Milligan Creek/Davis Spring Watershed Based Plan

WVKNG-22.7-(S) & WVKNG-22.7-A-1-(S)

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Partners

Greenbrier Valley Conservation District

West Virginia Conservation Agency

West Virginia University Cooperative Extension Service, Greenbrier County

USDA Natural Resources Conservation Service

West Virginia Department of Environmental Protection

Greenbrier River Watershed Association

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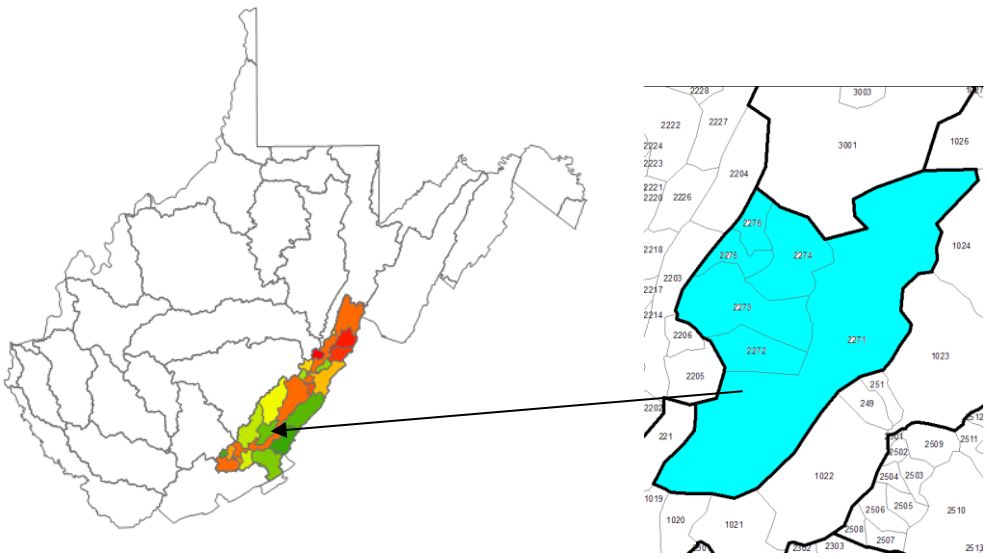
Introduction

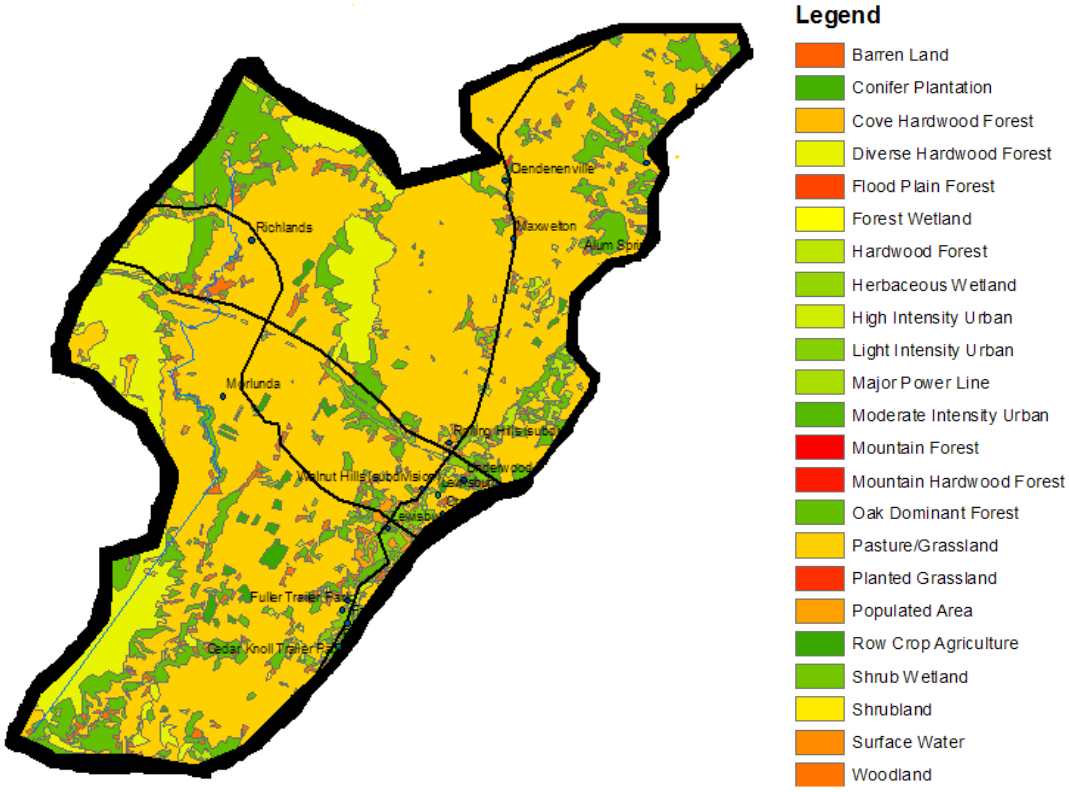
The Milligan Creek/Davis Spring Watershed is located entirely in Greenbrier County West Virginia. It contains the Karst area around Lewisburg, Frankford, and Richland. The only surface water perennial stream is this is watershed is Milligan Creek that originates in the Richland area, flows for 6.8 miles and sinks into the karst. The Creek surfaces at the Davis Spring where it flows for less than half a mile to the Greenbrier River.

Throughout time, this area had been managed as some of the only native grassland in West Virginia. Historical documents talk about the area as native bluegrass pasture, kept clear by Native Americans to attract wildlife for food. After European settlers entered the valley, these grasslands were used as grazing lands for horses raised for transportation and draft animals. Cattle and sheep production started to dominate the area after the industrial revolution. When predators began to migrate into the area, sheep production declined and cattle production took over.

Farms in the watershed are typically large, full time operations with an intensive management level. These producers are normally progressive toward new technology and marketing innovations as well as conservation practices. Many of them are college educated business people who understand that agriculture is an industry, and must be managed as such.



Location of Milligan Creek/Davis Spring Watershed within WV and the Greenbrier Valley as well as its Sub-Watersheds



Land use in the Milligan Creek/Davis Spring Watershed.

Impairments

1. Metals

There are no current or past abandoned Mine Land (AML) Problem Area Descriptions (PDA) located in the Mulligan Creek watershed and the TMDL does not identify metals as a concern for this watershed. Therefore it is not necessary to address metals in this watershed based plan

2. Fecal Coliform

Within the Milligan Creek/Davis Spring watershed there are three sub-watersheds requiring fecal coliform load reductions according to the TMDL. Two of these watersheds are on Milligan Creek its self, and the other is an entirely kirst drainage area that leads to the Davis Spring.

The narrative water quality criterion of 46 CSR 1-3.2.i. prohibits the presence of wastes in state waters that cause or contribute to significant adverse impacts to the chemical, physical, hydrologic and biological components of aquatic ecosystems. Numeric fecal coliform water quality criteria are applicable to the Water Contact Recreation and Public Water Supply designed uses. Section 8.12 of Appendix E of the West Virginia Water Quality Standards states:

Maximum allowable level of fecal coliform content for Primary Contact Recreation shall not exceed 200/100 ml as a monthly geometric mean based on not less than five samples per month; nor to exceed 400/100 ml in more than 10 percent of all samples taken during the month

The 2008 303 (d) list identifies Milligan Creek impaired for fecal coliform. Fecal coliform bacterium enters the water through one of two ways: point source or non-point source. There are no point sources located within the Milligan Creek/Davis Spring watershed. Non-point source (LAs) identified within the Greenbrier River watershed were categorized as pasture land, onsite sewage systems, residential run-off and background. The TMDL calls for reductions of non-point sources from pasture land and onsite sewage systems. A significant fecal coliform non-point loading source identified in the TMDL is agricultural land uses with estimates of 90% contributed by agricultural land uses. According to the TMDL, section 4.2.4 wildlife is not considered to be a significant nonpoint source of fecal coliform bacteria in the Greenbrier River Watershed

It should also be noted that preliminary results indicating that fecal coliform transport in waterways is a mechanism of sedimentation has also been seen in a study conducted along Milligan Creek. At five sites along the stream, water samples were taken two different ways and analyzed for fecal coliform counts and turbidity. The first sample at each site was taken at normal water flow and turbidity. The second sample at each site was altered. Sediment from the bottom of the stream was kicked up into suspension while the sample was being taken. The purpose of the experiment was to determine if sediment could be the source of bacterial contamination in the stream. In all five samples, a significant increase in turbidity demonstrated a significant increase in fecal coliform counts for that site. While Milligan Creek is a large karst window that sinks and rises several times, it can be speculated that one bacteria source for the stream is sediment being flushed out of the cave system that feeds the creek.

Results of water quality study experiment to determine fecal coliform correlation to stream turbidity in Milligan Creek.

Site 1 Normal Turbidity	745 Fecal Counts/ 100 ml	16.05 NTU Turbidity
Site 1 Altered Turbidity	2100 Fecal Counts/ 100 ml	56.3 NTU Turbidity
Site 2 Normal Turbidity	38 Fecal Counts/ 100 ml	42 NTU Turbidity
Site 2 Altered Turbidity	1500 Fecal Counts/ 100 ml	56.4 NTU Turbidity
Site 3 Normal Turbidity	2800 Fecal Counts/ 100 ml	1 NTU Turbidity
Site 3 Altered Turbidity	3900 Fecal Counts/ 100 ml	56.45 NTU Turbidity
Site 4 Normal Turbidity	791 Fecal Counts/ 100 ml	3.2 NTU Turbidity
Site 4 Altered Turbidity	891 Fecal Counts/ 100 ml	27.6 NTU Turbidity
Site 5 Normal Turbidity	360 Fecal Counts/ 100 ml	1 NTU Turbidity
Site 5 Altered Turbidity	636 Fecal Counts/ 100 ml	56.2 NTU Turbidity

a. Agriculture

The Milligan Creek/Davis Spring watershed has a large portion of pasture lands along the stream bank and in karst land, particularly in the headwaters of the stream.

Estimated Livestock Population within the Watershed

	Number of Head	Animal Units (AU) per Head	Number of Animal Units
Beef Cattle	25,000	1.3	32500
Dairy Cattle	600	1.3	780
Swine	100	.4	250
Sheep	2000	.3	600
Equine	500	1.25	625
Total	28200		34755
Total Grazing Acres within the Watershed			21733.87
Average Animal Units Per Acre			1.56

This chart is based on numerous references including: agricultural statistic bulletins, producer surveys, information from county extension service, and sale records.

According to the USDA NRCS WV Field Office Technical Guide Section III, fecal coliform contamination is a natural resource concern for: Water Quality – Harmful levels of pathogens in surface water. This concern is described as kinds and numbers of viruses, protozoa, and bacteria being present at a level that degrades surface water quality. Sampling conducted by the WV DEP demonstrated constant results over the state standard of 200 counts/1000 ml.

	Jan	Feb	Mar	Mar	May	June	Aug	Sept	Oct	Nov	Dec
Milligan Creek 2.5	62	110	26	2650	230	550	3400	800	104	130	80
Milligan Creek 5.8	220	66	24	2750	72	200	1050	1200	450	110	24
Milligan Creek 6.9	70	50	14	3450	80	180	1800	1200	**230**	102	36
Davis Spring	20	110	106	4	48	100	20	72	300	4800	290

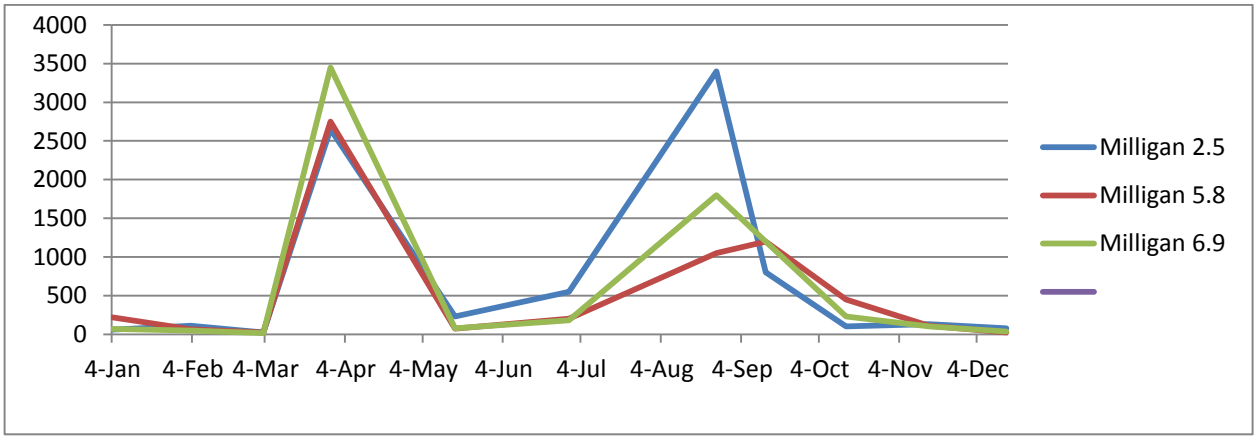
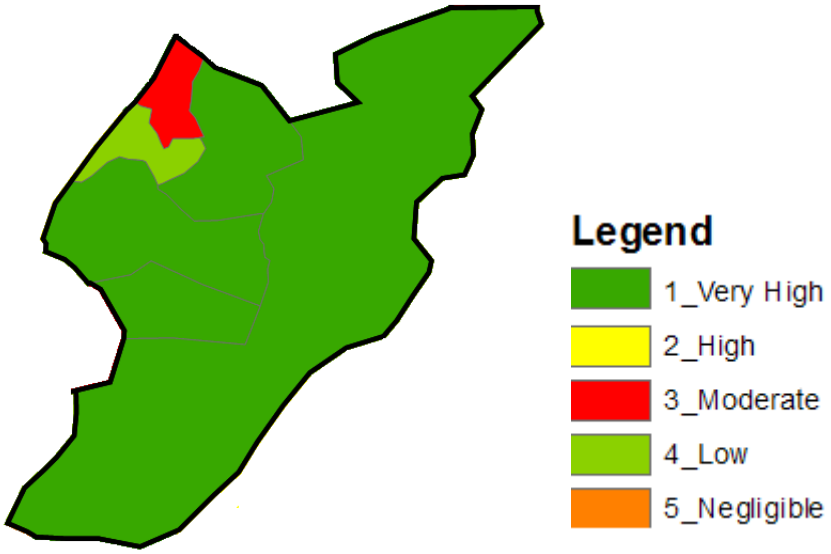
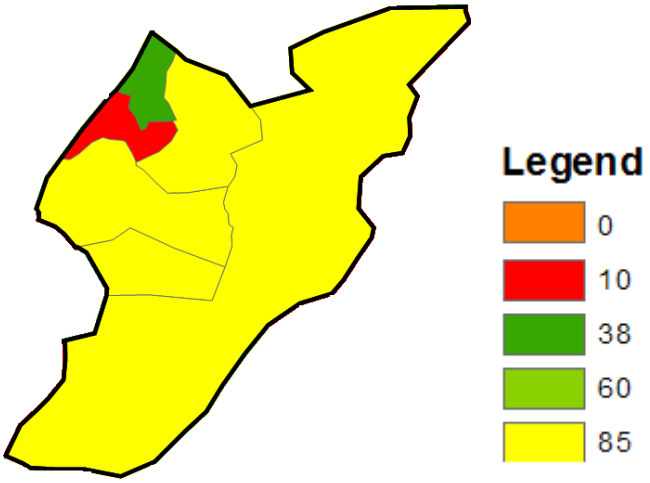


Chart X indicates the Fecal coliform spiking during the summer slump when cool season grasses stop growing



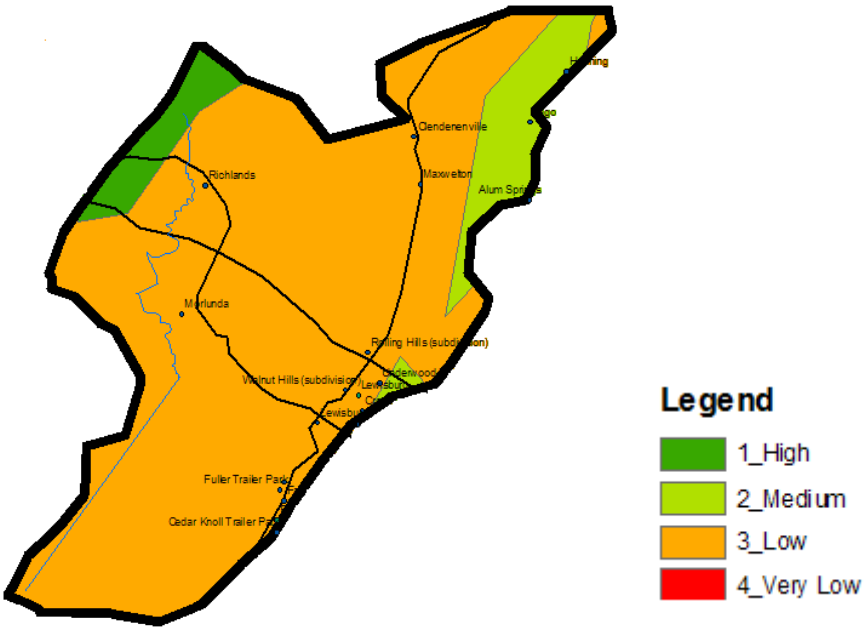
Agricultural Intensity of the Milligan Creek/Davis Spring watershed



Percent of land area in pasture

b. Failing On-site Sewage Systems

The TMDL used a model to identify the locations within the watershed that could be contributing fecal coliform from failing septic systems. First, each sub-watershed was identified and divided into one of the four septic failure zones (high, medium, low and very low) by geology, and rates of septic system failure. The map below shows the modeled failing septic flows (gpd) for Milligan Creek/Davis Spring from the TMDL. Two types of failures were considered, complete failure (50 gallons/per house/per day) and partial failure (25 gallons/per house/per day) to determine how much untreated sewage the stream was receiving. Both types of failures (complete and partial) were modeled as daily, year-round flows to simplify calculations. The model assumed that 54% of the 911 structures are homes with septic systems. That percentage was applied across each of the four zones to get the number of homes. Then the number of homes was multiplied for each failure rate and then totaled to get the baseline load condition.



Potential for failing Septic Systems

c. Residential

Run off from lawns and residential areas often contribute nutrients and pesticides into streams. A source of fecal coliform from these areas may be from penned up animals such as cats, dogs, and other animals traditionally used as pets. The TMDL does not require any reductions from residential lands.

d. Wildlife

According to the TMDL, section 4.2.4, wildlife is not considered to be a significant nonpoint source of fecal coliform bacteria in the Greenbrier River watershed. While wildlife surveys are not conducted on a watershed basis.

e. Sediment

Sediment was not identified in the TMDL as an issue that needed addressed in the Milligan Creek watershed. Even though it was not addressed, it should be monitored due to increased evidence that sediment is a carrier of fecal coliform. As livestock enter the stream to water, stream bank erosion is inevitable.

Load Reductions

1. Fecal Coliform

The TMDL sets goals for pollutant reductions from nonpoint and point source activities that, if enacted, this plan should improve water quality so that the stream segments are removed from the 303(d) list and meet standards (USEPA, 2001).

a. Agriculture

Load reductions for agricultural conservation practices will be calculated using efficiency data developed by Burns 2011 based on various studies that monitored the water quality associated with agriculture conservation practices. This document is attached in the appendix of this plan. Additionally, reductions will be calculated by a model utilizing local information about forage availability, soil types, and TMDL water quality data. With

these tools, the watershed will be modeled taking into consideration the BMP history to determine if the required load reductions have been achieved.

Practice efficiency rates as determined by Burns 2010

	Conservation Practice System	Expected Load Reduction
1	Livestock Exclusion	85%
2	Buffer	85%
3	Buffer with First Flush Prevention	99%
4	Alternative Watering System, Continuous Grazing	50%
5	Alternative Watering System, Rotational Grazing	90%
6	Livestock Waste Storage Facility	90%
7	Fully Implemented Resource Management System	99%

The below table shows the amount of required load reductions for each sub-watershed for the nonpoint sources regarding agriculture. To reach these goals BMP's will be selected from the USDA NRCS Field Office Technical Guide, and will comply with guidance documents and a point system found in Section III of this guide (see Appendix).

Required load reductions from agriculture for the Milligan Creek Watershed.

	Baseline counts/yr	Allocated counts/year	Reduction Counts/year	% Reduction
Milligan Creek (Davis Spring)2271	2.29E+14	2.04E+14	2.5E+13	10.9
Milligan Creek 2272	1.83E+13	1.15E+13	6.8E+12	37.2
Milligan Creek 2273	3.18E+13	2.32E+13	8.6E+12	27.1
Totals	2.11E+13	1.57E+13	5.4E+12	25.5

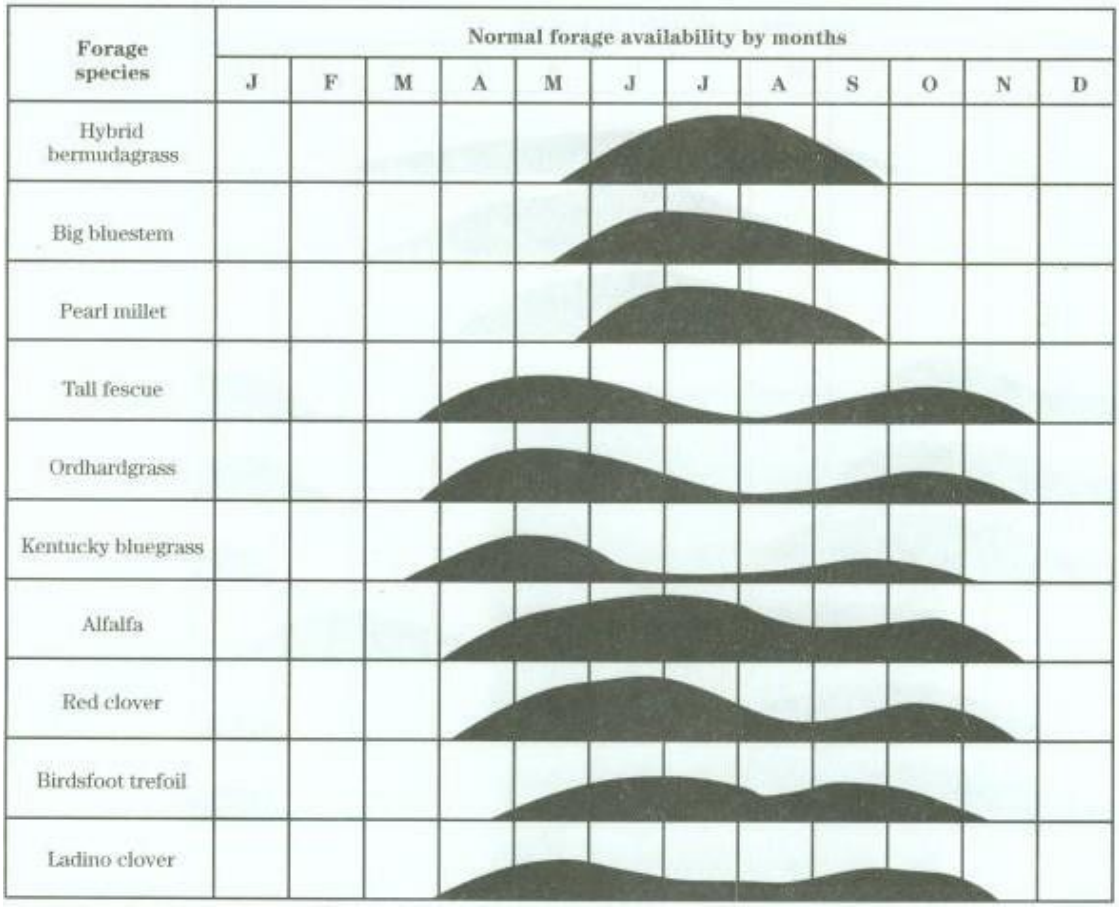
Source tracking conducted by the West Virginia Conservation Agency found 3 dairy farms, 37 beef cattle farms, 4poultry farms, and numerous small horse, sheep, and goat farms. Virtually all of these farms except the poultry operations allow livestock access to the stream for water and near open sink holes while on pasture. The manure produced from the 4 poultry farms is a highly sought after fertilizer product that is utilized by local farmers shortly after being removed from the facilities, thus no opportunity for runoff associated from these operations.

According to According to a model developed by Burns 2011, based on research conducted within by Boyer et all within the Milligan Creek watershed, it can be determined that if conservation plans that include nutrient management, prescribed grazing, and water distribution, then 90% or more load reduction should be seen per conservation plan once they are fully implemented.

After reviewing the TMDL water quality data for the Milligan Creek/Davis Spring watershed (Greenbrier River TMDL), an observation was made noticing that the rise and fall of fecal coliform counts correlate directly with the annual spring thaw out and the growth cycle of common cool season grasses found in the watershed. From this data, it can be speculated that as the soil begin to thaw out in the spring and water begins to move

through it, the first flush of coliform in the spring is due to the lack of vegetative action to intercept stormwater and snow melt. According to the USDA NRCS National Range and Pasture Handbook, the forages found in this watershed typically are available at a rate of 30% starting in May through June, and fall off to about 5% by the end of August. September's cooler weather allows for additional availability to about 10% and will maintain until mid November. This decrease in vegetative action also allows for increased rates of erosion and sediment delivered to surface water and open sink holes.

Typical Growth patterns of common perennial pasture forages in the watershed. The most common species are Tall fescue, orchard grass, and Kentucky bluegrass.



According to the data review, when forage availability increases by 30%, the fecal coliform level in Milligan Creek decreases by 95% with increases of 5% forage availability, fecal coliform decreases 48%. This data demonstrates an average reduction of 73% for increasing forage availability.

It is estimated based on local information that there are approximately 34,755 livestock animal units on 40 farms in the watershed, and a total of 21,733.87 acres of pastureland. Typically, farmers in this area maintain a stocking rate of 1.5 animal units per acre. Not all of this pastureland is utilized, thus increasing the average stocking rate far above the standard of 1 AU per acre. These figures are based on an average of 500 animal units per farm, mostly cattle in mixed breeding and stocker operations. Local information from USDA NRCS allow the assumption that not more than 25% of the pasture land in the watershed is actively covered under a current conservation plan that is being implemented. With a total baseline load of 3.03E+14 counts per year,

this makes the baseline load per animal unit 8.71E+9. According to the American Society of Agricultural Engineers, cattle produce 1.2045E+13 CFU/day, thus the survivability rate of fecal coliform bacteria in this watershed is 7%.

For every conservation plan implemented on a farm that is actively being pastured in which forage availability is increased by 30%,water is distributed evenly, sensitive areas are buffered, and livestock stocking rates are corrected, then 99% of approximately 4.085E+12 counts/year will be reduced for a total of 4.04415E+12 counts/year of fecal coliform will be reduced. Thus 63 conservation plans less 25% for a total of 47 conservation plans will need to be applied to achieve the required load reductions. While this figure exceeds the total number of farms in the watershed, it should be noted that some of these farms far exceed the average number of animal units and skewed the data to a higher number of conservation plans required.

Sub watershed	# of Conservation Plans Needed and Load Reduction goal	Animal Units to be Addressed	General BMP's to be Implemented
2271	41 Conservation Plans with a Fecal Coliform Reduction Goal of 2.5E+13 counts per Year	21,527	20,000 feet of Exclusion fence from open sink holes, karst windows, and other water sources 1000 acres Nutrient Management and Grazing Planning 50 acres of Herbaceous Buffer Development 1 Waste Storage Facility 20 Alternative Water Developments 1000 acres Pasture Planting 20 Stormwater Management Practices 2 De-Centralized Sewer systems 50 Septic System fix/Upgrades
2272	3 Conservation Plans with a Fecal Coliform Reduction Goal of 26.8E+12 counts per Year	586	10,000 feet of Exclusion fence from open sink holes, karst windows, stream, and other water sources 500 acres Nutrient Management and Grazing Planning 50 acres of Herbaceous Buffer Development 10 Alternative Water Developments 500 acres Pasture Planting 50 Septic System fix/Upgrades
2273	3 Conservation Plans with a Fecal Coliform Reduction Goal of 8.6E+12 counts per Year	741	10,000 feet of Exclusion fence from open sink holes, karst windows, stream, and other water sources 500 acres Nutrient Management and Grazing Planning 20 acres Forest Buffer Development 10 Alternative Water Developments 500 acres Pasture Planting 1 Stream Crossing 50 Septic System fix/Upgrades

b. Storm Water Management

While not addressed in the TMDL, stormwater management in the local municipalities is also having an impact of contributing fecal coliform to the watershed. UIC wells (storm water injection wells) located at the WV State Fair Grounds exhibit high levels of bacteria.

c. Failing Onsite Septic Systems

The TMDL calls for a fecal coliform load reduction from failing septic of 8.17E+12. This is substantially less than the required reductions from agriculture so our primary focus will be on agricultural BMP's. However, working with the local health department and watershed associations, we plan to do on the ground assessment of the current conditions of the wastewater needs in the watershed. We will identify the hot spots that need upgrades and promote the Onsite Loan Program (OSLP) to the landowners. The TMDL model calls for 100% load reductions from failing septic systems however this is often found to be unrealistic due to the economic status of individual system owners. We also hope to provide 319 funding as a match for the OSLP to reduce the cost for low income homes. While addressing the septic system issues will be a focus of this plan, the load reductions will be achieved by exceeding the reductions called for from agriculture.

Management Measures

a. Agriculture

To address load reductions as a result of agricultural activity streams, fencing will be utilized to keep livestock out of creeks. Other options that will be utilized in addition will be, manure storage facilities, alternative water systems, buffers, pasture planting, grazing system development, and rehabilitation of riparian areas. These practices will be designed to increase ground cover by a minimum of 30%, with an ultimate goal of 80% minimum ground cover. Increased ground cover decreases soil erodibility and motility of nutrients and fecal born bacteria. Utilizing three spreadsheets, BMP Efficiency Calculator, Region 5 Model, local information, and the USDA NRCS Field Office Technical Guide section 3; these management measures will be planed 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, 319 non-point source incremental grants, Federal Farm Bill Programs, and landowner contributions. The most critical areas for implementation of these practices will be along the mid section of Milligan Creek and the upper third of the Davis Spring watershed.

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

CREP: The Conservation Reserve Enhancement Program (CREP) is a federal-state land retirement conservation program targeted to address state and nationally significant agriculture-related environmental problems. The West Virginia CREP involves additional financial incentives to encourage the restoration of riparian and other natural habitats to protect the vitally important soil, water and wildlife resources of the Potomac, New, Greenbrier, and Little Kanawha Rivers. The goal of the West Virginia CREP program is to help reduce the occurrence of runoff, sediment, and nutrients from agricultural enterprises into the designated watersheds.

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

AEP: The Agriculture Enhancement Program is a state program funded by the local conservation district to increase farm productivity by conserving soil and making wise use of agricultural resources and to improve water quality in the state's streams and rivers. The basis of the program is to increase farm profitability and sustainability and encourage the voluntary installation of agricultural BMP's to meet WV non-point source pollution water quality objectives.

Fecal Coliform contamination in the Milligan Creek/Davis Spring Watershed as a resource concern falls under the categories of Water Quality – Harmful levels of pathogens in surface water. The following BMP's are practices recommended by USDA NRCS that will address this resources concern or are support practices necessary to achieve the goals of the primary practices.

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

- **Pasture Planting:** A practice incorporates additional species into a field to increase species diversity, increase forage availability, and extend the growing season of herbaceous plants in a pasture situation. All of these factors will provide additional root growth and vegetative action to intercept storm water flow and increase overall ground cover. Farmers will be encouraged to plant annual cool season grasses to assist in controlling fecal coliform directly after the spring thaw and legumes to provide cover and root action during the summer months when cool season grasses stop growing. Additionally, legumes have the ability to fixate nitrogen, preventing excess fertilization.

- **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, 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 load reductions in table 7 for: sediment ponds/swale in combination with filter strip.

- **Riparian Buffer practices**: Areas of vegetation (herbaceous or woody) that is 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 load reductions in table 7 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 load reductions in table 7 for: Filter Strip and fencing.

- **Heavy Use Area Protection**
  Practices that restore or put into proper use, areas that are or have been used by large numbers of areas for feeding, walking, loafing. NRCS conservation practices that can accomplish this are: 313 Waste Storage Facility, 342 Critical Area Planting, 484 Mulching, 512 Pasture & Hayland Planting, 528 Prescribed Grazing, 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 load reductions in table 7 for: Sediment Pond/Swale in combination with filter strip and fencing.

- **Nutrient Management Plans**: Farm operators develop a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield and appropriate ground cover. NRCS conservation practices that can accomplish this are: 100 CNMP Development, 313 Waste Storage Facility, 316 Animal Mortality Composter, 328 Conservation Crop Rotation, 329 Residue Management, 340 Cover Crop, 590 Nutrient Management, 634 Manure Transfer. These practices correspond to load reductions in table 7 for: Waste Stabilization Lagoon and fencing.

- **Nutrient Relocation.** Farm operators who manage waste storage facilities will retain the right to retain all the manure necessary for their own fertilization purposes, but will be willing to give excess manure other farmers to spread on hay, pasture, or cropland as an alternative source. NRCS conservation practices that can accomplish this are: 590 Nutrient Management, 634 Manure Transfer. These practices correspond to load reductions in table 7 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 load reductions in table 7 for: waste stabilization lagoon and fencing.

- **Storm Water Management -** Practices that prevent stormwater from coming into contact with fecal material and washing it into streams. NRCS conservation practices that can accomplish this are: 362 Diversions, 412 Waterway, 468 Lined Waterway, 558 Roof Runoff Management, 606 subsurface Drain, and 620 Underground Outlet. These practices correspond to load reductions in table 7 for: Sediment Pond/Swale in combination with filter Strip.

- **Sediment Ponds & Wetlands** – These structures intercept surface runoff and treat it through settling, then discharge it at a controlled rate to minimize the environmental and physical impacts on receiving waters. Less expensive runoff filtration practices such as vegetated swales may also be used. NRCS conservation practices that can accomplish this are: 350 Sediment Basin, 658 Wetland Creation, and 657 Wetland Restoration. These practices correspond to load reductions in table 7 for: Sediment Ponds/Swale in combination with filter Strip.

See Appendix for standards and specifications of all the above mentioned NRCS conservation practices.

b. Stormwater Management

To address bacteria laden stormwater from residential areas, the following management measures will be utilized

- Rain Gardens - A rain garden is a functional landscaped area constructed to capture and hold stormwater so that it filters and infiltrates into the soil rather than becoming surface runoff.
- Bioretention Basins -Bioretention basins are landscaped depressions or shallow basins used to slow and treat on-site stormwater runoff. Stormwater is directed to the basin and then percolates through the system where it is treated by a number of physical, chemical and biological processes. The slowed, cleaned water is allowed to infiltrate native soils or directed to nearby stormwater drains or receiving waters.
- Sedimentation Ponds –A sediment basin is a structure consisting of an earthen embankment, or embankment and excavated area, located in a suitable area to capture sediment-laden runoff. A sediment basin reduces the energy of water through extended detention to settle out the majority of the sediment and suspended solids and reduce sedimentation in waterways.
- Pervious Pavement is specially designed pavement that allows stormwater to percolate through without leading to runoff.

c. Failing Septic Systems

The health department and the watershed association will work together to compile the health department permit data into a map to show the areas of need for upgraded wastewater systems. Once these areas are located and documented residents will be approached to participate in the OSLP where onsite systems have been prescribed. If an area is prescribed for a cluster system wastewater treatment system we will work with the residents to implement this system.

A cluster system uses the same technology for treatment and dispersal as onsite systems, but is sized to handle more than one house. They require easements and maintenance. Legal easements are required for houses served by cluster systems to insure that the treatment system remains functional through time and ownership changes. These easements insure that treatment is always available to the lot. Maintenance agreements, usually a contract with a qualified third party, are also required to insure the sustainability of the treatment system.

Technical and Financial Assistance

While there are many conservation practices that can be applied to reduce the overall load of fecal coliform to the Milligan Creek/Davis Spring watershed, the following practices outlined in this budged will be the most critical. Since the majority of the watershed is karst geology, these practices will be applied in the areas where livestock are in an extremely close proximity to impaired streams and open sink holes. The waste storage facilities will allow for proper storage and relocation of nutrients generated from dairy and feedlot operations, and the watering systems will prevent un-necessary loafing of livestock near the streams. Fencing and riparian development will restrict livestock from direct contact with the waterways. Pasture planting will increase the overall ground cover and provide forage growth during the months when the typical perennial cool season grasses are not growing. Failing septic systems will be re-developed to allow for proper percolation. In order to implement the practices mentioned in section B these are the project and estimated cost required to reach the desired load reductions.

Best Management Practice	**Planned Units**	**Cost/Unit**	**Total**
Waste Storage Facilities	1	$50,000	$50,000
Stream Crossings	1	$10,000	$10,000
Pasture Planting	2000	$431.17	$862,340
Alternative Water Systems	40	$10,000	$400,000
Nutrient Management Application	2000	$45	$90,000

Nutrient Management Planning	40	$5,953.50	$238,140
Grazing Plans	16,300 acres	$8.40	$136,920
Forested Buffers	20	$1580	$30,160
Herbaceous Buffers	100 acres	$192.20	$19,220
Fence	40,000 feet	$2.53	$101,200
Stormwater Management Practices	20	$5,000	$100,000
Upgrade/fix failing Septic Systems	150	$7,500	$1,125,000
Individual Sewer Systems			
De-Centralized Sewer System	2	$500,000	$1,000,000
Educational Component			**$5,000**
Monitoring			**$20,000**
Total			$4,087,980

The NPS Program in WVDEP will administer the Section 319 grants and assist in plan and project development. The West Virginia Conservation Agency (WVCA) will be the state agency coordinating the implementation of BMP's. The Greenbrier Valley Conservation District will be the fiscal manager of 319 and other funds. These organizations will work together to oversee project installation as well as work with the partnering organizations to ensure success of the project. WVCA will organize a fecal coliform monitoring program to be conducted by the partners. WVCA will perform fecal testing in the focus sub-watershed prior to and following the implementation of each project. The TMDL section of the DEP will monitor water quality in five years, including 2014. Outreach will be coordinated by West Virginia University Cooperative Extension Service. The efforts of this organization will introduce the public to the goals and plans of the project. The USDA-Natural Resource Conservation Service will provide technical assistance in designing the agricultural best management practices. All cooperating agencies and organizations will promote the program within the watershed.

Sources of funding to achieve the goals of this plan:

- **Environmental Quality Incentive Program**, (EQIP) Offered by the USDA NRCS, EQIP can provide 50% cost share for agriculture practices that improve water quality, depending on ranking criteria and funding available.
- **WV Lime Incentive Program:** A state program that provides 50**%** cost share for farmers to implement the liming component of a nutrient management plan.
- **Conservation Reserve Enhancement Program**, (CREP) Offered by USDA FSA, CREP provides 90% cost share to develop riparian areas and alternative watering systems for livestock.
- **319 Grants** through WVDEP NPS program for systems incorporating various water quality improvement practices
- **The WV Onsite State Revolving Fund Program. This program can be used to promote loan funding for individual onsite systems as well as homeowner-owned components of decentralized systems**
- **West Virginia Conservation Agency** will provide 15% matching funds to implement agriculture practices
- **Health Department**
- **Landowners** will provide 25% matching funds for practices developed on their property. Much of these funds will be in kind for labor, equipment use, and materials

Outreach and Education

Education will be a key component to implementing the watershed based plan. Partnering with the West Virginia University Cooperative Extension Service (WVU), and the Greenbrier River Watershed Association (GRWA) will allow educational opportunities to reach the watershed association membership as well as

members of the community. The GRWA has committed to partnering in educational efforts to improve water quality within the watershed. As mentioned in the mission statement of the GRWA, education and outreach play a vital role in their mission and sustainability. They have a history of outreach and education in the local community and make use of a variety of media. In order to achieve the non-point source management measures, GRWA and other local and state organizations have and will conduct a number of activities to educate watershed residents and users about the problems and potentials of the watershed. These activities will also be used to communicate the goals and progress of the WBP:

- *Farm Field Days*
  - *Events held on farms for farmers to demonstrate new technology and the use of BMP's*
- *Mailings*
  - *Newsletters and postcards sent to residents of that area informing them of opportunities and developments of the watershed based plan.*
- *Envirothon*
  - *An educational environmental contest for high school students. Teams participating may be trained for many aspects of the contest along Second Creek.*
- *Watershed School (Adult Education)*
  - *A weekly class providing training on all aspects of watershed management geared toward volunteers associated with watershed organizations*
- *Stream Monitoring Workshop*
  - *Provided by the WV DEP through the SOS program, teach volunteers how to properly monitor streams.*
- *Water Resource Program*
  - *Provided by the U.S. National Parks Service, teaches students about natural stream systems*
- *Stream Clean ups*
  - *With the help of 4-H, FFA and other organizations, pick up trash along the stream banks*

F, G, H. Schedule, Milestones, and Performance

Milestone Schedule: include in schedule the septic evaluations
Assessment and approach for implementation

Action	**Time line**
Begin Project Proposal	May 2011
Submit Project Proposal Stage 1 to WV DEP to address Agriculture	June 2011
Submit Watershed Based Plan to West Virginia Department of Environmental Protection and U.S. Environmental Protection Agency	December 2011
Public Outreach and announcement of 319 Incremental Funding	January 2012
Hold 1 educational workshop to gain additional public interest	June 2012
Accept applications for project participants	June 2012
Implement project to address fecal coliform from agricultural sources Stage 1 (Focus on Sub watersheds 2272 and 2273)	June 2012- 2014
Develop 6 grazing and nutrient management plans	June 2012
Develop monitoring plan for wastewater study	
Hold 1 educational workshop	August 2012

Develop stream buffers (40 acres), exclusion fences (7,000 Feet), and other non-structural practices to prevent livestock from accessing streams	August 2012
Conduct inventory of existing treatment systems review of records and field survey.	September ,30 2012 including
Submit Project Proposal Stage 2 to WV DEP to address Agriculture activities	November 2012
A target fecal coliform reduction for Milligan Creek/Davis Spring Fecal Coliform 4.115E+13 counts/yr, (approximately ½ baseline)	December 2013
Accept applications for project participants	January- April 2013
Submit proposal to 319 to match the OSLP for areas identified in the plan for needed upgraded wastewater needs Stage 2 (Focus on Sub Watershed 2271)	
Implement project to address fecal coliform from agricultural sources	May 2013 - 2015
Hold educational workshop	May 2013
Implement structural practices such as waste storage facilities For stage 1 (3 waste storage facilities, 24 alternative water systems)	July 2014
Develop 40 grazing and nutrient management plans (stage 2)	June 2014
Develop 40 acres in stream buffers, 50,000 feet of exclusion fences, and other non-structural practices to prevent livestock from accessing streams (stage 2)	August 2014
Implement structural practices such as waste storage facilities For stage 2 (3 waste storage facilities, 24 alternative water systems)	August 2014
A target fecal coliform reduction for Fecal coliform 1.93E+14 counts/year (approximately ½ baseline)	December 2015
Complete Stage 1	November 2013
A target fecal coliform reduction Fecal Coliform 2.22E+13 counts/year,	December 2014
Hold educational workshop	May 2014
Complete Stage 2	November 2015
A target fecal coliform reduction Fecal Coliform at or below 2.22E+13 counts/year,	December 2015

Prioritization Rationale

The goal in this WBP is to achieve water quality standards in the watershed. The sub-watershed was prioritized through the information given by the WBP the GVCD. The local knowledge and concerns within the watershed is a considering factor in project determination.

Criteria for Project Prioritization:

It is critical to incorporate the local community to decide ranking and prioritization for projects.
These standards should be used to determine ranking for projects:

- Community Willingness- Eagerness and willing to share the cost of the projects by the landowners and community members
- Project Cost and Funding Leverage - Feasibility and cost of a project
- Water Quality- Identified “hot spots” for sources of fecal coliform from the TMDL and water monitoring
- Overall potential to decrease fecal coliform loads
- Proximity to Headwaters

The criteria may be altered as deemed necessary by the cooperating agencies and organizations.

Monitoring Protocol

The watershed association will work together along with WVDEP Nonpoint Source Program and WVCA as a monitoring team that will be responsible for pre- and post- project implementation. A project monitoring plan will be developed and include site locations upstream and downstream of the project site, sampling regime and responsible parties. All water sampling procedures will be done in accordance with the DEP Division of Water and Waste Watershed Assessment Branch's established assurance project plan (QAPP). This will assure not only that our installed projects are functioning properly, but will give up measureable reductions in fecal contamination associated with these streams as it pertains to the streams 303 (d) listing. Save Our Streams (SOS) protocols will also be used to assess the habitat and benthic macro-invertebrate communities before and after a project is implemented. Fecal coliform samples will continue to be collected by the watershed groups during 3 flow regimes following the project completion for two years.

WVCA and GRWA will conduct plan development monitoring for fecal coliform bacteria utilizing a private laboratory for analysis. The purpose of monitoring is to gather additional data that is necessary to identify "hot spots" and possible sources of fecal pollution entering the stream. Better data will lead to more informed decisions and a stronger watershed based plan. A QAPP for the monitoring of this plan will be developed and submitted to EPA for approval.

The monitoring and sampling project will be used as a mapping exercise to identify the areas with the largest need for assistance and improve the accuracy of the watershed based plan. Four (4) sites will be identified for monthly monitoring for six months and episodic higher flow sampling during runoff events if possible (not to exceed 2 additional sampling days). Monitoring points will be revaluated after six months based on monitoring results and a monthly sampling regiment established to be continued as necessary until TMDL requirements are met. Samples will be collected at sites with public access or landowner permission.