Watershed Based Plan

for the

James River Tributaries of

South Fork of Potts Creek and UNT of Sweet Springs Creek

Submitted by the

West Virginia Conservation Agency

2011

Watershed Based Plan for the James River Tributaries South Fork of Potts Creek and UNT of Sweet Springs Creek

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For implementation of the James River Total Maximum Daily Load

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INTRODUCTION

The purpose of this watershed based plan is to define the problems, resources, costs and course of action necessary to restore the impaired streams of Potts Creek and one unnamed tributary of Sweet Springs Creek to full compliance with water quality standards. Following this watershed based plan will implement the Total Daily Maximum Load (TMDL) set for these streams by the WV Department of Environmental Protection (DEP).

Potts Creek and Sweet Spring Creek watersheds are tributaries of the James River in West Virginia. The West Virginia portion of the James River watershed lies entirely within Monroe County and encompasses approximately 71square miles. These two creeks are at the headwaters of the James River watershed. The remainder of the James River watershed is located in the state of Virginia and drains into the Chesapeake Bay. The TMDL divides these watersheds into 25 subwatersheds but only 10 are considered impaired and are modeled in the TMDL. These 10 impaired subwatersheds are the focus of this watershed based plan (Table 2).

These watersheds are in the Ridge and Valley Geological Province that encompasses most of the eastern border area of the state. The average elevation in these watersheds is 2,676 feet with the highest point of 4,033 feet at Arnolds Knob and the minimum elevation of 1,868 feet along Potts Creek at the border between West Virginia and Virginia. The geology of these watersheds is made up of siltstones, sandstones and some thin layers of limestone in the Potts Creek drainage. The ridges forming the watershed boundary with the Greenbrier watershed separate these watersheds from the Greenbrier limestone karst region of Monroe and Greenbrier counties to the west.

There are two towns in these watersheds, Waiteville and Sweet Springs. Only Waiteville is in the TMDL subwatersheds. The estimated population of the 10 impaired subwatersheds is estimated to be about 100 people. Landuse and land cover estimates were originally obtained from vegetation data gathered from the West Virginia Gap Analysis Land Cover Project (GAP). Enhancements and updates to the GAP coverage were made to create a modeled landuse from DEP source tracking information and 2003 aerial photography.

Table 1: **Modified modeled landuse for the 10 modeled subwatersheds in the James River Watershed from the TMDL.**

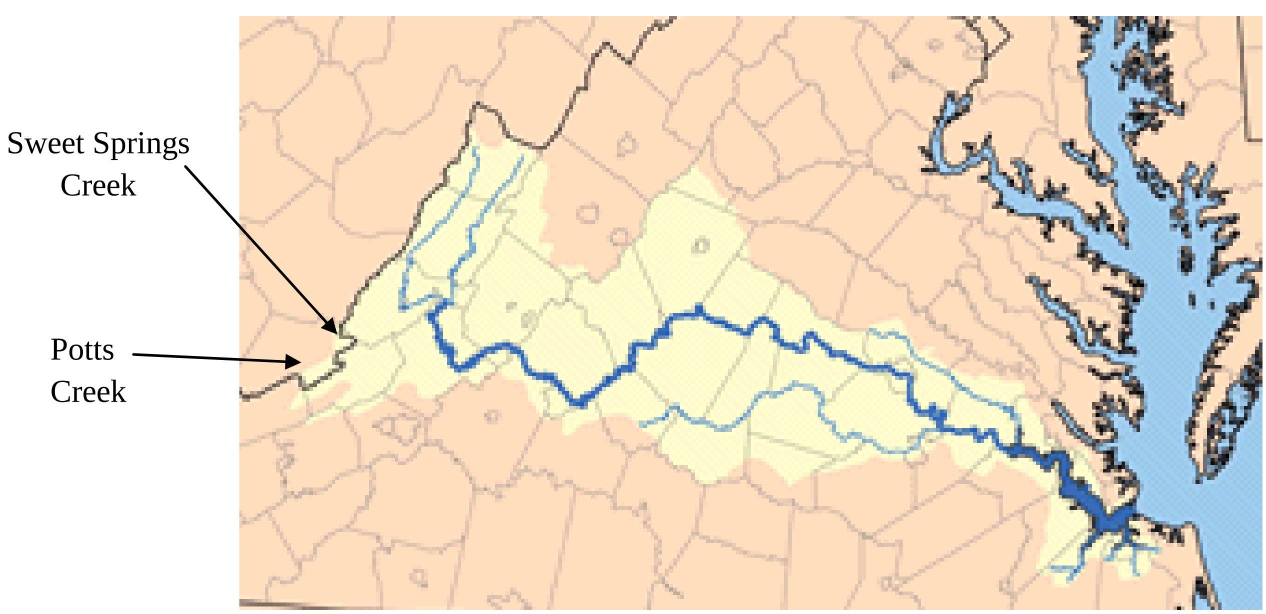
Landuse Type	Area of Watershed		
	Acres	**Square Miles**	**Percentage**
Water	< 0.01	0.00	< 0.01%
Wetland	0.45	0.00	0.01%
Forest	6730.04	10.52	87.46%
Barren	3.79	0.01	0.05%
Grassland	589.67	0.92	7.66%
Cropland	24.92	0.04	0.32%
Pasture	305.58	0.48	3.97%
Urban/Residential	40.00	0.06	0.52%
Total Area	**7694.45**	**12.02**	**100.00%**

The predominant economic activity in these subwatersheds is livestock agriculture. In the mountains draining into the South Fork of Potts Creek, especially in Ray Fork, there are hunting camps. Listed as residential they are only occasionally occupied. Most of the livestock are traditional species seen in Appalachia such as cattle, sheep and horses (Table A-5). But non-traditional species such as llamas are being grazed. On one farm in Potts Creek American Bison is the species being raised. Market conditions in the future may alter the numbers and species seen in these subwatersheds.

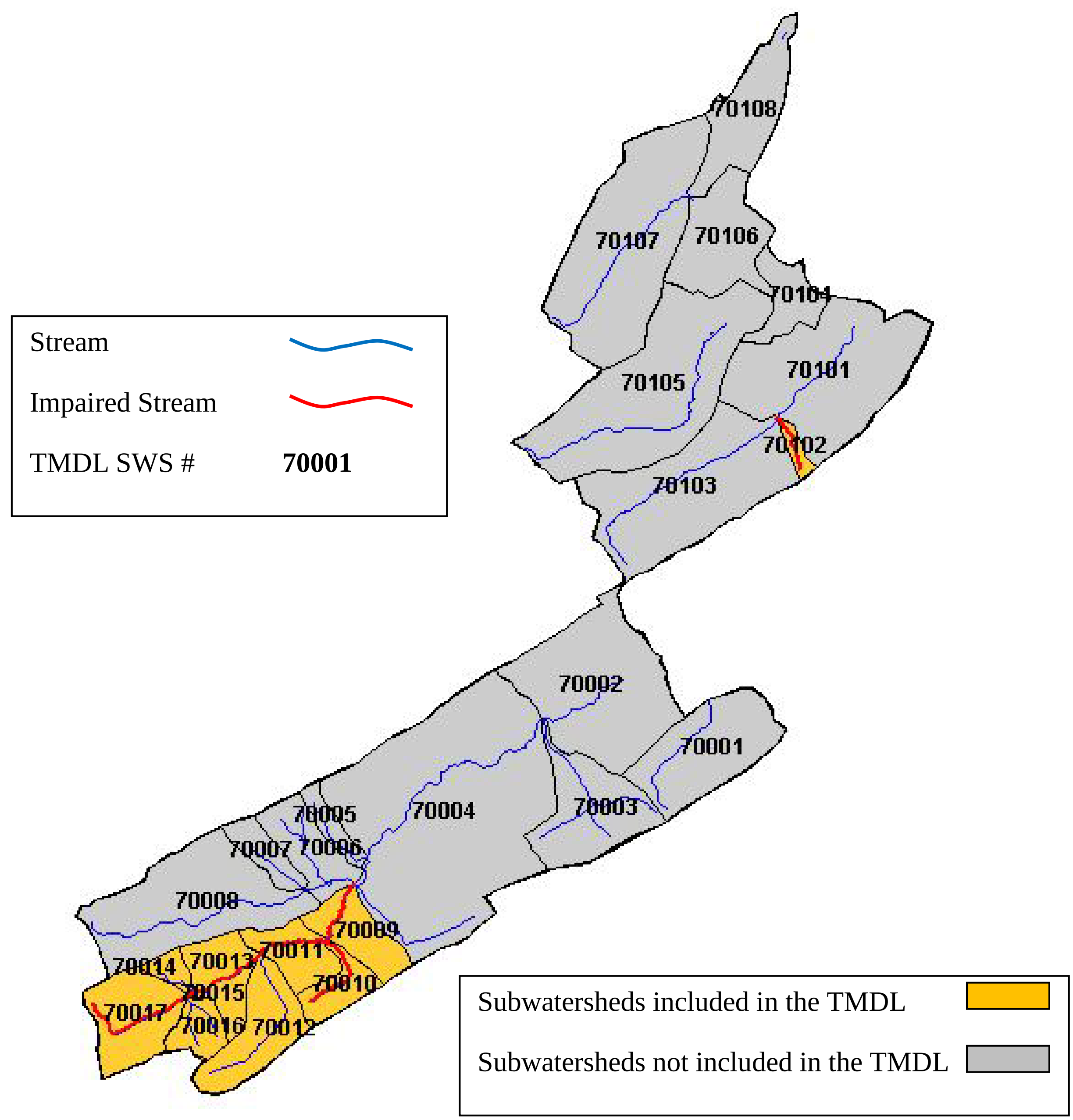
Table 2: **James River TMDL Subwatersheds in West Virginia**

Subwatershed	Stream Name	Stream Code
70009	South Fork/Potts Creek	WVJ-1-E
70010	Ray Fork	WVJ-1-E-1
70011	South Fork/Potts Creek	WVJ-1-E
70012	Crosier Branch	WVJ-1-E-2
70013	South Fork/Potts Creek	WVJ-1-E
70014	Whiskey Hollow	WVJ-1-E-3
70015	South Fork/Potts Creek	WVJ-1-E
70016	Harvey Hollow	WVJ-1-E-4
70017	South Fork/Potts Creek	WVJ-1-E
70102	UNT/Sweet Springs Creek RM 5.4	WVJ-2-H

Map 1: **James River Watershed**



Map 2: **The James River Subwatersheds in West Virginia**



A. CAUSES AND SOURCES

Section 303(d) of the federal Clean Water Act requires states to identify waterbodies that do not meet water quality standards and to develop appropriate TMDLs. A TMDL establishes the maximum allowable pollutant loading for a waterbody to achieve compliance with established water quality standards. It also distributes the load among pollutant sources establishing load reduction goals from each source.

The TMDL for West Virginia's portion of the James River watershed was approved by the U.S. Environmental Protection Agency (USEPA) in 2008. The TMDL model was based on extensive water quality monitoring from July 2004 through June 2005 by the DEP. The results of that monitoring were used to confirm the impairments to streams identified on previous 303(d) lists and to identify other impaired streams that were not previously listed.

Data obtained from pre-TMDL monitoring was compiled, and the impaired waters were modeled to determine baseline conditions and the gross pollutant reductions needed to achieve water quality standards. A TMDL is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS) that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving stream. TMDLs can be expressed in terms of mass per time or other appropriate units. TMDLs are calculated by the following equation:

$$\text{TMDL} = \text{sum of WLAs} + \text{sum of LAs} + \text{MOS}$$

The determination of impaired waters involves comparing instream conditions to applicable water quality standards. West Virginia's water quality standards are codified at Title 47 of the *Code of State Rules* (CSR), Series 2, titled *Legislative Rules, Department of Environmental Protection: Requirements Governing Water Quality Standards*. Water quality standards consist of three components: designated uses; narrative and/or numeric water quality criteria necessary to support those uses; and an antidegradation policy.

In the West Virginia portion of the James River watershed, water contact recreation and public water supply are listed as the designated uses that have been impaired based on the water quality criteria for fecal coliform bacteria. In addition to those impairments, the aquatic life use in Ray Fork has been listed as impaired based on the narrative water quality criteria "Conditions Not Allowable in State waters" as described in the state's water quality standards Title 47 CSR Series 2 – 3.2.i. The water quality standard for human health from 47 CSR, Series 2, *Legislative Rules, Department of Environmental Protection: Requirements Governing Water Quality Standards* is:

"**Human Health Criteria** Maximum allowable level of fecal coliform content for Primary Contact Recreation (either MPN [most probable number] or MF [membrane filter counts/test]) shall not exceed 200/100 mL as a monthly geometric mean based on not less than 5 samples per month; nor to exceed 400/100 mL in more than 10 percent of all samples taken during the month."

"**Conditions Not Allowable in State Waters** prohibits the presence of wastes in state waters that cause or contribute to significant adverse impacts to the chemical, physical, hydrologic, and biological components of aquatic ecosystems."

To determine biological impairment an assessment of the biological integrity of a stream is made based on a survey of the stream's benthic macroinvertebrate community. This community is rated using a multimetric index developed for use in wadeable streams of West Virginia. The West Virginia Stream Condition Index (WVSCI; Gerritsen et al., 2000) is composed of six metrics that were selected to maximize discrimination between streams with known impairments and reference streams. In general, streams with WVSCI scores of less than 60.6 points, on a normalized 0–100 scale, are considered biologically impaired.

Criteria for total fecal coliform bacteria are prescribed for the protection of the water contact recreation and public water supply human health uses. These criteria are presented as a geometric mean concentration, using a minimum of five consecutive samples over a 30-day period, and a maximum daily concentration that is not to be exceeded in more than 10 percent of all samples taken in a month.

Portions of Potts Creek and Sweet Springs Creek are parts of the James River watershed within the boundaries of West Virginia. The portions of these streams in WV have been subdivided into 25 catchment basins or subwatersheds for modeling purposes. Seven of these subwatersheds are bisected by the state boundary. (Map 2) This unusual dividing line between Virginia and West Virginia has not affected the TMDL because only ten of the subwatersheds have been determined to be impaired or contributing to the impairment of another stream and they all lie completely within West Virginia. These ten subwatersheds are all part of three streams listed in 303(d) list (Table 1).

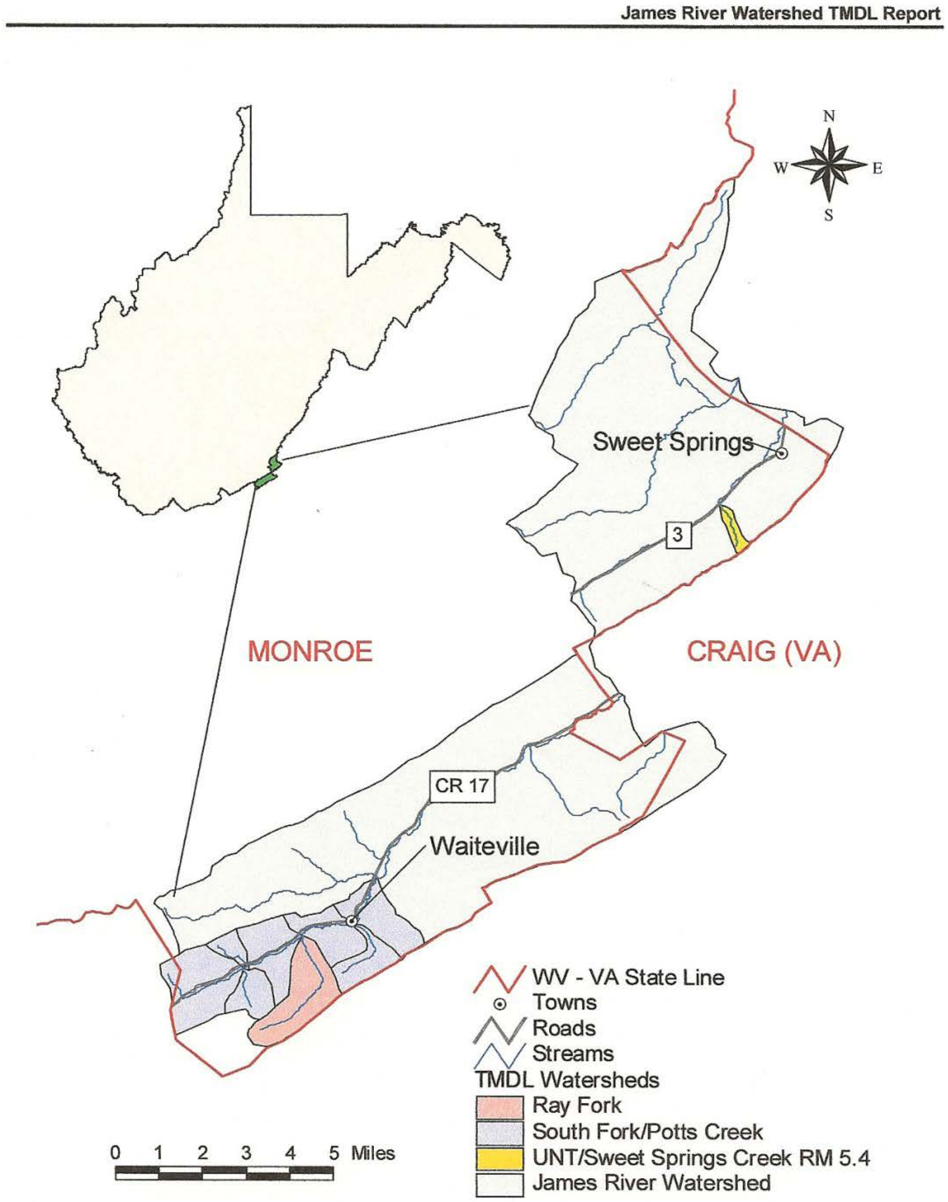
Table A-1. Waterbodies and impairments for which TMDLs have been developed

Stream Name	Code	FC	BIO
South Fork/Potts Creek	WVJ-1-E	X	
Ray Fork	WVJ-1-E-1	X	X
UNT/Sweet Springs Creek RM 5.4	WVJ-2-H	X	

Note:
FC indicates fecal coliform bacteria impairment
BIO indicates biological impairment
UNT = unnamed tributary.

Eight of the TMDL subwatersheds are part of the South Fork of Potts Creek and the mainstem. Ray Fork, which is a tributary of the South Fork of Potts Creek, is separated out due to its listing for biological impairment as well as fecal coliform impairment. The tenth subwatershed is the unnamed tributary (UNT) of Sweet Spring Creek at river mile (RM) 5.4.

MAP 3: **James River TMDL Subwatersheds**



Note: From the James River TMDL Report, WV Department of Environmental Protection, 2008

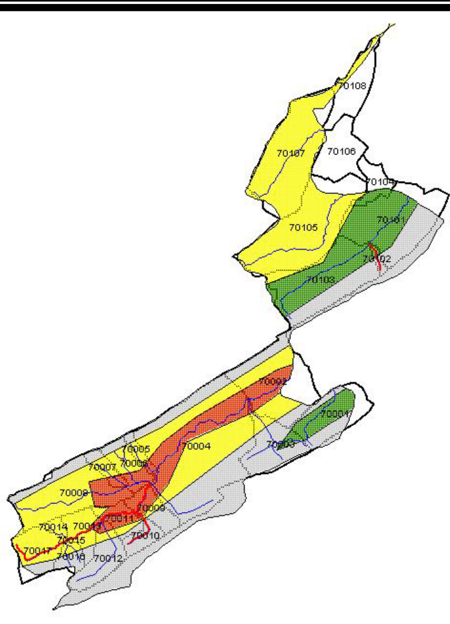
DEP used the USEPA developed *Stressor Identification: Technical Guidance Document* (Cormier et al., 2000) (SI) to evaluate and identify the significant stressors to the impaired benthic communities. The SI process identified organic enrichment as the cause of biological impairment in Ray Fork, where data also indicated violations of the fecal coliform water quality criteria. DEP determined that implementation of fecal coliform TMDLs would remove untreated sewage and reduce agricultural runoff thereby reducing the organic and nutrient loading causing the biological impairment in Ray Fork and fecal coliform impairment in the other subwatersheds. Therefore, fecal coliform TMDLs will serve as a surrogate where organic enrichment was identified as a stressor. There are no NPDES pollutant discharge permits issued in subwatersheds therefore all fecal coliform sources are considered nonpoint sources, the two predominant ones being failing septics and livestock pasture.

Failing Septic Systems

To calculate failing septic wastewater flows, the watersheds were divided into four septic failure zones during the source tracking process. Septic failure zones were delineated by geology, and defined by rates of septic system failure. Two types of failure were considered: complete failure and periodic failure. In the model a complete failure was defined as 50 gallons per house per day of untreated sewage escaping a septic system as overland flow to receiving waters. Periodic failure was defined as 25 gallons per house per day of untreated sewage escaping a septic system as overland flow to receiving waters. Table A-2 from the TMDL shows the percentage of homes with septic systems in each of the four septic zones experiencing septic system failure as determined by the source tracking process.

Table A-2: **Percentage of septic system failure by septic failure zone**

Type	Zone			
	Very Low	Low	Medium	High
Periodic Failure	3%	7%	13%	19%
Complete Failure	5%	10%	24%	28%



Map 4: **Septic Failure Rate Zones in the James River Watershed**

High:

Medium:

Low:

Very Low:

Note: From the James River TMDL GIS, WV Department of Environmental Protection, 2008

There are no public sewage treatment plants in the affected watersheds. Therefore all the wastewater systems in the watershed are septic systems and any pollution from these sources is considered a nonpoint pollution source by the DEP and the TMDL. No straight pipes were identified in the DEP source tracking during monitoring. Only TMDL Subwatersheds 70009 to 70013, inclusive, are considered since these are both impaired and within the medium and high septic failure zones. All of these subwatersheds are in the South Fork of Potts Creek watershed. This has limited the number of homes considered in the TMDL to a total of 40.

Table A-3: **Homes with failing septic systems by subwatershed and failure rate zone**

SUB ID	# homes	Very Low	Low	Medium	High
70009	11				11
70010	5				5
70011	8			2	6
70012	5				5
70013	11			9	2

By taking the residences located in medium and high septic system failure zones and applying the failure rates from Table A-2 a modeled number for complete and periodic failing systems is calculated. The model shows 9.55 complete failures and 8.15 periodic failures. Obviously this is modeling and not reality. These numbers will be raised to the next higher whole number to determine true failure rate. Actions needed to remove fecal coliform loading from these systems are explained in section C of this plan.

Agriculture

Agricultural runoff potential was assessed by DEP during source tracking efforts. Pastures were categorized into three general types of runoff potential: high, moderate, low or negligible. In general, pastures with steeper slopes and livestock with stream access or close proximity to the stream channel received a high runoff potential assessment. Pastures in areas with gentle slopes, without livestock stream access, with greater distance to a stream, or where streams contained well-established riparian buffers received a negligible runoff potential. Fecal coliform build-up, wash-off and storage limit parameters in areas rated as high or moderate with respect to runoff potential were assigned higher values; pastures with negligible runoff potential were assigned values slightly above natural background conditions. Table A-4 shows the ten TMDL subwatersheds and their ranking for agricultural runoff potential. Such a rating was not required for the other 15 subwatersheds.

Table A-4: **Agricultural Runoff Potential**

Sub ID	Stream	High	Moderate	Negligible
70009	SF Potts Ck		X	
70010	Ray Fork		X	
70011	SF Potts Ck		X	
70012	Crosier Br			X
70013	SF Potts Ck			X
70014	Whiskey Hl			X
70015	SF Potts Ck			X
70016	Harvey Hl			X
70017	SF Potts Ck			X
70102	UNT Sweet Spgs	X		

Agricultural sources were modeled based on a build up and wash off process dependent on average rainfall, number, type and distribution of animals. A recent survey of the numbers, types and distribution of animals within the subwatersheds is shown in Table A-5.

Table A-5: **Livestock Numbers by Subwatershed**

Subwatershed	Stream Name	# of Farms	Acres	# Cattle	# Sheep	# Horses	# Llamas
70009	South Fork/Potts Creek	4	181	102			5
70010	Ray Fork	1	0				
70011	South Fork/Potts Creek	4	337	85		25	5
70012	Crosier Branch						
70013	South Fork/Potts Creek						
70014	Whiskey Hollow	2	54	0			
70015	South Fork/Potts Creek						
70016	Harvey Hollow						
70017	South Fork/Potts Creek						
70102	UNT/Sweet Springs Creek RM 5.4	1	88	50	40		
	Totals	12	660	237	40	25	10

In particular Ray Fork (70010) had one farm but no animals are being grazed in this subwatershed as of March 2011. Visual and aerial surveys in Ray Fork show the presence of a significant number of hunting camps and some full time residences. Due to the discontinuation of grazing in this subwatershed the cause of biological impairment may be due to failing septic systems, if it's still impaired. However the disuse of the pasture land in Ray Fork may be due to market conditions or personal reasons of the farmer and could be just a temporary stoppage. If this farm becomes active again the TMDL will be reactivated and will place this farm on the priority list.

Whiskey Hollow (70014) is listed as having two farms but they are not active and were not listed in the 2008 TMDL as having any baseline loading. This would indicate that these farms have been inactive since 2005.

Other causes and sources

Since these subwatersheds are a part of the Chesapeake Bay drainage, project results reporting will include reduction numbers for nutrients [nitrogen (N) and phosphorus (P)] as well as sediment. These parameters are important in the Chesapeake Bay Program's tracking efforts. However DEP has not indicated either nutrients or sediment as parameters of concern in the TMDL.

A significant part of the subwatersheds can be classified as Type A streams under the Rosgen classification system. As high gradient streams they do not retain sediment and are not impaired by it. But, the South Fork of Potts Creek lies in the Potts Creek valley. It is a low gradient, meandering stream closer to a Type E on the Rosgen scale. Despite livestock access, the valley portion of the South Fork of Potts Creek does not show extreme streambank erosion except in the lowest portion (SWS# 70009). Bank erosion is primarily occurring in the bends of meanders as can be expected. Only three subwatersheds in the South Fork of Potts Creek were listed as having a moderate runoff potential (see Table A-4). With grazing discontinued at this time in Ray Fork, that would reduce sediment runoff potential in one of those three subwatersheds. The UNT of Sweet Springs Creek has a high runoff potential but its impact would enter Sweet Springs Creek where no sediment impairment was indicated.

West Virginia does not have numeric nutrient water quality criteria for nutrients therefore it was not included in the TMDL. However, both livestock and failing septic systems contribute to nutrient loading. Because these tributaries do eventually flow into the Chesapeake Bay reporting on sediment and nutrient reductions will be required. There was no data collected for these parameters in the South Fork of Potts Creek during the TMDL monitoring. Baseline levels for this stream will need to be established during the next year to cover all seasons and water level conditions.

B. LOAD REDUCTIONS REQUIRED

The load reductions being called for in this watershed based plan are based on the TMDL for the three streams listed. The TMDL is a load allocation that expresses what is allowed to enter the stream. Load reduction (LR) targets are determined by subtracting the TMDL from baseline load (BL) levels:

LR= BL – TMDL

LR is the accumulated reductions from practices installed during the implementation process. As such, it becomes the primary criteria for tracking environmental results.

Table B-1: **TMDL Load Reduction targets (Fecal coliform)**

Stream Name	Baseline (counts/yr)	LA (counts/yr)	MOS (counts/yr)	TMDL (counts/ yr)	% Reduction	LR (counts/yr)
South Fork/Potts Creek	1.97E+13	1.64E+13	8.63E+11	1.73E+13	16.87	2.46E+12
Ray Fork	1.52E+12	1.37E+12	7.18E+10	1.44E+12	10.05	8.07E+10
UNT/Sweet Springs Creek	1.39E+12	5.93E+11	3.12E+10	6.24E+11	57.34	7.66E+11

The ten subwatersheds in the three streams listed above have been assigned load allocations for each predominant land use in the TMDL. Allocation tables from the TMDL shows the allocations from the only two sources where reductions were called for.

Table B-2: **TMDL LAs for agriculture and septic systems**

Subwatershed	Pasture/Crop land Baseline Load (counts/yr)	Pasture/Crop land Allocated Load (counts/yr)	Pasture/Crop land Percent Reduction	Onsite Sewer Systems Baseline Load (counts/yr)	Onsite Sewer Systems Allocated Load (counts/yr)	Onsite Sewer Systems Percent Reduction
70009	3.19E+12	1.87E+12	41.3	3.42E+10	0.00E+00	100
70010	3.91E+11	2.54E+11	35.0	1.56E+10	0.00E+00	100
70011	3.71E+12	1.96E+12	47.2	2.37E+10	0.00E+00	100
70012	0.00E+00	0.00E+00	0.0	1.56E+10	0.00E+00	100
70013	0.00E+00	0.00E+00	0.0	2.90E+10	0.00E+00	100
70014	0.00E+00	0.00E+00	0.0			
70015	0.00E+00	0.00E+00	0.0			
70016	0.00E+00	0.00E+00	0.0			
70017	0.00E+00	0.00E+00	0.0			
70102	1.14E+12	3.43E+11	69.9			

Other land uses contribute to the baseline but have no load reductions required by the TMDL.

Table B-3: **Other land use contributions**

Subwatershed	Background & Other Nonpoint Sources Baseline Load (counts/yr)	Residential Baseline Load (counts/yr)
70009	1.46E+12	1.11E+11
70010	1.06E+12	5.06E+10
70011	1.23E+12	8.09E+10
70012	2.48E+12	5.07E+10
70013	1.70E+12	1.11E+11
70014	4.35E+11	0.00E+00
70015	1.26E+10	0.00E+00
70016	9.31E+11	0.00E+00
70017	2.59E+12	0.00E+00
70102	2.50E+11	0.00E+00
Total	**1.21E+13**	**4.04E+11**

While these land uses will not be the focus of project implementation project managers will take advantage of any opportunity to make load reductions, even in these categories.

The load reduction targets (LR) for the two activities of concern are listed in Table B-4.

Table B-4**: Load Reduction targets (Land uses of concern)**

Stream Code	Subwatershed	Pasture/Cropland LRs (counts/yr)	Onsite Sewer Systems Baseline Load (counts/yr)
WVJ-1-E	70009	1.32E+12	3.42E+10
WVJ-1-E-1	70010	1.37E+11	1.56E+10
WVJ-1-E	70011	1.75E+12	2.37E+10
WVJ-1-E-2	70012	0.00E+00	1.56E+10
WVJ-1-E	70013	0.00E+00	2.90E+10
WVJ-1-E-3	70014	0.00E+00	
WVJ-1-E	70015	0.00E+00	
WVJ-1-E-4	70016	0.00E+00	
WVJ-1-E	70017	0.00E+00	
WVJ-2-H	70102	7.97E+11	
Total		**4.00E+12**	**1.18E+11**

Failing septic systems (Onsite sewer systems)

The TMDL sets a target of zero load allocation for failing septic systems because West Virginia Bureau for Public Health (BPH) regulations prohibit the discharge of raw sewage into surface waters from all illicit discharges of human waste from failing septic systems and straight pipes. A base concentration of 10,000 counts per 100 mL was used as a beginning concentration for failing septics. This concentration was further refined during model calibration at the subwatershed scale. In the James River TMDL a count of 12,000 per 100 ml was used for loading calculations. As explained in the TMDL, the source tracking process and modeling resulted in 9.55 households with a completely failing system and 8.15 with a periodically failing system. Raising these to the next highest whole number would mean 10 households have a complete failure and 9 a periodic one. The resulting load reductions needed to achieve the TMDL and called for in this plan are shown in Table B-5.

Table B-5: **Septic Fecal coliform load reductions required**

Failure Rate	# households	gal/household/day	(ml/gal)/cfu	Days/yr	cfu/yr
Complete	10	50	4.54E+05	365	8.29E+10
Periodic	9	25	4.54E+05	365	3.73E+10
Total Reduction					**1.20E+11**

Pastureland

The TMDL only requires load reductions from pastureland in subwatersheds 70009, 70010,70011 and 70102. This is the lower portion of the South Fork of Potts Creek, Ray Fork and the UNT of Sweet Springs Creek. The other six subwatersheds in the headwaters of the South Fork of Potts Creek were rated as having negligible runoff potential from pastureland. Table A-5, which shows the latest figures on livestock numbers, which shows that the farm in Ray Fork is no longer pasturing livestock. This should result in an immediate load reduction in Ray Fork of 3.91E+11counts/year (baseline load) from the TMDL load allocation. A recent, April 2011, sampling for fecal coliform in Ray Fork resulted in a concentration of only 40 cfu/100 ml. This is well within standards. Because of this the load reduction, calculations for this plan will only include subwatersheds 70009, 70011 and 70102. The total load reductions to be achieved from livestock pastureland is shown in Table B-6 with a breakout by subwatershed.

Map 4: **Pastureland Runoff Potential Zones**

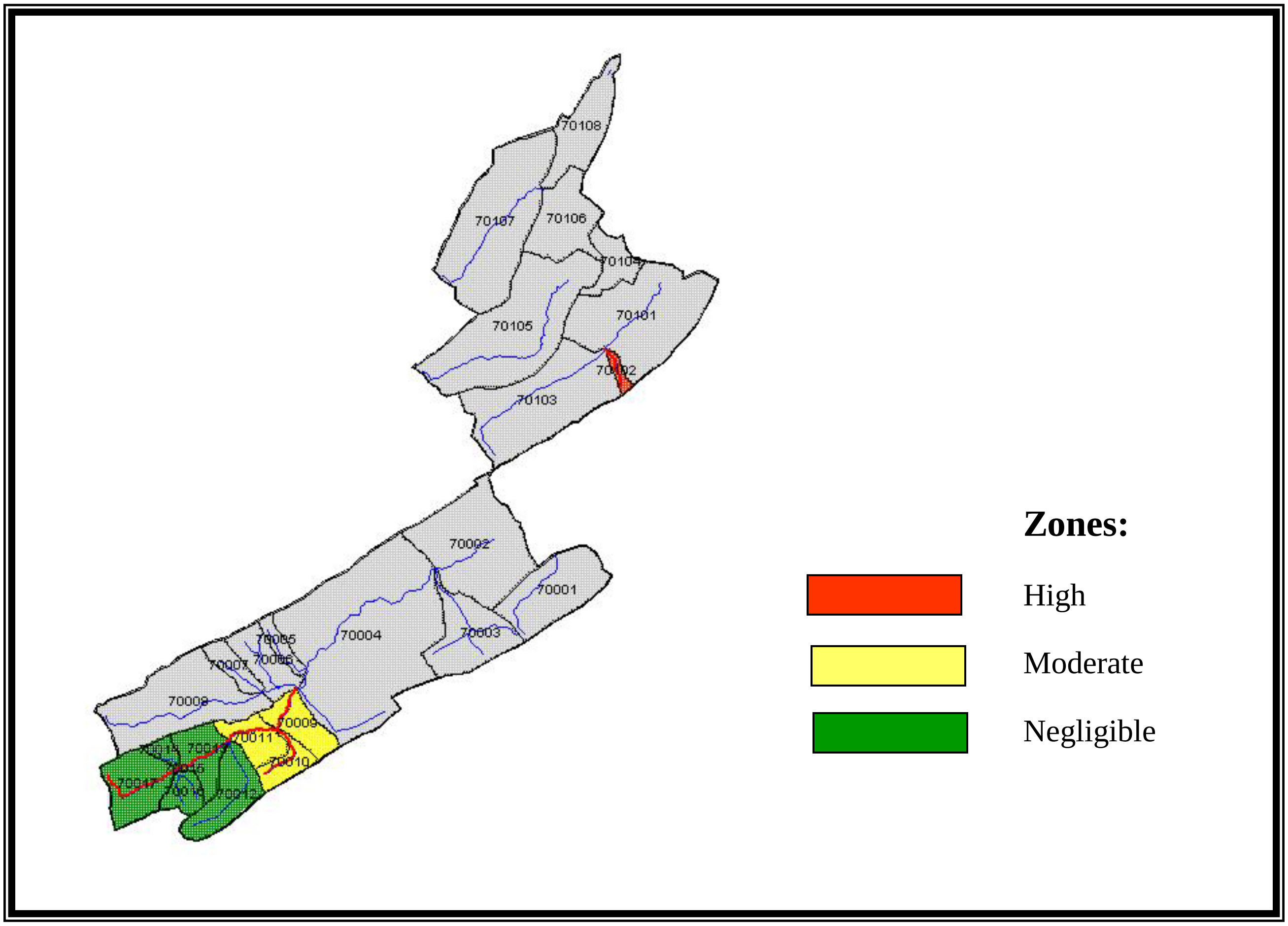


Table B–6: **Required Load Reductions from Pastureland**

Stream Code	Subwatershed	% Reduction	Pasture/Cropland LRs (counts/yr)
WVJ-1-E	70009	41.3	1.32E+12
WVJ-1-E	70011	47.2	1.75E+12
WVJ-2-H	70102	69.9	7.97E+11
Total			**3.87E+12**

Different species have varying impacts on the environment. Agricultural agencies use a standardized animal unit (AU) to measure these impacts. Table B-7 shows the total animal units in the subwatersheds. The conversion is based upon the Maryland Department of Agriculture's

Animal Unit Equivalencies, except for horses which was reduced to 1 because of the small breed being pastured in the watershed.

Table B-7: **Animal Units and % Reduction by Species**

Species	# of Head	Animal Unit /Head	# of AU	% Reduction /species
Beef Cattle	237	1	237	88.04
Horses	25	1	25	9.29
Sheep	40	0.1	4	1.49
Llamas	10	0.32	3.2	1.19
Total	312		269.2	100.00

Separating the animal units into the subwatersheds of concern according to the numbers in Table A-5 and calculating the load reductions required for each species in each subwatershed results in the load reductions shown in Table B-8.

Table B-8: **Load Reductions per Species per Subwatershed**

Subwatershed	Pasture/Cropland LRs (counts/yr)	Cattle LR (counts/yr)	Horses LR (counts/yr)	Sheep LR (counts/yr)	Llamas LR (counts/yr)
70009	1.32E+12	1.17E+12	1.34E+11	0	1.78E+10
70011	1.75E+12	1.49E+12	2.36E+11	0	2.91E+10
70102	7.97E+11	7.38E+11	0.00E+00	5.91E+10	0.00E+00
Total	**3.87E+12**	3.39E+12	3.69E+11	5.91E+10	4.69E+10

To predict how practices installed in the future will affect the pollution in these streams the modeled fecal coliform count for the livestock, if the animal had direct access to the stream, must be known. These counts would be the maximum count per animal. Other factors considered in the TMDL model included rainfall, runoff potential, seasonal variance and bacterial die off when deposited on the land. Other variables that can affect load reduction calculations are: the amount of time livestock spends in or near a stream; the mobility of the livestock and the location of feeding and watering areas especially during the wet winter season. All factors taken together have resulted in the modeled TMDL baseline for the subwatersheds.

The BMPs to be installed have a rated efficiency for reducing pollutant loads, these efficiencies are from the Chesapeake Bay Model. The WVCA will work with individual farmers to develop a combination of practices for a farm conservation plan. The intent of the plans is to restrict livestock access to the streams or lure them away from the streams. This reduces the levels of direct deposit of waste into the stream and the runoff potential of the farm.

Table B-9: **BMP Efficiencies**

BMP	Efficiency Rate
Filter Strip	70%
Single Stage Waste Stabilization Lagoon	85%
Sediment Pond/Swale in Combination with Filter Strip	85%
Fencing (complete removal of livestock from waterway)	90%
Buffer	80%
Off Watering System Without fencing	50%
Off Site Watering System With Flash Rotational Grazing In the Riparian Zone	90%

The BMPs to be installed are explained in greater detail in section C. In order to calculate load reductions based on the planned BMPs and to remain consistent with the TMDL some assumptions must be made. For example, it is assumed that the numbers and types of livestock have not changed since the source tracking efforts used in the TMDL. This allows the TMDL baseline load to be used as the starting point to track the load reductions from BMPs. Taking the pasture baseline loads only from the three subwatersheds being considered and dividing by the number of animal units (AU) results in a load of 3.21E+10 cfu/AU for the South Fork of Potts Creek (70009 and 70011) and 2.11E+10 cfu/AU on UNT Sweet Springs Creek. Multiplying the cfu/AU by the number of AU affected by the BMP(s) and multiplying that by the BMP efficiency will result in the estimated load reductions for that project. For example:

Table B-10: **Load Reduction Estimates for range of BMPs**

Subwatershed	baseline/au	Practice	Efficiency	LR	TMDL LR	LR/TMDL LR
70009	3.21E+10	Water w/o fence	0.5	1.90E+12	1.32E+12	144.21%
70011	3.21E+10	Water w/o fence	0.5	1.55E+12	1.75E+12	88.6%
70102	2.11E+10	Water w/o fence	0.5	5.70E+11	7.97E+11	71.48%
70009	3.21E+10	water w/ flash graze	0.9	3.43E+12	1.32E+12	259.37%
70011	3.21E+10	water w/ flash graze	0.9	2.79E+12	1.75E+12	159.47%
70102	2.11E+10	water w/ flash graze	0.9	1.03E+12	7.97E+11	128.66%

Table B-10 shows that the range of BMP efficiencies will achieve the TMDL except in UNT Sweet Springs Creek at the lowest efficiency (see page 28). This assumes all animals are included in each practice.

C. MANAGEMENT MEASURES

All pollution sources in these subwatersheds are considered nonpoint sources, therefore none can be dealt with through regulation. All management measures to be installed to restore these streams must come about with the voluntary cooperation of the landowners. To do this the project managers will offer a variety of practices which can be specifically designed or combined to suit the circumstances for each farm or residence. The two primary causes of impairment according to the TMDL are inadequate on-site wastewater treatment (failing septic systems) and livestock pasture.

On-site wastewater treatment:

Two categories of failing septic systems have been identified: completely and periodically failing systems. Experience has shown that completely failing systems usually indicates a lack of any system or one that is so antiquated or poorly maintained it fails on a year round basis. Periodically failing systems are usually septic systems that are not being properly maintained so that the drain fields are not functioning as they should and fail seasonally. To determine the specific needs a field survey must be conducted first to identify problem sites. This will require the participation of the Monroe County Health Department (MCHD), which is already involved in a similar effort in Second Creek in the adjoining watershed. Once a problem site has been identified a specific plan can be developed.

Completely failing systems usually require the installation of a new or upgraded system. New or upgraded systems will be installed in compliance with Health Department regulations based on home size and soil porosity and must be approved by the MCHD Sanitarian. The average cost for such a project is about $7500 but can range widely due to specific circumstances. Similar efforts in other watersheds throughout the state have used a combination of Section 319 grants administered through DEP and low interest loans from the On-Site Loan Program (OSLP) to fund these system replacements.

Periodically failing systems are usually systems where pumping the system combined with proper maintenance will solve the problem. One potential solution that has been used successfully in some Potomac watersheds is to offer residents partial payment coupons for septic tank pumping in combination with an educational effort to inform homeowners how to maintain their system in the future. In most cases this has cost less than $500 per home.

Due to the low population density of these subwatersheds, about 100 people, it is not likely a cluster system will be cost effective. However if the survey shows a grouping of failures in one location such a system could be an option. Cluster systems use the same technology for treatment and dispersal as onsite systems, but are sized to handle more than one house. They introduce two complexities over onsite systems, though: easements and required maintenance. Legal easements are required for houses served by cluster systems to insure that the treatment system remains functional through time and ownership changes. These easements insure that treatment is always available to the lot. Maintenance agreements, usually a contract with a qualified third party, are also required to insure the sustainability of the treatment system.

Livestock Pasture

To reduce fecal coliform pollution of these streams technicians with the WVCA and the NRCS will work closely with the farmers to develop conservation plans. The goal of these plans will be to install practices that will reduce the time livestock spend in or near a stream or ephemeral drainage. These practices will also have the intent of dispersing the livestock to avoid serious damage from trampling and manure build up. These management measures will be planned to assure they meet the overall load reduction required by the TMDL. These BMPs will be implemented through sound conservation planning and funded by various State programs, Federal Farm Bill Programs, Section 319 grants and landowner contributions. Any BMPs installed will comply with NRCS standards.

Conservation Plans: A record of landowners' decisions combined with a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality; the plan must meet agency technical standards. These plans include technical advice prepared by a certified conservation planner. All practices included in the USDA Natural Resources Conservation Service Field Office Technical Guide are eligible to be included in a conservation plan.

CREP: The Conservation Reserve Enhancement Program (CREP) is a federal-state land retirement conservation program targeted to address state and nationally significant agriculture-related environmental problems. The West Virginia CREP involves additional financial incentives to encourage the restoration of riparian and other natural habitats to protect the vitally important soil, water and wildlife. NRCS ranking protocols have not listed any of the farms in these subwatersheds as being qualified for CREP. If this changes then CREP will be promoted to the farmers for protecting riparian zones.

CRP: Due to the present ineligibility of these farmers for CREP, CRP may be a better fit for this effort. The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, farmers can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland. The Commodity Credit Corporation makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

EQIP: The Environmental Quality Incentive Program (EQIP) is a federal farm bill program, advised by a local work group, which provides cost-share funds to landowners with conservation plans to develop practices that address resource concerns on their farm.

The following BMP's are practices recommended by USDA NRCS that will address this resources concern or are support practices necessary to achieve the goals of the primary practices.

Alternative watering sources, with fencing: To reduce occurrences of livestock coming into direct contact with a stream or other waterway, a narrow strip of land along the stream bank can be fenced off. Alternative watering sources, such as spring development and wells with pipelines and troughs, must then be provided for the livestock. This will prevent livestock form defecating in or close to the stream, and reduce stream bank erosion. NRCS conservation practices that can accomplish this are: 378 Pond, 382 Fence, 516 Pipeline, 533 Pumping Plant for Water Control, 574 Spring Development, 587 Structure for Water Control, 614 Watering Facility, 636Water Harvesting Catchment, 642 Well, 472 Access Control. These practices correspond to BMP efficiencies in Table B-9 7 for: off site watering systems and fencing.

Alternative watering sources, without fencing: By providing an alternative source of clean water it has been shown that livestock will spend less time watering in streams and thereby impact the stream and the stream bank less than without the alternative source of water. Stream protection without fencing typically involves the use of livestock water troughs placed away from streams. With proper placement of the watering system, a better distribution of grazing and manure deposition occurs over the entire pasture as compared to the livestock using the stream exclusively for water. Research has indicated that these measures will reduce the time livestock spend in streams. These practices correspond to BMP efficiencies in Table B-9 for off-site watering without fencing.

Erosion and sediment control: Practices that protect water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams. *Examples:* Silt fence, slope drain, permanent vegetation. NRCS conservation practices that can accomplish this are: 342 Critical Area Planting, 395 Stream Habitat Improvement and Management, 580 Streambank and Shoreline Protection, 362 Diversion, and 561 Heavy Use Area Protection. Other practices are available and located in the WV Erosion and Sediment Control Handbook. These practices correspond to BMP efficiencies in Table B-9 for: sediment ponds/swale in combination with filter strip.

Riparian Buffer practices: Areas of vegetation (herbaceous or woody) that are tolerant of intermittent flooding or saturated soils and that are established or managed in the transitional zone between terrestrial and aquatic habitats. NRCS conservation practices that can accomplish this are: 314 Brush Management, 390 Riparian Herbaceous Cover, 412 Waterways, 468 Lined Waterways, 490 Tree/Shrub Site Prep, 612 Tree/Shrub Establishment, 391 Riparian Forest Buffer. These practices correspond to BMP efficiencies in Table B-9 for: Buffer and fencing.

Filter Strip: A strip or area of herbaceous vegetation situated between cropland, grazingland, or disturbed land (including forestland) and environmentally sensitive areas. NRCS conservation practices that can accomplish this are: 393 Filter Strip. These practices correspond to BMP efficiencies in Table B-9 for: Filter Strip and fencing.

Heavy Use Area Protection: Practices that restore or put into proper use, areas that are or have been used by large numbers of areas for feeding, walking, loafing. NRCS conservation practices that can accomplish this are: 313 Waste Storage Facility, 342 Critical Area Planting, 484 Mulching, 512 Pasture & Hayland Planting, 528 Prescribed Grazing, 560 Access Road, 561 Heavy Use Area Protection, 575 Animal Trails and Walkways, 561 Heavy Use Area Protection., as well as various erosion and sediment control measures according to the WV Erosion and Sediment Control Handbook. These practices correspond to BMP efficiencies in Table B-9 for: Sediment Pond/Swale in combination with filter strip and fencing.

Nutrient Management Plans: Farm operators develop a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield and appropriate ground cover. NRCS conservation practices that can accomplish this are: 100 CNMP Development, 313 Waste Storage Facility, 316 Animal Mortality Composter, 328 Conservation Crop Rotation, 329 Residue Management, 340 Cover Crop, 590 Nutrient Management, 634 Manure Transfer. These practices correspond to BMP efficiencies in Table B-9 for: Waste Stabilization Lagoon and fencing.

Nutrient Relocation. Farm operators who manage waste storage facilities will retain the right to retain all the manure necessary for their own fertilization purposes, but will be willing to give excess manure other farmers to spread on hay, pasture, or cropland as an alternative source. NRCS conservation practices that can accomplish this are: 590 Nutrient Management, 634 Manure Transfer. These practices correspond to BMP efficiencies in Table B-9 for: Waste Stabilization lagoon and fencing.

Animal Waste Management Systems - livestock and Poultry operators design practices for proper storage, handling, and use of wastes generated from confined animal operations. This includes a means of collecting, scraping, or washing wastes and contaminated runoff from confinement areas into appropriate waste storage structures. For poultry operations, litter sheds are typically used. Livestock feedlots and dairies commonly utilize waste lagoons or move animal feeding areas away from the streamside. NRCS conservation practices that can accomplish this are: 313 Waste Storage Facility, 359 Waste Treatment Lagoon. These practices correspond to BMP efficiencies in Table B-9 for: waste stabilization lagoon and fencing.

Storm Water Management: Practices that prevent stormwater form coming into contact with fecal material and washing it into streams. NRCS conservation practices that can accomplish this are: 362 Diversions, 412 Waterway, 468 Lined Waterway, 558 Roof Runoff Management, 606 subsurface Drain, and 620 Underground Outlet. These practices correspond to BMP efficiencies in Table B-9 for: Sediment Pond/Swale in combination with filter Strip.

Sediment Ponds & Wetlands: These structures intercept surface runoff and treat it through settling, then discharge it at a controlled rate to minimize the environmental and physical impacts on receiving waters. Less expensive runoff filtration practices such as vegetated swales may also be used. NRCS conservation practices that can accomplish this are: 350 Sediment Basin, 658 Wetland Creation, and 657 Wetland Restoration. These practices correspond to BMP efficiencies in Table B-9 for: Sediment Ponds/Swale in combination with filter Strip.

Prescribed Grazing (flash grazing): Significant resistance to establishing and/or maintaining woody buffers has already been encountered in these subwatersheds. This is due to two primary objections from the farmers. First, especially true in the meandering part of the South Fork of Potts Creek, there is a significant loss of acres of available pasture. Secondly, woody buffers create additional labor and costs to the farmer to clean and maintain due to flood debris. There has been less resistance expressed about grass buffers. Grass buffers can be maintained through a system of flash grazing following NRCS standards established in 528 Prescribed Grazing and 528 Prescribed Grazing Supplement Riparian Grazing. Flash grazing is used primarily for vegetation management of a filter strip, or other vegetated areas along a waterway, by allowing livestock to quickly graze off the vegetation during dry periods; it replaces the need for mowing and provides additional feed for livestock.

Any flash grazing program will be implemented in accordance with NRCS standards (appendix) to minimize impacts to water quality and bank stability. The program will manage the kind of animal, animal number, grazing distribution, length of grazing and timing of use following recommendations for prescribed grazing as part of the conservation plan. This practice will be used in combination with other practices such as fencing, rotational grazing and alternative watering. Alternative watering will be close by, no more than ¼ mile, access to the buffer will be designed to minimize bank erosion and water crossings and a alternative grazing site will be designated to use in case of water saturation of the soil in the buffer zone.

Figure C-1: A portion of the South Fork of Potts Creek showing two intermittent drains and the meanders of the creek. Woody buffers on this farm would significantly reduce the acres of pasture available to the farmer.

* Note: Source, satellite image from Google Earth.

D. TECHNICAL AND FINANCIAL RESOURCES

Technical Resources:

West Virginia Conservation Agency (WVCA) – The WVCA will be the lead agency on this effort and will provide most of the technical assistance needed for implementation. The WVCA coordinates statewide conservation efforts to conserve natural resources, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, conserve wildlife and assist farmers with conservation practices. The WVCA Environmental Specialists (ES) will coordinate with other agencies and work directly with landowners to implement the practices called for in this watershed based plan. The WVCA ES will also conduct monitoring to determine the environmental results for the three impaired streams. They will also produce grant proposals and status reports.

The West Virginia Department of Environmental Protection (DEP) – The DEP is the agency with primary responsibility for protecting the environment including stream water quality. The Nonpoint Source Program (NPS) within the DEP administers the Section 319 grants and the Basin Coordinators in the program work closely with project managers to accomplish the approved watershed based plans including assistance, if needed, with monitoring. The NPS also has experience and materials for outreach, education and volunteer monitoring. The Watershed Assessment Branch (WAB) includes the programs that develop the integrated watershed report with the 303(d) list of impaired streams, the TMDL and conduct water quality monitoring around the state. After completion of the installation of practices it will be WAB that makes the final determination if the TMDL has been fully implemented.

The Monroe County Health Department (MCHD) – The MCHD has the primary responsibility of inspecting and approving all on-site wastewater systems in Monroe County. The MCHD will have to conduct the initial survey to locate failing on-site systems. Through their contacts with homeowners the education of how to maintain an on-site system will be affected. The MCHD Sanitarian will have to select, inspect and approve all practices to be used in the treatment of failing septic systems.

The Natural Resources Conservation Service (NRCS) – The NRCS is the federal agency that works directly with farmers for designing and installing practices. In West Virginia they work closely with the WVCA for installing BMPs. The NRCS has an extensive monitoring program that has focused on collecting water quality data in the Potomac drainage as a part of the state's participation in the Chesapeake Bay Program.

Financial Resources

Clean Water Act Section 319 Grants – 319 funds are provided to the state by the US Environmental Protection Agency (EPA). In West Virginia these funds are distributed by the

DEP for agencies or organizations who are conducting projects related to nonpoint source pollution.

The WVCA – provides up to 15% cost share for agricultural practices associated with an approved Section 319 grant proposal.

The WV Onsite State Revolving Fund Program - is administered through the DEP. This program can be used to provide loan funding for individual onsite systems as well as homeowner-owned components of decentralized systems

WV Infrastructure and Jobs Development Council (IJDC) - Most sources of public funding for wastewater infrastructure are administered by the IJDC.

Landowners – Farmers will provide 25% matching funds for practices developed on their property. Much of these funds will be in kind for labor, equipment use, and materials. Homeowners who participate in any septic project will provide 40% of the funding.

Estimated Financial Needs

Table D-1: **Cost Estimates for BMPs**

BMP	Unit cost	Unit
Livestock fencing	$2	linear foot
Riparian buffer establishment	$1,000	acre
Armored stream crossing	$1,200	18” culvert, 20’ length
	$2,800	30” culvert, 30’ length
	$5,900	48” culvert, 40’ length
Alternative watering source	$3,000	unit
Conservation plans	$150	plan
Critical area planting	$720	acre
Armored, roofed feeding area	$75,000	unit
Stream channel stabilization	$185	linear foot
Septic system replacement	$7,500	unit
Septic system pumping	$500	unit action

The above cost estimates are based on averages for West Virginia and can vary considerably. These subwatersheds are in a remote area so transportation costs are expected to be higher than average. In Table D-2 unit costs have been adjusted dependent on transportation needs and estimated cost. However transportation costs are extremely volatile and could raise or lower the overall costs.

In addition personnel costs are not included, with the exception of conservation planning, because the project specialists will be funded from other sources.

Table D-2: **Estimated costs of the Watershed Based Plan**

BMP	# Units	Cost/Unit	Total Cost
On-site wastewater system replacement	10	$10,000.00	$100,000.00
On-site wastewater system pumping	9	$550.00	$4,950.00
Conservation plans	5	$150.00	$750.00
Well development	5	$3,300.00	$16,500.00
Spring development	2	$3,300.00	$6,600.00
Fencing	41,500	$2.00	$83,000.00
Stream crossings	3	$5,900.00	$17,700.00
Stream channel stabilization	600	$185.00	$111,000.00
Drain tile	400	$2.50	$1,000.00
Roofed feeding shed	1	$82,500.00	$82,500.00
Total Cost			**$424,000.00**

E. INFORMATION AND EDUCATION

In any watershed restoration effort informing and educating the residents of the watershed and all other stakeholders is vital. In watersheds that are as small as these with such a small population the most important form of that communication is done face to face. The WVCA Environmental Specialist has already started that process by contacting local farmers. It will be their responsibility to directly inform each farmer about the water quality issues as well as productivity issues. They will work closely with each farmer to design and customize each conservation plan to meet the TMDL while helping the farm improve his operation.

For the onsite wastewater issue the WVCA and DEP will assist the MCHD in passing out information packets and brochures to the residents. Face to face contacts between the involved agencies and homeowners will be made to explain the problems and solutions.

The WVCA will also contact local organizations such as the 4-H to set up educational efforts. Field visits and farm tours especially after BMP installation will be conducted. Finally an attempt will be made to use the WV Save Our Streams volunteer monitoring program as both an educational tool and to promote citizen involvement in protecting their watershed.

F: IMPLEMENTATION SCHEDULE

Projected Implementation Schedule

Date	*Activity*
June 2011	Submit 1st 319 project proposal
	Begin contacting landowners
Nov 2011	Acquire landowner permission
	Begin developing conservation plans
	Start baseline monitoring
	Initiate discussions with the MCHD on onsite wastewater plan
May 2012	Receive funding approval for proposal
	Start BMP installation for 1st proposal
	Finish baseline monitoring
	Begin educational effort
June 2012	Submit 2nd 319 project proposal
	Submit proposal for MCHD septic survey
Oct 2012	Start project WQ monitoring
	Acquire landowner permission for 2nd proposal
	Begin conservation planning for 2nd proposal
May 2013	Receive funding approval for 2nd proposal
	Project WQ monitoring
June 2013	Submit 3rd 319 proposal
	Submit 319 proposal for septic system repair or replacement
	Begin septic survey
	Begin onsite wastewater education

Projected Implementation Schedule continued

Nov 2013	Acquire landowner permission for 3rd proposal
	Finish installing 1st proposal BMPs
	Project WQ monitoring
	Assess effectiveness of installed BMPs
	Identify failing septic systems
	Initiate septic pumping program
May 2014	Receive funding for 3rd proposal and septic proposal
	Begin installing BMPs from 3rd proposal
	Project WQ monitoring
June 2014	Start replacing failing septic systems
Dec 2014	Finish 2nd proposal BMPs for agriculture
	Finish septic system installation and pumping
	Project WQ monitoring
2015	DEP conducts watershed monitoring and determines success
	BMP effectiveness assessment
2016	Complete agriculture BMPs
	Final assessment of success

G&H: MILESTONES

Anticipated Milestones

Date	*Implementation Milestone*	*Environmental Milestone*
June 2011	Apply for funding	
Dec 2012	Discussions with landowners and educational efforts are made.	
Dec 2013	1st set of BMPs installed affecting 30% of the livestock. 4 homes have had pumping or minor repairs to fix seasonally failing septi systems	Anticipated load reduction of fecal coliform: 1.70E+12 cfu/yr
Dec 2014	2nd set of BMPs installed affecting a total of 70% of the livestock. All seasonally failing septic systems have been repaired and the septic educational program is complete. 10 new septic systems have been installed.	Anticipated load reduction of fecal coliform: 4.0E+12 cfu/yr
Dec 2015	100% of livestock are under conservation plans. All completed BMPs are evaluated for effectiveness and all adjustments or alterations of installed BMPs are identified. WAB monitors watershed. An application to WAB to remove streams from the 303(d) list is made if WQ data warrants it.	Anticipated load reduction of fecal coliform: 5.8E+12 cfu/yr
Dec 2016	BMP installation is complete. Revisions to the watershed based plan are made if necessary. New proposals are made base on revised plan, if necessary.	Total TMDL required reduction, minus Ray Fork farm, is 3.99E+12cfu/yr. TMDL is implemented.

There are several factors that should be taken into consideration regarding the relationship between this watershed based plan and the TMDL. Monitoring for the TMDL occurred six years prior to this plan and may not accurately reflect the conditions in the watershed as of 2011. The discontinuation of grazing livestock on the Ray Fork farm is just one example of the changes that have occurred since 2005. Another factor is the changing nature of the livestock being grazed with some non-traditional species entering the watershed. While some farms may be diminishing in numbers of livestock, new areas are being leased or grazing is being reestablished.

One consideration that should require additional monitoring is the UNT of Sweet Springs. Since 2005 the only farmer in that subwatershed has installed some BMPs such as rotational grazing and moving feeding areas away from drainages. In April 2011 the WVCA and the consultant sampled this tributary for fecal coliform. Samples were taken throughout the watershed and the highest count in that drainage was 39 cfu/100 ml. However cattle were seen in the stream in Sweet Springs Creek itself, which is not currently listed as impaired. The sample taken at the West Virginia/Virginia state line in Sweet Springs Creek was 400 cfu/100 ml, a violation of water quality standards. Much more sampling needs to be done to confirm any restoration to UNT of Sweet Springs or to challenge the TMDL. Sweet Springs Creek may be in more danger of impairment than the TMDL recognized.

Land use changes and how that impacts all 25 James River subwatersheds in West Virginia may require an expansion of the monitoring that was done for the TMDL. For example in Potts Creek one landowner has built a mud bog race track in close proximity to the stream. A pond for a housing development built on the adjacent property was seen discharging muddy water. This kind of activity, while not increasing fecal coliform contamination, can adversely impact Potts Creek due to sediment.

The WVCA is working with any willing landowner and pulling together varied resources to implement BMPs. Yet, it may come about that serious nonpoint pollution problems are not restricted to the ten TMDL subwatersheds. Also, indications are that sediment may become as serious a contaminant as fecal coliform. The WVCA Environmental Specialists will watch for these problems and consider actions to prevent pollution even before the DEP lists a stream on the 303(d) list.

A newly constructed pond in Potts Creek discharging mud. (March 2011)

I: MONITORING

There are several important components where water quality monitoring will be needed. First a baseline for nutrients and sediment must be established for the three impaired streams in this plan. Second, a determination of the status of Ray Fork must be determined because of the land use change that has occurred there since the TMDL. Third, monitoring must be done to determine the rate of success in comparison to the criteria established in Section H.

The responsibility for monitoring will fall primarily on the WVCA who will enlist the assistance of DEP and any other state or federal agency as well as volunteers. The parameters to be monitored will have to fulfill the requirements of this plan and the reporting requirements of Section 319 grants and the Chesapeake Bay Program's reports. The parameters will include: temperature, flow, fecal coliform, total nitrogen, total phosphorus and total suspended solids and any others that may be considered important. Monitoring stations will be located at the mouths of UNT of Sweet Springs Creek, South Fork of Potts Creek and Ray Fork. Because of the small size of these subwatersheds one station at the mouth should be sufficient to assess the progress being made. However, if other stations need to be established to locate sources or any other reason they will be located strategically to accomplish that goal. The timing of sampling will be up to the local project managers but should include three samples within a year during different flow regimes for establishing the baseline. Afterward, two a year during different seasons and only after practices have been installed should provide adequate data for progress assessment.

Biological monitoring will be completed by the DEP WAB when a new assessment of this watershed is made in 2015. This date should be in time to measure some of the water quality improvements being made by implementing this plan. As stated in Section E, the WVSOS program is an important educational tool for teaching citizens about the value of clean streams. It can also be a valuable monitoring tool. If suitable volunteer monitors are willing to sample these streams then WVCA and DEP will facilitate their efforts. By using the WVSOS protocols a good biological assessment of the streams' conditions can be made.

In order to assure the data being collected is of good quality and usable for determining progress, a Quality Assurance Project Plan (QAPP) will be developed for this effort. The QAPP will be submitted to the DEP Nonpoint Source Program Coordinator for review and approval. The Coordinator will then be responsible for submitting the QAPP to EPA for review, comment and approval.

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