Coldwater Conservation Plan

for the

Cacoosing Creek Watershed

Prepared by the Berks County Conservation District

March 2019

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Coldwater Heritage Partnership

Berks County Conservation District

Tulpehocken Creek Watershed Association
A Program of Berks Nature

Trout Unlimited Tulpehocken Chapter

Coldwater Heritage Partnership

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The Berks County Conservation District prepared this plan in order to provide a road map for the conservation of the Cacoosing Watershed's coldwater characteristics. The Townships of Spring, Lower Heidelberg, South Heidelberg, and the Boroughs of Sinking Spring, Wernersville, and Wyomissing are to be commended for their willingness to recognize the need for conservation and enhancement of the Cacoosing Watershed and surrounding lands. The Berks County Conservation District wishes to recognize these municipalities for their partnership, planning efforts, and active participation.

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Lastly, the Berks County Conservation District acknowledges Mike Bilger and the Susquehanna University Fresh Water Initiative for the technical assistance, guidance, field work, and partnership that they provided in the watershed wide assessment.

Thank you.

Introduction

The main objective of this Coldwater Conservation Plan is to assist the municipalities and stakeholder associations in conserving the coldwater characteristics and resources of the Cacoosing Watershed by providing a road map that will outline how to reduce the impacts of Nonpoint Source (NPS) pollution.

In 2017, the Berks County Conservation District (BCCD) applied for and received a grant from the PA Coldwater Heritage Partnership to create an overview of suggestions that would assist the watershed municipalities and stakeholders in reducing nonpoint source pollution inputs into the Cacoosing Creek and its tributaries. Formed in 1946, the Berks County Conservation District (BCCD) is dedicated to the encouragement of and education in the wise stewardship of soil and water, so that present and future generations in Berks County may have healthy land on which to live and work, and clean water for drinking and recreation. The BCCD has a long, successful history of partnering with local and state organizations to implement Best Management Practices (BMP) that reduce the amount of nonpoint source water pollution from entering Berks County streams.

The BCCD also has many valuable partnerships with local and regional conservation organizations including the Tulpehocken Chapter of Trout Unlimited, the Tulpehocken Creek Watershed Association, Berks Nature, and Schuylkill Action Network (SAN). The Cacoosing Creek is recognized as the primary coldwater tributary to the Tulpehocken Creek below Blue Marsh Lake. This section of Tulpehocken Creek has long been a favored trout fishery and destination for regional fisherman, due to the Pennsylvania Fish and Boat Commission's (PFBC) Keystone Select Trophy Trout stocking program. The consistent cold waters from the Cacoosing provide a refuge for trout in the hot summer months, allowing angling enthusiasts to fish the waters year-round. Since 2012, American Rivers, PFBC, and many local conservation groups have been diligently working to remove the Papermill Dam, located on the Cacoosing Creek, just upstream from its confluence with the Tulpehocken Creek. The goal of the dam removal is to connect aquatic ecosystems, reduce thermal pollution caused by the dam's slack water, and provide a much needed coldwater refuge for trout in the summer.

Additionally, all municipalities (except Wyomissing Borough) where required to renew or obtain Pennsylvania Department of Environmental Protection (PA DEP) Municipal Separate Storm Sewer System (MS4) permits for regulated stormwater outfalls discharging to the Cacoosing Creek watershed. Each municipality was responsible for developing Pollution Reduction Plans (PRPs) for Urbanized Areas delineated by PA DEP. The municipal PRP's included Best Management Practices (BMPs) to reduce sediment and nutrient pollution generated from urban stormwater runoff. The required implementation of these municipal BMP's through PA DEP MS4 permit is recognized as a critical element to protecting the coldwater properties and ecosystems of the Cacoosing Creek Watershed.

In similar fashion, PA American Water Company (PAWC) provides drinking water to over 30,000 customers through several public water supply (PWS) wells located in the Cacoosing watershed. PAWC voluntarily has an active Source Water Protection Plan and cooperates with PA DEP's Source Water Protection and Assessment Program (SWAP). PAWC's SWP Plan establishes protection zones around wellheads and incorporates management strategies to educate the public on NPS pollution and identify illicit discharges, to prevent contamination to natural water resources and PWS. These management strategies also promote the protection and enhancement of forest and riparian buffer habitats to keep sources of groundwater and surface water healthy.

The BCCD recognized the importance of acquiring the contribution from all watershed stakeholders to develop the Coldwater Conservation Plan. The goal of this plan was to first assess the current conditions in the Cacoosing Creek Watershed, solicit recommendations and comments from all watershed users, and thirdly to begin prioritizing BMP implementation. In the spring of 2018, an assessment of 10 stream sites in the Cacoosing Watershed was conducted by BCCD staff and Michael Bilger, formally with the Susquehanna University Freshwater Initiative. In this watershed wide assessment, chemical parameters, biological life, and habitat were assessed in accordance with the PA DEP's Instream Comprehensive Evaluations (ICE) Protocol.

The surface water assessment along with field work, helped to shape the recommendations in this Coldwater Conservation Plan. The Coldwater Conservation Plan is to serve as a guiding document for the BCCD, municipalities, partners in conservation, and the general public in addressing nonpoint source water pollution and protecting the coldwater heritage of the Cacoosing Creek.

Background

Watershed Description

The Cacoosing Creek Watershed is located in Berks County, Pennsylvania; it originates in the forested hills of South Heidelberg and Spring Township, just south of Sinking Spring and Wernersville Boroughs, and flows in a northeasterly direction for approximately 8.4 miles before its confluence with the Tulpehocken Creek near the Village of Van Reed Mills. Municipalities in the watershed include the Townships of Lower Heidelberg, South Heidelberg, and Spring, and the Boroughs of Sinking Spring, Wernersville, and Wyomissing. The 21.8 square mile watershed contains only one named tributary, the Little Cacoosing Creek which drains approximately 7.8 sq. miles of the watershed. According to the National Land Cover Database (NLCD), approximately 42% of the land is in urban land use, 34% in agricultural land use, 24% is covered in forest or open space.

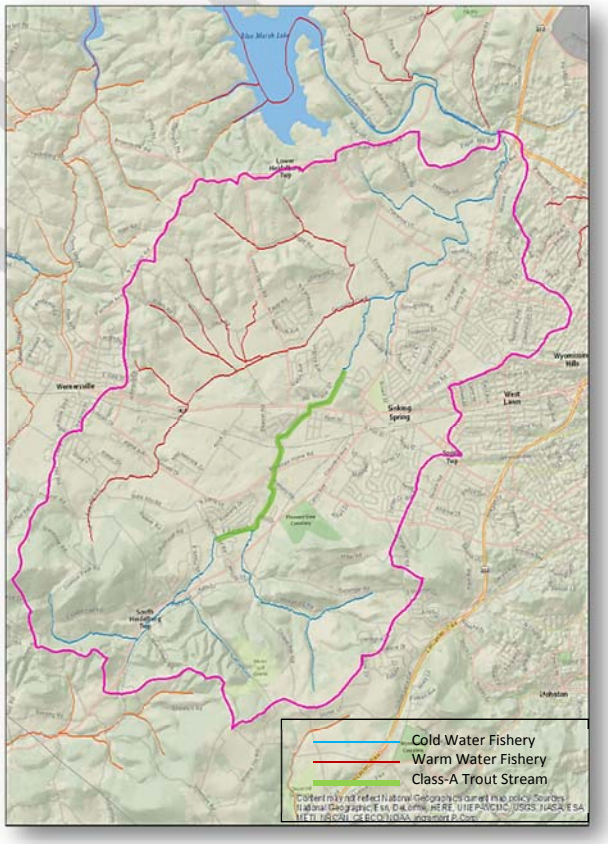


Figure 1: Cacoosing Watershed Map with PADEP Chapter 93 Designated Use.

In Pennsylvania, streams or stream reaches are classified under water quality standards regulated by the PA DEP. There are five protected use designations assigned to streams that support the maintenance and propagation of fish species and suitable habitat for flora and fauna. The Cacoosing Creek is listed as a Cold Water Fishery – Migratory Fish (MF) due to the presence of the American eel (Anguilla rostrate) under its Pennsylvania Chapter 93 Designated Use. Adversely, the Little Cacoosing is designated as a Warm Water Fishery. There is a 2.5 mile stretch of the Cacoosing Creek located from Wernersville Road (T668) and north of State Route 422 that is listed as Class-A Wild Brown Trout Fishery by the PFBC. Additionally, the Cacoosing Creek is designated as a Natural Reproduction Trout Stream from its headwaters to its confluence with the Tulpehocken. The designation provides Exception Value (EV) protections to all wetlands located within the watershed, including the wetlands associated with the Little Cacoosing which does not have any designated trout water classifications by the PFBC.

Protected uses of the Cacoosing Creek Watershed include *Aquatic Life* and *Recreation*. However, the Cacoosing Creek watershed was surveyed under the PADEP's Statewide Surface Water Assessment Program, which resulted in over 25 miles of stream being determined as impaired with sediment, nutrients, and pathogens, and not meeting its Designated Use. In 2002, a Total Maximum Daily Load (TMDL) was developed for the Little Cacoosing Creek, which set sediment and nutrient pollutant load allocations for the tributary watershed. The TMDL has since been approved by the United States Environmental Protection Agency.

The stream corridor includes the stream and adjacent land along the stream. Stream characteristics and water quality are greatly dependent upon the natural features of this land, as well as the modifications that have occurred over time. Most of the land closest to the Cacoosing Creek and its tributaries is subject to periodic flooding during rainstorms. This land is usually flat and contains alluvial soils that may be wet a portion of the year. It often supports wetland vegetation that can serve as excellent areas for wildlife habitat. Floodplain areas vary with topography and the size of the stream, increasing with stream order and drainage area. The floodplain serves as a natural buffer area along the creek. This greatly aids in the impact of runoff and nutrient loading. The Cacoosing Creek's floodplain lies in both residential, agricultural, wooded areas. The residential areas have shorter grass and lawns and normally do not feature natural wetland vegetation.

Land uses in a watershed directly affect the quality and quantity of both surface and groundwater. Uses such as agriculture, timber harvesting, and urban and suburban development can impact water quantity by changing runoff amounts, timing and infiltration rates. These uses can also change water quality by contributing sediment and nutrients to runoff and groundwater. Below is a table summarizing the major land uses in the watershed.

Table 1: Cacoosing Creek Watershed Land Use

Parameter	Value
Area in square miles	21.8 sq. mile
Total stream length in miles	29.1 miles
Percent of area covered by forest	24.5 %
Percent of area covered by lakes, ponds, reservoirs and wetlands	0.3 %
Percent of area covered by urban uses	41.5 %
Percent of area covered by agricultural uses	33.7 %

Many of the Cacoosing Creek's headwater tributaries flow through forested habitats, which enhance the water quality of the stream system as a whole. In contrast, these tributaries eventually encounter and receive runoff from agricultural and urban land uses. Much of the land along the mainstem of Cacoosing Creek is developed as residential housing. Residential housing can create serious water-related problems associated with earth moving activities and increased impervious surfaces. These changes increase runoff, which carry sediment, nutrients and chemicals to streams, degrading the water quality. In areas where natural buffering cannot handle these impacts or a buffer is lacking, nonpoint source pollution is the result.

Previous Studies

Berks Nature (formally Berks County Conservancy) created a Watershed Conservation Management Plan for the Tulpehocken Watershed in 2001, funded by the Department of Conservation and Natural Resources (DCNR). The goal of the 2001 plan was to provide local governments, nonprofits, and watershed residents with recommendations to restore and conserve the resources of the Tulpehocken watershed. Management goals and strategies that related to the Cacoosing watershed included:

1. Improving water quality degraded as a result of agricultural activity
2. Improving water quality degraded as a result of urban impacts
3. Establishing a continuous riparian corridor along the Tulpehocken Creek and its major tributaries.
4. Provide education on a watershed basis.

A result of the Tulpehocken Creek Watershed Conservation Management Plan was the establishment of the Riparian Corridor Conservation District along the Cacoosing Creek in 2004. The District was established by the Lower Heidelberg-South Heidelberg-Wernersville Joint Zoning Ordinance to *"Reduce the amount of nutrients, sediment, organic matter, pesticides, and other harmful substances that reach watercourses through subsurface and surface flow".*

In 2001, the PA DEP Environmental Quality Board (EQB) established the protective designated uses for the Cacoosing Creek Watershed. The designated uses were determined through the evaluation of several water quality assessments conducted by the PA DEP and PFBC. The results of these assessments concluded that - *"The fish populations of the Cacoosing Creek basin were sampled during various surveys conducted by Department and Commission staff. While the Cacoosing Creek fishery was very diverse and dominated by species commonly associated with cold-water habitats (trout, blacknose and longnose dace, white sucker and mottled sculpin) the Little Cacoosing Creek fishery was dominated by the banded killifish, a warm water species. The Department recommends that the Cacoosing Creek basin (excluding the Little Cacoosing Creek subbasin) be designated CWF, MF and the Little Cacoosing Creek basin be designated WWF, MF"*

Consequently, the only named tributary to the Cacoosing Creek main stem, the Little Cacoosing Creek, was designated a Warm Water Fishery. Due to the evidence of severe impairment from agricultural siltation and nutrients, a Total Maximum Daily Load (TMDL) was developed for the 8.0 Sq. mile tributary drainage area. The last sampling for fish species composition on the Little Cacoosing Creek by PA DEP or PFBC was conducted in 1996.

Unique and Outstanding Features in the Watershed

As previously discussed, the Cacoosing Creek is listed as a Cold Water Fishery stream under its Pennsylvania Chapter 93 Designated Use. There is a 2.5 mile stretch of the Cacoosing Creek located from Wernersville Road (T668) and north of State Route 422 that is listed as Class-A Wild Brown Trout Fishery by the Pennsylvania Fish and Boat Commission (PFBC). Additionally, the Cacoosing Creek is designated as a Natural Reproduction Trout Stream from its headwaters to its confluence with the Tulpehocken.

These cold water characteristics can be attributed in large part to the unique karst geology of the Cacoosing watershed. Large formations of limestone and dolomite stratify the drainage basin. Over 40 productive, cold water springs can be identified throughout the watershed. The springs generate year-round, 50 – 60 ^{o}F mineral rich water, allowing stream temperatures to not regularly exceed 70 ^{o}F in peak summer months. Some springs may only yield a slow seep, while others can generate over a hundred gallons per minute (gpm). The springs make the Cacoosing Creek and its tributaries true limestone streams. In Pennsylvania, alkalinity or a solution's ability to neutralize acids, is the measurement between a limestone or free stone stream. A stream that has an alkalinity of 140 mg/L is considered to be a limestone stream. The Cacoosing Creek and its tributaries consistently have alkalinity levels ranging between 140 – 200 mg/L. The water, rich in calcium carbonate (CaCO3) and other minerals, acts like a buffer against stormwater and acid rain. The stream pH levels are typically within the *neutral* (7.0) to *slightly basic* (8.0) pH range. Coldwater ecosystems are abundant in these springs including watercress, slimy sculpins, and sensitive caddis fly larvae.

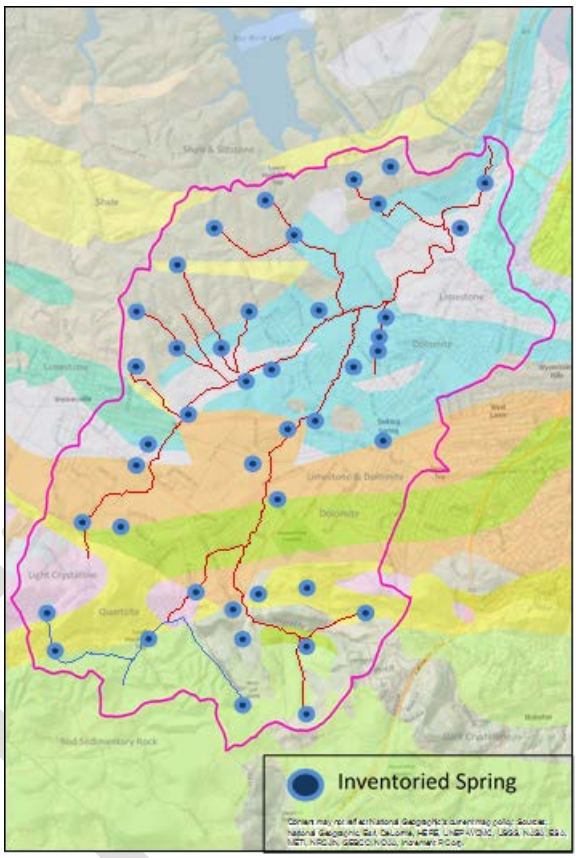


Figure 2: Geological map of the Cacoosing Watershed with inventoried cold water springs.

Prior to colonial settlement, attracted by the deep soils and fresh water springs, Leni Lenape tribes populated the Cacoosing Watershed. They name the area "Gokhosing' meaning "place of the owl". Fortunately, many forested and shrub wetland habitats along the Cacoosing can still be observed, and it is still very much the "place of the owl". Although, almost half of the watershed is developed; municipal zoning, hydric soils and seasonal flooding have prevented much of the riparian corridor from being developed. This provides ample opportunity for enhancement and protection of the riparian habitat. In 29 miles of stream, Cacoosing Meadows Park is the only municipally owned park where the public can access the stream for recreation. Cacoosing Meadows Park provides ADA accessible trails and fishing access to the stream. There are still some large parcels along the Cacoosing and Little Cacoosing that are owned by municipalities and private associations. These parcels provide some access either through permission or residency. Residential or institutional trails exist in close proximity to each other, particularly along the Little Cacoosing Creek in Lower Heidelberg Township. Pennsylvania's Recreation Use of Land and Water Act, which relieves a landowner from liability and penalties if they provide public access to their land, is an avenue which could possibly enhance public access to the Cacoosing Creek and its tributaries.

A list of municipalities, Public Utilities, and conservation organizations that work within the Cacoosing is included as *Appendix D: Watershed Stakeholders*.

Watershed Impairments

As previously determined, the Cacoosing watershed was assessed to be impaired by sediment and nutrients from agricultural runoff, and pathogens from unknown sources. These impairments prevent the Cacoosing from obtaining its Designated Use of *Aquatic Life* and *Recreation*, under PA DEP's 2016 Integrated Water Quality Report (303[d] List).

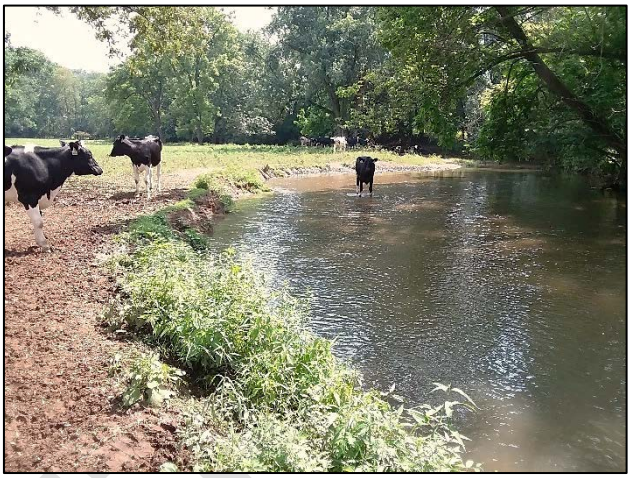


Figure 3: Unrestricted livestock access denudes and erodes stream banks. Stream sections can become wider, shallower, and habitat covered with sediment. Limited shade from trees and a lack of in stream habitat contributes to warmer water temperatures and impairments to aquatic ecosystems.

Sediment

Sedimentation of streams is Pennsylvania's greatest pollutant and source of water quality impairment. The siltation of stream bottoms, and contributions to decreasing the clarity of water [turbidity], impacts sensitive aquatic species and ecosystems. This can include smothering important habitat for aquatic macroinvertebrates, fish spawning grounds, and decreasing the amount of dissolved oxygen available to aquatic organisms. Additionally, sediment transport in surface and ground water resources adds in the proliferation of pathogens, greatly increasing the hazards and costs to treating private and public drinking water supplies. Livestock activity and sedimentation from agricultural runoff to surface waters can also contribute to the thermal pollution of the waterbody. Turbidity or suspended sediments in streams can trap heat, greatly increasing water temperatures. Livestock access to streams, can denude stream bank vegetation, increasing erosion and influencing the width and depth of a stream. Stream sections that are over grazed and show evidence of concentrated livestock traffic, can be wider and shallower and lack any substation shade from a mature tree canopy. Theses stream sections can exceed water temperature maximums for cold water species and ecosystems.

Nutrients

Sources of nutrients from agricultural runoff to streams can have varying pathways, but in general can occur from animal concentration areas (barnyards, feed lots, loafing areas, etc.) and the over application of manure or commercial fertilizers. The conversion of nitrogen into nitrite (NO^-_2) and ammonia (NH_3) can be lethal to most aquatic organism, while excess nitrate (NO^-_3) in water supplies can be harmful to human health. Nitrates cause exponential growth in brackish and saltwater plants, algae, and phytoplankton. The eventual death of these organisms and breakdown, cause reduced dissolve oxygen to hypoxic levels, creating a *dead zone* for most organisms. In freshwater systems, these plant communities respond in similar fashion to an abundance of Phosphorus or phosphate (PO_4^{3-}). Unlike nitrogen which is highly soluble, phosphate is mostly insoluble and clings to sediments, and can be introduced to surface water through soil erosion.

Pathogens

Water-borne bacteria such *E. coli, Giardia*, and *Cryptosporidium* are serious threats to private and public drinking water supplies, and can be costly to treat. The public's ability to enjoy recreation of streams, rivers, and lakes is negatively impacted with pathogen pollution. Pathogen transport to surface water

can be caused by concentrated animal operation, unmaintained or failing residential septic systems, and aging municipal sewer infrastructure.

Little Cacoosing Creek: Total Maximum Daily Load (TMDL)

Over 75% of the Cacoosing watershed's agricultural land use is within the Little Cacoosing tributary drainage area. The 2002 PA DEP TMDL developed for the Little Cacoosing Creek establishes a Load Allocation (LA) for sediment and nutrients due to the impairments of upstream agricultural activities. The goal of any TMDL is to calculate the maximum amount of pollutant that a water body can receive and still meet its water quality standards. Reductions in sediment and phosphorus pollutant loads in accordance with the TMDL, is a step toward the Little Cacoosing Creek achieving the attainable designated use of *Aquatic Life*. Below is a breakdown of the Sediment and Phosphorus TMDL for the Little Cacoosing Creek.

Load Allocations for Sources of Sediment			
Source	**Current Loading (lbs./yr.)**	**Load Allocation (lbs./yr.)**	**% Reduction**
Hay and Pasture	71,400.00	56,997.05	20%
Cropland	1,152,200.00	705,496.16	39%
Stream Bank Erosion	151,926.20	121,279.34	20%
NPS Loads Not Reduced	30,600.00	30,600.00	-
Total	**1,406,126.20**	**914,372.55**	**35%**

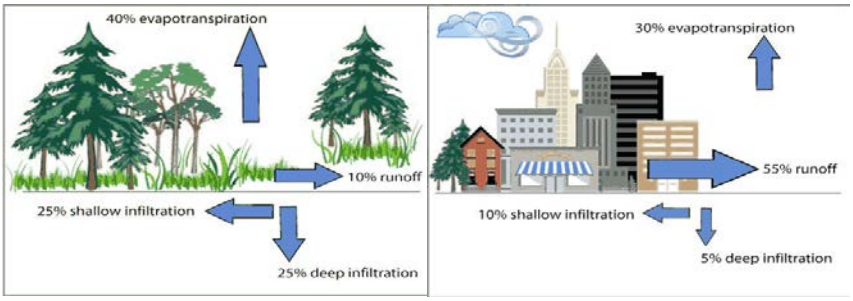
Load Allocations for Sources of Total Phosphorus			
Source	**Current Loading (lbs./yr.)**	**Load Allocation (lbs./yr.)**	**% Reduction**
Hay and Pasture	309.60	205.07	34%
Cropland	2,097.20	517.26	75%
Stream Bank Erosion	88.42	58.57	34%
NPS Loads Not Reduced	916.10	916.10	-
Total	**3,411.32**	**1,697.00**	**50%**

Tables 2 & 3: Taken from the 2002 Little Cacoosing Creek Total Maximum Daily Load

Urban Runoff & Municipal Separate Storm Sewer Systems (MS4)

Development can remove beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is often eliminated by storm sewers that discharge runoff directly into a stream. In addition, land development often results in the accumulation of pollutants on the land surface that runoff can then transport to streams. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients. In addition to increased pollutant loading, various land use

changes can adversely affect water quality and cold water ecosystems. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.



Water Cycle in undeveloped areas versus urbanized areas. *Illustrations taken from Clean Water Education Partnership*

Through MS4 permits, PA DEP places regulatory requirements on municipalities to reduce pollutants and illicit discharges from storm sewer outfalls to surface waters. All municipalities (*except Wyomissing Borough*) within the Cacoosing Creek watershed, have regulated storm sewer discharges and require MS4 permits. Similar to a TMDL, municipalities are charged with developing Pollution Reduction Plans (PRP's) demonstrating existing and proposed Best Management Practices (BMPs) that will achieve reduction in sediment and nutrient pollution.

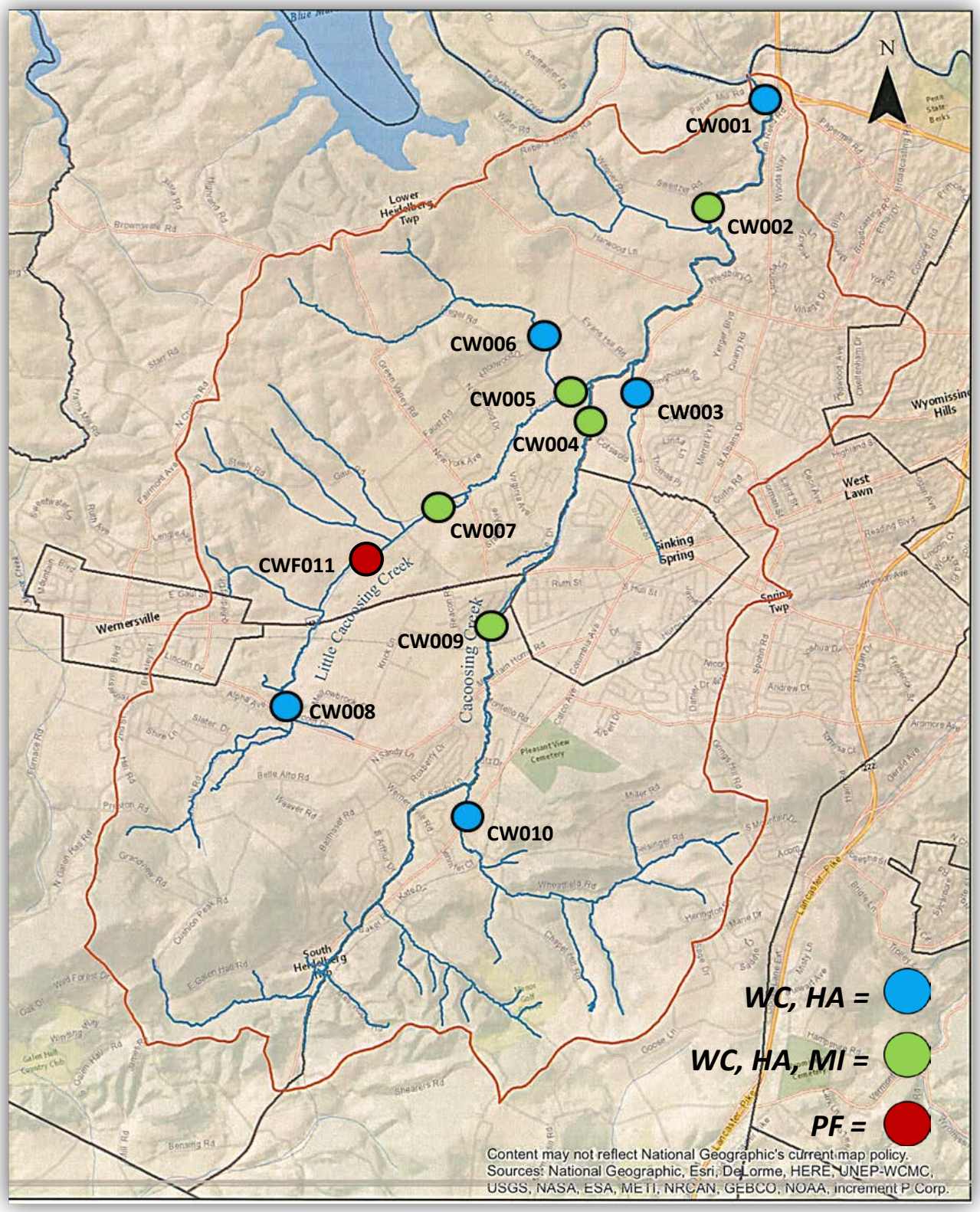
2018 Cacoosing Creek Surface Water Assessment

In May of 2018, an assessment of the Cacoosing Creek Watershed was conducted. The assessment was completed by Mike Bilger formally with the Susquehanna University Freshwater Initiative. The BCCD provided field assistance during the assessment process. The Surface Water Assessment evaluated the stream's physical habitat, water chemistry, and biological life (macroinvertebrates) according to PA DEP's Instream Comprehensive Evaluations Protocol. Sites were chosen based on previous PA DEP or PFBC sites for comparison. The results of this assessment were processed by utilizing the Index of Biotic Integrity (IBI), which PA DEP uses to determine if a stream is attaining its Designated Use or is impaired. A summary of the findings of the Stream Assessment are included with this Coldwater Conservation Plan.

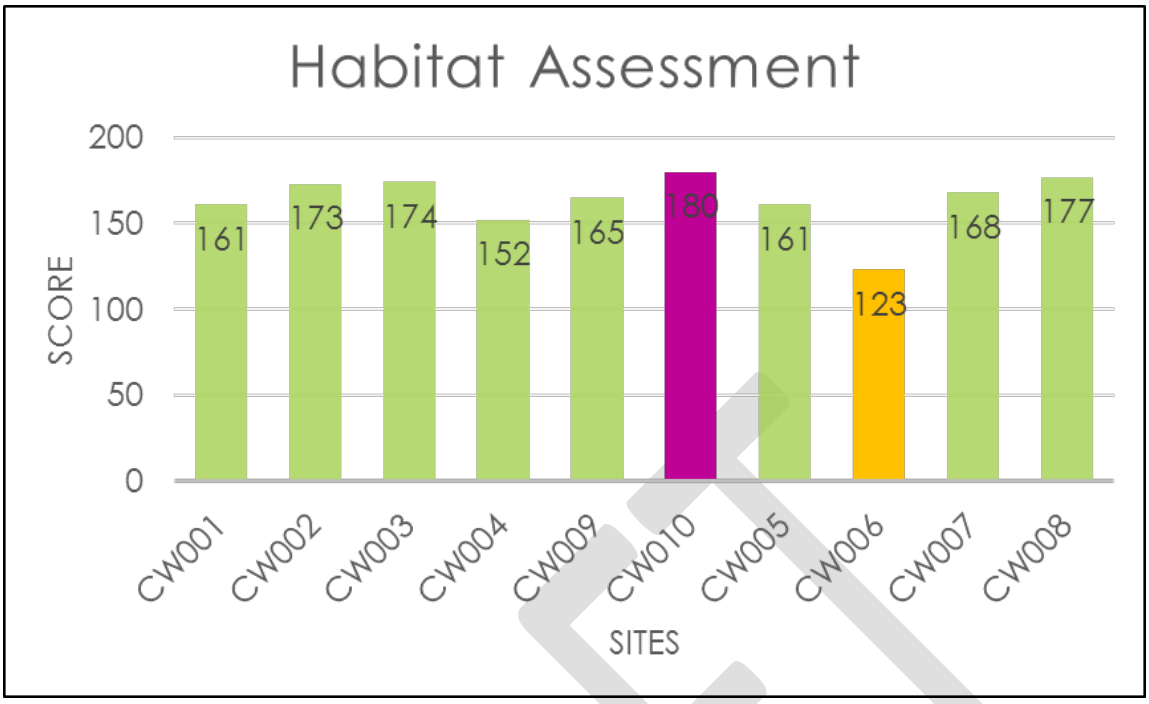
Site	Alkalinity (mg/l)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	pH	Total Suspended Solids (TSS)	Temperature (°C)	Microbial Fecal Coliform cfu/100mL
CW001	160	560	9.6	3.53	0.08	7.31	6	13.9	229
CW002	180	540	9.5	4.11	0.1	7.86	10.8	14.4	283
CW003	200	700	8.7	3.93	0.03	8.0	4.8	14	66
CW004	140	400	9.9	2.64	0.04	7.9	7.6	14.7	276
CW005	200	510	9.1	4.04	0.06	7.69	10.4	17.7	168
CW006	160	350	8.5	3.66	0.05	7.28	4	16.3	84
CW007	180	460	8.8	3.11	0.08	7.77	34	19.7	112
CW008	180	430	9.7	3.01	0.06	7.93	4	15.6	168
CW009	180	510	9.3	1.9	0.04	8.12	7.6	16.8	116
CW010	140	430	10.1	2.61	0.04	7.78	4	15.2	212
Color Key = GOOD, FAIR, POOR									

Table 5:2018 Cacoosing Creek Assessment, chemical and physical parameters

Figure 4: Cacoosing Creek Watershed Assessment Site Locations



WC= Water Chemistry, HA = Habitat Assessment, MI=Macroinvertebrate Collection, PF= Passive Fish Sampling



Figures 6: The habitat scores were ranked in this study as follows: OPTIMAL: 240-180; SUBOPTIMAL: 179-132; MARGINAL: 131-72; and POOR: ≤ 72.

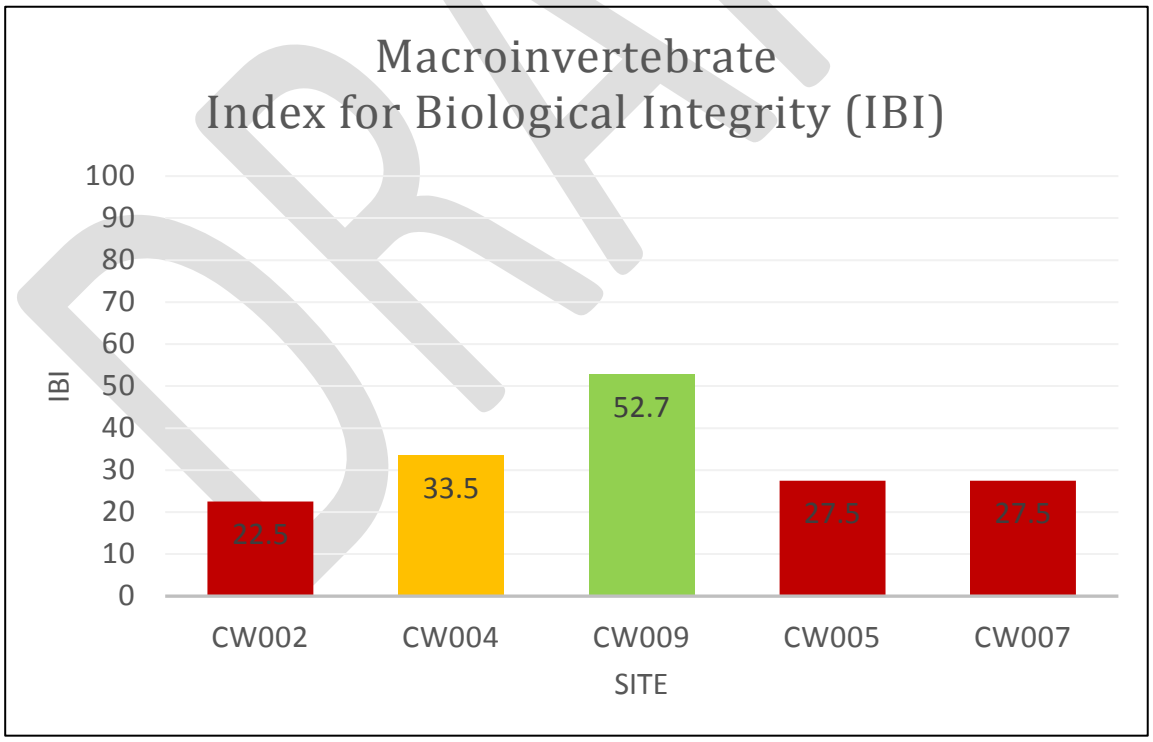


Figure 7: The Macroinvertebrate Index for Biological Integrity (IBI) scores were in this assessment as follows: SEVERELY IMPAIRED: ≤ 30; IMPAIRED: 30 – 50; SUB ATTAINING: 50 – 63; ATTAINING AQUATIC LIFE USE: 63 – 100.

Table 6: Summary of Passive Fish Sampling at CWF011 (Little Cacoosing Creek)

Common Name	Species	# Individuals
Brook Trout	*S. fontinalis*	1
Banded Killifish	*F. diaphanous*	1
Blacknose Dace	*R. atratulus*	4
Creek Chub	*S. atromacutalus*	3
Tessellated Darter	*E. olmstedi*	5
Unidentified Minnows		3
TOTAL		**17**
Species Color Key = COLD WATER, COOL WATER, WARM WATER		

Figure 5: Brook Trout (Salvelinus fontinalis) captured with a seine net and release at site CWF011 on the Little Cacoosing Creek.

The overall results showed that macroinvertebrate sites WC002, WC004, WC005, WC007 did not meet the criteria to be deemed attaining. The remaining site [WC009], was considered to be approaching attainment. In other words, the segments of Lower Cacoosing and Little Cacoosing Creek still are impaired by agricultural runoff and not attaining *Aquatic Life* or *Recreational* uses. Thus, the need for the TMDL is still relevant. In contrast, upstream from the US RT. 422 [Penn Avenue], the Cacoosing Creek mainstem appears to have the ability to meet the attaining use for *Aquatic Life*. This segment is also identified as the Class-A Wild Trout Water's by the PFBC.

Contrary to its WWF designation, passive fish sampling on the Little Cacoosing Creek resulted in the capture and release of fish species closely related to cold and cool water transition habitats. This included a brook trout (Salvelinus fontinalis), which is among one of the most sensitive cold water species. It may be plausible that the Little Cacoosing Creek can demonstrate the same coldwater characteristics as the main stem of the Cacoosing Creek, and hold isolated populations of naturally reproducing trout. In this scenario the Little Caccosing should receive the same regulatory protections as the Cacoosing Creek mainstem.

Other than high total suspended solids (TSS) on sections of the Little Cacoosing Creek, chemical water quality data showed no specific item of concern that would affect the biological community. The Habitat Assessments for the watershed revealed 1 site that was considered optimal, 8 suboptimal, and 1 marginal (WC006). Although habitat scores were relatively high, it is important to note that many of the sites scored high on riparian habitat, while instream habitat received lower scores due to sediment deposition, limited riffle sections, and embedded substrate.

Recommended Management Strategies

The findings of the 2018 Stream Assessment of the Cacoosing Watershed have helped shape this Coldwater Conservation Plan. Three general recommendations are put forth in this plan that will aid in the conservation and enhancement of the Cacoosing Creek watershed's coldwater characteristics. The strategies can be implemented both on private or publicly owned land. Figure 8: *Priority Watershed Projects*, identifies key opportunities where these strategies and Best Management Practices (BMPs) could be implemented.

Strategy #1 *Identify Agricultural BMP/Riparian Restoration Opportunities*

Strategy #2 *Actively Educate Watershed Stakeholders*

Strategy #3 *Pursue Municipal Stormwater Improvements*

Strategy #1 Identify Agricultural BMP & Riparian Restoration Opportunities

The agricultural community has made significant advances in conservation technologies in the last decade. It continues to be a keystone industry not only in the watershed, but throughout the United States. In every industry there are challenges, and agricultural operations within Cacoosing Creek Watershed should be encouraged to implement current Best Management Practices and innovative technologies to reduce sediment, nutrient, and pathogen pollution to surface and ground water resources. There are many local, state, and federal resources available to agricultural producers including the Conservations District, Conservancies, Watershed Associations, and USDA Natural Resource Conservation Service (NRCS) that can provide technical and financial assistance to implement Agricultural BMP's. Every effort should be made to develop productive and consensual relationships with the agricultural producers and landowners within the watershed.

Stream corridor enhancement and stream bank restoration are important practices that maintain stream functionality and improve stream health. There are many opportunities in the Cacoosing watershed to implement these "on the stream bank" practices. It is important to note that when considering these practices, one should begin in the headwaters of the watershed and work down to the mainstem. This ensures restorative and enhancement efforts completed downstream are not impacted by up stream activities.

Types of Agricultural Best Management Practice

Conservation Planning

- Nutrient/Manure Management Plans
- Conservation Plans & Ag Erosion Sediment Control Plans
- Agricultural preservation & environmental easements

Headquarter Conservation Practices

- Manure storage and handling systems
- Animal Heavy Use Area Protection
- Stormwater Controls. Divert roof water away from barnyards (gutter & downspouts)

Stream Riparian Buffer

- Livestock Exclusion & Stream Bank Fencing
- Streambank tree & shrub plantings [Riparian Forest Buffers]
- Stream restoration and mill dam removals

Cropland & Soil Health

- No till and high crop residue technology
- Cover crops
- Retention and Infiltration [Reduce compaction, high organic matter, cropland terraces]

Strategy #2: Actively Educate Watershed Stakeholders

A community that is connected to its watershed, will protect the watershed. Access to the Cacoosing Creek is very limited. Private landowners control nearly all the land within the Cacoosing Creek watershed, with the exception of a few municipally owned parcels. There is only one municipal public park existing along the Cacoosing that provides access to the stream. Opportunities should be examined, to provide more public access to the stream. Along stream strategies such as educational signage, stream programs, and clean ups can engage the local community.

Private landowners fall into a number of categories: residential, commercial, agricultural, and industrial. It is the practices that landowners carry out on their land that has the greatest influence on water quality in the Cacoosing Creek and its tributaries. For that reason, it is essential that effective outreach and education target this group, ensuring that they have the appropriate information to properly manage their land, and put in place conservation and BMPs that will protect water resources. While creating this Coldwater Conservation Plan, two public meeting were held to inform residents about the process to create the Plan and to garner their suggestions as to how to improve the Cacoosing Creek watershed.

Public Education and Engagement

General Public

- Provide watershed programing and community volunteer opportunities
- Educate the general public on practical home best management practices
- Promote programs such as *Trout in the Classroom* in schools located in the watershed

Outreach to stream side landowners

- Provide educational materials on streamside BMPs
- Connect landowners to regional and local conservation organizations and associations
- Preserve privately owned riparian areas & cold water springs (easements & open space)

Municipality and Elected Officials

- Encourage passive recreational opportunities on municipally owned streamside parcels
- Link community trails, walkways, with municipal greenways
- Assist municipalities in educating landowners on septic system care and maintenance

Source Water Protection & Public Utilities

- Engage watershed public utilities and identify critical SWP Zones
- Coordinated natural resource protection and SWP efforts
- Educate the watershed community on sources of their drinking water

Strategy#3: Pursue Municipal Stormwater Improvements

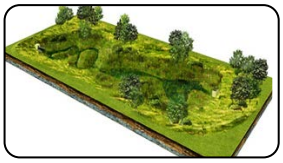
While the headwaters of the Cacoosing Creek watershed are mainly rural areas, the mouth of the stream and up Wernersville Road in South Heidelberg Township is mainly urbanized residential and commercial areas. Most of the urbanization in this portion of the watershed took place before modern stormwater regulation/practices were implemented. As is common in most of these older communities, there is an opportunity to introduce stormwater retrofits. Stormwater retrofits often involve updating, changing, or enhancing current, onsite stormwater management practices and converting them into practices that address a pollutant or issue of concern. Retrofits include but are not limited to: wetland plantings and removal of low flow channels in stormwater basins to decrease the amount of water entering the stream during storms; installation of rain gardens or other bioinfiltration practices; and decreasing the amount of impervious surfaces. These types of practices should be installed where it is feasible and practicable as the specific site permits.

Watershed municipalities have regulator responsibilities to reduce sediment and nutrient pollution to surface waters through the PA DEP's MS4 Permit Program. Several stormwater BMP's are proposed throughout the waters in accordance with Municipal Pollution Reeducation Plans (PRPs). It is important to note, residential development is expected to expand in the watershed, especially within Lower Heidelberg, South Heidelberg, and Spring Townships. This will further increase the urban footprint of the watershed. Effort should be made to working with municipalities, individual land developers, and local conservation partners to preserve the riparian floodplains of not only the Cacoosing Creek but its tributaries, too.

Stormwater BMP

Bioretention

- Rain Gardens (schools, churches, parks, private residents)
- Bioswales (municipal drainages, abandoned Right-Of-Way's,
- Green Infrastructure (permeable pavement, green roof, infiltration trench & rain barrels)



Basin Retrofits

- Constructed Wetland & permanent pools
- Spillway or outfall discharge modification
- Increase stormwater flow path (time of travel)

Floodplain Restoration & Enhancement

- Municipal Forested Riparian Buffers
- Enhance municipal zoning to protect wetlands, floodplains, and cold water springs
- Establish "No-Mow" or "Limited Mow" Zones in floodplains and utility Right-Of-Ways

Municipal Stormwater Sewer Systems (MS4)

- Inventory Proposed Municipal MS4 Projects
- Coordinated with County MS4 committee to provide trainings for municipal staff
- Illicit Discharge Prevention

Priority Watershed Projects

Figure 8: A map of priority projects that can protect or enhance the water quality and cold water properties of the Cacoosing Creek Watershed . See Table 7 for a description of each potential project.

Table 7: List of priority water quality improvement and enhancement projects in the Cacoosing Creek Watershed

Site #	Project Name	Proposed BMP's
1	Papermill Dam Removal	*Dam removal project. Legacy Sediment & Stream Restoration. [Currently fully funded]*
2	Scattered Acres	*Animal Exclusion Fencing, Riparian Forest Buffer, No-Till, Cover Crops.*
3	Yerger Boulevard Basin Retrofit	*Basin retrofit. Bioretention. Municipal owned. MS4 PRP BMP.*
4	Spring Township Reservoir Trail	*Trail and Greenway. Passive Recreation and Fishing Access.*
5	Kreider Property	*Riparian Forest Buffer*
6	Sinking Spring WWTP	*Riparian Forest Buffer, Passive Fishing Access.*
7	Little Cacoosing Farms	*Riparian Forest Buffer, No-Till, Cover Crops.*
8	Green Valley Estates	*Basin Retrofit. Bioretention. MS4 PRP BMP.*
9	Little Cacoosing Greenway Trail (see appendix)	*Connect existing and proposed trails. Green Valley Estates, Wilson West Exercise Trail, Calvary Bible Fellowship Church Trail. Passive Fishing Access*
10	Broad Street Ditch	*Stream & Floodplain Restoration. MS4 PRP BMP.*
11	Willow Glen Flea Market	*Passive Fishing Access*
12	Little Cacoosing Unnamed Tributaries	*Riparian Forest Buffer.*
13	Schaeffer Farm	*Conservation Plan, Animal Exclusion Fencing, Riparian Forest Buffer, No-Till, Cover Crops, Grassed Waterway.*
14	Gerhart Road Bioswale	*Bioretention. MS4 PRP BMP.*
15	Heidelberg Run West	*Riparian Forest Buffer*
16	Lutz Farm	*Stream Restoration, Animal Exclusion Fencing, Riparian Buffer.*
17	Residential Septic System Outreach	*Educational material and outreach for privately owned septic systems in Cacoosing headwaters. Appendix E Drinking Water Protection Brochures*
18	Wolfskill Property	*Riparian Forest Buffer, No-Till, Cover Crops.*
19	Grandview Dairy Farm	*Conservation Plan, Manure Management Animal Exclusion Fencing, Riparian Forest Buffer, No-Till, Cover Crops.*
20	Cushion Peak Preservation	*Preservation of the headwater forests of the Cacoosing Creek watershed.*

Summary/Conclusion

Although it appears that the Cacoosing Creek Watershed has two stories, one of agricultural land use and one of urbanization, any effort to protect and enhance the cold water characteristics of the watershed should be merged into one common goal. In 83,000 miles of stream in Pennsylvania, less than 2% are considered to be High Quality waters that contain naturally reproducing wild trout. Although it is a high standard, it is an achievable standard for the Cacoosing Creek Watershed. The 2018 surface water assessment of the Cacoosing Creek Watershed, provided both positive and negative insights into the challenges that the watershed faces. The rural characteristics, such as numerous cold water springs, forested areas, and shrub wetlands serve the stream well. Sensitive cold water fish species were identified in the Cacoosing Creek's primary tributary, which has a WWF designation. In contrast, segments of the Cacoosing Creek and its tributaries still show the symptoms of sediment and nutrient pollution. However, modeling suggests that with just the implementation of a handful of prioritized BMPs, both in the rural and urban land uses of the watershed, the sediment and nutrient pollution could be significantly reduced [see Appendix B – MapMyWatershed]. Implementation of these would assist in the Little Cacoosing Creek meeting Load Allocations established by the TMDL. The implementation of agricultural BMP's and municipal compliance with MS4 permits, will play a critical roll in pollution reduction to the Cacoosing Creek.

It is important that Riparian Corridor Zoning be enforced or amended to place protections on the floodplain and wetlands of the Cacoosing and its tributaries. Due to the natural reproducing populations of wild trout in the watershed, all wetlands have Exceptional Value regulatory protections. These wetlands are often connected to cold water springs and seeps, many of which have historical and cultural significant structures. Municipalities, historical societies, conservancy groups should make every effort to protect these structures and springs. These springs are the cold water life line of the Cacoosing Creek Watershed.

As it was previously mentioned, a community that is connected to its watershed, will protect its watershed. This will require providing more public access to the Cacoosing Creek and its tributaries. This could include passive activities like walking trails and *Walk-In-Only* catch and release fishing access on both municipally and privately owned near-stream parcels. Providing more stream access, also allows municipalities and conservation groups to host community watershed programing and volunteer opportunities. The conditions of Pennsylvania's Recreation Use of Land and Water Act, reduces the liability of municipalities and landowners who provide recreational access to their lands.

While this Coldwater Conservation Plan provides a list of management strategies and possible restoration and/or best management practice installation recommendations, it should be noted that the list is not an exhaustive list and is meant to be flexible. The strategies and priority projects put forth in the plan are to aid and guide municipal officials and watershed stakeholders in determining and examining watershed protection. There are a number of other strategies and BMP's that could be implemented such as increasing forest and open space watershed wide (not just near stream) or adoption of a watershed Environmental Advisory Council (EAC). It is the BCCD's recommendation that the municipalities within the watershed view the Cacoosing Creek comprehensively, and not just within municipal boundaries. It is encouraged that all watershed stakeholders adopt watershed wide based planning as an approach to solving water quality issues and protecting the coldwater heritage of the Cacoosing Creek Watershed.

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United States Geological Survey. StreamStats Website.

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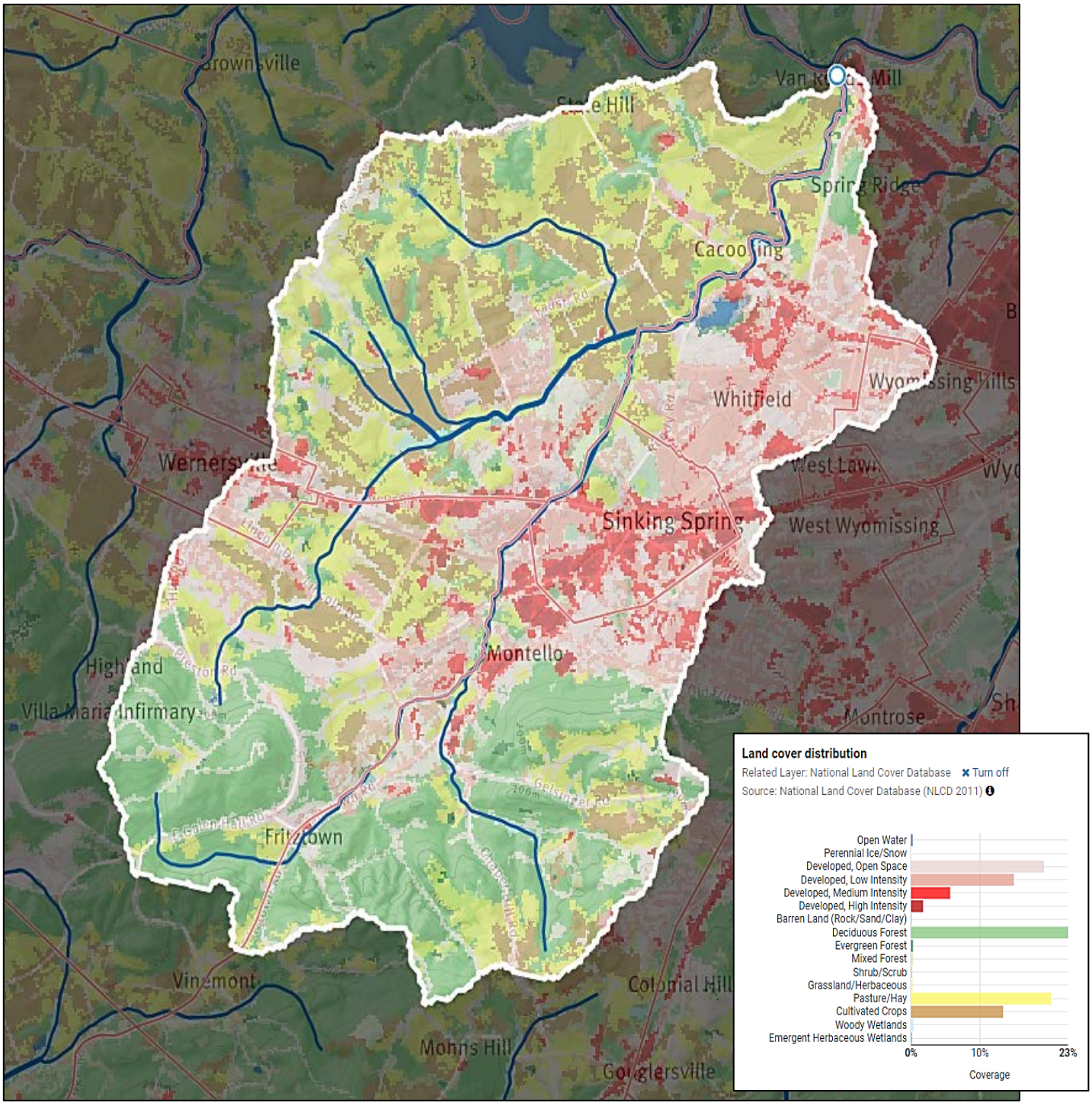
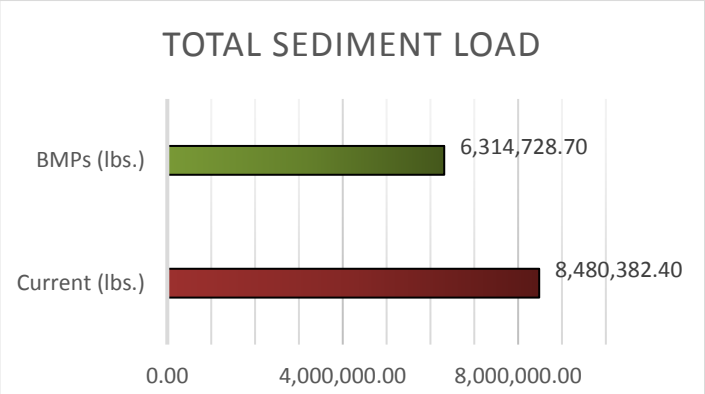
Appendix A – Cacoosing Creek Watershed Land Use

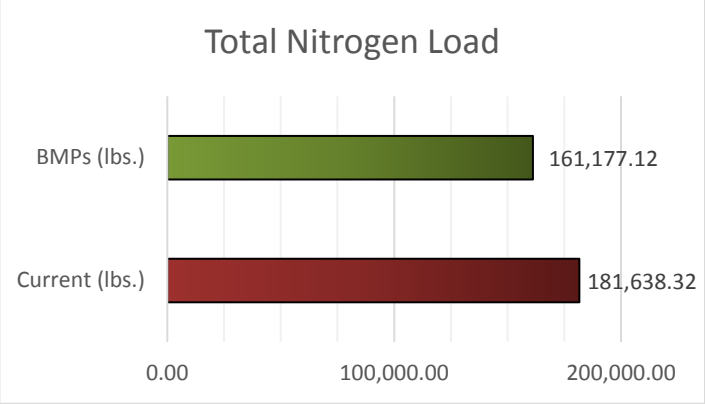


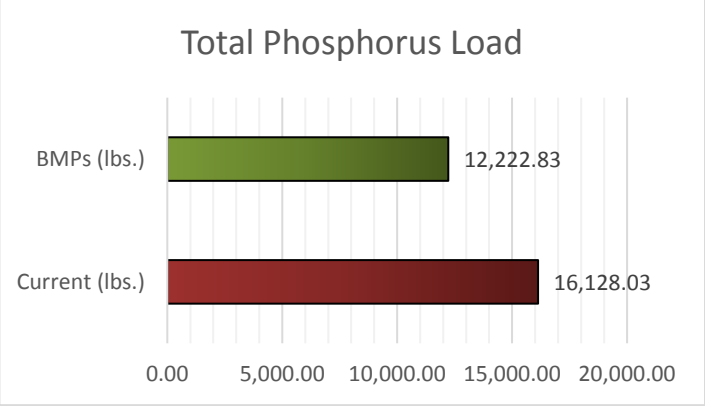
Appendix B – Wikiwatershed Model: Implementation of Priority BMPs

Wikiwatershed Model My Watershed: The figures below demonstrate achievable reductions of sediment, nitrogen, and phosphorus. The model compares multi-year scenarios including the current watershed condition vs. the watershed if the priority Best Management Practices were implemented.

Pollutant	Current (lbs.)	BMPs (lbs.)	Reduction (lbs.)
Sediment	8,480,382.44	6,314,728.70	**2,165,653.74**
Total Nitrogen	181,638.32	161,177.12	**20,461.21**
Total Phosphorus	16,128.03	12,222.83	**3,905.21**







BMP	Implementation Amount
Stream Bank Fencing	17,500.00 ft.
Rural Riparian Buffer	35.0 acres
Rural Stream Rest.	1500 ft.
Nutrient Mgmt.	800 acres
No-Till Practices	400 acres
Cons. Crop Rotation	800 acres
Urban Riparian Buffer	6.0 acres
Urban Stream Rest.	1000 ft.
Urban Infiltration	4.0 acres
Urban retention	2.75 acres


Green Valley Heights
Green Valley Estates Resident Trail (1.0 mi.)
Existing
Wilson School District Exercise Trail (2.0 mi.)
Under Construction/Proposed
Potential Link Trail Ext. Sidewalk or Access Road
Calvary Bible Fellowship Exercise Trail (0.75 mi.)
Existing
Green Valley Crossing
Green Valley West
Green Valley Estates
Sinking Spring Borough
Faust Rd
Green Valley Rd
Lt. Cacoosing Creek
Cacoosing Creek
Little Cacoosing Creek
Reedy Rd
Green Valley Elementary School
Wilson West Middle School
Calvary Bible Fellowship Church
Sheetz #289
Dairy Queen (Treat)
Willow Glen Park
Village Greens Golf Course
Fabric Mart
The Tomcat Cafe
Lords & Ladies Salon and Medical Spa...
YMCA
Wendy's
Salute Ristorante Italiano
Redner's Warehouse Markets
422
423

Appendix D – List of Watershed Stakeholders

Municipalities

Lower Heidelberg Township
Sinking Spring Borough
South Heidelberg Township
Spring Township
Wernersville Borough
Wyomissing Borough

Public Utilities

American Propane, LP
Buckeye Pipeline Company
Norfolk Southern Corporation
Lower Heidelberg Municipal Authority
PA American Water (Penn District)
PPL Electric Utilities
Sunoco Pipeline Company
UGI Energy Services Inc.
Sinking Spring Waste Water Treatment Plant
South Heidelberg Municipal Authority
Spring Township Waste Water Treatment Plant
Wernersville Municipal Authority
Western Berks Water Authority

Cultural Heritage

Heidelberg Heritage Society
Tulpehocken Settlement Historical Society

Schools

Green Valley Elementary School
Shiloh Hills Elementary School
Spring Ridge Elementary School
St. Ignatius Loyola School
The Goddard School
Whitfield Elementary School
Wilson High School
Wilson West Middle School

Conservation Organizations

Berks County Conservation District
Berks County Master Watershed Stewards
Berks County MS4 Committee
Berks County SWP Program
Berks County Water & Sewer Assoc.
Berks Nature
Schuylkill Action Network
Trout Unlimited Tulpehocken Chapter
Tulpehocken Creek Watershed Association

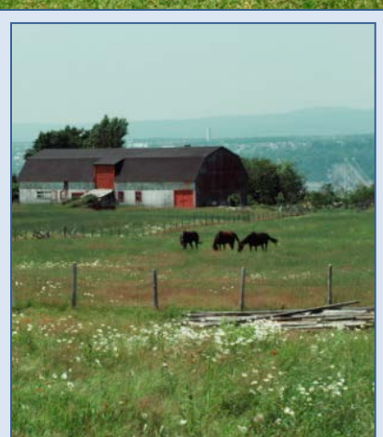
Appendix E – Educational Materials for Watershed Protection

1. Agriculture and Your Drinking Water – Trifold Brochure
2. Protecting Your Drinking Water "Septic System Care" – Trifold Brochure
3. The Homeowner's Guide to Stormwater *"How to develop and implement a stormwater management plan on your property"*
   Visit www.stormwaterguide.com

Protecting Our Drinking Water

Much of the Pennsylvania countryside is in agricultural operations, and plays a huge role in our commonwealth's production of food. Conversely, agriculture also has a huge impact on the drinking water sources throughout the state. Farmers have a unique challenge in balancing efficient operations with environmental stewardship. This brochure is designed to provide information on various Best Management Practices (BMPs) that can help reduce nutrients found in manure and sediment from row crops.

All agricultural producers are encouraged to seek assistance from their County Conservation District and the Natural Resources Conservation Service for the installation and implementation of these practices.



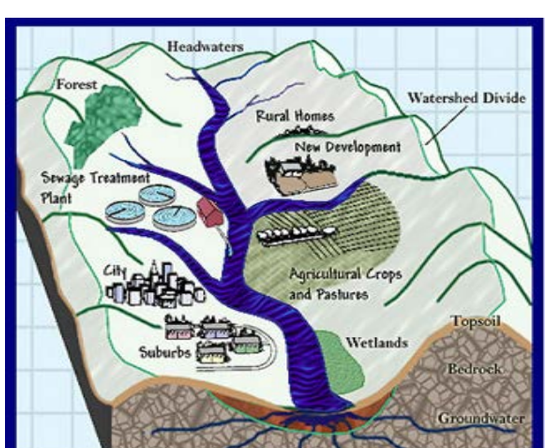
What is a Watershed?

A watershed is all the land that drains to the same river or lake. Water travels from the highest points at the watershed edge to the lowest point at the bottom of the watershed. Wherever you are, you are in a watershed!

When it rains, some water travels over the land surface to the nearest stream or creek. This water is called *surface runoff* or *stormwater*. As the stormwater flows, it picks up any contaminants lying on the surface – pesticides and fertilizer from lawns, manure from farms, sediment from construction sites, and oil and gas from roads. Small streams join to form larger and larger rivers, until the water – and any contaminants it is carrying.

Some precipitation, instead of traveling over the land, will percolate into the soil and reach the *groundwater*. Similarly, the groundwater may pick up these contaminants, which are then carried by the groundwater into one of the rivers or lakes in the watershed.

This brochure has been funded by the Pennsylvania Department of Environmental Protection's Source Water Protection's Source Water Protection Technical Assistance Program.



CITIZEN'S GUIDE

Agriculture and Your Drinking Water

Berks County
Source Water Protection Program

A Program By:
Berks County Water & Sewer Association
Center for Excellence in Local Government
c/o Albright College
http://www.albright.edu/localgov/bcwsa/index.html

For More Information Contact:
Berks County Conservation District
1238 County Welfare Road, Suite 200
Leesport, PA 19533
610-372-4657
www.berkscd.com

How Does Drinking Water Become Polluted?

Your drinking water may become polluted when substances that are harmful to human health enter the groundwater or surface source, like a lake or reservoir. Sometimes pollutants like manure and sediment from stormwater runoff find their way into streams and creeks. Once water is contaminated, it must be treated or abandoned as a drinking water source. The expense of treating polluted water or finding a new source of drinking water can be avoided through source water protection.

For more information:

Berks County Conservation District
http://www.berkscd.com/

Natural Resources Conservation Service
http://www.pa.nrcs.usda.gov/

Berks County Conservation District

USDA

Examples of Agriculture Practices That Reduce Pollution

No-Till Planting and **Contour Strips** reduce loss of sediment through stormwater runoff.

Streambank Fencing prevents animals from depositing manure into streams. The fence also avoids destruction of the streambanks that add sediment to the water.

Grazing Management helps maintain plant life on pasture lands, reducing soil loss during rain events or snow melts.

Conservation and Nutrient Plans help farmers with sustainable operations while complying with Pennsylvania Chapter 102 and Act 38 regulations.

Buffer Plantings along streams and creeks help filter pollutants in stormwater runoff from getting into the water.

Creek Crossings minimize animal access to streams, and reduces manure and sediment contamination.

What is A Septic System?

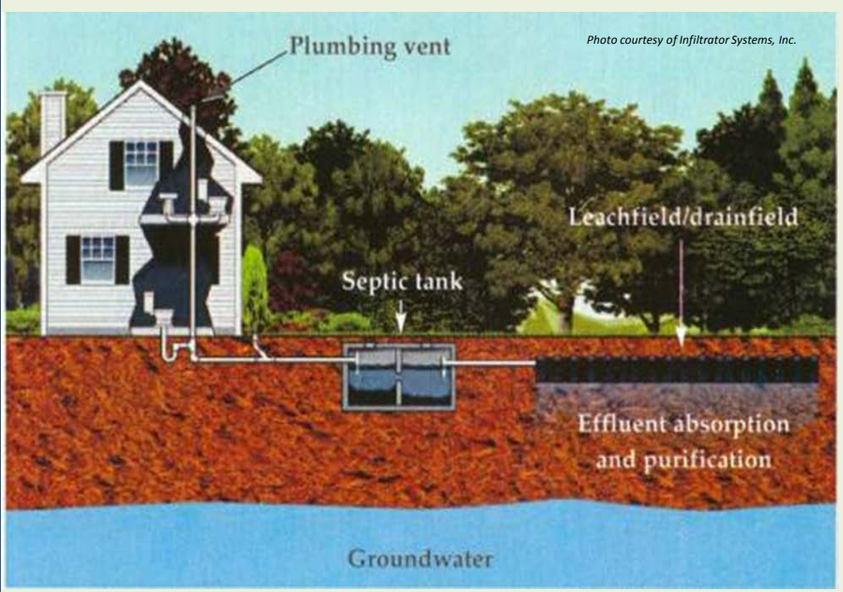
Households that are not on a public sewer system may use an on-lot septic system to dispose of their wastewater. Household wastewater contains all the wastes from our homes, including toilet use, bathroom and kitchen use, laundry, and other activities. It contains human waste, detergents, chemicals, grease, oils, and many other substances. If not treated properly, these substances can travel through soil and potentially contaminate groundwater and/or local waterways.

Most systems have three components:

• **Septic Tank** – Tanks can be constructed from plastic, fiberglass, or concrete. Tank size and specifications are determined by state regulation, and systems are permitted and approved by local agencies.

• **Drainfield** – a drainfield is constructed from a series of perforated pipes buried in gravel- filled trenches in the soil. When wastewater enters the septic tank, an equal amount (known as *effluent)* is forced into the drainfield for treatment.

• **Soil** – the soil encompassing the trenches treats the wastewater by allowing infiltration of the liquids to neutralize most of the pollutants. The effluent eventually is incorporated into groundwater.



For more information

On-lot Sewage Program
http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqp_wm/FACTS/pa1607.htm

On-lot Wastewater Systems: Basics
http://extension.psu.edu/natural-resources/water/septic-systems/on-lot-sewage-systems

On-lot System Operation and Maintenance
http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqp_wm/facts/pa1608.htm

Water Wellness Seminar
http://files.dep.state.pa.us/EnvironmentalEd/Environmental%20Education/EnvEdPortalFiles/DEP_At_Home/Water_Wellness/Onlot_Sewage_Systems_Presentation_Sept2012.pdf

Caring for your System

Remember that the Homeowner is responsible for the care and maintenance of the septic system! Here are some ideas to keep your system in top shape:

• Inspect the entire system every 1 to 3 years to ensure good working order.

• Pump the solids from the tank every three (3) years to avoid overfilling and failing tanks.

• Keep service and pumping records handy.

• Repair the system as soon as trouble signs appear, such as sluggish toilets, sewer odors, spongy ground around septic tank, or raw sewage backups.

• Conserve water and follow directions to prevent malfunctions.

•If you use a private supply, ensure safe drinking water by periodically testing the water.

Visit the PA Department of Environmental Protection website for more information at http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqp_wm/FACTS/pa1607.htm

Septic System Maintenance Record

Date	Company	Service	Comments

CITIZEN'S GUIDE

Protecting Your Drinking Water

Berks County
Source Water Protection Program

A Program By:
Berks County Water & Sewer Association
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http://www.albright.edu/localgov/bcwsa/index.html

For More Information Contact:
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610-372-4657
www.berkscd.com

A Message from the Berks County Source Water Protection Committee

Everyone uses local water sources every day, but do you know where your water really comes from?

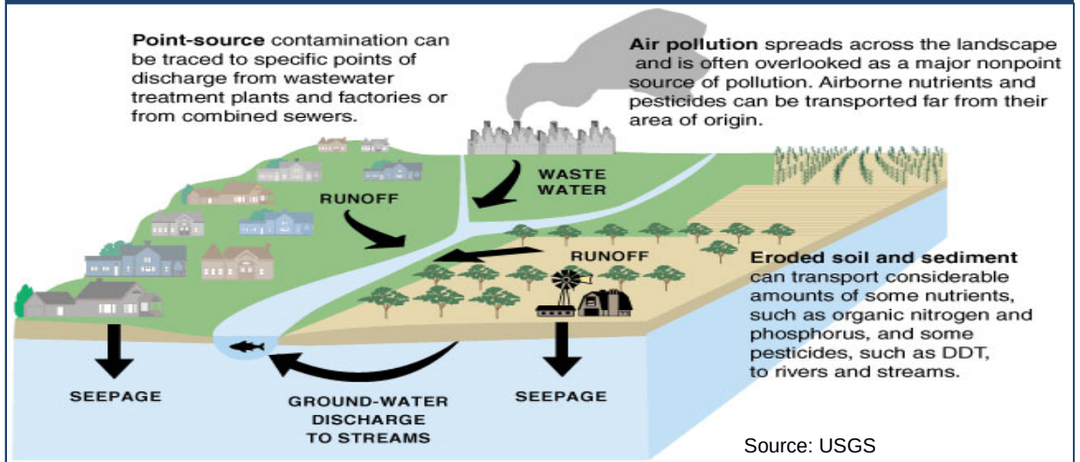
The staff at your water utility work around the clock to provide top quality water to every tap. Wastewater facilities work hard to discharge water that meets regulations and protects your water resources, which are the heart of your community, your way of life and your children's future. To maintain a clean, dependable water supply, they need your help!

This brochure was developed to make your community aware of the importance of protecting your water supply. Once a water source becomes contaminated, the cleanup often takes many years and can be very expensive. It is in our community's best interest to take the proper precautions to prevent contaminants from entering our water supply.

Who is responsible for protecting your drinking water? EVERYONE! Whether you use a public supply or a private source, we are all connected to the same water!

If you have any questions about source water protection in your area, please contact the Berks County Water & Sewer Association at BCWSA@alb.edu, or visit the BCWSA website at https://www.albright.edu/localgov/bcwsa/index.html for more information.

Examples of Source Water Contamination



Source: USGS

Water utilities obtain your drinking water from a variety of sources, such as a groundwater well, spring, surface reservoir, river, or creek. Source water protection can help prevent your drinking water from becoming polluted by managing possible sources of contamination in the watershed. Everyone has an important part to play in protecting drinking water – today and for the future. Source water protection is a community effort – we hope you will read this and other information forwarded to you, and help protect our water supply.

Why do water sources sometimes become polluted? A water supply can become polluted when substances that are harmful to human health enter the groundwater, rivers, reservoir, or springs. Common pollutants include gasoline or oil from leaking tanks, nitrate and pesticides from agriculture and lawns, pathogens from livestock and pet waste, salt from winter road maintenance, and chemicals from industrial facilities. Once drinking water is contaminated, it must be treated or abandoned as a drinking water source. The expense of treating polluted water or finding a new source of drinking water can be avoided through source water protection.

Ways to Help

What can you do?

- Pump out your septic system every three years, or as required by local ordinance. Look under "Septic Tanks" in the Yellow Pages to find a contractor.
- Minimize the use of pesticides and herbicides on your lawn and garden.
- If you drill a new well, make sure the old one is properly closed and abandoned, and periodically test the new water.
- Do not dump swimming pool water into a creek or storm drain at the end of the season. If possible, direct the water into the sanitary sewer. Otherwise, wait until the chlorine diminishes and then direct pool water onto grass, forest, or other natural area.
- Remember: anything you throw or store on the ground can find its way into the water supply. Store and handle chemicals properly.
- Dispose of motor oil at a garage that will recycle it. Never pour oil on the ground or in a storm drain or sewer on the street.
- Bring household hazardous waste – such as paint, varnishes, and other chemicals – to a Berks County waste collection event. Check for dates on this website: http://www.co.berks.pa.us/Dept/SWA/Pages/default.aspx
- Do not flush medications or pour down the drain, as they may affect groundwater and private wells. Dispose of these at a Berks County collection event.
- Call the PA Department of Environmental Protection office at **(877) 333-1904** immediately if you observe a chemical spill.

This brochure has been funded by the Pennsylvania Department of Environmental Protection's Source Water Protection Technical Assistance Program.

Berks County Water & Sewer Association

SOURCE WATER PROTECTION