reduction in sewer overflows

Table 4. Agricultural Best Management Practices

Control Measure	BMP Code	Units	Average Unit Cost	Extent Required							
				Stage 1		Stage 2		Total	Stage 1	Stage 2	Total
				#	% LU Treated	#	% LU Treated	#	Costs		
Livestock Exclusion											
Livestock Exclusion with Riparian Buffers	SL-6	system	\$32,800	9	85%			9	\$295,200	\$0	\$295,200
Livestock Exclusion with Reduced Setback	LE-2	system	\$20,000	1	10%			1	\$20,000	\$0	\$20,000
Stream Protection System	WP-2	system	\$10,000	1	5%			1	\$10,000	\$0	\$10,000
Pasture (Stage 1 = Option 1)											
Grazing Land Management System	EQIP 528, SL-9	acres	\$75	4,827	95%	27	5%	4,854	\$362,025	\$2,025	\$364,050
Reforestation of Erodible Pasture	FR-1	acres	\$600			113	2%	113	\$0	\$67,800	\$67,800
Permanent Vegetative Cover on Critical Areas	SL-11	acres	\$330			114	2%	114	\$0	\$37,620	\$37,620
Heavy Use Area Protection	EQIP 561	system	\$20,000			20	4%	20	\$0	\$400,000	\$400,000
Animal Waste Control Facility	WP-4	system	\$150,000					0	\$0	\$0	\$0
Water Control Structures	WP-1	acres-treated	\$138					0	\$0	\$0	\$0
Cropland											
Continuous No-till	SL-15A	acres	\$20	6	2%			6	\$120	\$0	\$120
Harvestable Cover Crop	SL-8H	acres	\$25	3	1%			3	\$75	\$0	\$75
Small Grain Cover Crop	SL-8B	acres	\$25	3	1%			3	\$75	\$0	\$75
Technical Assistance			\$60,000	1		1		2	\$60,000	\$60,000	\$120,000
Total Cost										\$1,314,940	

Table 5. Stream Exclusion Fencing Needs

Stream Length (ft)	Fencing installed after TMDL* (ft)	Remaining IP Fencing (ft)
29,553	10,664	18,889

*Four systems installed since TMDL and recorded in the DCR BMP Cost-share database

Table 6. Stream Exclusion Fencing Estimates

Stage	Goal	Unit	SL-6	LE-2T (systems)	WP-2T (systems)	CREP (systems)		SL-6 (\$)	LE-2T (\$)	WP-2T (\$)	CREP (\$)	Total (ft)	Total Cost (\$)	
			Feet*	1,870	1,870	1,870	1,870	Cost/ system	\$32,800	\$20,000	\$10,000	\$35,000		
			Distribution	85%	10%	5%	0%							
1	100%	system	9	1	1	0		\$295,200	\$20,000	\$10,000	\$0	20,570	\$325,200	
2	0%	system	0	0	0	0		\$0	\$0	\$0	\$0	0	\$0	
Total	100%		9	1	1	0		\$295,200	\$20,000	\$10,000	-	0	\$325,200	

*Average feet per system

Table 7. Pasture Best Management Practices Stage 1 Options

Best Management Practices	Unit	Cost/ Unit	Option 1		Option 2		Option 3	
			#	Total Cost	#	Total Cost	#	Total Cost
Riparian Buffers	acres treated		36	\$0	36	\$0	36	\$0
Heavy Use Area Protection	acres treated	\$20,000	0	\$0	0	\$0	20	\$400,000
Pasture Management	% pasture treated	\$75	4,827	\$362,025	4,174	\$313,050	4,318	\$323,850
Permanent Vegetation on Critical Areas	% pasture converted	\$330	0	\$0	170	\$56,100	0	\$0
			Total	\$362,025		\$369,150		\$723,850