Spring Creek

Watershed Based Plan

Submitted by the

West Virginia Conservation Agency

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Watershed Based Plan for Spring Creek

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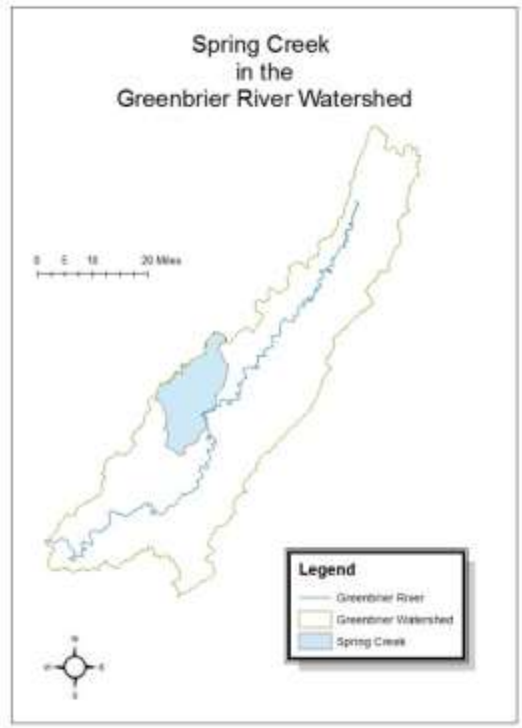
Contents

Tables and Figures

INTRODUCTION

The purpose of this watershed based plan (WBP) is to define the problems, resources, costs, and course of action necessary to restore the impaired streams of the Spring Creek watershed 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).

Spring Creek, stream code WVKNG-30, is a significant tributary to the Greenbrier River. It and its tributaries start in the mountains of the Monongahela National Forest and enter the Greenbrier between the towns of Renick and Frankford. The Spring Creek watershed is a rural watershed with the predominant land use being forest with small communities and farms scattered throughout. The watershed is 95,050 acres with over 72% being forest. Karst geology is significant within the watershed and creates special challenges for producing a TMDL and for restoration efforts. Karst is a limestone geology typified by sink holes and underground streams which can allow pollutants to rapidly enter the groundwater and be transported to springs that enter surface streams. This geology comprises 16,274 acres or over 17% of the watershed. Of the over 19,000 acres of pasture land in the watershed 64% of it is in karst. Cropland comprises over 4000 acres of the watershed but 99.9% is in the karst region.



The underground waterways typical in karst can transport water that originated outside the surface drainage of the watershed to Spring Creek itself. The Total Maximum Daily Load (TMDL) produced by the DEP has taken this into account. Underground drainages that have been proven by dye testing are shown in the watershed map and included in the TMDL.

Spring Creek has been listed in the 2008 303(d) list as being impaired by fecal coliform contamination. It is included in the 2008 Greenbrier River TMDL. The WV Conservation Agency (WVCA) working with and through the Greenbrier Valley Conservation District (GVCD) will be the lead agency on this project. The WVCA will work with the Greenbrier and Pocahontas counties health departments on failing septic system issue and the National Resource and Conservation Agency (NRCS) on agricultural issues. The WVCA will also coordinate closely with the DEP's Nonpoint Source Program (NPS) with §319 grant applications and reporting.

Figure 1: The dye test results in the Spring Creek area (left). The TMDL map of the Spring Creek watershed (right).

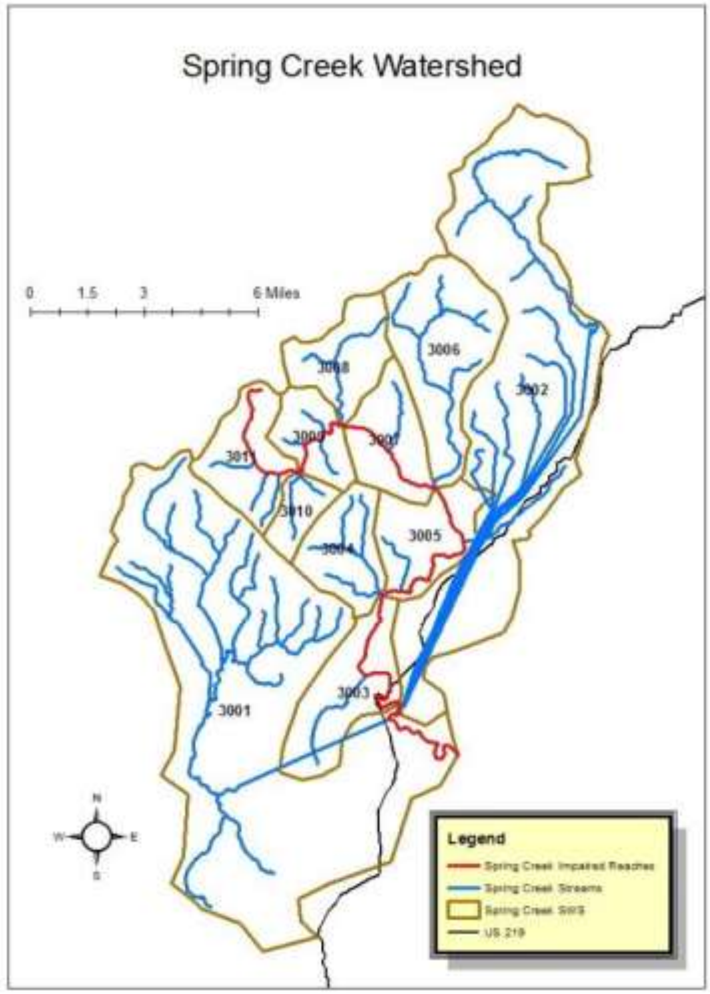


Figure 2: A comparison of the Spring Creek watershed: surface drainage vs the entire drainage including underground karst drainages.

TMDL (entire drainage) -

Surface Drainage -

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 Total Maximum Daily Load (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 Greenbrier 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. The TMDL identifies fecal coliform as the cause of impairment in the Greenbrier River including Spring Creek itself.

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 Greenbrier 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. 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."

The Greenbrier TMDL shows that there are no point sources within Spring Creek so that all impairments come from nonpoint sources. The TMDL calls for a 32.79% reduction in fecal coliform levels for Spring Creek (Table 1) from these sources. The TMDL identifies eleven subwatersheds (SWS) in the Spring Creek watershed with numbers 3001 to 3011 assigned to identify them.

Table 1: Spring Creek TMDL (from the Greenbrier River TMDL)

Spring Creek Watershed - Fecal Coliform TMDLs							
TMDL Watershed	Stream Code	Stream Name	Baseline LA (counts/yr)	LA (counts/yr)	MOS (counts/yr)	TMDL (counts/yr)	% Reduction
Spring Creek	WVKNG-30	Spring Creek	5.26E+14	3.54E+14	1.86E+13	3.72E+14	32.79

The TMDL identifies two land use sources for the fecal coliform pollution: agriculture and on-site wastewater treatment. The agricultural land use specifically identified as contributing to the contamination is pasture/cropland.

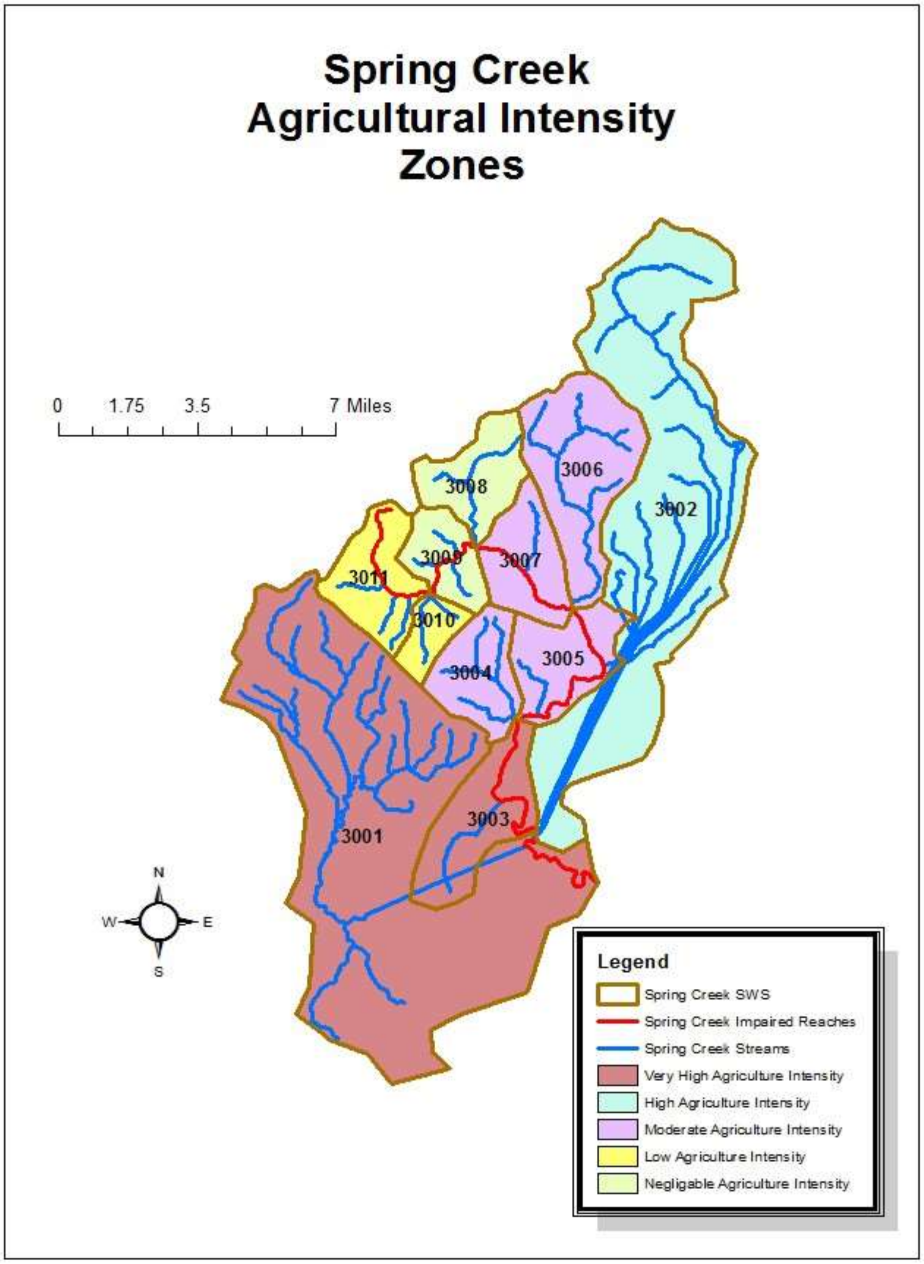
Table 2: Baseline loads from Pasture and On-site wastewater systems

Subwatershed	Stream Name	Stream Code	Pasture/Cropland Baseline Load (counts/yr)	Onsite Sewer Systems Baseline Load (counts/yr)
3001	Spring Creek	WVKNG-30	3.05E+14	3.19E+12
3002	Spring/Spring Creek RM 3.63 (JJ Spring)	WVKNG-30-0.7A	8.10E+13	1.99E+12
3003	Spring Creek	WVKNG-30	2.83E+13	4.07E+11
3004	Dry Run	WVKNG-30-B	7.93E+12	2.85E+11
3005	Spring Creek	WVKNG-30	6.19E+12	1.67E+11
3006	Robbins Run	WVKNG-30-C	8.77E+12	2.31E+11
3007	Spring Creek	WVKNG-30	6.12E+12	3.47E+11
3008	Panther Camp Creek	WVKNG-30-E	0.00E+00	6.55E+10
3009	Spring Creek	WVKNG-30	0.00E+00	1.71E+11
3010	Wolfpen Run	WVKNG-30-I	3.02E+11	3.98E+10
3011	Spring Creek	WVKNG-30	1.07E+12	9.86E+10
	Total		4.45E+14	7.00E+12
	Total Baseline Load			4.52E+14

Agriculture

In the agricultural land use category all but two of the subwatersheds, 3008 and 3009, contribute fecal coliform to Spring Creek. The largest contributors are SWSs 3001, 3002 and 3003. The TMDL model looks at agricultural intensity zones and the run off potential of the land to determine the need for reductions.

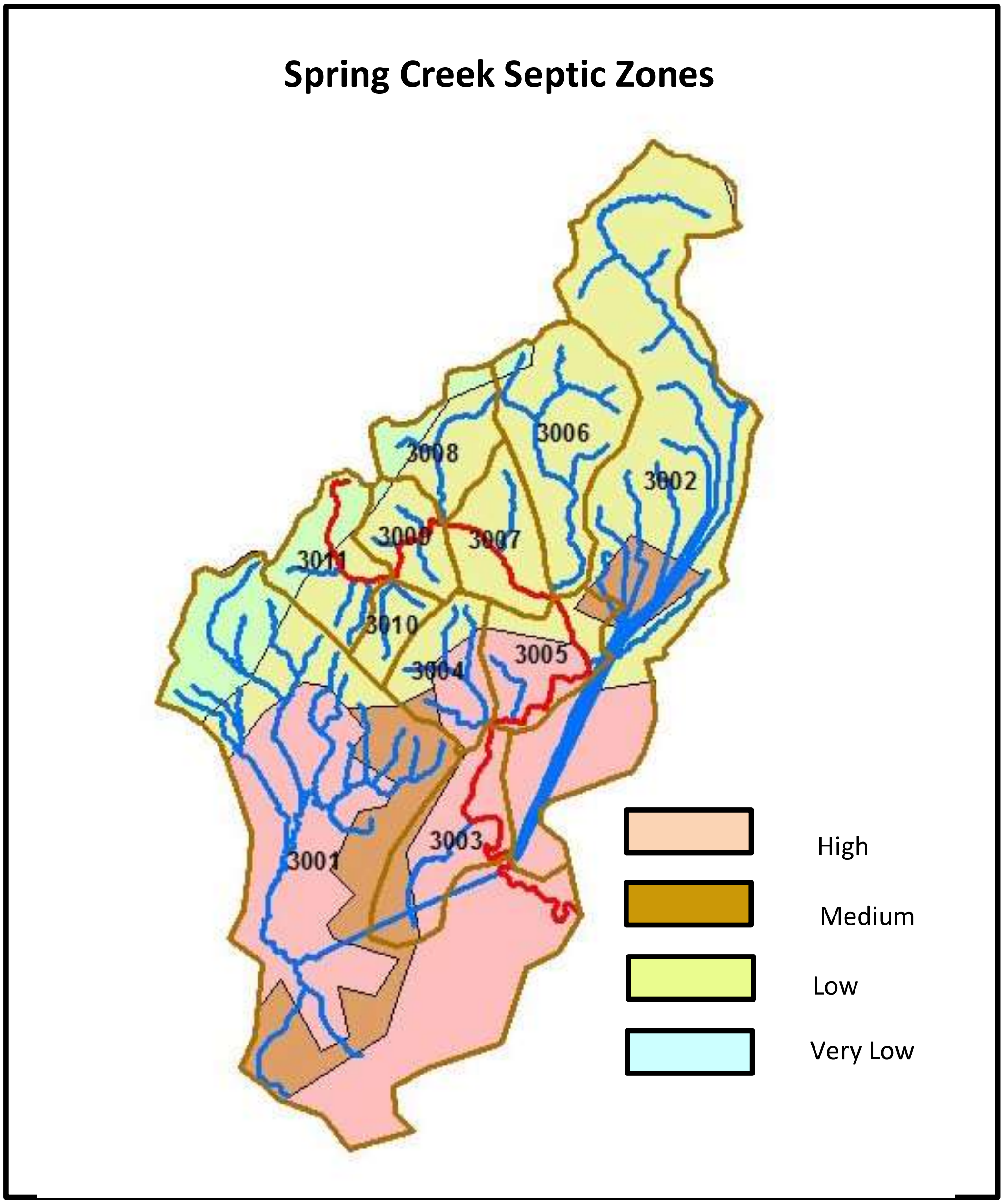
Figure 3: Agricultural Intensity Zones



On-site Wastewater Sewage Treatment

In the on-site wastewater category reductions are called for in all eleven subwatersheds with the highest reductions in the two largest subwatersheds, 3001 and 3002. The determination of the baseline contribution and reduction is based on several factors including residential density, soil porosity and proximity to the stream or underground drainage. These factors go into modeling the vulnerability to pollution from failing septic systems.

Figure 4: Failing Septic System Vulnerability Zones



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. A base concentration of 25,000 counts per 100 mL was used as a beginning concentration for failing septic. In the Spring Creek watershed there are four identified septic failure zones: high, medium, low, and very low.

The TMDL calculates the estimated number of residences with septic system failures in each vulnerability zone. The percentages of homes estimated to have failing septic systems are listed by zone in Table 3.

Table 3: Percentage of Homes with Failing Systems by Septic Zone

Seasonal Failure: Assume 25 gpd/home failing septic effluent reaching stream		
Complete Failure: Assume 50 gpd/home failing septic effluent reaching stream		
Type	**% homes with seasonal failure**	**% homes with complete failure**
Very Low	3.00	5.00
Low	7.00	10.00
Medium	13.00	24.00
High	19.00	28.00

The TMDL model estimates the number of residences with some form of septic system failure by subwatershed. The calculations often end in a fraction but in reality, this can't exist, either a system is failing, or it is not. Table 4 shows the whole number estimates of the number of periodic and complete failures in the watershed. The TMDL does not show any failures in the very low zone. The total number of septic failures are:

Modelled Periodic Failures	193
Modelled Complete Failures	308

Over 75% of the failures occur in SWSs 3001 and 3002 with 43.23% in 3001 and 27.01% in 3002. SWS 3010 has the least with only 3 failures total about .5% of the total.

Table 4: The Number of Failing Systems by SWS

Septic Failures by Zone and SWS								
	Low Septic Zone		Medium Septic Zone		High Septic Zone		SWS Totals	
SWS	periodic fails	complete fails	periodic fails	complete fails	periodic fails	complete fails	periodic fails	complete fails
3001	41	59	7	13	45	66	93	138
3002	14	20	36	66	2	3	52	89
3003	3	5	0	0	9	13	12	18
3004	2	3	4	8	1	2	8	13
3005	1	2	3	5	0	0	4	7
3006	0	0	6	10	0	0	6	10
3007	0	0	9	16	0	0	9	16
3008	0	0	2	3	0	0	2	3
3009	0	0	4	8	0	0	4	8
3010	0	0	1	2	0	0	1	2
3011	0	0	2	4	0	0	2	4
Totals	62	89	73	136	57	84	193	308

Table 5: Trackable Load Reductions
(*load reductions that will be achieved by full implementation according to a model developed according the Greenbrier River TMDL calculations for determining fecal load from septic failures)*

Load Reductions by SWS and Failure Type			
SWS	**Type of Failure**	**# Units**	**Load Reduction (counts/year)**
3001	Complete	138	2.39E+12
	Periodic	93	8.04E+11
3002	Complete	89	1.54E+12
	Periodic	52	4.50E+11
3003	Complete	18	3.11E+11
	Periodic	12	1.04E+11
3004	Complete	13	2.25E+11
	Periodic	8	6.92E+10
3005	Complete	7	1.21E+11
	Periodic	4	3.46E+10
3006	Complete	10	1.73E+11
	Periodic	6	5.19E+10
3007	Complete	16	2.77E+11
	Periodic	9	7.78E+10
3008	Complete	3	5.19E+10
	Periodic	2	1.73E+10
3009	Complete	8	1.38E+11
	Periodic	4	3.46E+10
3010	Complete	2	3.46E+10
	Periodic	1	8.65E+09
3011	Complete	4	6.92E+10
	Periodic	2	1.73E+10
Total			7.00E+12

LOAD REDUCTIONS REQUIRED

The load reductions being called for in this watershed based plan are based on the TMDL for the entire Greenbrier River watershed. 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.

In Spring Creek load allocations (LA) for the number of fecal coliforms that can be assimilated in the stream without impairment are assigned to the Pasture/Cropland and On-site Sewer Systems land uses. In the Pasture/Cropland (agriculture) category only three SWS are required to make reductions: 3001, 3002 and 3003. In the On-site Sewer Systems (failing septic) category all SWS have 100% reductions called for. This is because the West Virginia Bureau for Public Health regulations prohibits the discharge of sewage into the waters of the state. Assigning any allocation to this category would be condoning a violation of those regulations.

The TMDL calls for a reduction of fecal coliform of 1.65E+14 cfs/yr for agriculture and 7.00E+12 cfs/yr from failing septic for a total reduction of 1.72E+14 cfs/yr from Spring Creek.

Table 6: Land use allocations in the TMDL

Subwatershed	Stream Name	Stream Code	Pasture/Cropland Baseline Load (counts/yr)	Pasture/Cropland Allocated Load (counts/yr)	Reduction Required (counts/yr)	Onsite Sewer Systems Baseline Load (counts/yr)	Onsite Sewer Systems Allocated Load (counts/yr)	Reduction Required (counts/yr)	SWS Totals (counts/yr)
3001	Spring Creek	WVKNG-30	3.05E+14	1.67E+14	1.38E+14	3.19E+12	0.00E+00	3.19E+12	1.41E+14
3002	JJ Spring	WVKNG-30-0.7A	8.10E+13	6.09E+13	2.01E+13	1.99E+12	0.00E+00	1.99E+12	2.21E+13
3003	Spring Creek	WVKNG-30	2.83E+13	2.12E+13	7.07E+12	4.07E+11	0.00E+00	4.07E+11	7.48E+12
3004	Dry Run	WVKNG-30-B	7.93E+12	7.93E+12	0.00E+00	2.85E+11	0.00E+00	2.85E+11	2.85E+11
3005	Spring Creek	WVKNG-30	6.19E+12	6.19E+12	0.00E+00	1.67E+11	0.00E+00	1.67E+11	1.67E+11
3006	Robbins Run	WVKNG-30-C	8.77E+12	8.77E+12	0.00E+00	2.31E+11	0.00E+00	2.31E+11	2.31E+11
3007	Spring Creek	WVKNG-30	6.12E+12	6.12E+12	0.00E+00	3.47E+11	0.00E+00	3.47E+11	3.47E+11
3008	Panther Camp Creek	WVKNG-30-E	0.00E+00	0.00E+00	0.00E+00	6.55E+10	0.00E+00	6.55E+10	6.55E+10
3009	Spring Creek	WVKNG-30	0.00E+00	0.00E+00	0.00E+00	1.71E+11	0.00E+00	1.71E+11	1.71E+11
3010	Wolfpen Run	WVKNG-30-I	3.02E+11	3.02E+11	0.00E+00	3.98E+10	0.00E+00	3.98E+10	3.98E+10
3011	Spring Creek	WVKNG-30	1.07E+12	1.07E+12	0.00E+00	9.86E+10	0.00E+00	9.86E+10	9.86E+10
	Totals				**1.65E+14**			**7.00E+12**	**1.72E+14**

Agriculture

While the TMDL calls for reductions from agriculture in only three subwatersheds , 3001, 3002 and 3003, the other subwatersheds contribute to the impairment of Spring Creek except SWS 3008 and 3009. Since Spring Creek is listed as impaired from mouth to headwaters agricultural projects should be considered in all subwatersheds with priority given to those in the high and very high agricultural intensity zones. In order to meet the TMDL 1.65E+14 cfs/yr of fecal coliform or 37.21% of the baseline load should be reduced from agricultural sources.

On-site Wastewater

The TMDL determines the fecal coliform loads by estimating the gallons per day (GPD) of contaminated flow entering the streams. The Greenbrier TMDL used a base concentration for raw sewage of 25,000 counts/100ml. To determine the counts per year of fecal coliform the TMDL used the formula:

*Counts/yr = concentration (25,000/100mL)*1000 mL/L*flow gal/day*3.785 L/gal*365day/yr*

The variable for each subwatershed is the flow so the formula becomes: *Counts/yr = Flow (GPD) * 345,381,250.* The TMDL technical document lists the flow for each subwatershed as shown in Table 7.

Table 7: Septic Flow per SWS

Septic Flow by SWS					
SWS	VL_Flow (gpd)	L_Flow (gpd)	M_Flow (gpd)	H_Flow (gpd)	Total_Flow_gpd
3001	24.57	3962.12	831.74	4414.50	9232.92
3002	0.00	1366.88	4199.85	202.50	5769.23
3003	0.00	328.05	0.00	850.50	1178.55
3004	0.00	225.99	485.87	111.38	823.23
3005	0.00	116.64	345.87	20.25	482.76
3006	0.00	0.00	667.04	0.00	667.04
3007	0.00	0.00	1004.67	0.00	1004.67
3008	0.00	0.00	189.41	0.00	189.41
3009	0.00	0.00	494.10	0.00	494.10
3010	0.00	0.00	115.29	0.00	115.29
3011	5.27	0.00	279.99	0.00	285.26
Total					20242.44

The total septic load equals the load reduction required in the TMDL as shown in Table X.

Table 8: Septic Load and Reductions Required per SWS

Septic Load by SWS			
SWS	Total Flow (gpd)	Total Load (cts/yr)	TMDL LR (cts/yr)
3001	9232.92	3.19E+12	3.19E+12
3002	5769.23	1.99E+12	1.99E+12
3003	1178.55	4.07E+11	4.07E+11
3004	823.23	2.85E+11	2.85E+11
3005	482.76	1.67E+11	1.67E+11
3006	667.04	2.31E+11	2.31E+11
3007	1004.67	3.47E+11	3.47E+11
3008	189.41	6.55E+10	6.55E+10
3009	494.10	1.71E+11	1.71E+11
3010	115.29	3.98E+10	3.98E+10
3011	285.26	9.86E+10	9.86E+10
Totals		7.00E+12	7.00E+12

MANAGEMENT MEASURES

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), cropland 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 during the wet season. To determine the specific needs a field survey must be conducted first to identify problem sites. This will require the participation of the county Health Departments (HD). Once a problem site has been identified a specific project plan can be developed and must be approved by the HD.

Completely failing systems usually require the installation of a new or upgraded system. New or upgraded systems will be installed in compliance with HD regulations based on home size and soil porosity and must be approved by the HD 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. Individual costs could be higher due to the remoteness of the residence. Due to the sparse population density in the watershed cluster systems would not be cost effective. However, if the survey shows a grouping of failures in one location such a system could be an option. .

Assuming a new system for complete failures and pumping for periodic failures then this plan calls for 308 new systems and 193 pumped.

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, ephemeral drainage, and Karst features. 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. Where appropriate, these practices will be combined with the stream bank restoration work already in progress. The result will be a comprehensive conservation plan for each farm.

The following BMP's are practices recommended by NRCS that are necessary to achieve the goals of the TMDL target reductions.

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.

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. This includes dry hydrants for any systems that have enough water to support them. Dry hydrants are needed in case of drought conditions. They aid in grass fire suppression and alternative water for livestock during a drought. This reduces erosion common after fires and eliminates the need to allow livestock into the riparian buffer zones for water. 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 12 for: off-site watering systems 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 12 for: Sediment Pond/Swale in combination with filter strip and fencing.

Nutrient Management, Grazing, and Winter Feeding 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. Additionally, these plans prescribe an appropriate livestock density for the farm, and methods of winter feeding to protect waterways. 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, 528 Prescribed Grazing, 634 Manure Transfer. These practices correspond to BMP efficiencies in Table 12 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 12 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 to 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 12 for: Waste Stabilization lagoon and fencing.

Land Use Covenants: These covenants would control or restrict certain land use activities in highly sensitive areas.

Conservation Easements: These easements compensate landowners for voluntarily restricting their activities in sensitive areas.

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 12 for: Buffer and fencing.

Filter Strip: A strip or area of herbaceous vegetation situated between cropland, grazing land, 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 12 for: Filter Strip and 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 12 for: sediment ponds/swale in combination with filter strip.

The TMDL calls for a slightly over 37% reduction in fecal coliform from agriculture, assuming a 99% load reduction from implementing a full conservation plan, then 16,393 acres will have to be put under a conservation plan. Looking at projects that have been done within karst and surface flow landscape like that in Spring Creek watershed then the following types of BMPs are expected:

- Watering systems (pipelines, troughs, etc.)
- Fencing (exclusion for stream protection and divisional for rotation grazing)
- Roofed storage areas
- Nutrient management planning

To accomplish the required load reductions the following types and numbers of agricultural BMPs are expected to be installed:

Number of Farms	69
Acres in Conservation/Nutrient Plans	16,393
Exclusion Fence (feet)	425,086
Division Fence (feet)	206,148
Pipeline (feet)	180,457
Water Troughs	275
Waste Storage Facility	3
Stream Crossings	10

The conservation plans for the 69 farms will be developed to best suit the circumstances and problems for each farm and may include some or all of the above mentioned BMPs.

TECHNICAL AND FINANCIAL RESOURCES

Technical Resources:

West Virginia Conservation Agency (WVCA) – The WVCA will be the applicant for CWA Section 319 grants on this effort and will provide 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 Conservation Specialists (CS) will coordinate with other agencies and work directly with landowners to implement the practices called for in this watershed based plan. The WVCA CS will also conduct monitoring to determine the environmental results for the three impaired streams. They will also produce grant proposals and status reports.

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 also implements the Wildlife Habitat Improvement Program (WHIP) and the Conservation Reserve Enhancement Program (CREP).

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 Pocahontas and Greenbrier County Health Departments (HD) – The HD has the primary responsibility of inspecting and approving all on-site wastewater systems in their counties. The HD 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 HD Sanitarian will have to select, inspect, and approve all practices to be used in the treatment of failing septic systems.

The Pocahontas County Water Resources Task Force (WRTF) – The WRTF is a county based group who are developing a water management plan in cooperation with the DEP’s Water Use Program. While most of the emphasis for this group will be on surface and ground water quantity, issues of water quality and education will be addressed by the WRTF.

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.

Conservation Reserve Enhancement Program (CREP) – CREP is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. CREP addresses high-priority conservation issues in priority watersheds as designated by the NRCS State Conservationist.

Environmental Quality Incentive Program (EQIP) – EQIP is a voluntary conservation program that aids farmers who face threats to soil, water, air, and related natural resources on their land. The NRCS through EQIP offers financial and technical assistance to eligible participants to install or implement structural and management practices to promote agricultural production and optimize environmental benefits to help farmers meet environmental requirements on eligible agricultural land.

Budget

The following budget estimates the total cost of the Spring Creek TMDL implementation. The BMPs listed are a best estimate of the BMPs needed for enough comprehensive conservation plans and septic system improvements to reduce fecal coliform bacteria by the 37% called for in the TMDL.

The estimated total cost is $5,695,373.50. At a 60%/40% cost share for the §319 program this would mean potential grant requests of $3,432,224.10 with $2,273,149.40 coming from non-federal sources. However, EQIP and CREP may be a part of the federal funding sources.

Table 9: Plan Budget

Budget			
BMP	**# BMPs**	**Cost Each**	**Total $**
Acres in Precision Nutrient Plans	16,393	$4.00	$65,572.00
Exclusion Fence (feet)	425,086	$3.00	$1,275,258.00
Division Fence (feet)	206,148	$3.00	$618,444.00
Pipeline (feet)	180,457	$3.50	$631,599.50
Water Troughs	275	$1,500.00	$412,500.00
Waste Storage Facility	3	$80,000.00	$240,000.00
Stream Crossings	10	$2,800.00	$28,000.00
Septic System Replacement	309	$7,500.00	$2,317,500.00
Septic System Repair	193	$500.00	$96,500.00
Equipment and Administrative	1	$10,000.00	$10,000.00
Planning (hours, 150 hours per farm)	10,350	$26.00	$269,100.00
Education (years)	1	$1,000.00	$5,000.00
Monitoring (years)	5	$1,000.00	$5,000.00
Total Cost			**$5,974,473.50**

The above cost for conservation practices includes the total cost of labor, implementation, and materials.

SCHEDULES AND MILESTONES

The Spring Creek restoration effort will be presented to the residents of the watershed as one whole effort divided by fecal coliform sources. While an emphasis will be made on the larger priority subwatersheds interested participants in other subwatersheds will not be excluded if their farm/residence qualifies as a source of bacteria. Participation in the effort is voluntary as there is no regulatory authority in implementing this effort.

The implementation schedule is set to coincide with the §319 grant funding cycle. After the submission of this WBP there will be periods of review, comment, editing and final approval. It is expected that the first opportunity to submit a §319 grant proposal will be in the third quarter of 2016. If approved funding should become available by the second quarter of 2017. Therefore, the implementation schedule is set to begin in the third quarter of 2017. The expectation is that 2017 and part of 2018 will be a period of introducing the local residents to the effort with the first installation of BMPs not expected until the second or third quarter of 2018. Table 10 shows the expected timeframe for this restoration effort.

Table 10: Implementation Schedule

IMPLEMENTATION SCHEDULE FOR THE SPRING CREEK WATERSHED BASED PLAN																								
	2017				2018				2019				2020				2021				2022			
	Quarters				Quarters				Quarters				Quarters				Quarters				Quarters			
Actions	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Public Meetings																								
Contract Signing																								
Septic Replacements																								
Septic Repairs																								
Ag BMP Installation																								
Project Monitoring																								
Reporting																								
Baseline Monitoring																								

The implementation and environmental milestones estimates are based on the best professional judgement and experience from other restoration efforts. The primary focus will be on SWS 3001,3002 and 3003, the greatest source of the contamination, where most practices will be installed. However, the remaining subwatersheds will also be eligible for BMP installation since the entire length of Spring Creek is listed as impaired. Reduction estimates are based on the TMDL model.

Table 11 shows the expected time period, types and numbers of BMPs installed and the expected load reductions achieved. Table X shows the BMPs and anticipated cost per SWS. Monitoring and public outreach and education were not included since they will be applied throughout the watershed. (The additional eight cents in the final cost is due to rounding errors in the spreadsheet calculations and should be disregarded.)

Table 11: Implementation and Environmental Milestones (2018 – 2022)

Implementation and Environmental Milestones

Year	*2018*				*2019*				*2020*				*2021*				*2022*			
	Septic Repairs	Septic Rplaceme s	Acres in Conserv tion Plans	FC Reductions Ex	Septic Repairs	Septic Rplaceme s	Acres in Conserv tion Plans	FC Reductions Ex	Septic Repairs	Septic Rplaceme s	Acres in Conserv tion Plans	FC Reductions Ex	Septic Repairs	Septic Rplaceme s	Acres in Conserv tion Plans	FC Reductions Ex	Septic Repairs	Septic Rplaceme s	Acres in Conserv tion Plans	FC Reductions Ex
SWS																				
3001	20	10	1000	1.04E+13	20	20	3000	3.08E+13	20	40	3000	3.11E+13	20	40	1000	1.10E+13	13	28	500	5.64E+12
3002	20	10	1000	1.04E+13	15	20	2000	2.06E+13	15	20	2000	2.07E+13	2	20	1000	1.05E+13	0	19	0	3.29E+11
3003	2	1	1000	1.01E+13	4	3	50	5.91E+11	4	8	250	2.70E+12	2	6	100	1.13E+12	0	0	0	
3004	2	1	0	3.46E+10	4	3	100	1.10E+12	2	5	18	2.85E+11	0	4	0	6.92E+10	0	0	0	
3005	1	1	0	2.59E+10	3	2	150	1.57E+12	0	3	0	5.19E+10	0	1	0	1.73E+10	0	0	0	
3006	1	1	0	2.59E+10	2	2	150	1.57E+12	3	3	0	7.78E+10	0	3	0	5.19E+10	0	1	0	1.73E+10
3007	2	1	0	3.46E+10	3	3	75	8.35E+11	2	5	0	1.04E+11	2	5	0	1.04E+11	0	2	0	3.46E+10
3008	1	1	0	2.59E+10	1	1	0	2.59E+10	0	1	0	1.73E+10	0	0	0		0	0	0	
3009	1	1	0	2.59E+10	1	2	0	4.32E+10	2	4	0	8.65E+10	0	1	0	1.73E+10	0	0	0	
3010	0	0	0		1	1	0	2.59E+10	0	1	0	1.73E+10	0	0	0		0	0	0	
3011	0	0	0		1	1	0	2.59E+10	1	3	0	6.05E+10	0	0	0		0	0	0	
Totals	50	27	3000	3.118E+13	55	58	5525	5.72E+13	49	93	5268	5.521E+13	26	80	2100	2.281E+13	13	50	500	6.02E+12
Total Reduction				1.724E+14																

Table 12: Implementation and Cost Milestones (2018 – 2022)

BMP Installation and Cost by SWS

Year	2018				2019				2020				2021				2022			
	Septic Repairs	Septic Rplacement	Acres in Conservation Plans	Costs	Septic Repairs	Septic Rplacement	Acres in Conservation Plans	Costs	Septic Repairs	Septic Rplacement	Acres in Conservation Plans	Costs	Septic Repairs	Septic Rplacement	Acres in Conservation Plans	Costs	Septic Repairs	Septic Rplacement	Acres in Conservation Plans	Costs
SWS																				
3001	20	10	1000	$284,560.00	20	20	3000	$758,680.00	20	40	3000	$908,680.00	20	40	1000	$509,560.00	13	28	500	$316,280.00
3002	20	10	1000	$284,560.00	15	20	2000	$556,620.00	15	20	2000	$556,620.00	2	20	1000	$350,560.00	0	19	0	$142,500.00
3003	2	1	1000	$208,060.00	4	3	50	$34,478.00	4	8	250	$111,890.00	2	6	100	$65,956.00	0	0	0	$0.00
3004	2	1	0	$8,500.00	4	3	100	$44,456.00	2	5	18	$42,092.08	0	4	0	$30,000.00	0	0	0	$0.00
3005	1	1	0	$8,000.00	3	2	150	$46,434.00	0	3	0	$22,500.00	0	1	0	$7,500.00	0	0	0	$0.00
3006	1	1	0	$8,000.00	2	2	150	$45,934.00	3	3	0	$24,000.00	0	3	0	$22,500.00	0	1	0	$7,500.00
3007	2	1	0	$8,500.00	3	3	75	$38,967.00	2	5	0	$38,500.00	2	5	0	$38,500.00	0	2	0	$15,000.00
3008	1	1	0	$8,000.00	1	1	0	$8,000.00	0	1	0	$7,500.00	0	0	0	$0.00	0	0	0	$0.00
3009	1	1	0	$8,000.00	1	2	0	$15,500.00	2	4	0	$31,000.00	0	1	0	$7,500.00	0	0	0	$0.00
3010	0	0	0	$0.00	1	1	0	$8,000.00	0	1	0	$7,500.00	0	0	0	$0.00	0	0	0	$0.00
3011	0	0	0	$0.00	1	1	0	$8,000.00	1	3	0	$23,000.00	0	0	0	$0.00	0	0	0	$0.00
Totals	50	27	3000	$826,180.00	55	58	5525	$1,565,069.00	49	93	5268	$1,773,282.08	26	80	2100	$1,032,076.00	13	50	500	$481,280.00
Total Reduction				$5,677,887.08																

MONITORING

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 reports. The parameters may include temperature, flow, fecal coliform, and any others that may be considered important. Monitoring stations will be located at the mouth of Spring Creek (WVKNG-30, Station ID KNG-00056-0.1, Lat 37.9546, Lon -80.3479) and at Wolfpen Run (WVKNG-30-I, Station ID KNG-00062-0, Lat 38.0634, Lon -80.4228). These sites will mirror monitoring that was conducted by the WVDEP Stream Assessment Branch when developing the TMDL. If other stations need to be established to locate sources or for any other reason, such as determining project success, they will be located strategically to accomplish that goal.

The timing of sampling will be up to the local project managers but will include monthly samples within a year during different flow regimes for establishing the baseline. Afterward, two a year during different seasons and after practices have been installed should provide adequate data for progress assessment. To determine if stream or stream segments have been returned to water quality standards WVCA will conduct fecal coliform sampling of at least ten samples in a one month period. The methods and location will correspond to DEP quality assurance standards and the data will be submitted to DEP.

Biological monitoring will be done as a part of the volunteer monitoring program WVSOS. 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. By using the WVSOS protocols a good biological assessment of the streams' conditions can be made. Another assessment will be made by WAB in 2020 and after project completion to determine final success or a need for further action.

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.

INFORMATION AND EDUCATION

In any watershed restoration effort informing and educating the residents of the watershed and all other stakeholders is vital. In rural watersheds with a small population the most important form of that communication is done face to face. For the onsite wastewater issue the WVCA and WRTF will assist the HDs 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. Public meetings to announce the project, the reasons for it and provide educational materials on septic system maintenance will be scheduled in the watershed.

The WVCA works directly with farmers to educate them to the benefits of installing BMPs which includes an explanation of the benefits of a clean and properly functioning stream. In addition, field days to show farmers installed BMPs and explain how they work will be conducted.

COMMON ACRONYMS

TMDL	Total Maximum Daily Load
WLA	Waste load allocation
LA	Load allocation
LR	Load reduction
MOS	Margin of safety
BL	Baseline
USEPA or EPA	US Environmental Protection Agency
DEP	WV Department of Environmental Protection
WVCA	WV Conservation Agency
NRCS	Natural Resources Conservation Service
HD	Health Department
BPH	Bureau of Public Health
WAB	Watershed Assessment Branch
OSLP	On-site Loan Program
BMP	Best management practice
WQ	Water quality
ES	Environmental Specialist