Cherry Fork Watershed Based Plan

HUC 12 Headwaters of Eighteen Mile Creek 050500080401 of the Lower Kanawha TMDL Watershed

West Virginia Conservation Agency

Watershed based plan for Cherry Fork of Eighteen-mile Creek

February, 2018

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Preface

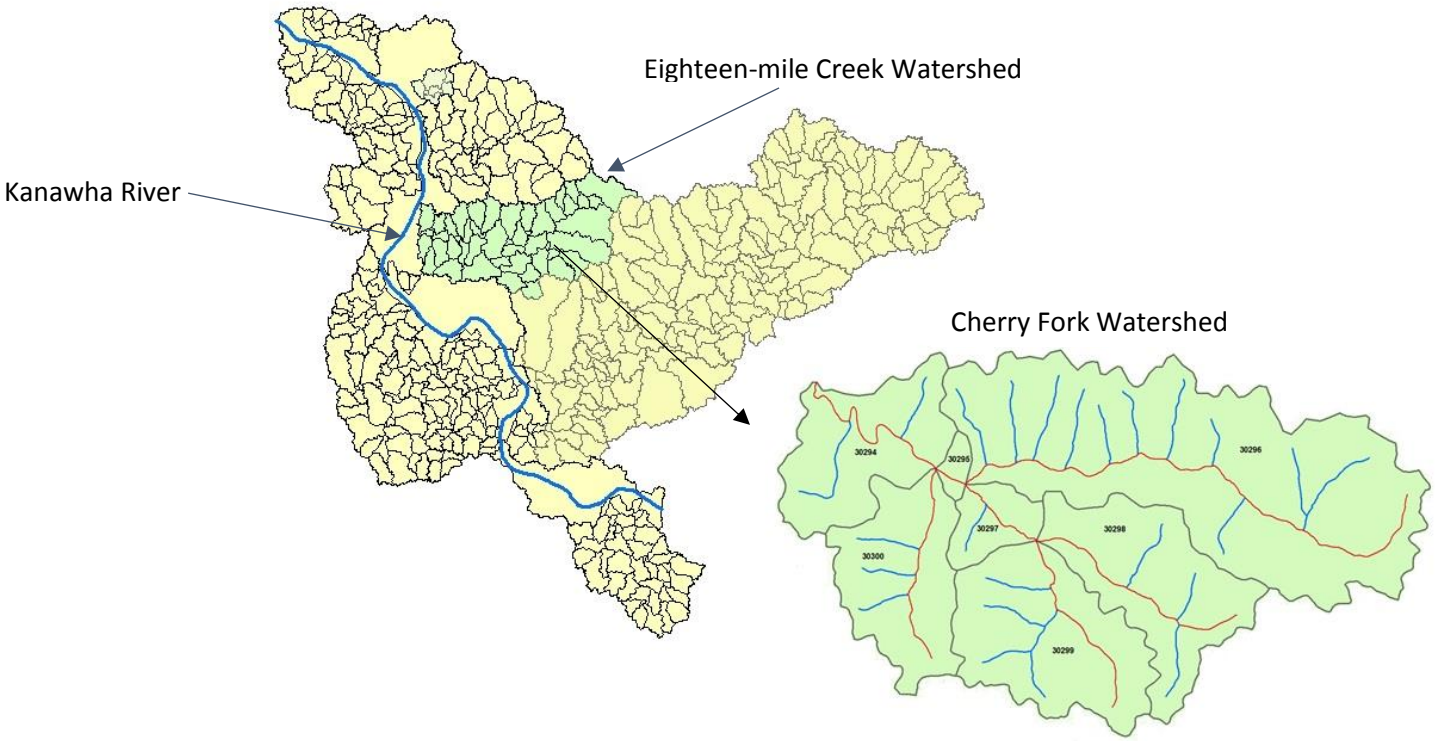
The Eighteen Mile Creek Watershed was selected in early 2015 after a discussion with the District Conservationist in Western District regarding agriculture impacts in the Lower Kanawha drainage. Initial efforts included multiple reconnaissance visits and an in-depth review of the Eighteen-Mile Creek TMDL and technical report. After deliberation with technical support staff, it was decided that the drainage was too large to address with a single plan; dividing the effort into multiple plans would allow for a more efficient approach to addressing the nonpoint source issues. It was decided that sub-sheds located at the head of the Eighteen-Mile Creek would be considered. Consequently, Cherry Fork was chosen. Additionally, the NRCS is currently moving forward with a new approach for conservation efforts called ***focused area planning***. These efforts seek to measure success of conservation efforts in a specific area. The Natural Resource Conservation Service in Western District plans to focus on a watershed located within the Eighteen Mile Creek drainage. The potential for establishing truly quantifiable conservation practices in the Western district and Lower Kanawha drainage have never been greater.

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 Cherry Fork 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.

Cherry Fork is a relatively small watershed, 9057 acres, located in Putnam and Jackson Counties. It is part of the Eighteen-mile Creek Watershed in the Lower Kanawha drainage. It consists of seven sub-watersheds numbered 30294, 30295, 30296, 30297, 30298, 30299, and 30300.

Figure 1: Cherry Fork in the Lower Kanawha Watershed



Cherry Fork 30294, 30295, 30297, 30299, Painters Branch 30296, Sigman Fork 30298, and Stumpy Run 30300 are listed as impaired in the 2010 Section 303(d) list as impaired by fecal coliform and Iron. Pollutant load allocations are included in the Lower Kanawha TMDL approved by the EPA in 2012.

The predominant land use is forest. The topography is typical for this section of West Virginia; with narrow valleys and steep ridges. Areas along the narrow valleys and ridgetops are developed.

The West Virginia Conservation Agency will be the lead agency in implementing this watershed based plan but will work closely with the USDA Natural Resources Conservation Service and the Putnam County Health Department in doing so.

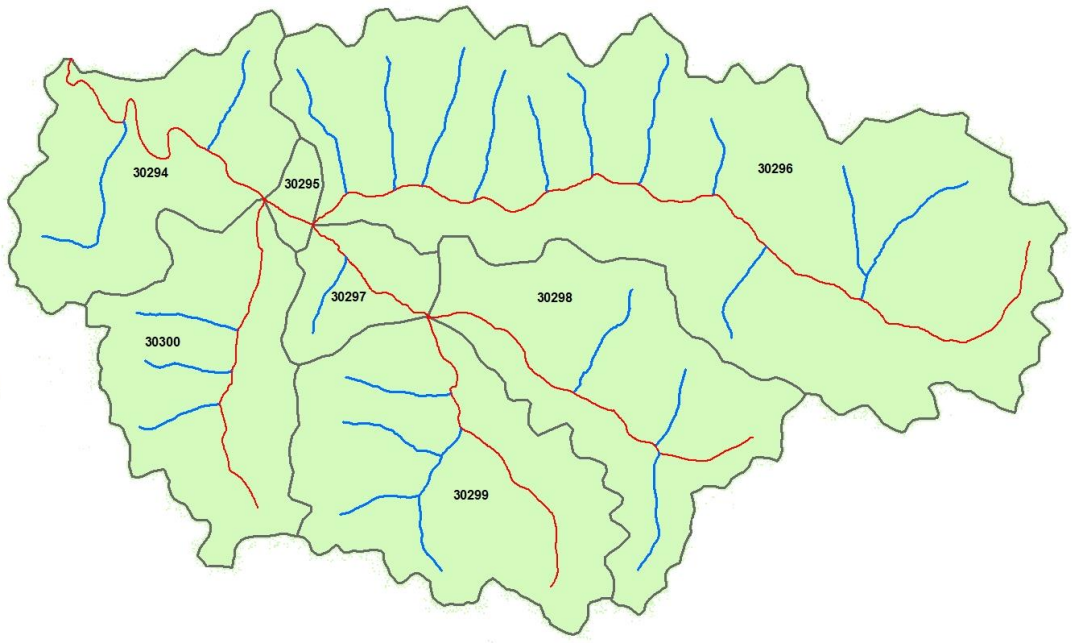


Figure 2: Cherry Fork Watershed

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 water body 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 the Lower Kanawha River watershed was approved by the US Environmental Protection Agency in 2012. The WVDEP conducted extensive water quality monitoring throughout the Lower Kanawha River watershed from July 2007 through June of 2008. The results of that effort were used to confirm the impairments of waterbodies identified on previous 303(d) lists and to identify other impaired waterbodies 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.

The TMDL modeled baseline conditions that demonstrated additional pollutant impairments to those identified via monitoring. A TMDL is composed of the sum of individual waste-load 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:

TMDL = sum of WLAs + sum of LAs + 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 anti-degradation policy.

In the Lower Kanawha 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:

The 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.

Fecal Coliform

The Eighteen-mile Creek TMDL shows that there are no point sources of fecal coliform in the TMDL streams within Cherry Fork, therefore, all impairments come from nonpoint sources. The TMDL calls for a 44.29% reduction in fecal coliform levels for Cherry Fork (Table 1-A). Metals TMDLs call for reductions in Iron levels for Cherry Fork 82.17%, Painters Branch 87.36%, Sigman Fork 49.48%, and Stumpy Run 54.88% respectively (Table 1B)

Table 1-A

Lower Kanawha Watershed - Fecal Coliform TMDLs

TMDL Watershed	Stream Code	Stream Name	Baseline LA (counts/yr)	LA (counts/yr)	MOS (counts/yr)	TMDL (counts/yr)	% Reduction
Eighteen-mile Creek	WV-KL-27-AB	Cherry Fork	3.62E+13	2.02E+13	1.06E+12	2.12E+13	44.29

Table 1-B

Lower Kanawha Watershed Metals TMDLs

TMDL Watershed	Stream Code	Stream Name	metal	Baseline LA (lbs/yr)	LA (lbs/yr)	Baseline LA (lbs/yr)	WLA (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)	% Red.
Eighteen-mile Creek	WV-KL-27-AB	Cherry Fork	Iron	111729.66	18104.56	2204.85	2204.85	1068.92	21378.3	82.17
Eighteen-mile Creek	WV-KL-27-AB-4	Painters Branch	Iron	56941.15	6384.15	930.79	930.79	385.00	7699.93	87.36
Eighteen-mile Creek	WV-KL-27-AB-6	Sigman Branch	Iron	4713.68	2228.50	308.99	308.99	135.55	2671.05	49.48
Eighteen-mile Creek	WV-KL-27-AB-3	Stumpy Run	Iron	6484.31	2783.98	258.16	258.16	160.11	3202.25	54.88

The Lower Kanawha TMDL calls for reductions in the Cherry Fork watershed from the categories of on-site wastewater systems and agriculture. The agricultural land use specifically identified as contributing to the contamination is pasture/cropland. The TMDL identifies six sub-watersheds (SWS) in the Cherry Fork watershed. They are identified in Table 2.

The total reduction needed from the on-site wastewater category is 7.64E+10. The total reduction needed from agriculture sources is 1.53E+13.

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

Sub-watershed (sws)			Pasture/Cropland Baseline Load (counts/yr)	Onsite Sewer Systems Baseline Load (counts/ yr)
30294	Cherry Fork	WV-KL-27-AB	1.07E+13	7.40E+10
30296	Painters Branch	WV-KL-27-AB-4	2.67E+12	3.01E+11
30297	Cherry Fork	WV-KL-27-AB	1.25E+11	7.97E+09
30298	Sigman Branch	WV-KL-27-AB-6	1.92E+11	1.24E+11
30299	Cherry Fork	WV-KL-27-AB	4.53E+11	1.24E+11
30300	Stumpy Run	WV-KL-27-AB-3	2.16E+12	1.33E+11
	Total		1.63E+13	7.64E+11
	Total Baseline Load			1.71E+13

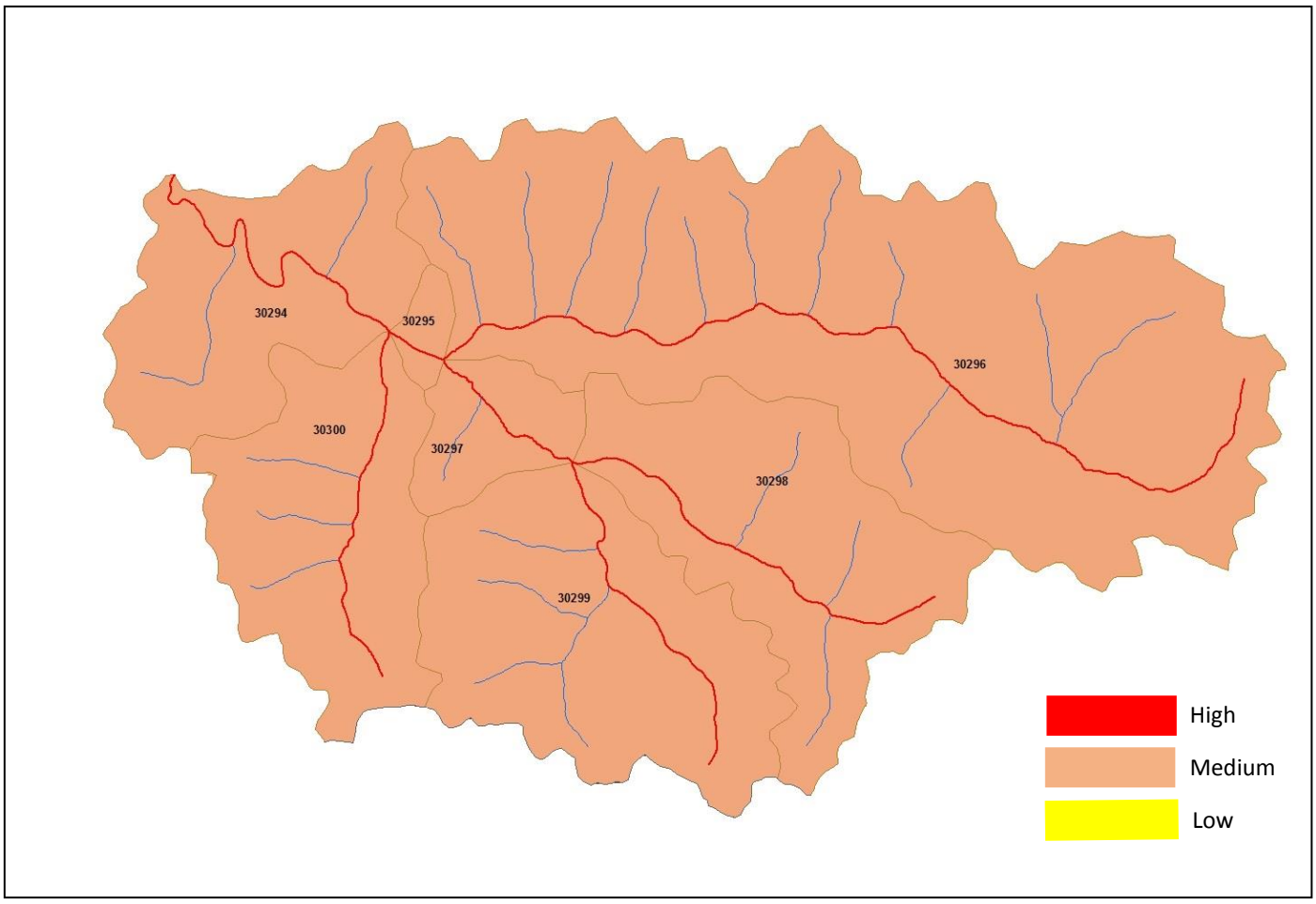
Agriculture

In the agricultural land use category, sub-watersheds 30294, 30296, 30299 and 30300 contribute fecal coliform to Cherry Fork. The total reduction needed from agriculture is 1.53E+13. Based on the TMDL, 93.41% of all fecal coliform reductions will come from reductions in agricultural sources.

On-site Wastewater Sewage Treatment

In the on-site wastewater category reductions are called for in six sub-watersheds with the highest reduction in SWS 30296 “Painters Branch”. 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 3: Cherry Fork Septic System Failure Rate Zones



Onsite Sewer Systems

To calculate wastewater flows, the watersheds were divided into four septic failure zones during the source tracking process. Septic failure zones were delineated by soil characteristics soil permeability, depth to bedrock, depth to groundwater, and drainage capacity as shown in the United States Department of Agriculture (USDA) county soil survey maps. Two types of failure were considered: complete failure and periodic failure. In the analysis, 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 and a periodic failure was defined as 25 gallons per house per day. A base concentration of 10,000 counts per 100 ML was used as a beginning concentration for failing septic systems. The TMDL estimates the number of residences with failure by the percentages in the table below. The TMDL identifies the entire Cherry Fork watershed failure zone as medium.

In the TMDL, the calculation for determining residences with failed systems can end with a fraction. There can be no fractions, a system is failing or it is not. All fractions in the model are rounded up to the next whole number. The estimated number of residences with failing systems, for the Cherry Fork watersheds is shown in the tables below.

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

Type	% of homes, with seasonal failure	% of homes, with complete failure
Very Low	3%	5%
Low	7%	10%
Medium	13%	24%
High	19%	28%

Table 4: Septic Failures by zone and 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
30294	0	0	5	8	0	0	5	8
30295	0	0	0	0	0	0	0	0
30296	0	0	19	34	0	0	19	34
30297	0	0	0	1	0	0	0	1
30298	0	0	8	14	0	0	8	14
30299	0	0	8	14	0	0	8	14
30300	0	0	8	15	0	0	8	8
Totals	0	0	47	87	0	0	47	87

Table 5: Load reductions by SWS and failure type

Load Reductions by SWS and Failure Type			
SWS	**Type of Failure**	**# Units**	**Load Reduction (counts/year)**
30294	Complete	8	5.82E+10
	Periodic	5	1.58E+10
30295	Complete	0	0.00E+00
	Periodic	0	00.00E+00
30296	Complete	34	2.37E+11
	Periodic	19	6.41E+10
30297	Complete	1	6.29E+9
	Periodic	0	00.00E+00
30298	Complete	14	9.77E+10
	Periodic	8	2.64E+10
30299	Complete	14	9.77E+10
	Periodic	8	2.64E+10
30300	Complete	15	2.84E+10
	Periodic	8	2.64E+10
Total Complete Failures		86	**Total load** **6.01E+10**
Total Seasonal Failures		48	**Total load** **1.63E+10**
Totals			**7.64E+10**

LOAD REDUCTIONS REQUIRED

The load reductions being called for in this watershed based plan are based on the TMDL for the entire Lower Kanawha. The TMDL is a load allocation that expresses what can 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 Cherry Fork, the Pasture/Cropland (agriculture) category require four SWS to make reductions: 30294, 30296, 30299, 30300. The total reduction needed from agriculture is 1.53E+13. In the On-site Sewer Systems (failing septic systems) category six SWS: 30294, 30296, 30297, 30298, 30299 and 30300 have a 100% reduction required because the West Virginia Bureau for Public Health regulations prohibit the discharge of raw sewage into surface waters. Therefore, all illicit, non-disinfected discharges of human waste from failing on-site systems will be reduced by 100% in the TMDL. The total reduction needed from the on-site wastewater category is 7.64E+10.

Table 6: Required Fecal Coliform Reductions

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)
30294	Cherry Fork	WV-KL-27-AB	1.07E+13	2.37E+11	1.05E+13	7.40E+10	0.00E+00	7.40E+10	1.06E+13
30295	Cherry Fork	WV-KL-27-AB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30296	Painters Branch	WV-KL-27-AB-4	2.67E+12	2.80E+11	2.39E+12	3.01E+11	0.00E+00	3.01E+11	2.69E+12
30297	Cherry Fork	WV-KL-27-AB	1.25E+11	1.25E+11	0.00E+00	7.97E+09	0.00E+00	7.97E+09	7.97E+09
30298	Sigman Fork	WV-KL-27-AB-6	1.92E+11	1.92E+11	0.00E+00	1.24E+11	0.00E+00	1.24E+11	1.24E+11
30299	Cherry Fork	WV-KL-27-AB	4.53E+11	4.16E+10	4.11E+11	1.24E+11	0.00E+00	1.24E+11	5.35E+11
30300	Stumpy Run	WV-KL-27-AB-3	2.16E+12	2.02E+11	1.96E+12	1.33E+11	0.00E+00	1.33E+11	2.09E+12
	Totals				1.53E+13			7.64E+10	1.54E+13

Agriculture (Pasture and Crop)

The TMDL calls for reductions from agriculture in four sub-watersheds; 30294, 30296, 30299, and 30300. Since Cherry Fork is listed as impaired from the mouth to headwaters and most the drainage is considered moderate agriculture intensity, ag related projects should be considered in all sub-watersheds. See figure 4. To predict how installed practices will affect pollution in the 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 model included rainfall, runoff potential, seasonal variance and bacterial die off when deposited on land. Other variables that can affect load reduction calculations are: the amount of time livestock spend in or near a stream; mobility of the livestock and the location of watering and feeding areas especially during the wet winter season. All factors being considered together have resulted in the modeled TMDL baseline for the sub-watersheds.

Field surveys for the four sub-watersheds suggest the following livestock present:

147 Cattle, 48 calves, 35 Horses, and 10 Sheep.

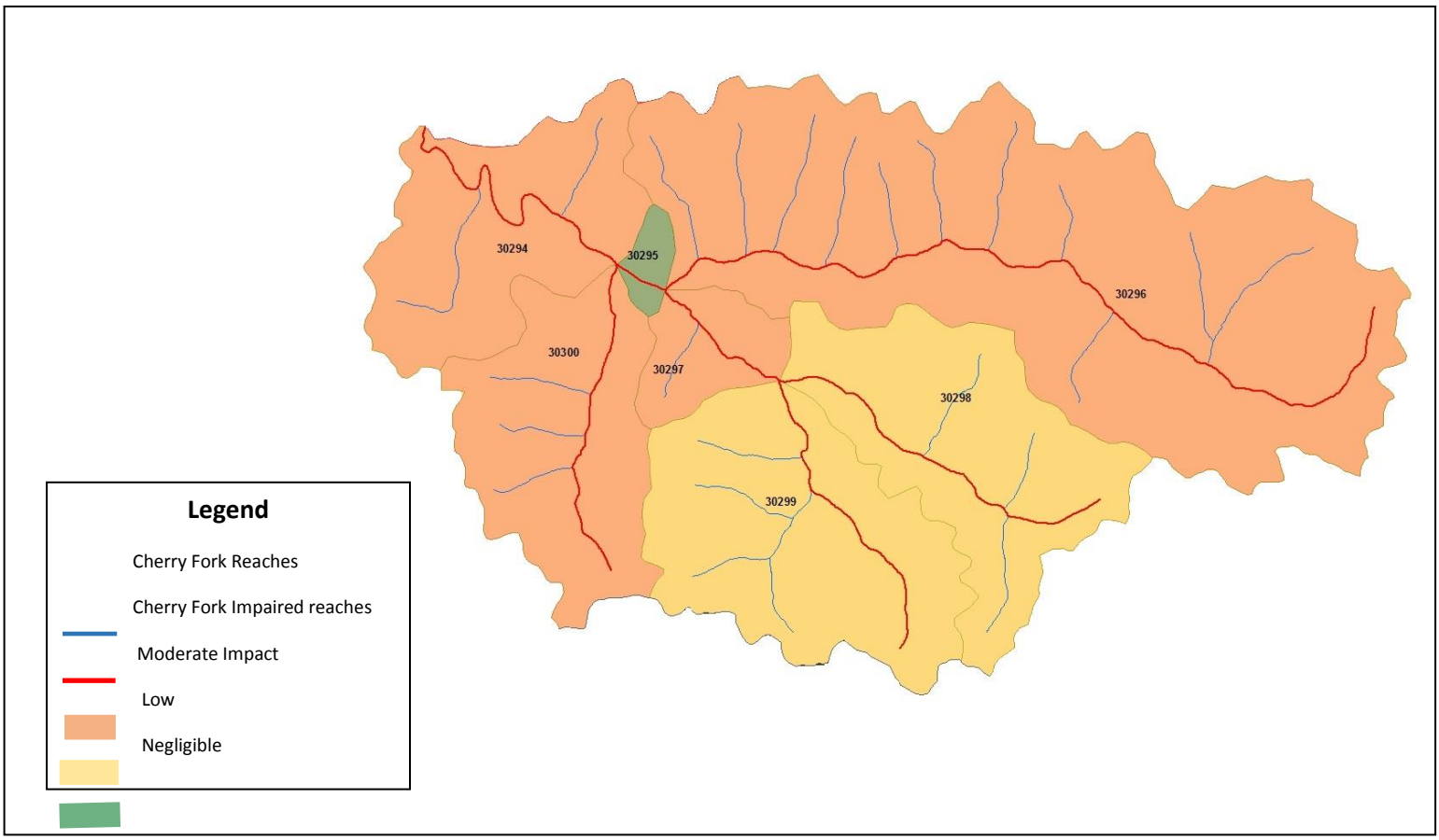


Figure 4: Cherry Fork Agriculture Intensity zones

To calculate the effect of installed BMP's a TMDL compatible loading per animal is needed along with the estimated efficiency of the BMP. To accomplish this, the different species need to be converted to animal units (AU). The conversion is based on Maryland Dept. of Agriculture's animal unit equivalencies. Other assumptions need to be made in calculating load reductions:

1. The TMDL model is the basis for estimating fecal coliform survival and entry into the stream.
2. The AU's remain stable over time and are the same numbers and species that existed in the watershed at the time of source tracking/modeling for the TMDL.

Animal Type	AU Equivalency	# of animals	Total AU
Cattle	1	147	147
Calves	.75	48	36
Horses	2	35	70
Swine	.2	0	0
Sheep	.1	10	1
Totals		240	254

Using these assumptions, the total number of AUs in the four sub-watersheds of concern is 240. Considering the baseline load from the TMDL of 1.63E+13 as the starting point this would give a loading of 6.79E+10 counts/year per AU.

To sum up the TMDL target load reductions for agriculture the BMPs must achieve a load reduction of 1.53E+13 counts/year or a 93.41% reduction from agricultural sources.

Iron

Metals TMDLs call for reductions in Iron levels for Cherry Fork 82.17%, Painters Branch 87.36%, Sigman Fork 49.48%, and Stumpy Run 54.88% respectively.

Table 7: Lower Kanawha Watershed Metals TMDL's

Lower Kanawha Watershed Metals TMDLs										
TMDL Watershed	Stream Code	Stream Name	metal	Baseline LA (lbs/yr)	LA (lbs/yr)	Baseline LA (lbs/yr)	WLA (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)	% Red.
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Eighteen-mile Creek	WV-KL-27-AB-3	Stumpy Run	Iron	6484.31	2783.98	258.16	258.16	160.11	3202.25	54.88

The maximum allowable concentrations of total Iron that exceed the designated use of aquatic life and public water supply is 1.5mg/L as a four-day average concentration more than once in a three-year period.

Reductions in Iron needed to comply with the TMDL are listed by source in Table 8. The table shows that 42% of the reductions should come from the forest harvest category.

Table 8: Sources for Total Reductions in Iron in Cherry Fork Watershed

Sources Reduction (lbs./yr.) % of Total		
Sources	**Iron reductions lbs./yr.**	**% of total**
Agriculture	**5350**	**5.78%**
Unpaved Roads	**5706**	**6.16%**
Oil and Gas	**4218**	**4.56%**
Urban Residential	**4414**	**4.77%**
Stream Bank Erosion	**33,926**	**36.64%**
Forest harvest	**38,978**	**42%**
Totals	**92,592**	**100%**

Agriculture

Agricultural activities can contribute sediment loads to nearby streams through poor land management practices and uncontrolled livestock access to sensitive areas. Agriculture is present throughout the entire drainage but prevalent along the ridgetops and isolated tight valley areas adjacent to streams.

Forest Harvest

100% of the Iron reductions for forest harvest come from the Painter's Branch watershed. The number acres being logged in 2016 in the impaired sub-watersheds is 96 % less than in 2008 when data was collected for the TMDL. The logging impact is due to erosion from roads, landings and disturbed hillsides. If this disturbance is 96% less than 2008, it can be assumed the impact is also 96% less by modeling. The baseline load in 2008 was 40,679 lbs./yr. of iron, a 96% reduction would result in a baseline of 1627.16 lbs./yr. iron. The load allocation is 1701 lbs./yr. which means the load reduction required would be 501.8 lbs./yr. of iron, or 0.63 tons/yr. of sediment. This load reduction and more will be accomplished by the revegetation of roads and landings before the companies are released from their Logging Sediment Control Act requirements by the Division of Forestry. The combination of reduced logging and enforcement of the LSCA will accomplish the TMDL. However, logging is a variable and usually a short-lived activity. Over time the loadings, locations and reductions from this source will change.

Unpaved Roads

Runoff from paved and unpaved roadways can contribute significant sediment loads to nearby streams. Heightened storm-water runoff from paved roads can increase erosion potential. Unpaved roads can contribute significant sediment loads through runoff, as they are both a source and easy pathway for sediment transport. Roads that traverse stream paths elevate the potential for direct deposition of sediment. Road construction and repair can further increase sediment loads if BMPs are not properly employed. There are 44 acres of paved roads and 36.21 acres of unpaved roads in the Cherry Fork watershed.

Oil and Gas

There are approximately 75 acres of oil and gas well activity in the Cherry Fork Watershed. Runoff from unpaved access roads to these wells and the disturbed areas around the wells contribute sediment to adjacent streams.

Stream Bank Erosion

Streambank erosion has been determined to be a significant sediment source. The sediment loading from bank erosion is associated with bank condition and upland imperviousness According to the TMDL, the second largest contributor of iron in the impaired waters of Cherry Fork comes from stream bank erosion. This source alone accounts for 36.64% of the iron. Field observations suggest this number is considerably higher. While establishing monitoring sites in 2015, 7500 linear feet of failing bank were documented.

The information for stream bank stability was provided by the WVDEP during the monitoring process using the Rapid Bio-assessment Protocol. Most of the stream bank erosion is occurring along the main stem of Cherry Fork but is also prevalent in Painter Branch, Sigman Branch and Stumpy Run.

Iron/sediment correlation

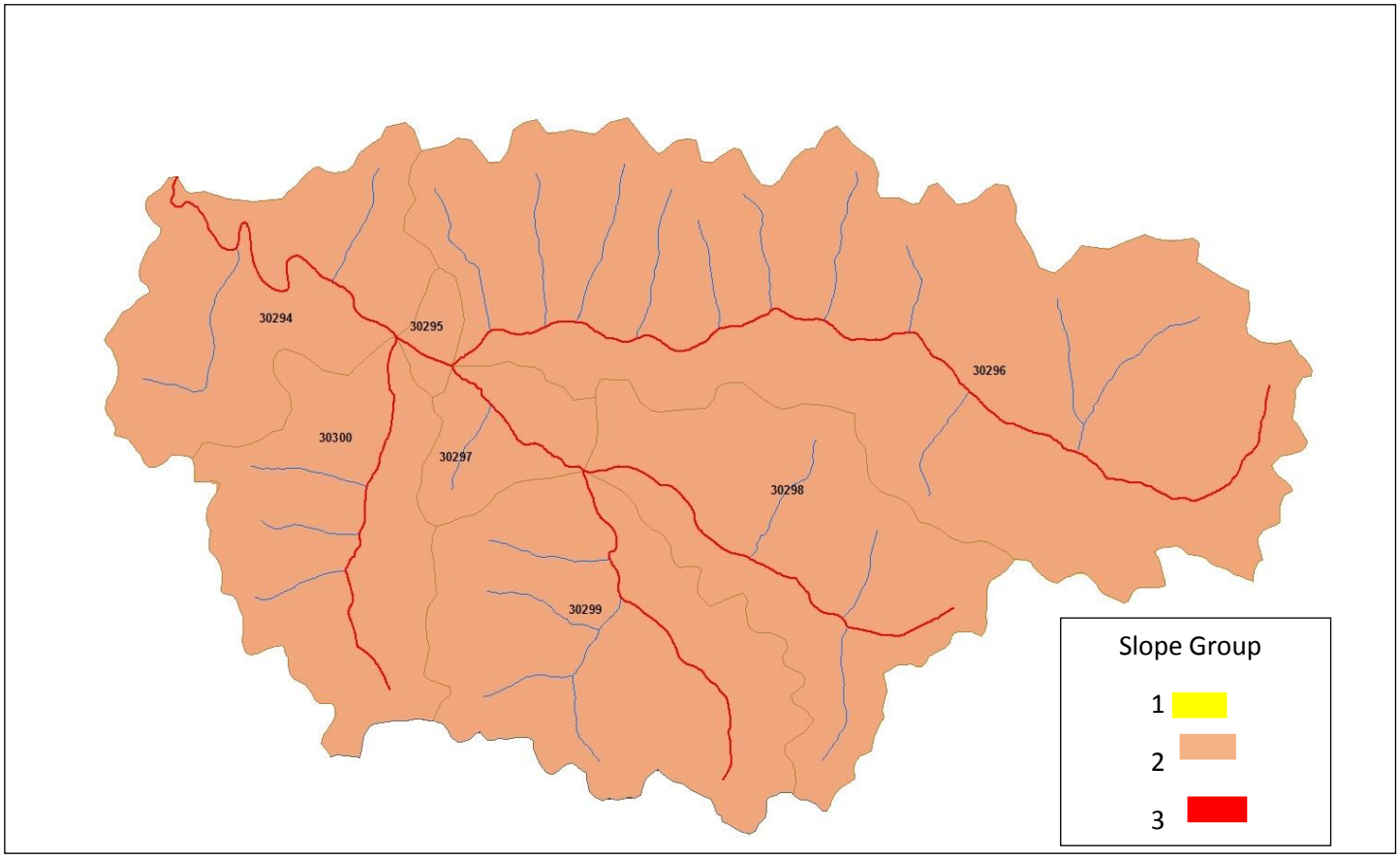
Sediment-producing land-uses and bank erosion are sources of iron because of the relatively high iron content of the soils in the watersheds. Statistical analyses using pre-TMDL monitoring data collected throughout the subject watersheds were performed to establish the correlation between iron loads and sediment loads.

The iron sediment slopes calculated from linear regression analysis was grouped into slope groups to calculate potency factors used in the modeling. Potency factors indicating the iron loads relative to the sediment produced from soil and stream bank erosion was calculated from average Fe/TSS slope of each slope group. Average iron sediment slopes and associated sediment potency factors for the slope groups in the Lower Kanawha River Watershed and are given in **Table 9** respectively.

Table 9: Slope group Iron Sediment Relationship

Slope Group	Fe/TSS Slope	Potency Factor Lbs./Iron per ton of sediment
1	.024	48
2	.035	70
3	.045	90

Figure 5: Iron sediment slope for slope groups in the Cherry Fork watershed



*Derived using the Fe/TSS relationship illustrated in **Table 9**. The entire Cherry Fork Watershed falls under slope group 2. **Table 10** highlights the total amount of sediment reduction required to yield the required Iron reduction.*

Table 10: Source Reductions for Cherry Fork

Sources Reduction (lbs./yr.)			
Sources	**Iron reductions lbs/yr**	**Total sediment reduction (Based on Fe/TSS Slope)**	**% of total**
Agriculture	**5350**	**152,858 lbs.**	**5.78%**
Unpaved Roads	**5706**	**163,029 lbs.**	**6.16%**
Oil and Gas	**4218**	**120,515 lbs.**	**4.56%**
Urban Residential	**4414**	**126,115 lbs.**	**4.77%**
Stream Bank Erosion	**33,926**	**969,315 lbs.**	**36.64%**
Forest harvest	**38,978**	**1,113,658 lbs.**	**42%**
Totals	**92,592**	**2,645,490 lbs.**	**100%**

As mentioned, the Iron reductions under forestry are attributed to logging activities in Painters Branch that occurred nearly ten years ago, in 2008. Removing the Iron reduction attributed to forest harvest would give a total Iron reduction of 53,614 pounds per year to meet the TMDL requirements. Table 13 offers a summary of reductions

Photo by Mark Buchanan

Streambank failure is common throughout the Cherry Fork Watershed and accounts for an estimated 36% of total Iron loading to the stream.

Photo by Mark Buchanan

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 per 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 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 Department (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 Health Department regulations based on

home size and soil porosity and must be approved by the Health Department 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 watersheds in West Virginia 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 86 new systems and 48 pumping events.***

Livestock/Pasture

To reduce fecal coliform and sediment 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 direct flow from ephemeral drainages. 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 11 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 per the WV Erosion and Sediment Control Handbook. These practices correspond to BMP efficiencies in Table 11 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 11 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 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 11 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 11 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 11 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 11 for: sediment ponds/swale in combination with filter strip.

The TMDL calls for a reduction in fecal coliform from agriculture totaling 1.53E+13. Per the technical report, there are approximately 1037 acres currently used as crop and pasture. Looking at other projects throughout West Virginia, the following types of BMPs are expected to be used in the Cherry Fork Watershed:

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

To accomplish the required load reductions, the following types and numbers of agricultural BMPs are expected to be installed as part of conservation plans.

Number of Farms: 45
Acres in Conservation/Nutrient Plans: 1250
Exclusion Fence (feet): 277,200
Division Fence (feet): 134,444
Pipeline (feet): 117,689
Water Troughs: 180
Waste Storage Facility: 2
Stream Crossings: 7
Streambank Restoration/stabilization (feet): 7500

The conservation plans for 45 farms will be developed to best suit the circumstances and problems for each farm and may include some or all the above mentioned BMPs.

Table 11 BMP Efficiencies – Expected load reductions for management measures

Best Management Practice	Efficiencies
Filter Strip	70%
Waste Treatment Lagoon and Animal Waste Management Systems	85%
Sediment Pond/Swale in combination with filter strip, and other Erosion and Sediment Control	85%
Fencing (complete removal of livestock from stream)	90%
Riparian Buffer	80%
Alternative watering system without fencing	50%
Alternative watering system with flash rotational grazing in the riparian zone	90%
Conservation Planning, Nutrient Management, Grazing and Winter Feeding Planning	80%
Heavy Use Area Protection and Critical Area Planting	
Land Use Covenants	90%
Conservation Easements	90%
Streambank Stabilization	90%

(Specific load reductions are calculated based on animal numbers and soil bacteria concentration of specific sites. A percent of efficiency is the only way to provide a specific load reduction per management measure for this plan.)

Streambank Stabilization

A variety of techniques will be employed to address streambank failure including Natural Stream Channel Design (NSCD) Natural Stream Channel Design is the application of fluvial geomorphology principles to create stable channels that maintain a state of dynamic equilibrium among water, sediment, and vegetation such that they do not aggrade or degrade over time.

NSCD will not be possible on every problem reach due to adjacent land uses in some areas. Therefore, some sights will benefit from general streambank stabilization projects including floodplain excavation, instream structures and or other soil bioengineering approaches. All stream projects will focus on the effort of reconnecting the stream with the floodplain. Additionally, reductions will be tracked and credited based on multiple BEHI surveys conducted within the drainage area during 2016. The surveys yielded the following averages:

Sediment load totals averaged 380 pounds per linear foot. Assuming an estimated reduction attributed to restoration of 50% (The default rate for stream restoration in the Chesapeake Bay Model) the expected reduction for stream restoration projects on Cherry Fork will be 190 lbs./linear foot/ year. Restoring or stabilizing the 7500 linear feet of failing bank will remove an estimated 49,795 pounds of Iron.

Unpaved Roads

Although no delineation is given in the TMDL as to the type of unpaved roads found in the Cherry Fork drainage, the technical report did offer a classification system. For this plan, the majority of unpaved roads in the Cherry Fork drainage will be classified as follows:

A-5 *A road in this category is usable only by four-wheel drive vehicles, is usually a one lane dirt trail, and is almost exclusively found in very rural areas.*

A-7 *A road in this category is not part of the vehicle highway system. It is used by bicyclists or pedestrians, and is typically inaccessible to mainstream motor traffic except for private owners and service vehicles.*

As part of the overall effort to reduce sediment/Iron loading to the stream, landowners who have dirt roads present on their property either for access through woodland areas or those for recreational off-road riding etc. will be offered a suite of BMP's if the road is deemed as a resource concern during conservation planning efforts. The following NRCS Practices may apply to such situations:

410 Grade Stabilization Structure, 654 Road/trail/landing closure and treatment, 350 Sediment Basin, 587 Structure for water control, 638 water and sediment control basin.

Prioritization

All Best Management Practices will be implemented at the sub watershed level. Sub watersheds will be selected to receive restoration based on the overall load reductions required and landowner's willingness to participate. After the sub watershed is selected and funding is procured, landowners in the most upstream reaches will be contacted to participate in BMP implementation. As these landowners either agree or decline to participate, landowners downstream from them will then be contacted. This will assure that all restoration is implemented in order from the head of the watershed and proceed downstream. Prioritization by SWS is outlined in Table 11. While some practices are not divided out by SWS, this provides flexibility to mitigate practices throughout the watershed as needed and not lock in specific quantiles of practices in specific SWS's. These practice goals will be better quantified by SWS in individual project proposals after landowners have been approached about what practices they are willing to implement.

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

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 for the Cherry Fork 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 called for in the TMDL.

The estimated total cost is $3,390,443. At a 60%/40% cost share for the 319 program. This would mean potential grant requests of $2,034,266 with $1,356,177 coming from non-federal sources. However, EQIP and CREP may be a part of the federal funding sources.

Table 12: Budget

Budget				
BMP	unit	extent	Cost per unit	Total cost
Acre in nutrient plans	acres	1250	$4.00	5000
Exclusion Fence	Feet	277,200	$3.00	831,600
Division Fence	Feet	134,444	$3.00	403,332
Pipeline	Feet	117,689	$3.50	411,911
Water troughs	per	180	$1,500.00	270,000
Waste Storage Facility	per	2	$80,000.00	160,000
Stream crossings	per	7	$2,800.00	19,600
Septic replacement	per	86	$7,500.00	645,000
Septic system repair	per	48	$500.00	24,000
Equipment/Administration			$10,000.00	10,000
Education	year	5	$1,000.00	5000
Monitoring	Year	5	$1,000.00	5000
Streambank Stabilization	Feet	7500	$80.00	600,000
Total Cost				3,390,443

Education and Outreach

Any large-scale effort such as this requires a great amount of planning and coordination as well as a well-informed public if it is to be successful. An open dialogue with farmers and landowners has already begun to be formed. Multiple mass mailings to landowners registered with the Farm Service Agency were executed in the spring of 2016.

Additionally, announcements about the potential project were made at the local farm bureau meetings to identify potential participants.

As typical with other watershed scale projects, a variety of informative brochures will focus attention to the project and its intended goals. General information as well as signup periods will be announced. Other methods to disseminate information include the local paper and signage hung at local business establishments within the surrounding vicinity. The Environmental Specialist will also utilize social media outlets to bring public attention to the project.

A long term educational effort about water quality and resource management is the key to sustainable improvements in the watershed. Such an approach changes lifestyle perceptions and involves commitments from resource professionals as well as the community itself. Beyond brochures and initial contact regarding the project, the Cherry Fork project will seek to establish such a program. Confidence Elementary, the local elementary school that serves the residents living within the drainage area, will be targeted for multiple resource education events with most them relating directly and indirectly to water quality. A long-term classroom component involving Project WET Curriculum will be handled through a cooperative agreement with the College of Education at Marshall University.

Other efforts include public meetings held each year within the watershed that highlight completed projects and encourage landowner participation during the following year.

Schedules and Milestone

Cherry Fork Schedule/Milestones

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Submit WSBP to WVDEP for review												
Outreach Efforts Begin												
Inventory streambank failure sites												

2017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Begin Septic Survey with PCHD												
Complete Septic Survey with PCHD												
complete 1st 319 grant application (request $585,987)												
Begin writing conservation plans (phase I)												
Education/Outreach												

2018	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Receive funding approval for proposal/start BMP installation												
Monitoring												
Install 8 septic systems												
perform 6 pumpings												
stabilize 650' streambank												
complete 10 conservation plans (phase I)												
Installing BMP's by conservation plan (Phase I)												
Education/Outreach												
Anticipated Iron reductions (4,243 lbs)												
Anticipated Fecal Reductions (4.08E+12)												

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monitoring												
Install 17 septic systems												
perform 12 pumpings												
stabilize 2000' streambank												
complete 10 conservation plans (phase II)												
Complete Installing BMP's by conservation plan Phase I)												
Installing BMP's by conservation plan (phase II)												
Education/Outreach												
Anticipated Iron reductions (14,489lbs.)												
Anticipated Fecal Reductions (4.09E+12)												

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monitoring												
Install 32 septic systems												
perform 22 pumpings												
stabilize 2000' streambank												
complete 10 conservation plans (phase III)												
Complete Installing BMP's (Phase II)												
Installing BMP's by conservation plan (phase III)												
Education/Outreach												
Anticipated Iron reductions (14,489lbs.)												
Anticipated Fecal Reductions (4.1E+12)												

2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monitoring												
Install 29 septic systems												
perform 8 pumpings												
stabilize 850' streambank												
complete 10 conservation plans (phase IV)												
Complete Installing BMP's (Phase III)												
Installing BMP's by conservation plan (phase IV)												
Education/Outreach												
Anticipated Iron reductions (14,489lbs.)												
Anticipated Fecal Reductions (4.09E+12)												

2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monitoring												
Complete Installing BMP's (Phase IV)												
Anticipated Iron reductions (6247lbs.)												
Anticipated Fecal Reductions (2.04E+12)												

Table 13: NPS Reduction/Cost Schedule

NPS Reduction /Cost Schedule	SWS															
Activity	30294	30295	30269	30297	30298	30299	30300	Extent	Average Cost Per Unit	Fecal Coliform Reduction	% of Reduction Goal	Sediment Reduction	% of Sediment Goal	Iron Reduction	% of Iron Goal	Total Estimated Cost
Year 1																
Septic, Complete Systems	1	0	3	0	1	1	2	8	7500		0.00					$60,000.00
Septic, Pumping's	1	0	2	0	1	1	1	6	500	7.63E+09	1.00					$3,000.00
Conservation Plans								10	46698.74	4.07E+12	26.60	33960.00	104.29	1188.60	0.67	$466,987.40
Streambank Stabilization								650	80			121220.00	372.25	4242.70	2.38	$52,000.00
Monitoring								1	1000							$1,000.00
Education/Outreach								1	1000							$1,000.00
Equipment/Admin								1	2000							$2,000.00
Total Anticipated Reduction /yr										4.0776E+12	27.60	155180.00	476.54	5431.30	3.04	
Total Cost/yr																$585,987.40
NPS Reduction/Cost Schedule	SWS															
Activity	30294	30295	30269	30297	30298	30299	30300	Extent	Average Cost Per Unit	Fecal Coliform Reduction	% of Fecal Goal	Sediment Reduction	% of Sediment Goal	Iron Reduction	% of Iron Goal	Total Estimated Cost
Year 2																
Septic, Complete Systems	2	0	6	1	2	2	4	17	7500		0.00					$127,500.00
Septic, Pumping's	2	0	4	0	2	2	2	12	500	1.60E+10	2.09					$6,000.00
Conservation Plans								10	46698.74	4.07E+12	26.60	33960.00	104.29	1188.60	0.67	$466,987.40
Streambank Stabilization								2000	80			380000.00	1166.93	13300.00	7.46	$160,000.00
Monitoring								1	1000							$1,000.00
Education/Outreach								1	1000							$1,000.00
Equipment/Admin								1	2000							$2,000.00

Total Anticipated Reduction /yr										4.086E+12	28.70	413960.00	1271.22	14488.60	8.12	
Total Cost/yr																$764,487.40
NPS Reduction/Cost Schedule	SWS															
Activity	30294	30295	30269	30297	30298	30299	30300	Extent	Average Cost Per Unit	Fecal Coliform Reduction	% of Fecal Goal	Sediment Reduction	% of Sediment Goal	Iron Reduction	% of Iron Goal	Total Estimated Cost
Year 3																
Septic, Complete Systems	4	0	12	0	4	4	8	32	7500		0.00					$240,000.00
Septic, Pumping's	2	0	8	0	4	4	4	22	500	2.98E+10	3.90					$11,000.00
Conservation Plans								10	46698.74	4.07E+12	26.60	33960.00	104.29	1188.60	0.67	$466,987.40
Streambank Stabilization								2000	80			380000.00	1166.93	13300.00	7.46	$160,000.00
Monitoring								1	1000							$1,000.00
Education/Outreach								1	1000							$1,000.00
Equipment/Admin								1	2000							$2,000.00
Total Anticipated Reduction /yr										4.0998E+12	30.50	413960.00	1271.22	14488.60	8.12	
Total Cost/yr																$881,987.40
NPS Reduction/Cost Schedule	SWS															
Activity	30294	30295	30269	30297	30298	30299	30300	Extent	Average Cost Per Unit	Fecal Coliform Reduction	% of Fecal Goal	Sediment Reduction	% of Sediment Goal	Iron Reduction	% of Iron Goal	Total Estimated Cost
Year 4																
Septic, Complete Systems	1	0	13	0	7	7	1	29	7500		0.00					$217,500.00
Septic, Pumpings	0	0	5	0	1	1	1	8	500	2.30E+10	3.01					$4,000.00
Conservation Plans								10	46698.74	4.07E+12	26.60	33960.00	104.29	1188.60	0.67	$466,987.40
Streambank Stabilization								2000	80			380000.00	1166.93	13300.00	7.46	$160,000.00
Monitoring								1	1000							$1,000.00
Education/Outreach								1	1000							$1,000.00

Equipment/Admin								1	2000							$2,000.00
Total Anticipated Reduction /yr										4.093E+12	29.61	413960.00	1271.22	14488.60	8.12	
Total Cost/yr																$852,487.40
NPS Reduction/Cost Schedule	SWS															
Activity	30294	30295	30269	30297	30298	30299	30300	Extent	Average Cost Per Unit	Fecal Coliform Reduction	% of Fecal Goal	Sediment Reduction	% of Sediment Goal	Iron Reduction	% of Iron Goal	Total Estimated Cost
Year 5																
Septic, Complete Systems								0	7500		0.00					$0.00
Septic, Pumping's								0	500	0.00E+00	0.00					$0.00
Conservation Plans								5	46698.74	2.04E+12	13.33	16980.00	52.14	594.30	0.33	$233,493.70
Streambank Stabilization								850	80			161500.00	495.95	5652.50	3.17	$68,000.00
Monitoring								1	1000							$1,000.00
Education/Outreach								1	1000							$1,000.00
Equipment/Admin								1	2000							$2,000.00
Total Anticipated Reduction /yr										2.04E+12	13.33	178480.00	548.09	6246.80	3.50	
Total Cost/yr																$305,493.70
Total Plan Reductions										1.8396E+13	129.74	1575540.00	4838.29	55143.90	30.91	
Total Plan Cost																$3,390,443.30

Monitoring

Pre-plan monitoring was conducted by the WVCA through the spring and summer months of 2015 to augment TMDL data as well as guide water quality restoration efforts. Table 13 illustrates those results.

Table 13: Cherry Fork Monitoring 2015

Unacceptable Limits For FE: > **1.5 mg/L**									
Unacceptable Limits For FC: > **200 col/100mL**									
Date:		5/29/2015	6/10/2015	7/02/2015	7/10/2015	7/17/2015	7/28/2015	8/07/2015	
Rainfall Amount:		0.09 (in.)	0.00 (in.)	0.35 (in.)	0.15 (in.)	0.00 (in.)	0.39 (in.)	0.12 (in.)	
Sites									
#1 Cherry Fork	**FE**	0.39 mg/L	0.21 mg/L	0.39 mg/L	2.63 mg/L	0.35 mg/L	0.18 mg/L	0.18 mg/L	
	FC	180 col/100mL	63 col/100mL	430 col/100mL	2100 col/100mL	380 col/100mL	220 col/100mL	360 col/100mL	
#2 Stumpy Run (mouth)	**FE**	0.05 ml/L	0.05 mg/L	0.09 mg/L	3.56 mg/L	0.20 mg/L	0.02 mg/L	0.03 mg/L	
	FC	108 col/100mL	171 col/100mL	250 col/100mL	3700 col/100mL	240 col/100mL	260 col/100mL	260 col/100mL	
#3 Painters Branch (mouth)	**FE**	0.15 mg/L	0.18 mg/L	0.33 mg/L	2.60 mg/L	0.29 mg/L	0.11 mg/L	0.11 mg/L	
	FC	360 col/100mL	500 col/100mL	550 col/100mL	2200 col/100mL	340 col/100mL	200 col/100mL	126 col/100mL	
#4 Tributary to Painters Br	**FE**	0.14 mg/L	0.69 mg/L	0.25 mg/L	7.38 mg/L	0.25 mg/L	0.09 mg/L	0.07 mg/L	
	FC	1636 col/100mL	2200 col/100mL	300 col/100mL	8000 col/100mL	144 col/100mL	400 col/100mL	909 col/100mL	
#5 Upper Painters Branch (Derricks Cr	**FE**	0.08 mg/L	0.44 mg/L	0.32 mg/L	1.72 mg/L	0.23 mg/L	0.04 mg/L	0.07 mg/L	
	FC	2000 col/100mL	3200 col/100mL	550 col/100mL	5900 col/100mL	240 col/100mL	550 col/100mL	420 col/100mL	
#6 Sigman Fork (Mouth)	**FE**	0.16 mg/L	0.09 mg/L	0.18 mg/L	1.43 mg/L	0.16 mg/L	0.05 mg/L	0.04 mg/L	
	FC	189 col/100mL	5200 col/100mL	260 col/100mL	1636 col/100mL	117 col/100mL	99 col/100mL	1364 col/100mL	
#7 Cherry Fork (Upper shed)	**FE**	0.03 mg/L	0.04 mg/L	0.09 mg/L	1.94 mg/L	0.11 mg/L	<0.02 mg/L	0.03 mg/L	
	FC	126 col/100mL	520 col/100mL	500 col/100mL	2300 col/100mL	108 col/100mL	45 col/100mL	1000 col/100mL	
#8 Cherry Fork	**FE**	0.05 mg/L	0.08 mg/L	0.15 mg/L	1.44 mg/L	0.27 mg/L	0.07 mg/L	0.08 mg/L	
	FC	162 col/100mL	210 col/100mL	270 col/100mL	1636 col/100mL	108 col/100mL	200 col/100mL	117 col/100mL	

Data from the 2015 effort confirms TMDL modeling with respect to fecal coliform contamination as 73% collected samples exceeded the 200 colonies/100 ml limit. Only 13% of samples exceeded the 1.5 mg/liter threshold for Iron.

Future Efforts

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 must fulfill the requirements of this base plan and the reporting requirements of the section 319 grant report and will include additional parameters over the previous monitoring efforts. Parameters will include: temperature, flow, fecal coliform, iron and any others that may be considered important. Monitoring stations will be located at the mouth of Painters Branch, Sigman Branch, and Stumpy Run, as well as the

mouth of Cherry Fork and its confluence with Eighteen Mile Creek. 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 project manager 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. To determine if stream or stream segments have been returned to water quality standards WVCA will conduct fecal coliform sampling of at least 10 samples in a one-month period. The methods and location will correspond to DEP quality assurance standards and the data will be submitted to the WVDEP.