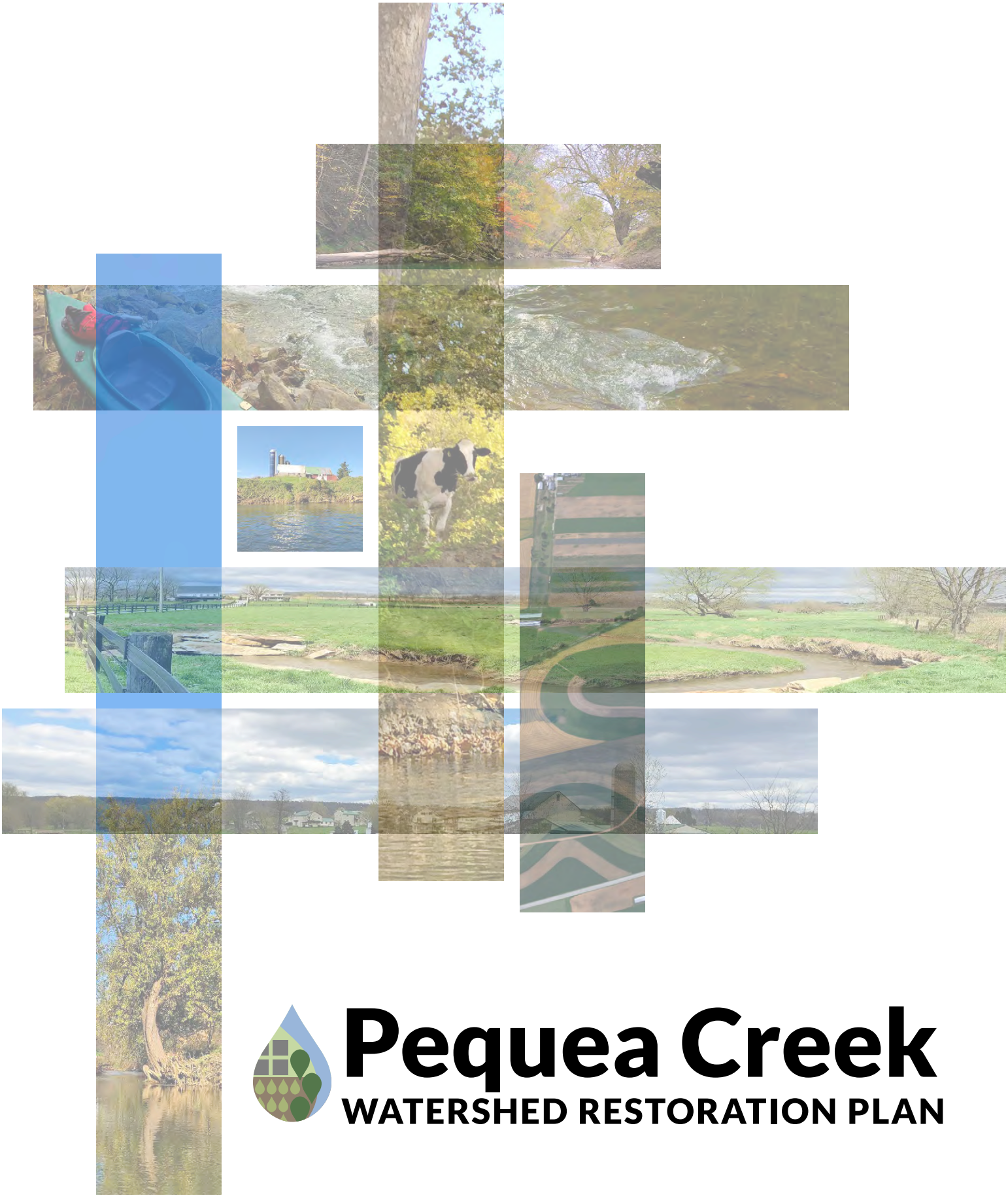

Pequea Creek

WATERSHED RESTORATION PLAN

Acknowledgments

The Chesapeake Bay Foundation (CBF) would like to sincerely thank our project partners for their time, collaboration, and expertise given throughout the development of this Section 319 Watershed Management Plan for the Pequea Creek. Project partners include (but are not limited to) the Lancaster Clean Water Partners, Lancaster County Conservation District, Pequea Creek Watershed Association, Lancaster Conservancy, Lancaster County Planning Commission, Lancaster County GIS Department, Chester County, Lancaster Farmland Trust, Chesapeake Conservancy, Alliance for the Chesapeake Bay, Stroud Water Research Center, Water Science Institute, Western Pennsylvania Conservancy, Theodore Roosevelt Conservation Partnership, Donegal Trout Unlimited, Pennsylvania State University Center for Agriculture & Environment, Franklin & Marshall College, Susquehanna River Basin Commission, DCNR, DEP, EPA, Paradise Township, Salisbury Township, TeamAg, Sickman's Mill, LandStudies, and the Amish Community. We would especially like to thank the community members, landowners, and farmers of the watershed with whom we have connected and formed a shared, vested stake in this plan for a healthier Pequea Creek. Their invaluable perspectives and knowledge from living in the watershed for many years, sometimes across generations, gave us insight into more tangible solutions for the Pequea Creek Watershed. And last, all of this would not have been possible without the generous support of our funders.

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Acronyms Listing

AU	Animal Unit
BEST	Buffer Establishment Support Team
BMP	Best Management Practice
CAP	Countywide Action Plan
CAST	Chesapeake Assessment Scenario Tool
CBF	The Chesapeake Bay Foundation
COVID-19	Coronavirus Disease 2019
CREP	Conservation Reserve Enhancement Program
CWF	Cold Water Fishery
DCNR	PA Department of Conservation & Natural Resources
DEP	PA Department of Environmental Protection
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
EV	Exceptional Value Waters
F&M	Franklin & Marshall College
GIS	Geographic Information System
HUC	Hydrologic Unit Code
HQ	High Quality Waters
IBI	Indicator of Biological Integrity
LCCD	Lancaster County Conservation District
LCWP	Lancaster Clean Water Partners
MMW	Model My Watershed
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
PADEP	Pennsylvania Department of Environmental Protection
PCWA	Pequea Creek Watershed Association
TMDL	Total Maximum Daily Load
TSF	Trout Stocked Fishery
USDA	United States Department of Agriculture
USDA ARS	Agricultural Research Services of the USDA
USGS	United States Geologic Survey
WIP	Watershed Implementation Plan
WSI	Water Science Institute
WWF	Warm Water Fishery

EXECUTIVE SUMMARY

The Pequea Creek drains roughly 153.3 square miles, feeding 240.5 miles of streams, spanning the border of Lancaster and Chester counties in Southeastern Pennsylvania. This Section 319 Watershed Management Plan was developed to address a variety of impairments impacting aquatic life in the basin, with a specific focus on reducing sedimentation and nutrients from agricultural sources. Through targeted, strategic, incremental steps, the objective is to make measurable strides towards improving water quality, in essence, restoring the watershed tributary by tributary.

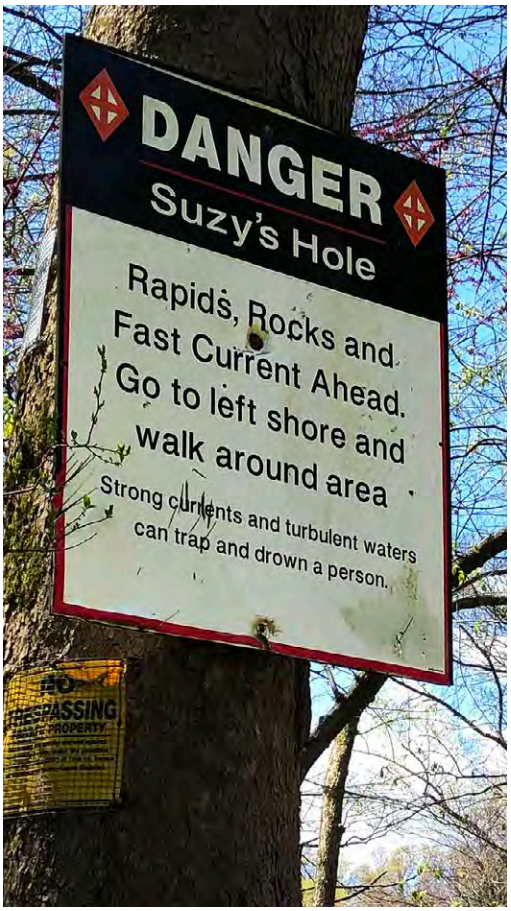
Maximum nutrient and sediment loads were established for the upper 80% of the watershed in 2001 and later revised in 2006. At the time, 38,904 tons of sediment and 75.9 tons of phosphorus were entering the stream every year, an amount which exceeded the target loads by roughly 400% and 100%, respectively. Hydrological analysis of the watershed indicates that since that time, sediment loading has been reduced by 13,059 tons and phosphorus by 0.6 tons. The reductions in sediment are significant, but still remains 230% above the targets established in the TMDL, and in practical terms, phosphorus loads remain unchanged. Though not included in the TMDL, nitrogen loading, per Lancaster's Countywide Action Plan, exceeds its target by 25%. Approximately 86% of the stream miles in the watershed have aquatic life impairments, and of those, over 70% are affected by four or more sources of impairment. To say the challenges facing the Pequea are daunting would be an understatement.

Confronting challenges like this requires a realistic approach. As desirable as it would be for the entire Pequea Creek Watershed to be returned to a healthy state, it represents a goal several decades in the making. Were this plan to have a watershed-wide focus, it would only serve to dilute its impacts and squander efforts. However, by narrowing the scope of the plan instead to areas where concentrated efforts stand to offer the greatest impacts, there is an opportunity to see real world results in a short time frame. That is the approach this plan takes.

The Pequea Creek Watershed was divided into 33 subbasins. Following detailed analysis of each of these catchments, they were placed into three tiers:

Tier I Healthy watersheds where efforts are best geared towards preservation
Tier II Impaired watersheds with near-term restoration potential
Tier III Impaired watersheds with a longer-term restoration focus

Of these, seven (comprising 23% of the watershed) were identified as the optimal areas in which to concentrate restoration efforts (Tier II), and 80% of the plan's proposed implementation funding is targeted at them. Within each of these, detailed mapping identifies the specific locations of deficiencies, and prescribes a combination of best management practices to address those conditions imperiling aquatic life. The long term strategy is to see incremental progress, where Tier III watersheds move into Tier II, and Tier II watersheds into Tier I



Quantitative analysis is exceptionally valuable in this process. However, at the end of the day, restoring the Pequea isn't a scientific problem; it's human one. Over three centuries of social, economic, cultural, and political forces have driven the impairments affecting the watershed today. It is these same forces which need to be brought to bear to correct them. This project was led by a diverse team, including representatives from local watershed and conservation groups, county conservation districts, educational institutions, research units, regional non-profits, state agencies, and local landowners, businesses and farmers of the Pequea Creek Watershed. This broad base was critical in ensuring the plan aligns with communities goals and values, and will be the linchpin to its success.

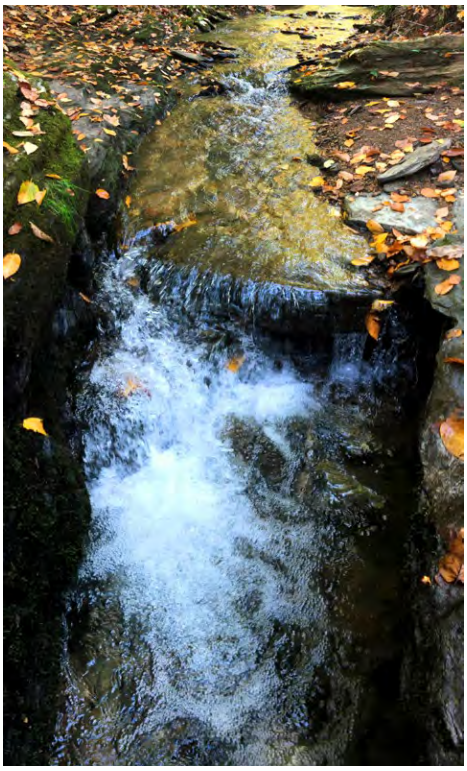
At full implementation, achieving this plan's goals will result in roughly 25 miles of streams no longer suffering from aquatic life impairments, and is projected to result in an annual reduction of 6,724.4 tons of sediment, 11.1 tons of phosphorus, and 59.3 tons of nitrogen across the watershed. It will involve an additional 2,500 acres of cover crops, 2,500 acres of no-till cropland, 3,900 linear feet of legacy sediment removal, 8 miles of bank stabilization, 20 new miles of forested buffers and an equal length of stream fencing, at an estimated cost of $31,055,000. To meet these challenges, the plan provides a timeline for achieving its goals, and identifies key roles played by the various partner organizations. In addition, the plan identifies a number of resources, both financial and technical to achieve its stated objectives. Recognizing the dynamic nature of this work, the plan is designed to be revised at key milestones.

INTRODUCTION

Project Process

The Chesapeake Bay Foundation (CBF) acquired private funding to create a Section 319 Watershed Management Plan for Pequea Creek and began working on the project in 2018. The CBF is a nonprofit organization dedicated to the restoration of the Chesapeake Bay and the rivers and streams of the Chesapeake Bay Watershed. The organization was founded in 1967 by local business leaders who were deeply concerned about the declining health of the Chesapeake Bay. What began as "an organized voice for citizens" with membership at 2,000 and a staff of three has now grown into the largest conservation organization dedicated solely to saving the Chesapeake Bay. The CBF's work each day is powered by over 200 highly-skilled staff working from CBF offices in Maryland, Virginia, Pennsylvania, and the District of Columbia and 15 field education centers throughout the watershed. No less essential are CBF's 300,000 members, donors, advocates, and volunteers, and our strong, diverse partnerships with local environmental groups, governments at every level, and businesses with deep commitments to a healthy environment.

Although the Bay watershed spans six states and the District of Columbia, covers 64,000 square miles, and is home to more than 18 million people and 3,600 species of plants and animals, we know that working at the local level is critical for us to achieve our mission. The Pennsylvania Office of the CBF has a strong history of successful collaboration with a broad range of stakeholders—including government officials, local decision-makers, farmers, landowners, students, and educators—to implement projects, policies, and programs that address pollution in our streams, rivers, and ultimately the Chesapeake Bay. Working with local stakeholders in the Pequea Creek Watershed to develop a Section 319 Watershed Management Plan is just another example of our commitment to working with local communities to bring about tangible success for the Pequea Creek and the greater Chesapeake Bay Watershed.



PEQUEA → SUSQUEHANNA → CHESAPEAKE

As a larger, regional organization, the CBF made a priority from the onset of this project to engage with a variety of local groups serving the Pequea Creek Watershed, as well as state agencies and other regional organizations. This was vital to form a group with diverse expertise, knowledge, and perspective, while also to be centered on local values and goals. In the fall of 2018, the CBF contacted organizations and individuals who were identified as potential stakeholders, and all were invited to attend a project kick-off meeting in March 2019 (see below). As stakeholder meetings continued throughout the course of the project, our network of partners grew as we made new connections. Project partners involved in the development of this watershed management plan for Pequea Creek include (but are by no means limited to):

- Chesapeake Bay Foundation
- Lancaster Clean Water Partners
- Lancaster Co. Conservation District.
- Pequea Creek Watershed Assoc.
- Lancaster Conservancy
- County of Lancaster
- County of Chester
- Lancaster Farmland Trust
- Chesapeake Conservancy
- Alliance for the Chesapeake Bay
- Stroud Water Research Center
- Water Science Institute
- Western Pennsylvania Conservancy
- Theodore Roosevelt Cons. Partnership
- Trout Unlimited
- Franklin & Marshall College
- Susquehanna River Basin Commission
- DCNR, DEP and EPA
- Pennsylvania State University
- Paradise Township
- Salisbury Township
- TeamAg
- Sickman's Mill
- LandStudies
- The Amish Community
- Countless Landowners and Citizens

The role of the CBF was to serve as the project facilitator, watershed analyst, plan writer, and overall coordinator of project meetings, events, and correspondence. Together, project partners collectively voiced watershed concerns, identified community values, formed project goals, determined restoration strategies, and reviewed plan documents. Throughout the course of the project, the CBF hosted multiple in-person meetings through March 2019 to February 2020. Virtual meetings and conversations took place during the final development of the plan due to COVID-19. Staff participated in multiple community events and fairs, as well as served on committees during the development of the Lancaster County Countywide Action Plan (CAP).

Connecting Local and State Watershed Planning

Efforts to meet the Chesapeake Bay Total Maximum Daily Load (TMDL) for nitrogen, phosphorus, and sediment are being coordinated at the federal, state and county levels through Pennsylvania's Chesapeake Bay Phase 3 Watershed Implementation Plan, or simply "WIP3." This process began in 2010 when the six Bay states, the District of Columbia, and the EPA agreed to reduce pollution and restore water quality in the Bay and local waterways. This agreement, also known as the Chesapeake Clean Water Blueprint, or simply, "Blueprint," includes the limits set forth in the TMDL, plans, milestones, and sanctions, should objectives not be met. If fully implemented, the Blueprint will ensure that the programs and practices needed to restore water quality and meet the Bay TMDL are in place by 2025.

As part of the WIP3 process, the counties within the Chesapeake Bay Watershed are developing their Countywide Action Plans (CAPs) to improve local water quality and determine local strategies for meeting state reduction targets for nitrogen, phosphorus, and sediment. In Lancaster County, implementation of its CAP has already begun.

Section 319 Watershed Management Plans serve as an additional tool to help bridge the gaps between federal, state, and local watershed planning. Under Section 319 of the Clean Water Act, states, territories, and tribes can receive federal grant money to address non-point source pollution for impaired water bodies once a non-point source management plan (the Section 319 plan) has been approved. As counties are developing and implementing their CAPs, it can be advantageous to develop these local watershed plans to link planning efforts at the community and county levels. Goals and objectives can be aligned for more streamlined planning, and thus allow for more successful and integrated implementation of sediment and nutrient reduction programs and practices as we strive to meet our 2025 targets. With the development of the Section 319 Watershed Management Plan for Pequea Creek, our project vision has been and continues to be to coordinate local planning efforts with those of the state and the counties comprising the watershed to elicit benefits across all levels—from the Pequea Creek to the Chesapeake Bay.

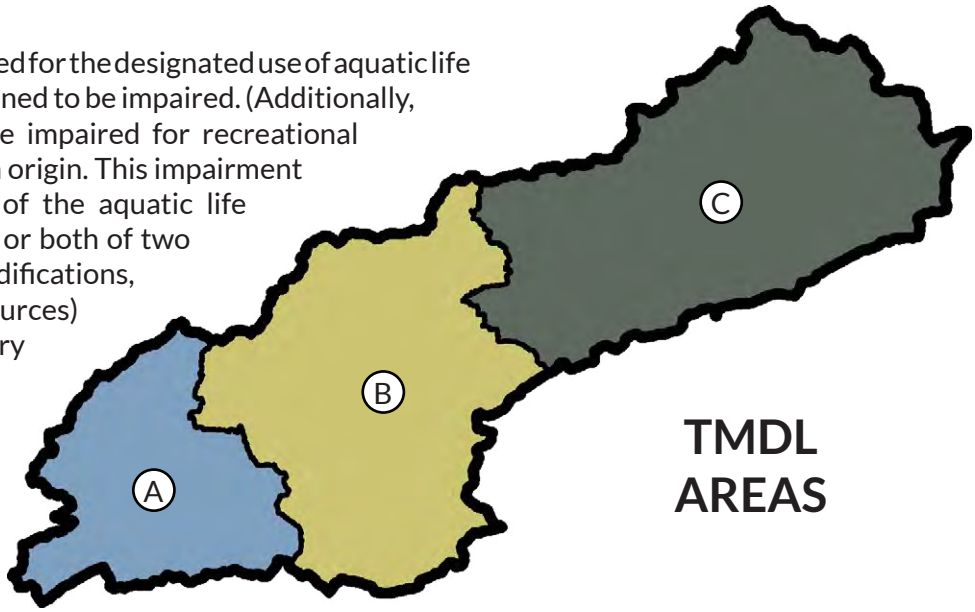
Clean Water Act

Section 303(d) of the Clean Water Act requires states to assess the protected uses of surface waters (e.g. aquatic life, water supply, recreation and fish consumption), and the results of these assessments fall into one of three status categories—attaining, impaired, or unassessed. Attaining bodies of water are determined by the state to be meeting its designated use, whereas impaired bodies of waters are failing to meet one of more water quality standards (DEP, 2018a). Water quality standards comprise multiple components including the water's designated use, but also include criteria to protect the designated uses and antidegradation policies to maintain and protect high quality and high value waters (EPA, 2018).

In accordance with Section 303(d) of the Clean Water Act, impaired waters must be listed by the state and be reported to the EPA every two years. For each impaired waterway, the state is required to determine its Total Maximum Daily Load (TMDL), establishing the maximum pollution/nutrient amount at which the waterway can achieve its designated use (PADEP, 2018a).

Impairment

In 1996, the Pequea Creek was assessed for the designated use of aquatic life and nearly all segments were determined to be impaired. (Additionally, large portions are determined to be impaired for recreational uses owing to pathogens of unknown origin. This impairment will not assessed in this plan.) All of the aquatic life impairments can be traced to either or both of two sources: agriculture and habitat modifications, with siltation (arising from both sources) being the cause of impairment in every listed stream segment. In 2001 (and later revised in 2006), a TMDL was established for both sediment and phosphorus, broken into two separate basins, with a combined coverage of 122.5 square miles (80% of the watershed).



Pequea TMDL	Square	2006 (Tons)			Current (Tons)***			Target (Tons)		
Subbasin	Miles	S	P	N	S	P	N	S	P	N
A. No TMDL	30.8	N/A	N/A	N/A	4,447	17.2	265.7	1,962*	9.6*	196.6**
B. Subbasin 1	57.2	21,295	41.4	N/A	11,952	35.5	616.1	3,624	17.8	455.9**
C. Subbasin 2	65.3	17,609	34.5	N/A	13,893	39.0	611.5	4,186	20.5	452.5**

* Extrapolated from TMDL, based on the average loading per square mile of subbasins one and two

** Based on the 26% nitrogen reduction goal in the Lancaster CAP

*** Figures from ModelMyWatershed, based on current land use and BMP implementation

Although sediment and nutrients are key components for aquatic life, human activities and modifications to the landscape can create excesses, leading to undesirable and unhealthy impacts to streams and its aquatic communities (PADEP, 2018b). In the table above, we can see that significant strides have been made since the TMDL was adopted in 2006. However, there remain significant gaps between the current and target loads. All of this excessive loading is the result of land use choices, both current and past. In particular, agricultural practices play a key role. Ground disturbance from centuries of tilling have caused great amounts of sediment to migrate towards waterways. The combined effects of banks of legacy sediment with new sediment moving across the surface are compounded by gaps in vegetated cover along streams. The application of fertilizers and manure are the driving agent behind nutrient loading (largely by proxy of groundwater, in the case of nitrogen). Animal husbandry contributes to both sediment and nutrients. The end result is an environment that creates substantial impairments to aquatic life.

The Pequea is a large and complicated entity, and a one-size-fits-all approach would be an ill-advised approach to return the stream to a healthy state. Still, there are a number of universal considerations across the watershed. First is the central role that sediment plays in this puzzle. Though other impairments such as nutrients afflict portions of the watershed, there is not a single mile of impaired streams in the Pequea not affected by siltation. Accordingly, lowering the sediment loads in the watershed is the top priority. There are three main avenues towards accomplishing this. The first is to prevent sediments from leaving their source, through agricultural practices like cover crops and proper tillage management. The second is impede sediment, by establishing vegetated buffers to prevent the migration of sediment into waterways (as well as affording thermal, habitat, and nutrient benefits). The third is to secure the sediment, preventing that which is already in the riparian interface from entering the stream, through stabilizations and removals. The exact menu for a given location will vary, but each of these has a role to play in restoring the Pequea's health.

PREVENT

IMPEDE

SECURE

Photo Credit: Donegal Trout Unlimited

Photo Credit: Matt Kofroth, LCCD

Project Goals

Our team established project goals collaboratively to help guide the development of our implementation plan for the Pequea Creek Watershed. Anchored in core values, these goals outline specific strategies for how we plan to put the Pequea Creek Watershed on a trajectory to attainment.

1. ***Decrease the amount of nonpoint source pollutants (e.g. sediment and nutrients) that enter the Pequea Creek to improve water quality and habitat.*** In particular, our goal is to prioritize the implementation of best management practices that effectively reduce sediment in accordance with the Pequea Creek's TMDL, and over the long term, its phosphorus goals.

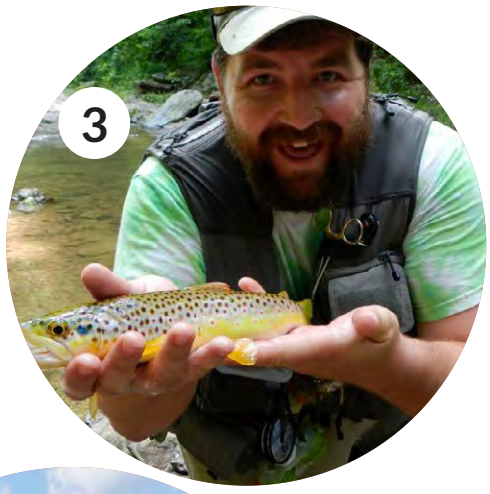
2. ***Engage the agricultural community in new and innovative ways to promote stream health.*** When it comes to stream health, no segment of the population is more important than farmers. Appreciating and partnering with this vibrant community and exploring new ways to do so is essential to achieve higher water quality in the Pequea.

3. ***Restore aquatic and riparian habitat in degraded areas to benefit water quality, wildlife and people.*** We aim to prioritize best management practices that create, enhance, and restore quality riparian habitat to support a healthy aquatic life community—including fish, macroinvertebrates, and other water-dwelling and dependent species—which will in turn benefit the community at large with improved opportunities for fishing and other outdoor recreational activities, farming, and overall quality of life.

4. ***Preserve ecologically critical landscapes that currently exist in the Pequea Creek Watershed that are vital for maintaining and improving water quality.*** We will encourage management measures that protect the watershed's riparian buffers, wetlands, forests, farmland, and overall rural character, which all play an important role in water quality.

5. ***Advance the goals of the Lancaster and Chester CAPs and those of the greater Chesapeake Bay Blueprint.*** Restoring the Pequea Creek is an integral component of both counties' efforts to meet regional sediment and nutrient loading goals. The health of the Pequea doesn't begin and end with its 240.5 miles of streams. Rather, it is a piece in a much larger mission.

6. ***Foster stewardship of the Pequea Creek Watershed within the local community.*** We will provide increased opportunities and resources for engagement and public education to promote successful implementation of the plan and long-term stewardship of the Pequea Creek and its watershed.



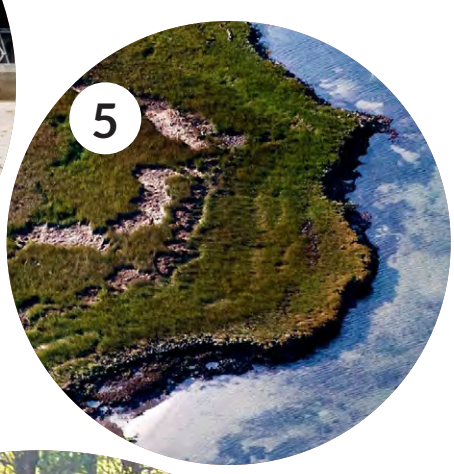
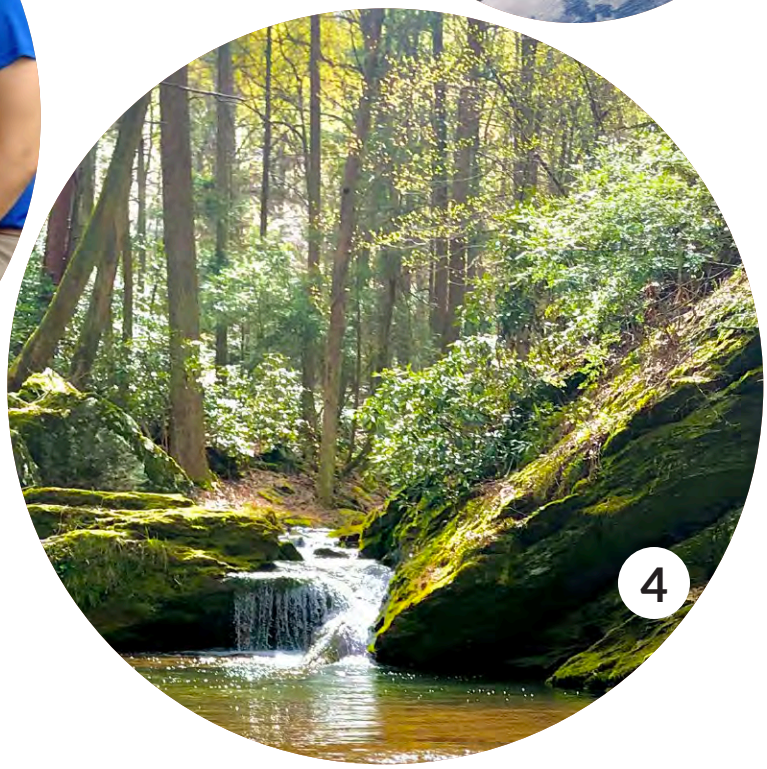
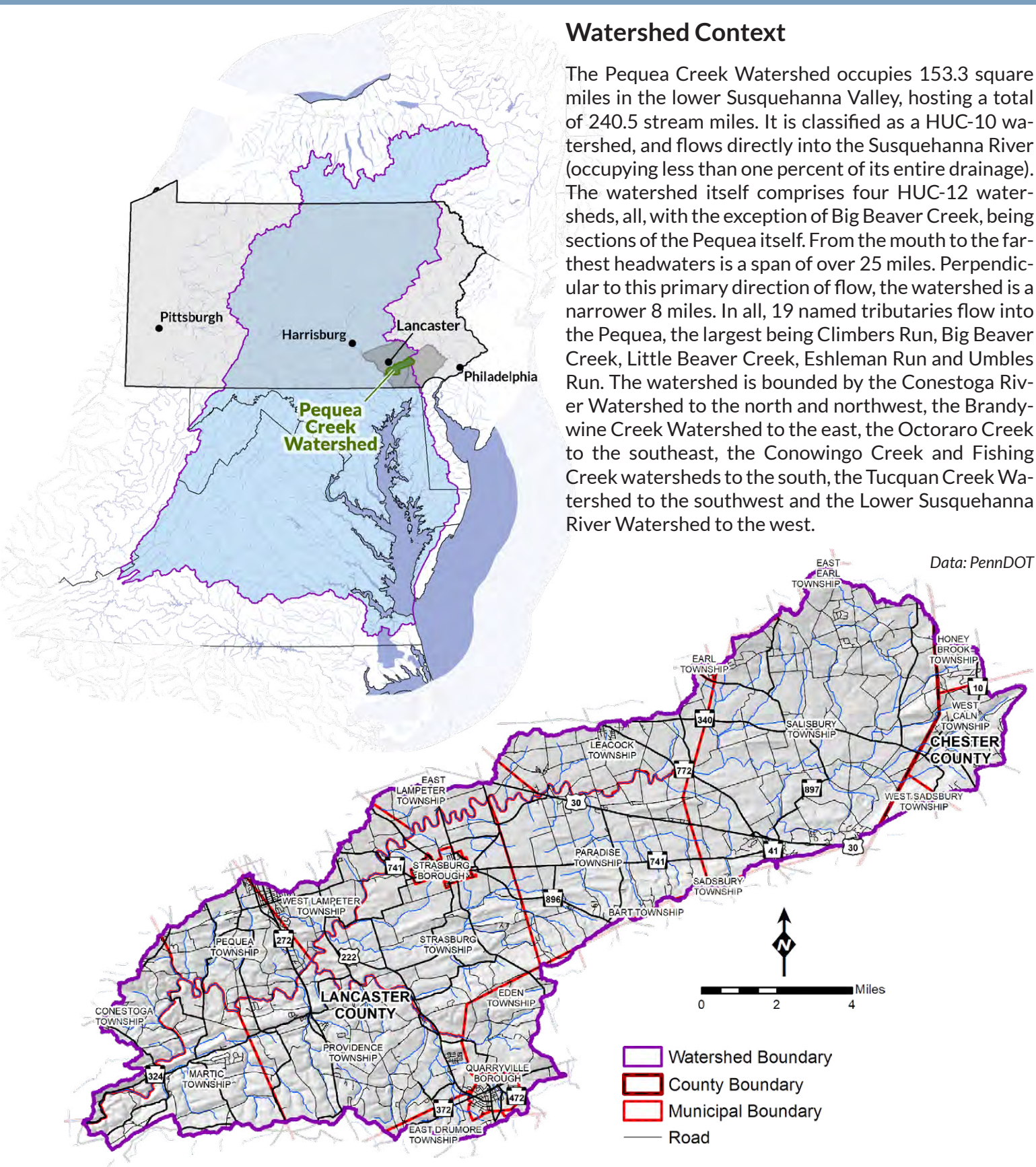


Photo Credit: Lancaster Clean Water Partners

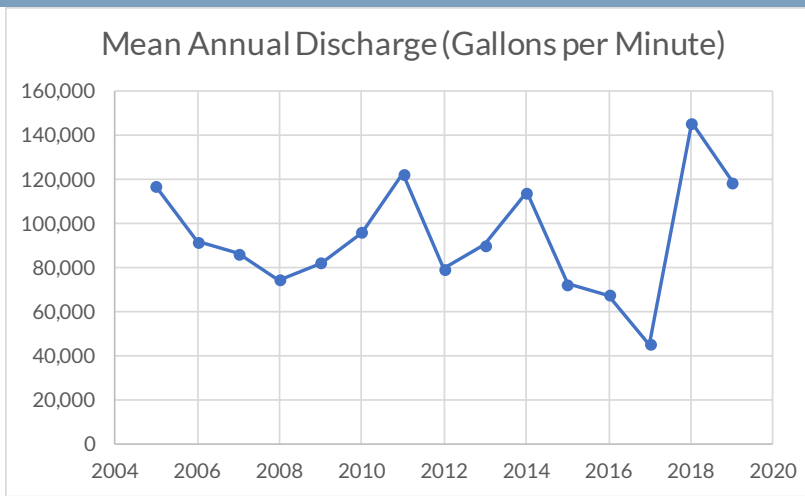


Watershed Context

The Pequea Creek Watershed occupies 153.3 square miles in the lower Susquehanna Valley, hosting a total of 240.5 stream miles. It is classified as a HUC-10 watershed, and flows directly into the Susquehanna River (occupying less than one percent of its entire drainage). The watershed itself comprises four HUC-12 watersheds, all, with the exception of Big Beaver Creek, being sections of the Pequea itself. From the mouth to the farthest headwaters is a span of over 25 miles. Perpendicular to this primary direction of flow, the watershed is a narrower 8 miles. In all, 19 named tributaries flow into the Pequea, the largest being Climbers Run, Big Beaver Creek, Little Beaver Creek, Eshleman Run and Umbles Run. The watershed is bounded by the Conestoga River Watershed to the north and northwest, the Brandywine Creek Watershed to the east, the Octoraro Creek to the southeast, the Conowingo Creek and Fishing Creek watersheds to the south, the Tucquan Creek Watershed to the southwest and the Lower Susquehanna River Watershed to the west.



Data: PennDOT



Stream Flow

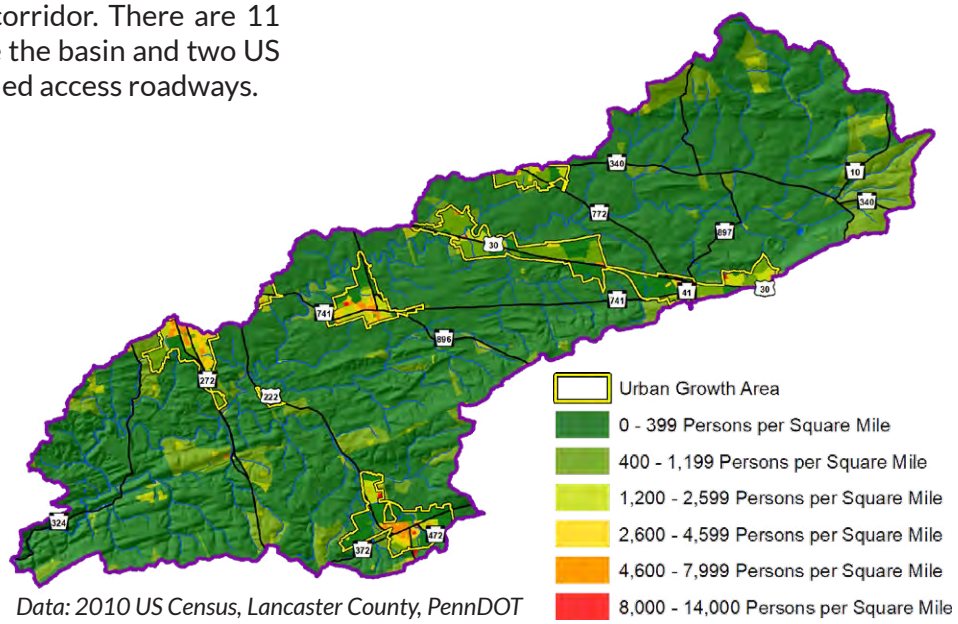
A USGS stream gauge located roughly 3.4 miles upstream of the mouth has recorded the stream's flow since 2005. Through 2019, the discharge has ranged (in cubic feet per second) from a low of 37 in 2007, to a peak of 14,200 in 2005, with a mean of 208. To put it another way, it typically takes the Pequea about six and a half minutes to fill an Olympic-sized swimming pool, though it has taken as long as 36 minutes and as little as (a terrifying) 5.7 seconds. (USGS)

Human Geography

The area has been inhabited for thousands of years, first by Native Americans, most notably the Piquaws, a Shawnee tribe from which the name Pequea derives. European settlement followed in 1710, with a group of Mennonite refugees under the leadership of Hans Herr. Since then, the population has grown to about 50,000 people, at a density of roughly 325 persons per square mile. (2010 US Census)

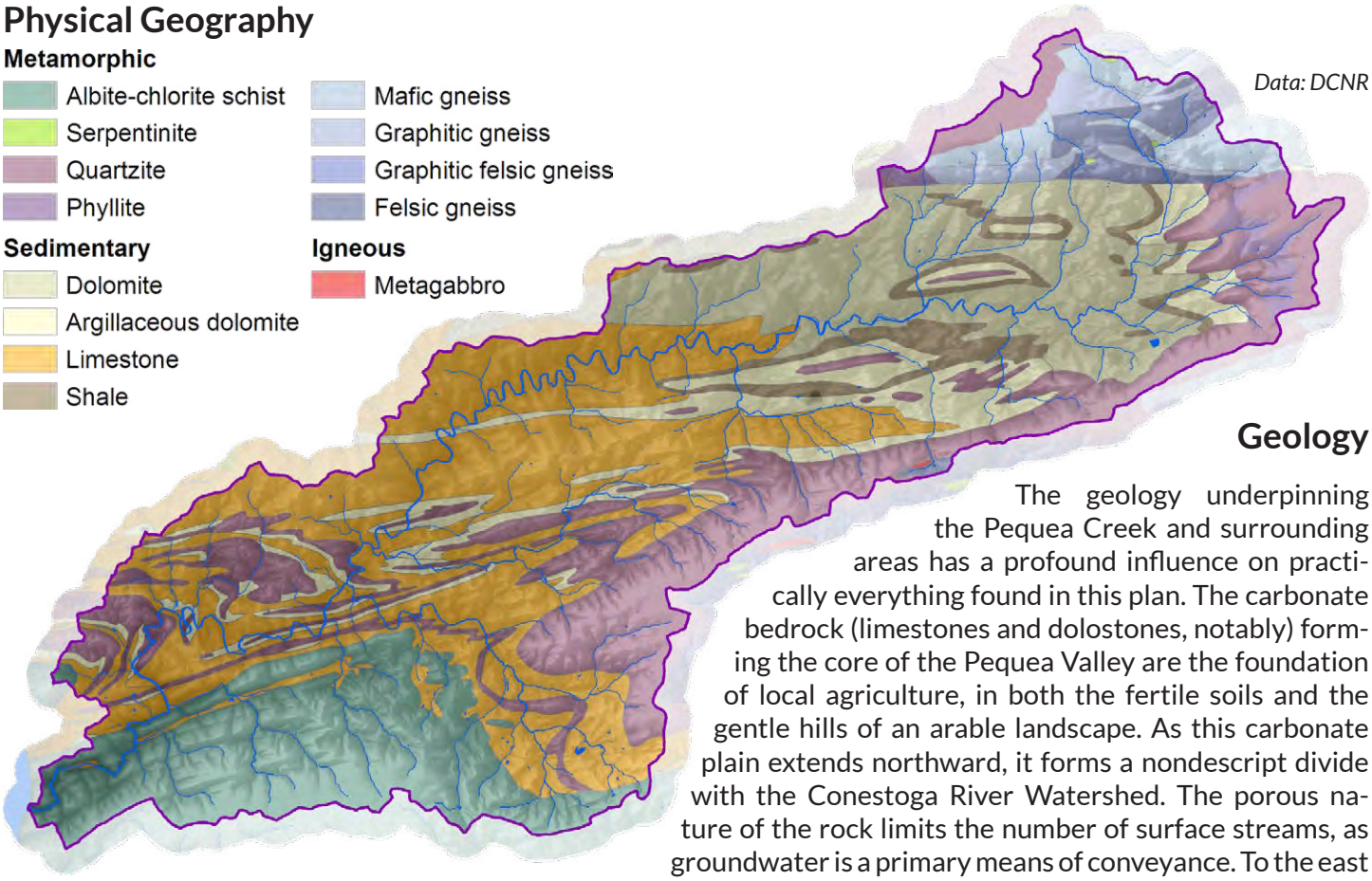
The watershed is broken up into 18 municipalities, 15 of which are in Lancaster County and 3 of which are in Chester County. Of these, 16 are townships, and 2 are boroughs. Four school districts comprise the bulk of the watershed, with an additional five on the periphery. The majority of the watershed is sparsely populated, though notable population centers are found in Gap, Intercourse, Quarryville, Strasburg, Willow Street, and along the US-30 corridor. There are 11 numbered state routes which traverse the basin and two US highways, though there are no controlled access roadways.

Photo Credit: John Packard



Data: 2010 US Census, Lancaster County, PennDOT

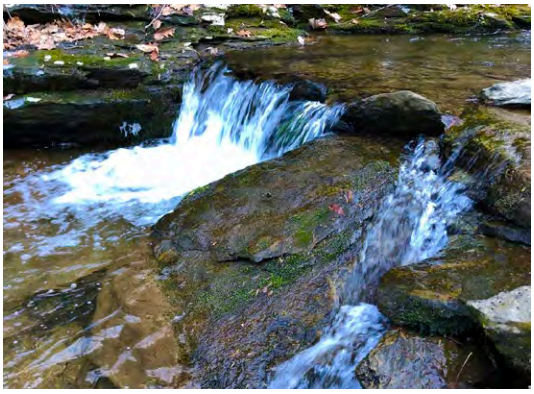
Physical Geography

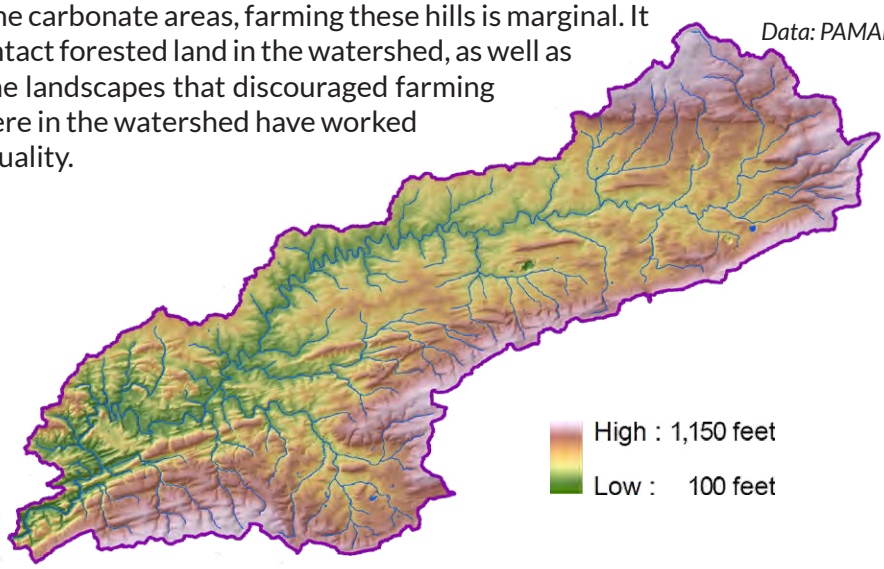


Data: DCNR

Geology

The geology underpinning the Pequea Creek and surrounding areas has a profound influence on practically everything found in this plan. The carbonate bedrock (limestones and dolostones, notably) forming the core of the Pequea Valley are the foundation of local agriculture, in both the fertile soils and the gentle hills of an arable landscape. As this carbonate plain extends northward, it forms a nondescript divide with the Conestoga River Watershed. The porous nature of the rock limits the number of surface streams, as groundwater is a primary means of conveyance. To the east and south, however, the geology dictates far more stark boundaries. Here, much harder metamorphic rocks form a hook shape, starting at an elevation of 1,107 feet in the Welsh Mountains, curving to the south, and then forming a steep ridge the length of the watershed, terminating a thousand feet lower at the mouth. In contrast to the clumsy, meandering streams along the central and northern flank of the watershed, the ones found in these hills form very deliberate, dendritic patterns. Relative to the carbonate areas, farming these hills is marginal. It is here that we find the largest portions of intact forested land in the watershed, as well as the only lengths of unimpaired streams. The landscapes that discouraged farming and development on the scale seen elsewhere in the watershed have worked in favor of both natural beauty and water quality.





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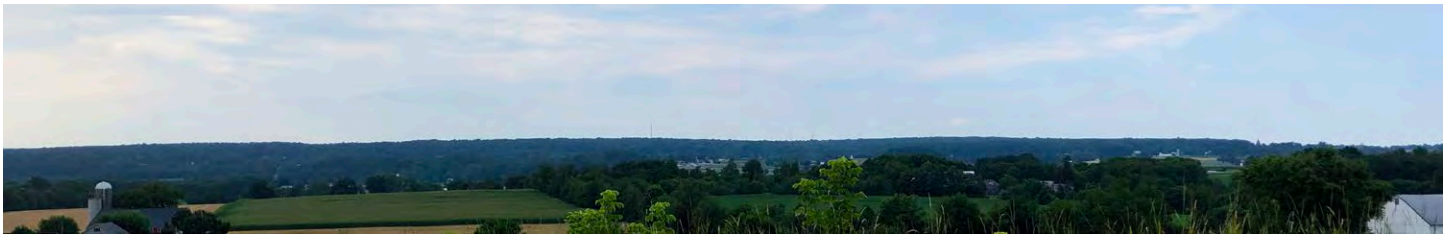


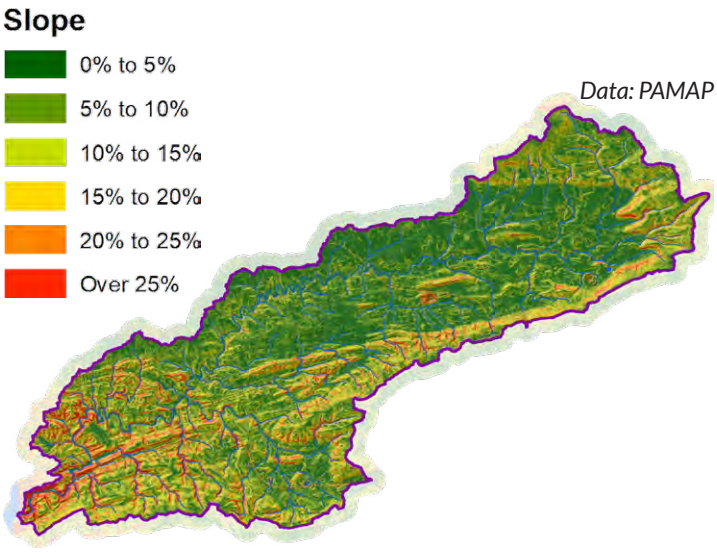
Slopes, Erosion and Infiltration

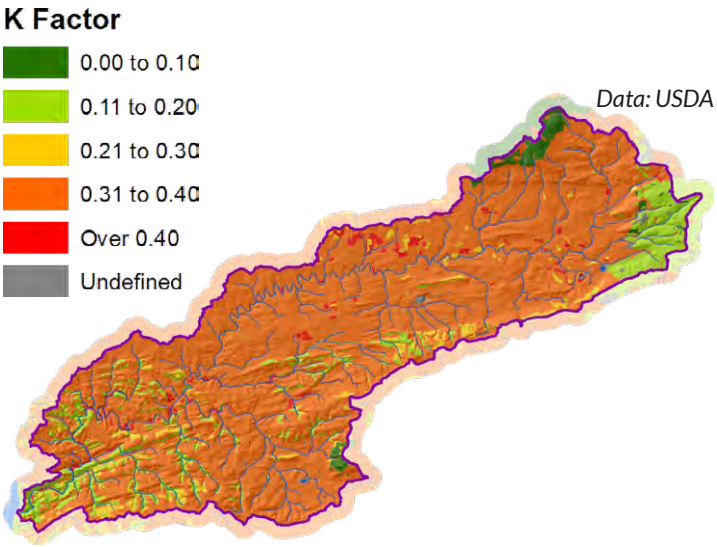
While steep slopes follow the metamorphic ridge discussed earlier, their most dynamic expression is in the River Hills. Here, large areas exceed grades of 25%. One of the benefits of this steep terrain is how it has stopped any form of significant urban or agricultural development in the area. Despite aggressive slopes, forests have done their job keeping soils in place, yielding some of the lowest sediment loading in the watershed.

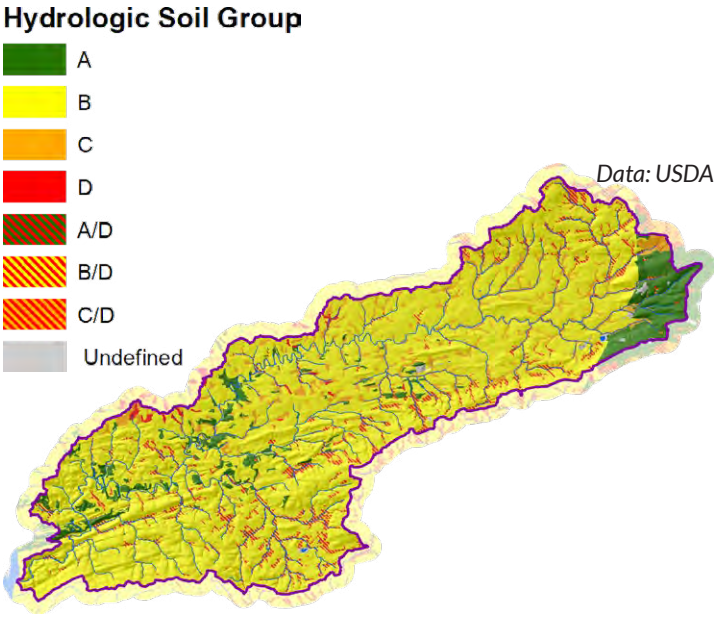
A curse throughout the watershed is how susceptible local soils are to erosion, noted as a K factor value. As K factors increase, soils become increasingly prone to erosion. This becomes a high concern in agricultural areas with low BMP implementation, where the combination of earth disturbance and the soils' innate properties creates an ideal path for sediment to enter waterways.

Soils are categorized into four categories based upon the rate at which water infiltrates. These range from Group A with very high infiltration rates to Group D with very low infiltration rates. At times, a dual rate is used, indicating varying conditions in drained and undrained soils. In the watershed, nearly all soils fall into Group B, characterized by moderate infiltration. This is generally sufficient to accommodate light to moderate rain events, though heavy precipitation, particularly when combined with limited BMPs, can lead to flashy conditions and high sediment transport.

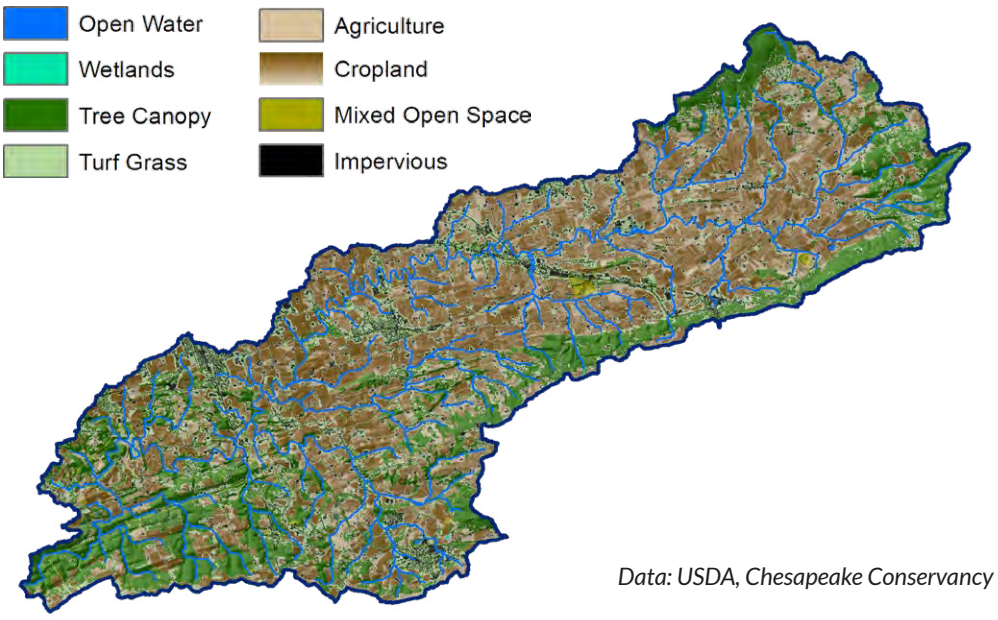
Note: Separate soil surveys were conducted for Lancaster and Chester counties. The varying values that follow the county line are less likely to indicate truly different conditions than they are to represent differences in methodologies and interpretations in the development of each survey.







Land Cover



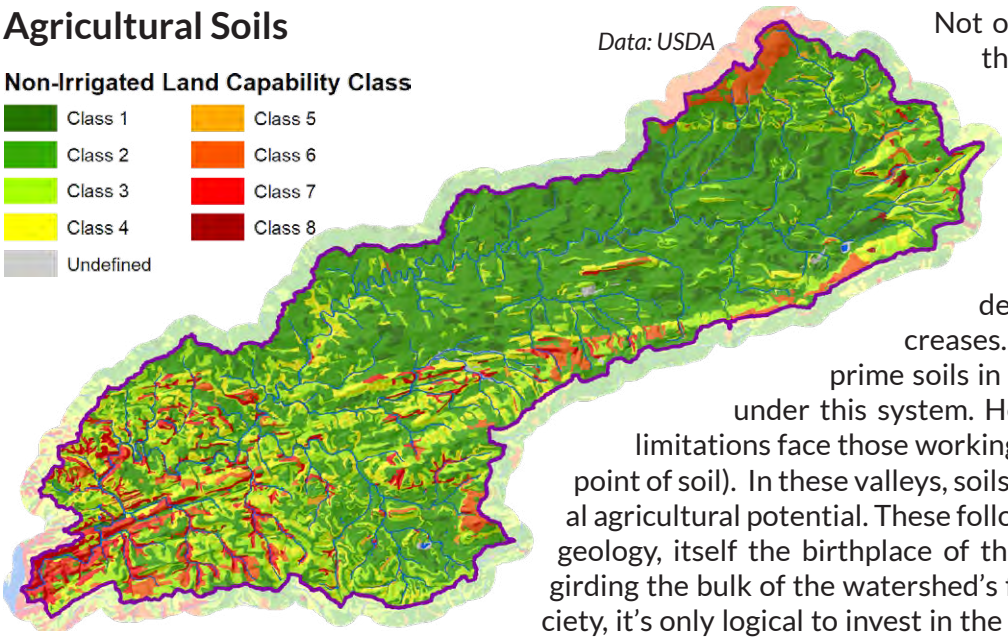
Data: USDA, Chesapeake Conservancy

Not surprisingly, agriculture dominates the land cover of the Pequea, occupying just shy of half of the watershed. Residential and urbanized areas make up another quarter of the basin, with forests occupying a fifth, and a mixture of open space and wetlands rounding out the remaining five percent. Patterns are evident as we move from geology to land cover. The green of the tree canopy follows the same ridge lines formed by erosion-resistant schist, phyllite, gneiss, quartzite and serpentine. Similarly, the brown tones of the agricultural land are largely analogous to the carbonate bedrock seen on the geology map. For centuries, the prominence of farming in the region dictated the location of settlements, serving to further facilitate agriculture and related enterprises. Accordingly, the urbanized areas, with the exception of Gap, a found exclusively in the lowland valleys. Notably absent are forested areas along many streams.

Land Cover	Sq. Mi.	Percent
Hay/Pasture	28.7	18.8%
Cropland	45.2	29.5%
Combined Agriculture	73.9	48.3%
Wooded Areas	33.4	21.8%
Wetlands	0.2	0.2%
Open Land	4.6	3.0%
Low-Density Mixed	1.9	1.2%
Medium-Density Mixed	0.9	0.6%
High-Density Mixed	9.3	6.1%
Low-Density Open Space	28.9	18.9%

Agricultural Soils

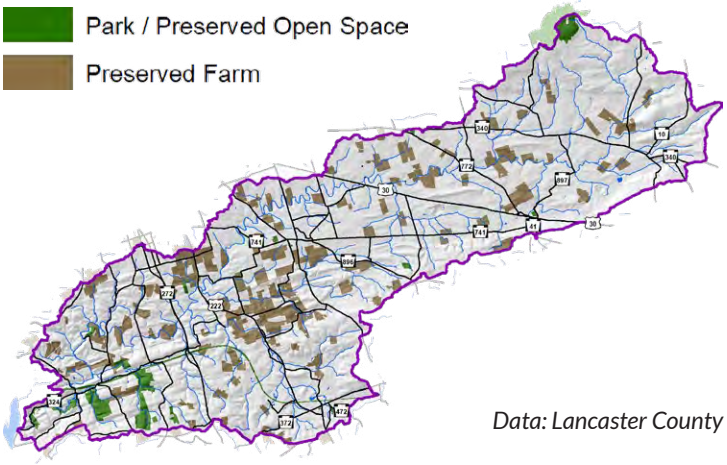
Data: USDA



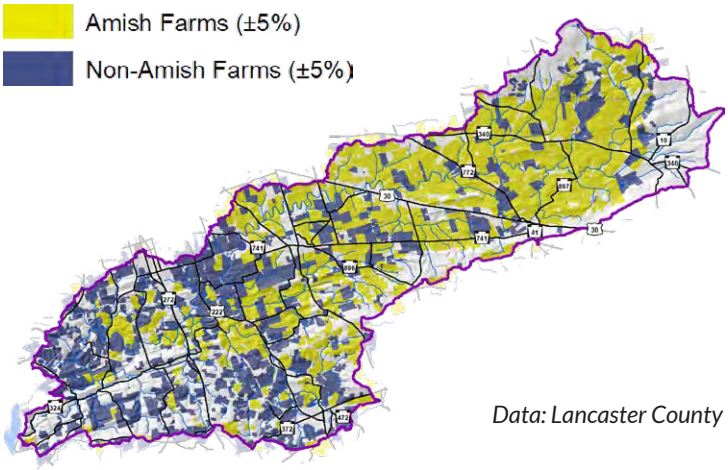
Not only is there a lot of agriculture in the Pequea Creek Watershed, there should be a lot of agriculture in the Pequea Creek Watershed. The USDA assesses soils based on their agricultural potential, classifying them in groups one through eight, with productivity decreasing as the class number increases. The Pequea boasts large areas of prime soils in classes one and two, the top tiers under this system. Here, few to moderate amounts of limitations face those working the land (at least from the standpoint of soil). In these valleys, soils are deep and rich, with exceptional agricultural potential. These follow the now familiar patterns of the geology, itself the birthplace of these soils. The carbonate bedrock girding the bulk of the watershed's farms is the driving force. As a society, it's only logical to invest in the most productive lands for agricultural use. The Pequea hosts just such lands. This illuminates a very important point: agriculture is not the problem with the Pequea Creek Watershed; the Pequea's problem is a lack of adequate BMPs to allow this tremendous and necessary resource to be utilized in harmony with natural communities.

Preserved Land

Very little natural land is preserved, the bulk of which is in the River Hills, followed by the Welsh Mountains. Despite this, many of the landscapes remain undeveloped, owing to unaccommodating terrain. There is a fair amount of preserved agriculture, particularly in the triangle formed between Strasburg, Quarryville and Willow Street. This is the result of a concerted effort by both the Lancaster Agricultural Preserve Board and the Lancaster Farmland Trust. Knowing that these farms will be in active agriculture in perpetuity, it is of heightened importance to focus BMPs in these areas.



Data: Lancaster County



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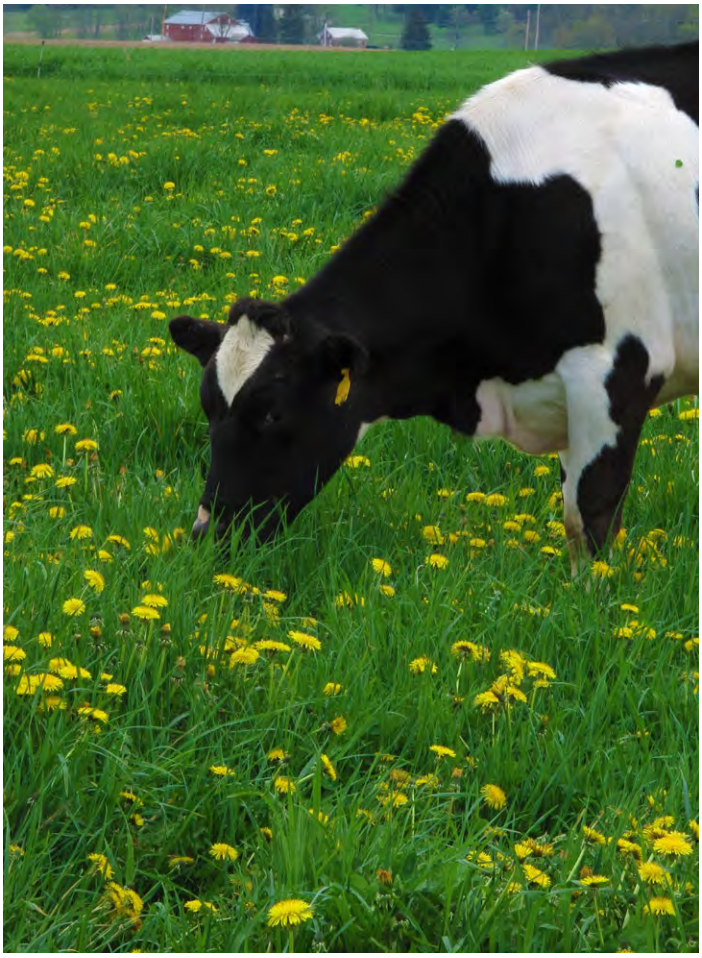
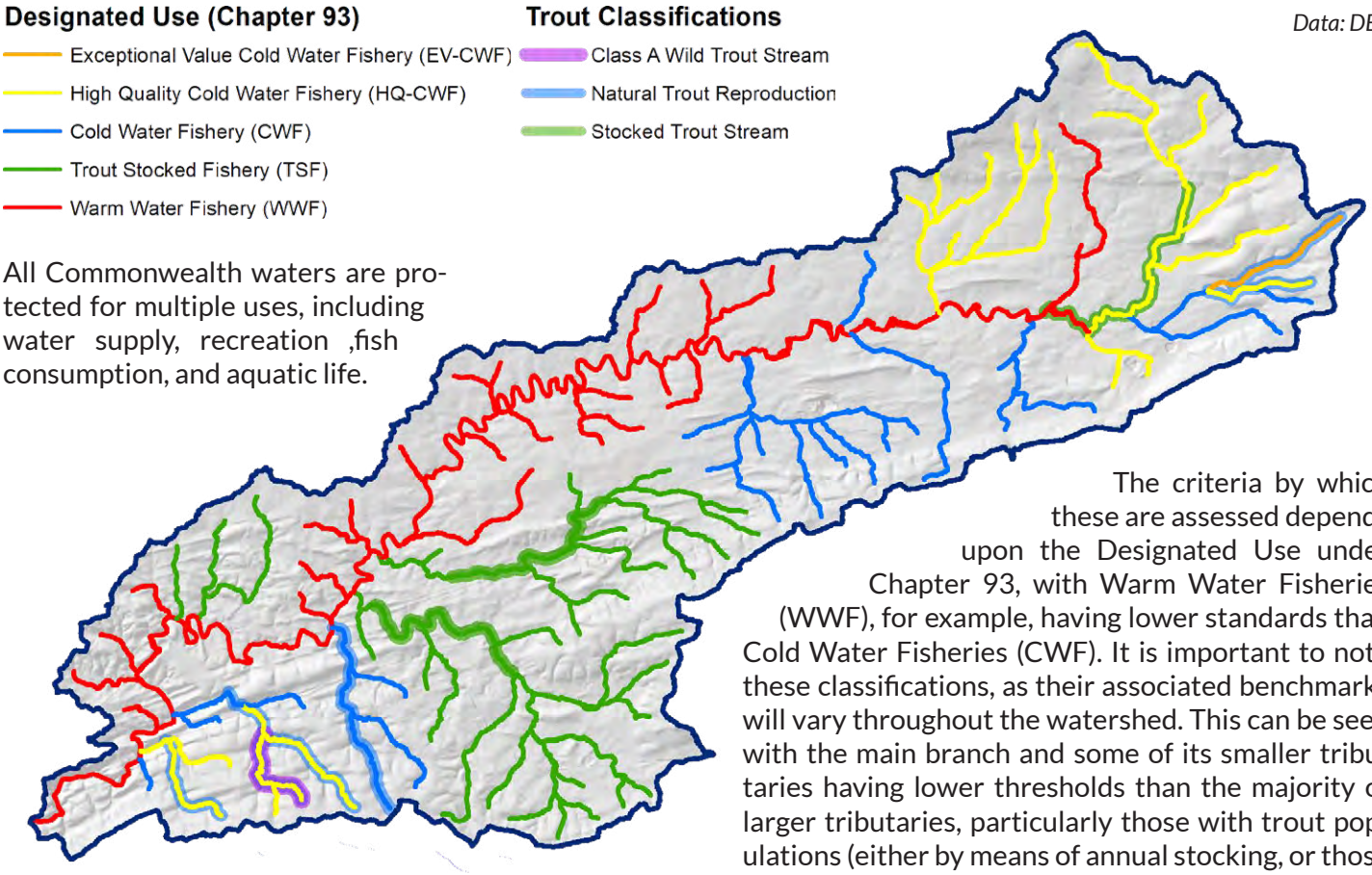


The Amish Community

Over half (56%, ±5%) of all of the agricultural land in the watershed is owned by Amish farmers. This poses both a challenge and an opportunity. Being an insular community, it is important to tailor outreach and communication to their specific needs. Every BMP type noted in this plan has been implemented on Amish farms, though some (such as no-till agriculture) must be geared towards their specific technological needs. While these considerations may serve as minor obstacles, the Amish social structure also affords greater impacts by bringing key community members on board. Working in partnership with these leaders has the potential to yield greater engagement than similar outreach efforts to non-Amish farmers. With such a large share of land in Amish hands, a variety of organizations including the LCCD, Lancaster Farmland Trust (LFT), Salisbury Township, and TeamAg have developed and are implementing strategies particularly focused on connecting with this community.

Note: Amish-owned land was calculated by selecting properties with agricultural land uses and common Amish surnames. This inevitably includes non-Amish individuals with these names and some Amish persons with uncommon names. Accordingly, figures have an estimated error of ±5%. Additionally, parcel-based datasets such as these are based on Lancaster County properties only.

Designated Uses



Data: DEP

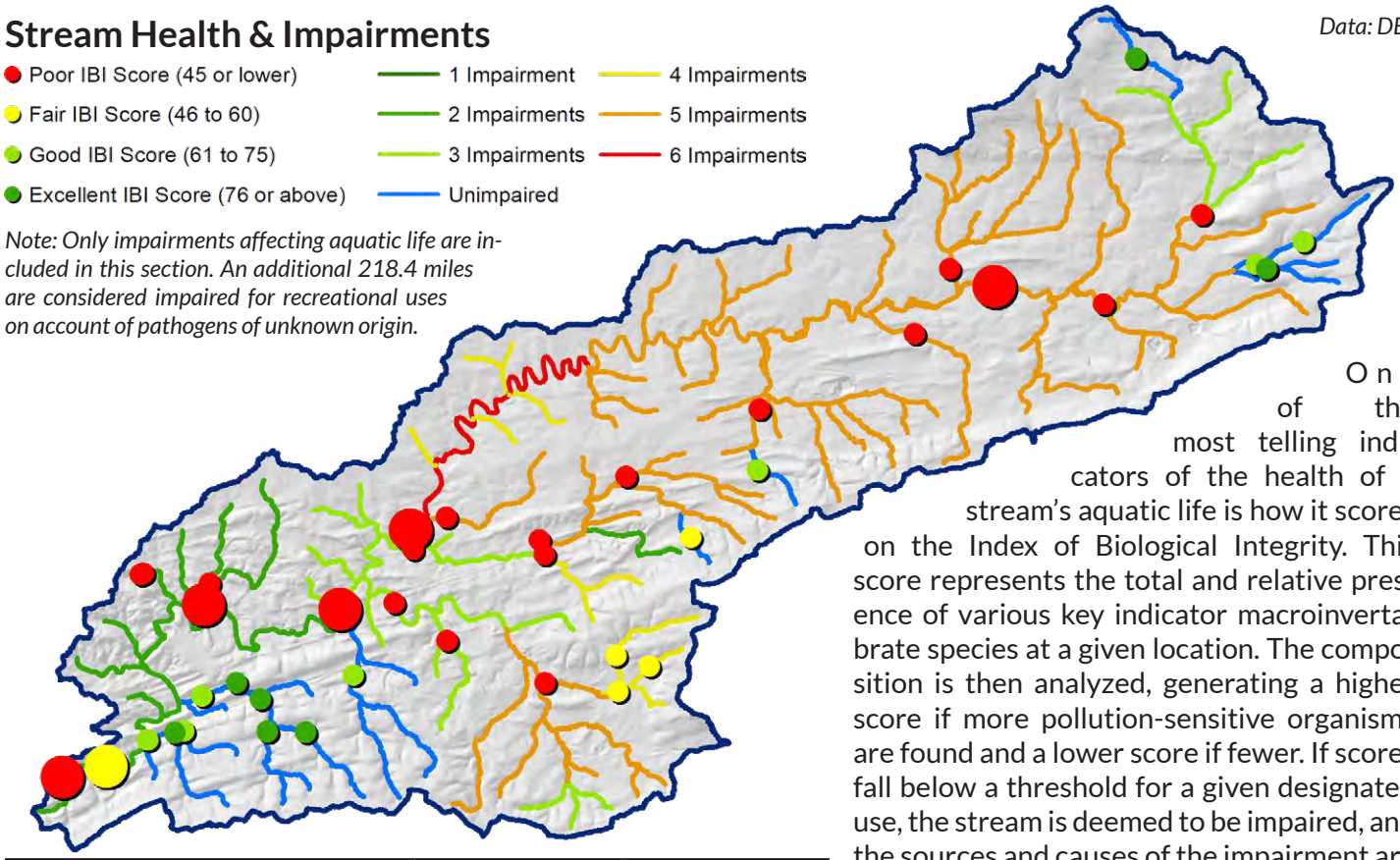
All Commonwealth waters are protected for multiple uses, including water supply, recreation ,fish consumption, and aquatic life.

The criteria by which these are assessed depends upon the Designated Use under Chapter 93, with Warm Water Fisheries (WWF), for example, having lower standards than Cold Water Fisheries (CWF). It is important to note these classifications, as their associated benchmarks will vary throughout the watershed. This can be seen with the main branch and some of its smaller tributaries having lower thresholds than the majority of larger tributaries, particularly those with trout populations (either by means of annual stocking, or those with self-sustaining populations). With each successive increase in quality, the total number of stream miles decreases, with Exceptional Value streams tallying the fewest, at only 3.1 miles.

Designated Use	Miles
Exceptional Value Cold Water Fisheries	3.1
High Quality Cold Water Fisheries	49.5
Cold Water Fisheries	51.0
Trout Stocked Fisheries	65.6
Warm Water Fisheries	78.6

Stream Health & Impairments

Data: DEP



Note: Only impairments affecting aquatic life are included in this section. An additional 218.4 miles are considered impaired for recreational uses on account of pathogens of unknown origin.

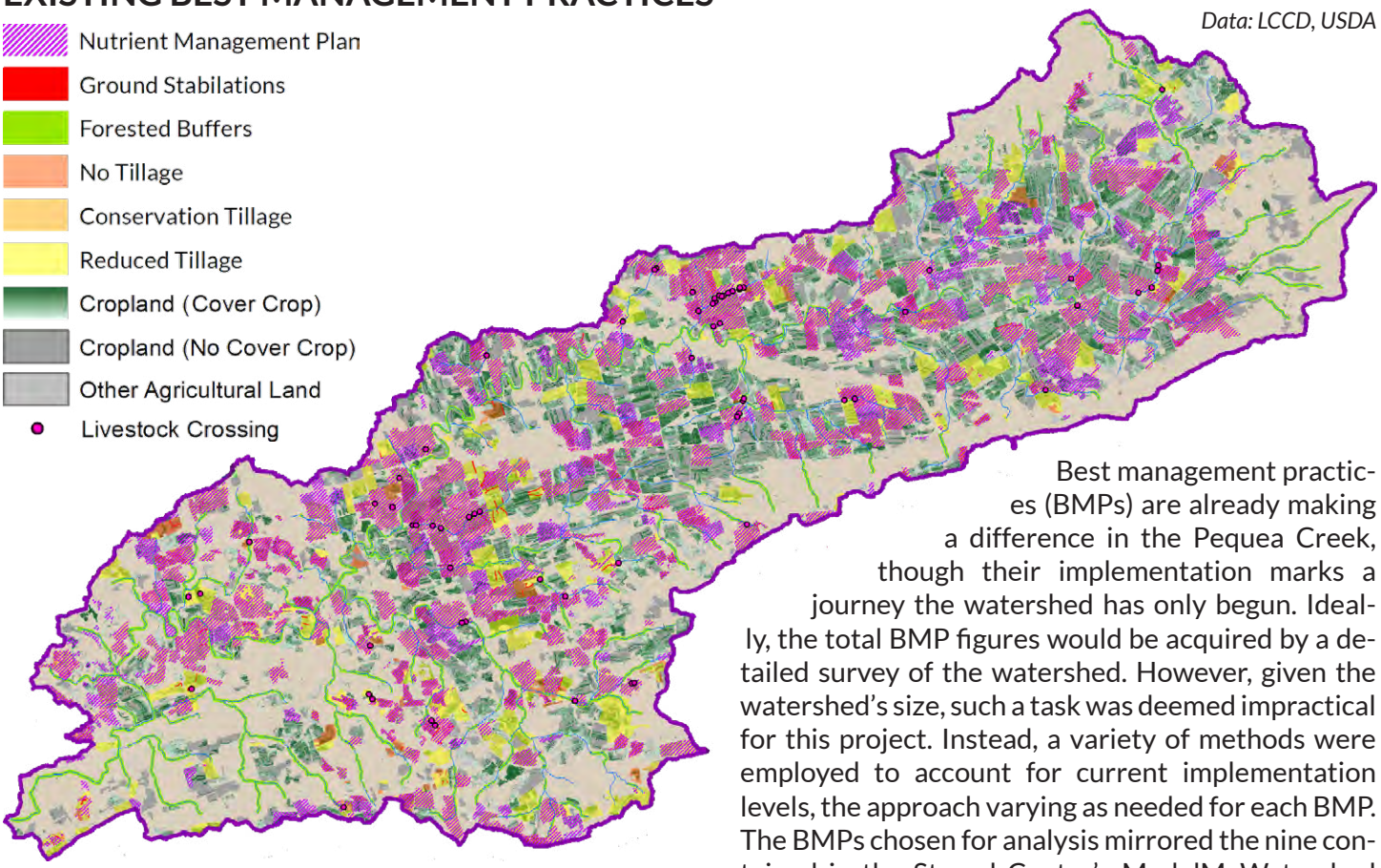
IBI Score	Small Stream	Large Stream
Poor (45 or lower)	17	5
Fair (46 to 60)	4	1
Good (61 to 75)	7	0
Excellent (76 or above)	8	0

Total Impairments	Miles	Percent
Unimpaired	34.6	14%
1 Impairment	0.0	0%
2 Impairments	28.2	12%
3 Impairments	33.9	14%
4 Impairments	13.3	5%
5 Impairments	121.6	51%
6 Impairments	8.7	4%

Impairment Source	Impairment Cause	Miles	Percent
Agriculture	Siltation	205.8	86%
Agriculture	Nitrogen	146.0	61%
Agriculture	Organic Enrichment	130.3	54%
Agriculture	Dissolved Oxygen	123.4	51%
Habitat Modification	Habitat Alterations	203.4	85%
Habitat Modification	Siltation	166.9	69%
Habitat Modification	pH	10.7	4%
Unimpaired	Unimpaired	34.6	14%

One of the most telling indicators of the health of a stream's aquatic life is how it scores on the Index of Biological Integrity. This score represents the total and relative presence of various key indicator macroinvertabrate species at a given location. The composition is then analyzed, generating a higher score if more pollution-sensitive organisms are found and a lower score if fewer. If scores fall below a threshold for a given designated use, the stream is deemed to be impaired, and the sources and causes of the impairment are determined. The report card isn't good. The Pequea Creek Watershed is home to some of the most impaired streams in Pennsylvania. Of the roughly 17,600 miles of streams with aquatic life impairments in the state, only 181 miles have six or more impairments. Narrowing this to only those streams with agricultural sources of impairment, it's just 67 miles. That means the Pequea Creek accounts for 13% of the most agriculturally impaired stream miles in the entire commonwealth. When viewing streams with five or more impairments, where at least one of the sources is agriculture, that figure jumps to 47%. It's very difficult to understate the problem. These impairments are most severe along the main stem and tributaries in the areas dominated by agriculture. The situation is not completely dire, however. Though a small share, 14% of the streams are presently in attainment, and 40% of the streams have three or fewer impairments. With the exception of the lower reaches of the main stem, these are located in the smaller basins of various tributaries. This creates manageable areas for focused and strategic action to remove streams from the state's impaired list. It may take several decades to heal the entire stream, but there are opportunities for incremental gains.

EXISTING BEST MANAGEMENT PRACTICES



Data: LCCD, USDA

Best Management Practice	Amount Implemented
Cover Crops	14,616 Acres
No Tillage	2,706 Acres
Conservation Tillage	586 Acres
Reduced Tillage	8,714 Acres
Nutrient Management	11,065 Acres
Animal Waste Management	6,924 AUs
Forested Buffers	85.8 Miles
Stream Fencing	13.7 Miles
Streambank Stabilization	0.0 Miles

Best management practices (BMPs) are already making a difference in the Pequea Creek, though their implementation marks a journey the watershed has only begun. Ideally, the total BMP figures would be acquired by a detailed survey of the watershed. However, given the watershed's size, such a task was deemed impractical for this project. Instead, a variety of methods were employed to account for current implementation levels, the approach varying as needed for each BMP. The BMPs chosen for analysis mirrored the nine contained in the Stroud Center's ModelMyWatershed (MMW) application. Obviously, this is a subset of applicable practices, but it does encompass the most important tools available in the Pequea.

Modeling these nine key practices indicates that BMPs are presently reducing stream loading by roughly 10,000 tons of sediment, 20 tons of phosphorus, and 90 tons of nitrogen. Those numbers are not inconsequential. For sediment and phosphorus, that's roughly one third of the way toward achieving the TMDL, and for nitrogen, about one fifth of the way toward meeting goals set out in the CAP. Considering modeled BMPs are only a subset, the loading has likely been reduced by even more. Still, there's quite a distance to go.

As the map indicates, BMPs are being implemented throughout the watershed. (Note: non-riparian forested areas are not shown as BMPs, but are factored into modeling through land use.) Gaps in key locations, especially in buffers, cover crops, and tillage practices, limit the impact of this conservation work. This is especially notable in the prime agricultural areas, where sediment and nutrient loading is most extreme. Outreach and education will be important going forward to implement BMPs on the scale needed to make substantive changes in the watershed.

Photo Credit: Donegal Trout Unlimited

Photo Credit: Donegal Trout Unlimited

WATERSHED ANALYSIS

METHODOLOGY

Model Selection and Approach

Hydrologic modeling of nutrient and sediment loading plays a key role in effective watershed and restoration planning. Selecting an appropriate model often calls for weighing the benefits of accuracy and precision versus efficiency. In particular, efficiency at larger spatial scales necessitates the aggregation of inputs, decreasing the model's ability to pinpoint load sources and determine the optimal placement of BMPs. In the case of the Pequea Creek Watershed, multiple models (e.g. CAST, SWAT, SPARROW, etc.) were considered and rejected. Though the specifics varied, in each case, our reservations came down to one of two issues. Either a) the model was generalized to such a large geography that it was impractical for calculations at a detailed scale; or b) the degree of calibration required was too onerous for the project's scope and time frame.

Ultimately, we settled on a more novel approach that afforded local specificity without the need for lengthy, complicated calibrations. To achieve both precision and efficiency, we focused on a subbasin-based analysis. By dividing larger watersheds into smaller subbasins, a model utilizing localized aggregation can be employed rapidly without losing valuable spatial specificity. The ModelMyWatershed (MMW) Suite, developed by the Stroud Water Research Center (Stroud Center), aligned perfectly with our approach. MMW uses a number of localized datasets (soil permeability, slopes, land use, BMPs, etc.) to develop loading coefficients specific to a given watershed. It performs these calculations in a matter of seconds and does so with a very intuitive graphical user interface. It also allows for customization within each modeled area. Combined, this afforded us the ability to calculate loading for a number of very small watersheds in a relatively short amount of time, all based on conditions specific to that watershed. It was this "best of both worlds" aspect that ultimately led us to choose this model and approach.

Model Development

Creating the base model was a multi-step process. The first step was to delineate the smaller basins on which the analysis would be based using ArcMap. This was accomplished by way of flow path analysis. A digital elevation model of the Pequea Creek Watershed was compiled using lidar-derived data available through the PAMAP program. This data was cleaned to account for sinks that could affect drainage patterns. Next, it was cut to account for subsurface movement (such as bridges or culverts). From here, flow accumulation paths were created. At key intersections of these flow paths, drainage points were allocated to serve as the outflow locations for the various subbasins. The final step was to delineate the watersheds based on these points. The resulting basins were then used for modeling.

Base Data

The majority of the data forming the basis for our loading figures was contained directly within MMW. However, two significant datasets required customization. The first of these was land use. Examining the land use data contained within model, we found it to be too coarse, with various inaccuracies apparent upon ground-truthing. Land use data developed by the Conservation Innovation Center of the Chesapeake Conservancy was at a much higher resolution (1 meter) and demonstrated markedly greater accuracy. This data was refined by incorporating USDA cropland data, to differentiate cropland and pastures from uses such as lawns. Land use category totals were calculated for each subbasin and subsequently entered into the model.

The second area of modification was related to BMPs. By default, MMW contains no baseline BMP data. Given the profound impacts such practices have on loading, it was incumbent upon us to add this data into the model. Multiple methodologies were employed to build the model's BMP inventory.

The first of these involved data collected by the Lancaster County Conservation District (LCCD, 2018) and stored in their PracticeKeeper database. This included all tillage, nutrient, and animal waste management practices, and

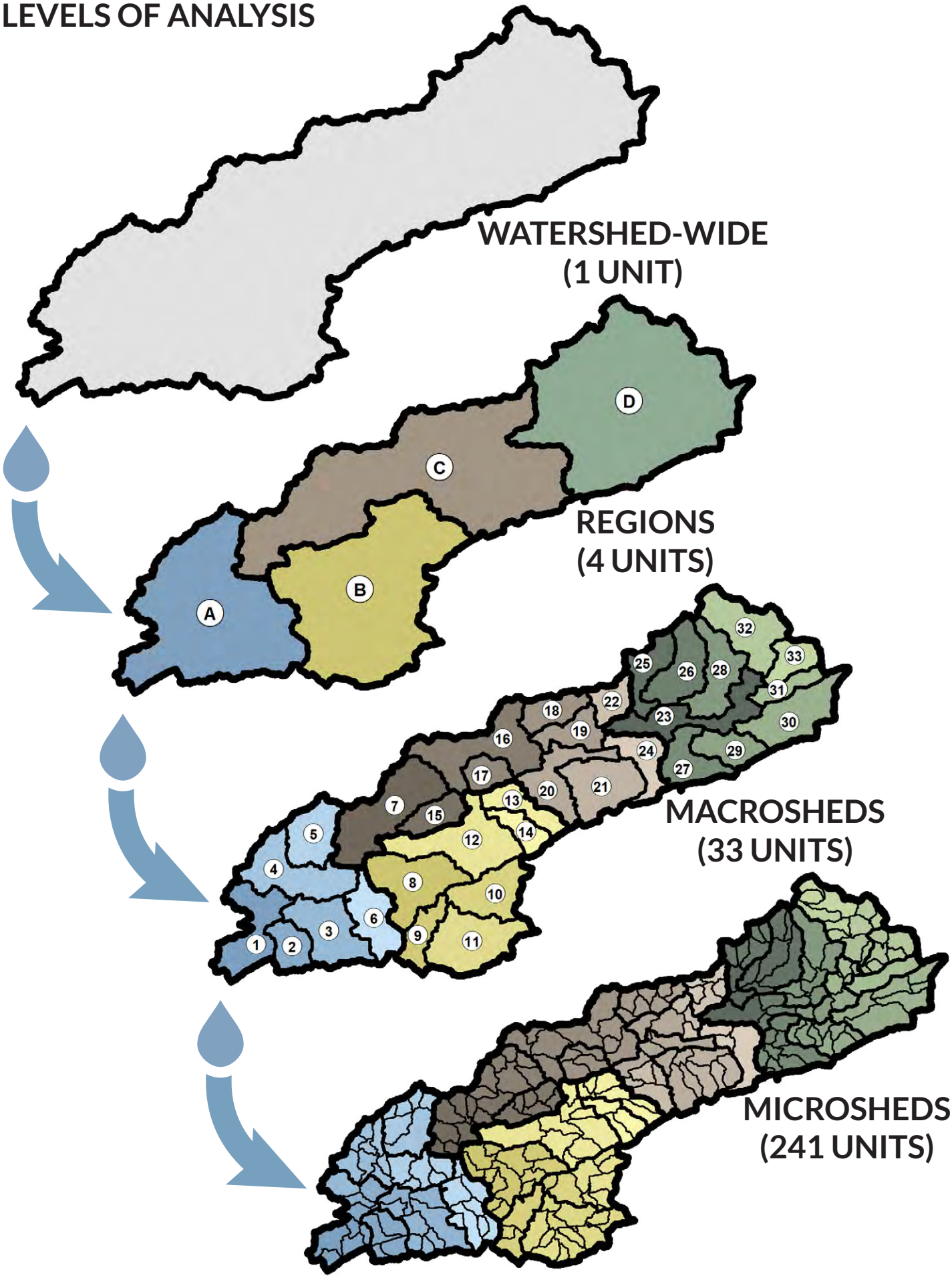
was parcel based. These were noted directly for most BMPs, though in the case of the "reduced tillage" practice, the presence of a conservation plan (without a noted tillage practice) was used as a proxy, as all conservation plans require some element of tillage reduction. Streambank fencing was found in the database, as well as livestock crossings (the latter of which was not modeled). With a few exceptions, Chester County farms were not included.

Remote sensing accounted for the remaining BMPs. Land cover data was combined with NHD flowlines to determine buffered lengths of streams. (MMW's calculations are based upon 100-foot buffers, and inventories were calculated to that standard.) This data was represented in both counties. In the case of cover crops, full-color aerial photography of Lancaster County (March 2012) was combined with USDA's cropland inventory. Those areas of cropland with green signatures were determined to possess cover crops. The photography was limited to Lancaster County, resulting in a data gap in Chester County.

These methods of generating BMP inventories were successful but had notable limitations. It had to be assumed that all practices recorded with LCCD were being implemented, which may or may not be the actual case. Additionally, it is certain that not all BMPs have been recorded in PracticeKeeper. The data (particularly cover crops) is dated, and greater implementation has taken place since then. With all datasets other than forested buffers limited to Lancaster County, the Chester County portion of the watershed (5%) is a notable gap. Streambank stabilization data was insufficient and not included, even though it has been employed in multiple locations. A number of BMPs are found in the CAP (most notably prescribed grazing, precision feeding, grass buffers, barnyard runoff controls, manure transport, stormwater management, dirt/gravel road erosion and sedimentation controls, and septic pumping) but are absent from MMW. Finally, stream data in MMW does not include all surface flows, artificially limiting potential stream-based BMPs. All things considered, we estimate that throughout the watershed, overall BMPs are likely underrepresented by at least 25%, and by more in specific subbasins. In some areas, more precise data was available; however, we felt it was important to use common datasets across the watershed as best we could, for the sake of consistency of methodology.

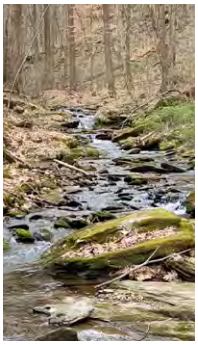
Rural BMP Type	Definition in ModelMyWatershed
Cover Crops	Use of annual or perennial plant cover to protect the soil from erosion during the time period between the harvesting and planting of the primary crop.
No-Till Agriculture	The purpose of this BMP is to leave some residue from harvested crops on the soil surface to reduce soil erosion. Ground coverage with residual matter is at or greater than 60%.
Conservation Tillage	The purpose of this BMP is to leave some residue from harvested crops on the soil surface to reduce soil erosion. Ground coverage with residual matter is between 30 - 60%.
Reduced Tillage	The purpose of this BMP is to leave some residue from harvested crops on the soil surface to reduce soil erosion. Ground coverage with residual matter is between 15 - 30%.
Nutrient Management	Refers to the planned use of organic and/or inorganic nutrients to sustain optimum crop production while at the same time protecting the quality of nearby water resources.
Animal Waste Management	These are systems that are designed to collect runoff and/or wastes from confined animal operations for the purpose of breaking down organic wastes via aerobic or anaerobic processes.
Vegetative Buffer	Areas of trees and/or grasses planted along streams or lakes that are designed to capture and renovate surface runoff and shallow subsurface flow from agricultural and urban areas.
Streambank Fencing	The construction of fencing that prohibits cattle from trampling streambanks, destroying protective vegetation, stirring up sediment in the streambed, and depositing organic waste directly into the stream.
Streambank Stabilization	The use of rip-rap, gabion walls, or a "bio-engineering" solution of some type along the edges of a stream to protect the banks during periods of heavy stream flow, thereby reducing direct stream bank erosion.

LEVELS OF ANALYSIS



Scaling Analysis

As we began to consider the scale at which to model the Pequea, it became clear that no single scale would work for all of the necessary levels of analysis. From the entire watershed to the 241 subbasins delineated in the flow path analysis, it was important develop a series of intermediate scales to pair the questions we were asking with the appropriate geographies. Ultimately, this resulted in four different levels of analysis, ranging from basins a mere quarter of a square mile to the full 153.3 square miles of the entire watershed.



Watershed Wide

At this level is generalized analysis, such as demographics, municipal structures, and physical geography of the watershed. Information here is painted with broad strokes to convey the general characteristics of the watershed.

Regions

Regions are used primarily for organizational purposes, most notably in coordinating local involvement and interest. Spanning over 25 miles from mouth to headwaters, this focuses watershed activities in nearby communities. Each of the four regions contains between six and ten macrosheds, and is coterminous with them.

A. River Hills
B. Beaver Valleys
C. Central Pequea
D. Pequea Headwaters

Macrosheds

The 33 macrosheds are the central foundation for modeling, proposals, and implementation work within the watershed. These areas range from 1.9 square miles in headwaters to 9.1 square miles along the some of the main stems. These were delineated using high-resolution flow-path analysis, with additional consideration given to the functional characteristics in human terms. Each align with one of the four regions and comprise several microsheds. The scale is meant to be both practical and flexible, as well as not singling-out individual landowners to avoid alienating potential partners. The table below corresponds with the numbers on the map.

1. Pequea River Hills Lower
2. Martic Forge
3. Climbers/Trout Run
4. Pequea River Hills Upper
5. Goods Run
6. Huber Run
7. Central Pequea Creek Lower
8. Big Beaver Creek Lower
9. Groff Run
10. Big Beaver Creek Upper
11. South Fork Big Beaver Creek
12. Little Beaver Creek Lower
13. Calamus Run
14. Little Beaver Creek Upper
15. Walnut Run
16. Central Pequea Creek Middle
17. Trib 7505 to Pequea Creek
18. Watson Run
19. Central Pequea Creek Upper
20. Eshleman Run
21. Londonland Run
22. Trib 7522 to Pequea Creek
23. Pequea Headwaters Lower
24. Houston Run
25. Umbles Run
26. Richardson Run
27. Trib 7531 to Pequea Creek
28. White Horse Run
29. Trib 7536 to Pequea Creek
30. Indian Spring Run
31. Trib 7542 to Pequea Creek
32. Pequea Headwaters Upper
33. Trib 7543 to Pequea Creek

Microsheds

Microsheds represent the smallest analysis unit in this plan, and range in size from .25 square miles to 2.5 square miles. Given the scale of the watershed, detailed modeling of all 241 of units was deemed impractical. At present, they contain baseline loading based on the given land uses, without calculations for BMP coverage. As projects are designed and proposed, however, these units can be populated with detailed data for analysis. To facilitate this, all of these baseline models are stored in HydroShare, and are available freely for anyone to use. The intention is for this plan to be a living document, not a static one, and these microsheds represent a tool to facilitate that.

Model Runs

Models were developed at both the microshed and macroshed levels. In both cases, this involved importing flowpath-derived spatial boundaries delineated in ArcMap into MMW. For each basin, land use figures were updated based on higher-resolution datasets. Upon entry, these models were saved in both MMW and exported to HydroShare.

Owing to the scale of the watershed, at this point, the focus shifted entirely to the macroshed level. BMPs derived from aforementioned sources were quantified at the macroshed level, and entered into the model. Models were run at this point to establish baseline loading, representing present conditions. Paired with impairment data and IBI scores, this formed the foundation for understanding the scope and scale of the issues facing the Pequea. As was expected, agriculture was the driving force behind a great deal of the steams' loadings, illuminating the key role to be played by agricultural BMPs.

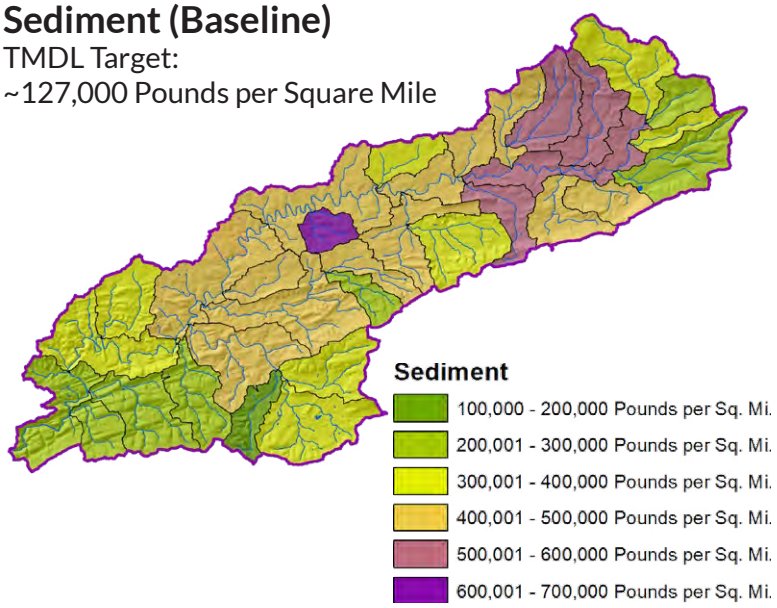
With a baseline established, we moved into the "BMP Build-Out" phase of analysis. A tool often used in municipal and regional planning, build-out analysis involves taking a finite resource and examining the outcome of its full utilization. Where municipal planners may examine developable land to see what the impacts would be if it were built to capacity, we have employed the same technique for available BMPs.

For every modeled BMP, we examined its range of impacts, from zero implementation, to current implementation, and finally, full implementation. From this, we were able to better understand current opportunities and the potential impacts of implementing some or all of them. It also assisted in determining priority areas within the watershed, where efforts would bear the most fruit.

A detailed analysis using this methodology follows in the implementation section of this plan. Within it, build-out data for each BMP is examined in key priority areas. From here, a delisting recommendation scenario is built, custom tailored to that macroshed. As the plan moves to implementation, microsheds can be populated with BMP data to assess potential small-scale impacts of projects in particular basins. The tool is dynamic, allowing for changes to single or multiple inputs, generating scenarios in real time. Ultimately, this will afford opportunities to move beyond this plan's priorities, as restoration goals become realities.

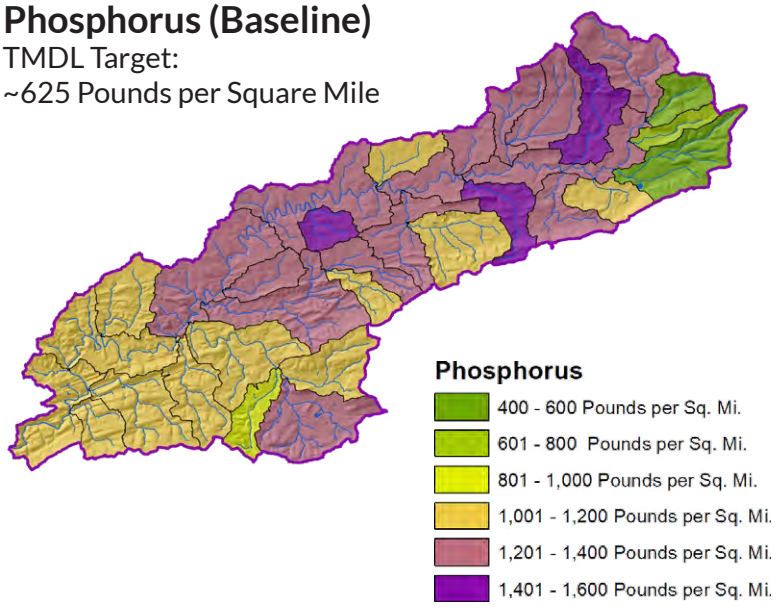
Sediment (Baseline)

TMDL Target:
~127,000 Pounds per Square Mile



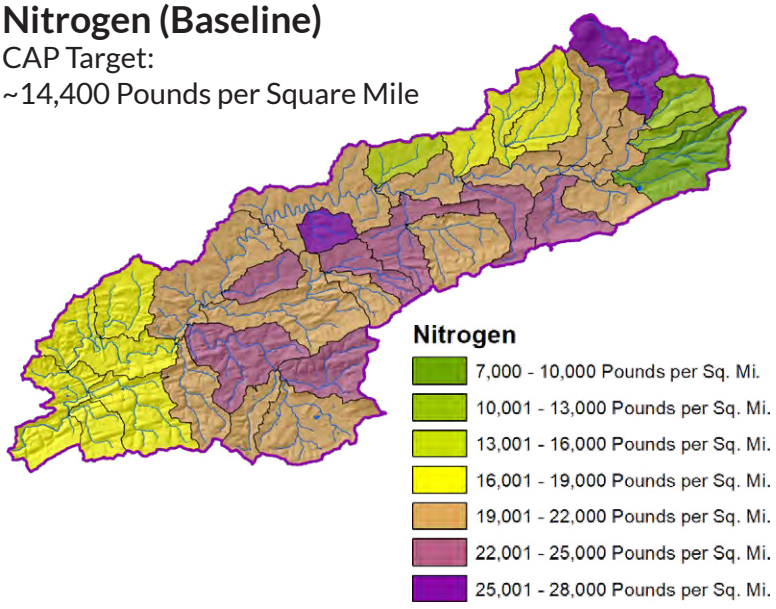
Phosphorus (Baseline)

TMDL Target:
~625 Pounds per Square Mile



Nitrogen (Baseline)

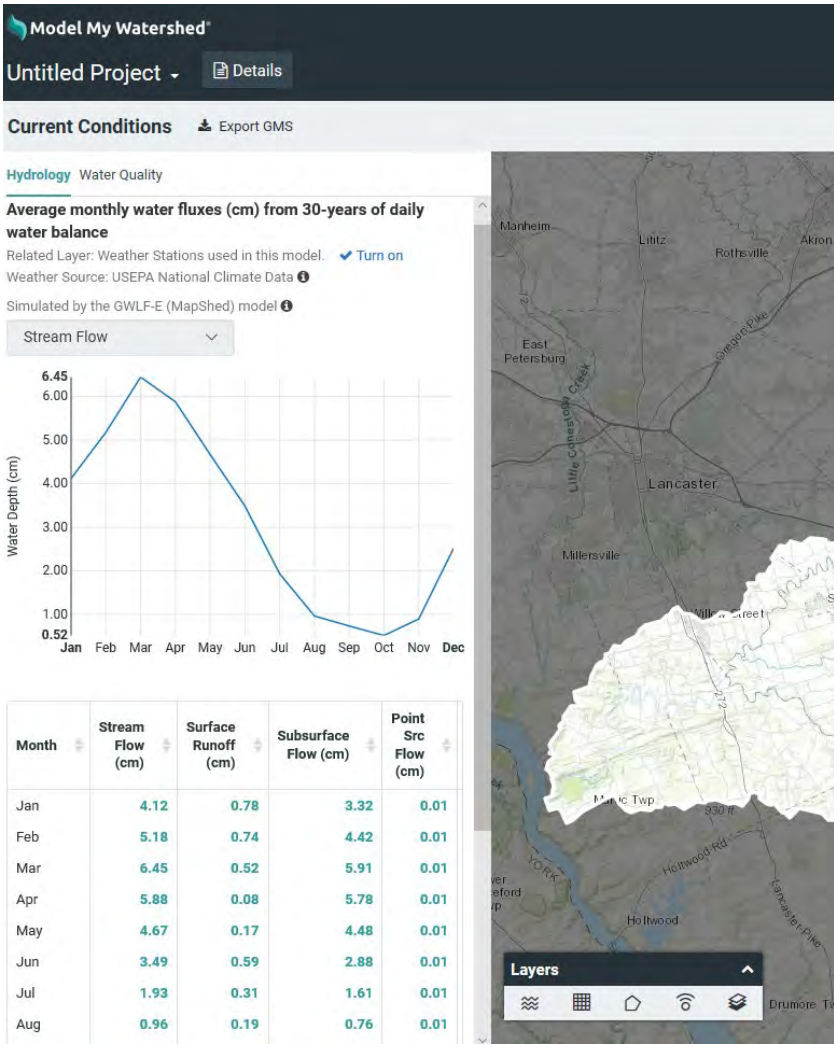
CAP Target:
~14,400 Pounds per Square Mile



Pequea Creek Watershed (Baseline)		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	18,384 Acres	19%	1,512.3	5%	2.4	3%	6.4	0%
Cropland	28,907 Acres	29%	21,933.5	72%	18.2	20%	71.1	5%
Combined Agriculture	47,292 Acres	48%	23,445.9	77%	20.5	22%	77.5	5%
Wooded Areas	21,398 Acres	22%	48.4	0%	0.1	0%	0.5	0%
Wetlands	155 Acres	0%	0.3	0%	0.0	0%	0.0	0%
Open Land	2,922 Acres	3%	124.0	0%	0.1	0%	1.1	0%
Low-Density Mixed	1,207 Acres	1%	1.9	0%	0.0	0%	0.0	0%
Medium-Density Mixed	553 Acres	1%	3.2	0%	0.0	0%	0.1	0%
High-Density Mixed	5,977 Acres	6%	43.3	0%	0.2	0%	1.6	0%
Low-Density Open Space	18,508 Acres	19%	27.4	0%	0.1	0%	0.6	0%
Animals	62,532 AUs	N/A	0.0	0%	59.8	65%	237.0	16%
Stream Banks	240.5 Miles	N/A	6,625.3	22%	1.6	2%	4.7	0%
Groundwater	N/A	N/A	0.0	0%	9.0	10%	1,168.5	78%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.9	0%
Point Sources	N/A	N/A	0.0	0%	1.1	1%	0.3	0%

Model Limitations

As with any process, this approach is not without its limitations. First, even within smaller geographies, there is a degree of aggregation, which may lead to misrepresentations of actual BMP yields. The choices of BMPs are themselves limited, restricting the ability to determine loading from the proposed implementation of absent practices. The model accounts for stream attenuation of sediment and nutrients based on length and orders of waterways; however, in breaking the watershed into smaller units, these reductions will not be expressed. In calculating BMP yields from build-out analysis, certain benefits will be overstated by missing compound effects. (For example, cover crops would likely yield greater reductions on conventionally tilled fields than those without tillage.) Finally, stream-based BMPs (vegetated buffers, streambank stabilizations, etc.) are based on lengths calculated by the model, and cannot be altered, even if local data indicates it should be. All of this in mind, the potential benefits of the approach far exceed the limitations. As MMW continues to add functionality, some of these limitations will be mitigated. Additionally, given the somewhat novel nature of this approach, efficiencies are bound to be gained as the process is repeated and improved upon.



IMPLEMENTATION

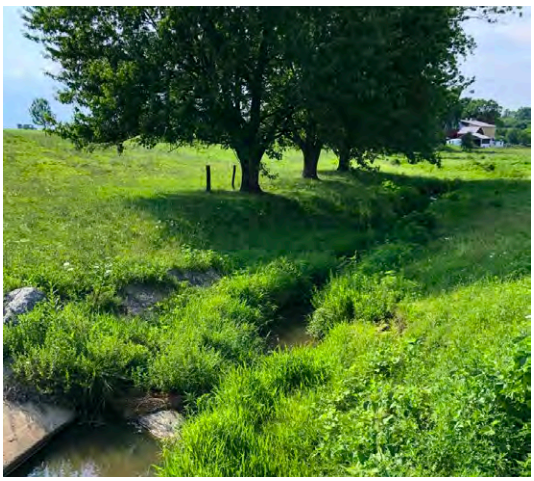
Overview

The Pequea Creek Watershed is far from homogeneous. Each basin has its own unique assets, challenges and opportunities. In recognizing this, the plan has divided the watershed into three different restoration tiers. Each tier establishes criteria for constituent watersheds, and recommends strategies tailored to those specific needs. This approach promotes the strategic application of resources, and maximizes benefits.

TIER I
PRIORITY PRESERVATION AREAS
(3 Basins, 9% of Pequea Creek Watershed, 5% of Resource Allocation)

It is far easier to maintain a working system than it is to fix a broken one. Such is certainly the case for three watersheds identified as being Tier I. These watersheds represent the most pristine areas in the greater Pequea Creek Watershed. No streams in these areas are listed as impaired, land uses are complimentary, and biological communities are intact. Here, rather than focus on the implementation of additional BMPs, the plan recommends vigilance in maintaining water quality through continued stewardship, appropriate land use, education, and expanded preservation activities.

TIER II
NEAR-TERM RESTORATION AND DELISTING AREAS
(7 Basins, 23% of Pequea Creek Watershed, 80% of Resource Allocation)



Given finite resources and time constraints, it is crucial to apply restoration efforts strategically. Tier II watersheds represent the core of this approach and form the central impetus of the plan. These seven areas were chosen for one or more of the following criteria:

A. Near Delisting

These watersheds were deemed to be the best candidates for the delisting of all constituent stream segments within 10 years. Representative watersheds could meet this criterion for a variety of reasons, including strong IBI scores, portions already attaining, lower numbers of impairments, complimentary land uses, and strategically located BMPs. Within Tier II, streams categorized as Near Delisting are the highest priority restoration areas.

B. Healthy Headwaters

Watersheds meeting this criterion have high quality headwater areas. This determination is made with the same considerations at the Near Delisting criteria, only to an even higher standard. The primary distinction between the Healthy Headwaters and Near Delisting criteria is

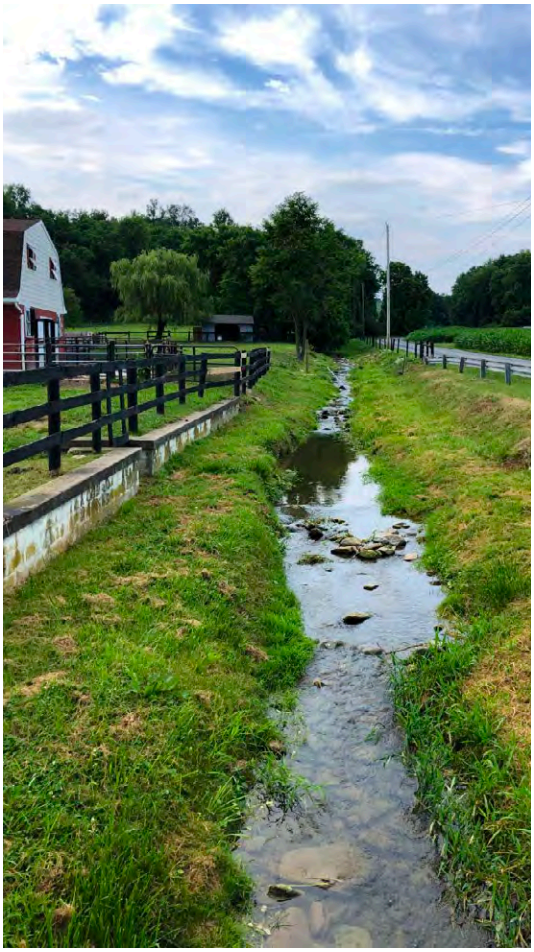
that Healthy Headwaters only applies to the upper reaches of the watershed. Downstream segments may be severely impaired, and poor candidates for restoration. Restoration proposals are meant to extend these unimpaired segments incrementally from the headwaters, eventually reaching the lower portions of the watersheds. *Basin-wide delisting in the near term is not necessarily implied under this criterion.*

C. Existing Initiative

Watersheds meeting this final criterion have demonstrated local leadership and initiative in improving stream health. Activities can range from outreach and education to project planning and implementation. No watershed is included in Tier II solely for this criterion. And, similar to Healthy Headwaters watersheds, *meeting this standard alone does not imply the delisting of the entirety of the watershed is a near-term goal.*

Proposed BMPs

BMPs proposed in Tier II are geared towards TMDL and CAP goals. The Pequea is not an island, and such reductions are currently established in regional plans. Even with full BMP implementation, no watershed in Tier II meets all of these standards. *However, it is very important to note that loading is not the same as biological health, and full implementation of BMPs is not needed for delisting.* Sediment is the causal agent found in all impaired streams in the Pequea; accordingly, emphasis should be given to incremental adoption of cost-effective sediment reduction practices, as they represent the best path to local stream health. In all of Tier II, increased monitoring will be key to tracking progress.



TIER III
LONG-TERM RESTORATION AND OUTREACH AREAS
(23 Basins, 68% of Pequea Creek Watershed, 15% of Resource Allocation)

In an ideal world, we would be able to implement all of the necessary BMPs throughout the entirety of the watershed, restoring the Pequea to a healthy state and doing so in short order. Regrettably, the resources required to perform such a feat are simply not available. It is important, however, to not lose sight of the bigger picture, particularly as it pertains to outreach and long-term planning. The 23 basins in Tier III are neither an afterthought nor irrelevant. They play a key role in the health of the watershed. The focus here is simply long-term, to allow for higher-impact, immediate action elsewhere. As priority areas are delisted, the impetus will shift to headwater areas in Tier III, followed by main stem portions. In the interim, targeted outreach, public education (particularly in regard to agricultural BMPs), and strategic projects in these areas will be key to building future support and maintaining momentum.

APPROACH AND CONSIDERATIONS

Following the modeling of the 33 constituent macrosheds, the steering committee met to determine into which tiers each basin should be placed. This is not an exact science. Rather, it is a best attempt to combine quantitative and qualitative aspects of the watershed to set a future course. As time goes on, watersheds may move from one tier to another, based upon real world conditions. Indeed, it is the objective of this plan that subbasins move from lower to higher tiers as restoration goals are met.

As is the case in any 319 plan, the primary focus is delisting the waters under consideration. In analyzing the Pequea Creek Watershed and its constituent basins, it was determined that focusing on sediment is the most likely means of achieving this goal. Throughout the recommendations, this point will be emphasized. However, nutrients are both a source of impairment in the watershed and a central focus of reductions under the CAP. In fact, the CAP has set rather aggressive goals for the Pequea, as detailed in this table:

Countywide Action Plan (CAP) Goals Practice	Proposed Amount	Pequea Share	Proposed Amount	Current Amount
Nutrient Management	215,324 Acres	16%	34,994 Acres	10,732 Acres
Tillage Management	188,699 Acres	16%	30,667 Acres	11,678 Acres*
Cover Crops	113,817 Acres	16%	18,497 Acres	14,258 Acres
Prescribed Grazing	12,603 Acres	21%	2,638 Acres	Unknown
Grass Buffers on Fenced Pasture	2,500 Acres	21%	522 Acres	Unknown
Forrest Buffers in Agricultural Areas	8,665 Acres	19%	1,664 Acres	788 Acres**
Land Retirement	3,240 Acres	17%	548 Acres	Unknown
Grass Buffers	8,800 Acres	19%	1,690 Acres	Unknown
Soil & Water Conservation Plan	247,167 Acres	17%	41,823 Acres	24,746 Acres
Stream Restoration	26.3 Miles	15%	4.0 Miles	Unknown
Animal Waste Management	694,150 AUs	17%	117,456 AUs	6,455 AUs***
Barnyard Runoff Control	1,222 Acres	17%	207 Acres	Unknown
Manure Transport	149,536 Dry Tons	17%	25,303 Dry Tons	Unknown
Dairy Precision Feeding	500 AUs	17%	85 AUs	Unknown
Stormwater Management	38,497 Acres	8%	2,998 Acres	Unknown
Dirt & Gravel Road E&S	42.5 Miles	10%	4.1 Miles	Unknown
Septic Pumping (Annualy)	10,000 Systems	17%	1,689 Systems	Unknown

* Includes No-Till, Conservation Tillage, and Reduced Tillage

** Buffers present on parcels with agricultural land use codes

*** As modeled in MMW, there are only roughly 60,000 AUs in the watershed

Recommendations for priority areas take this into account. Unfortunately, nutrients are often far more expensive to manage than sediment. This is especially the case for animal waste management BMPs, generally involving the construction of manure storage facilities. Determinations will need to be made in each subbasin as to how these practices are prioritized relative to sediment reduction goals.

Along these lines, the goals set forth in the plan exceed what is needed to meet established delisting objectives. The reason for this a three-fold. First, the TMDL and CAP set incredibly high bars. Sediment goals will be far easier and less expensive to achieve than those for nutrients, but simply ignoring nutrients is not an option. Second, it was important to connect to planning goals in the CAP. For example, there is no nitrogen TMDL for Pequea, but given broader regional initiatives, failing to address it in some way would simply be negligent. Finally, it's better to over-shoot than undershoot. Limiting goals from the start is a recipe for failure.

As noted in the methodologies, BMPs are underrepresented. There are a variety of reasons for this, from modeling constraints to available datasets and the desire to use uniform data throughout the Pequea Creek Watershed. There is a certain benefit in that the plan's inventories are lower than actual BMP levels, not higher. In many ways, this is a built-in margin of error. A broad variety of BMPs not directly listed in the priority area profiles are not only acceptable, they're encouraged. All of the recommendations of this plan are meant to serve as a starting point, not the end.

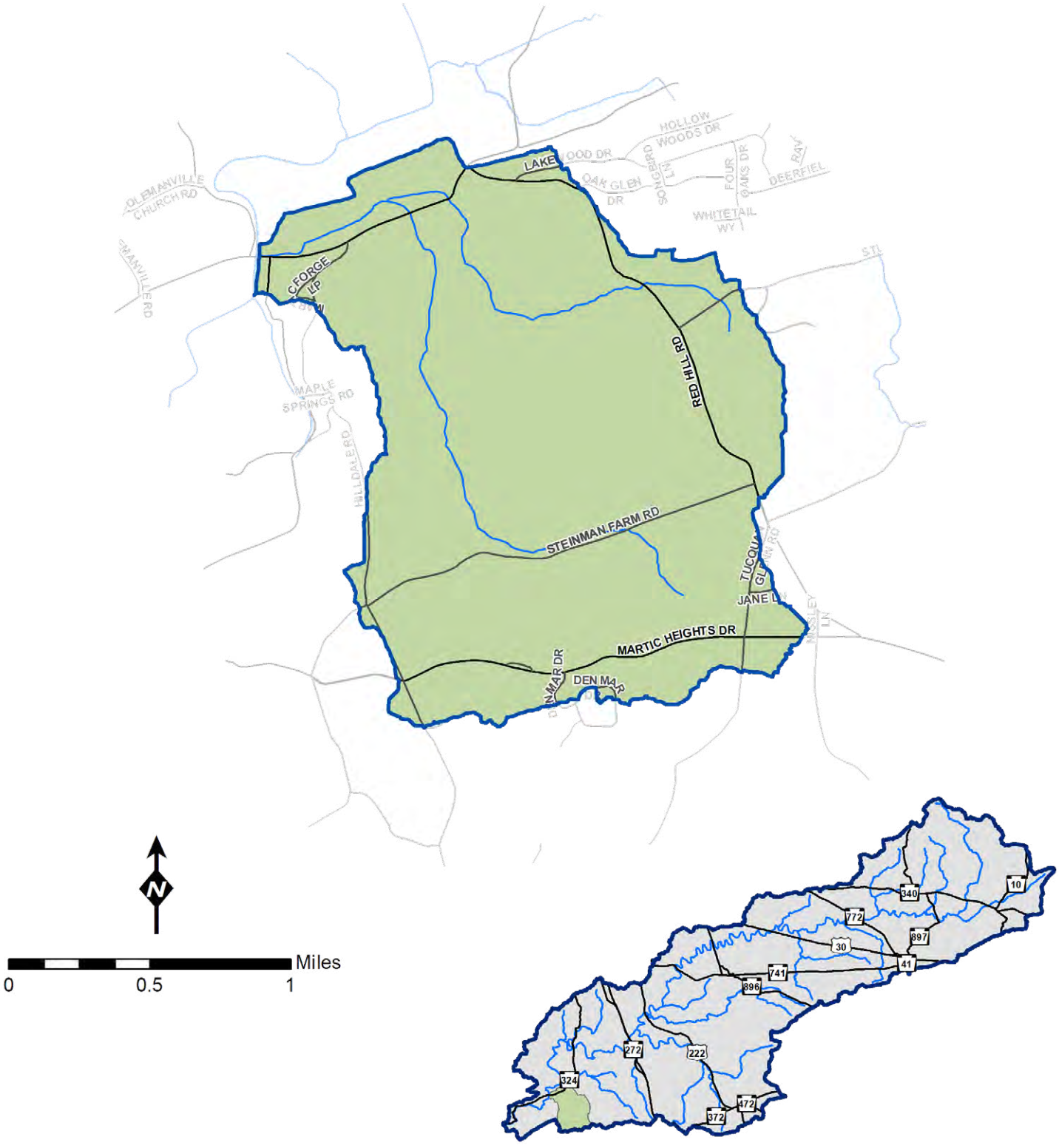
In MMW, the vegetated buffer BMP is based on 100-foot widths. Accordingly, all proposals here are designed to these standards as well. As a practical matter, buffers of a variety of widths will utilized based on site conditions and landowner specifications. Any buffer is better than no buffer. If a landowner is unwilling to install 100 feet, but agrees to 35 or even 10, this is a win and should be pursued. As the width of a buffer increases, there are undeniable benefits. However, it's important to not make perfect the enemy of good.

It was decided that one additional BMP would be added to the plan's proposals: floodplain restoration and legacy sediment removal. This choice is not without controversy. The practice is young, relative to other BMPs. It does not have the same body of research behind it that others do. There is debate as to its efficacy, not simply in removing sediment and nutrients, but in its ability to foster aquatic communities over time. These concerns were taken into account in making this decision. Ultimately, however, it was decided to include this BMP for several reasons. First, the practice was part of the WIP3 process and CAP recommendations. Second, much of the current research has been done at nearby Franklin & Marshall College. Faculty there, in particular Dorthy Meritts and Robert Walter have been very responsive to our queries as we developed the plan. Additionally, their seminal project at Big Spring Run is located in a watershed directly adjacent to the Pequea, and shares many of the site conditions found in our priority areas. (Data from this project was also used to determine yield estimates.) Finally, there is a track record of these projects having been done in the region, most notably by LandStudies and the Water Science Institute (WSI). If these efforts serve as springboards to restoration work, it is a benefit. Taking all of this into consideration, we chose to apply this BMP sparingly, focusing on areas of significant bank loss, especially where associated with historic mill dams.

Cost figures were acquired from multiple sources. The estimates for the majority of agricultural BMPs (cover crops, no-till agriculture, and animal waste management) are based on estimates provided by CAST, as are forest buffer planting costs. Buffer maintenance estimates were provided by Lancaster Buffer Establishment Support Team (BEST), a consortium of local restoration groups and research centers. Stream fencing and bank stabilization costs are from the Pennsylvania EQIP payment schedule. Finally, legacy sediment project costs were from Franklin & Marshall College and LandStudies. (These estimates do not include adjustments for the sale of removed sediment.) All costs are based upon a 10-year life. This is not meant to imply that all investment begins at year one and continues for a period of a decade. Rather, it is expected that projects will be funded and implemented in a rolling fashion. It is worth noting that these represent gross, not net costs. For example, farmers applying cover crops may save on feed or supplemental nutrient costs. In legacy sediment projects, the overburden removed could be sold as clean fill.

TIER I: MARTIC FORGE

Selection Criteria: Minimal Impairment
Region: River Hills
Area: 2.7 Square Miles, 4.4 Stream Miles

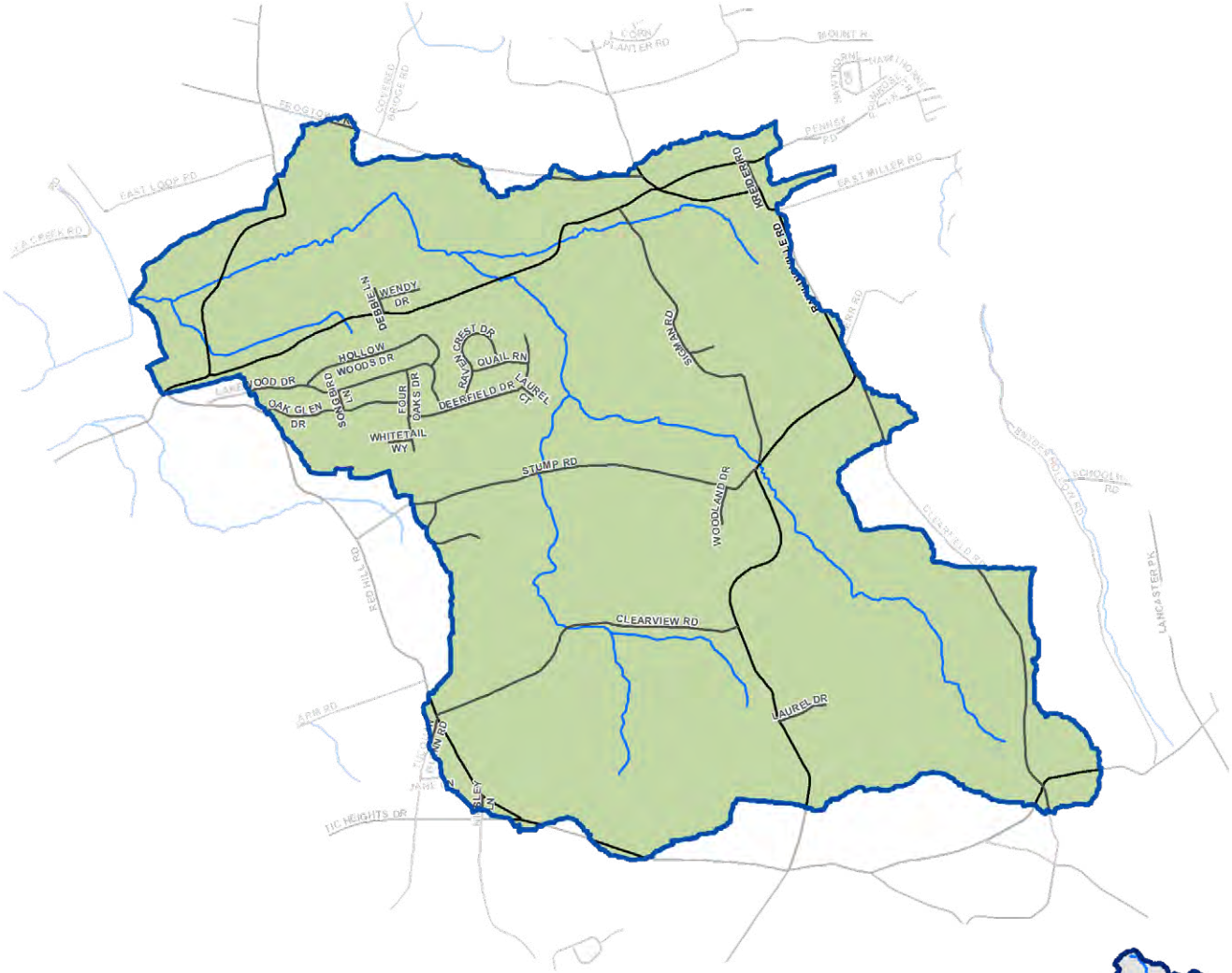


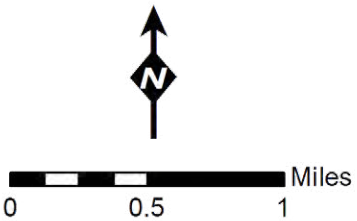
Overview

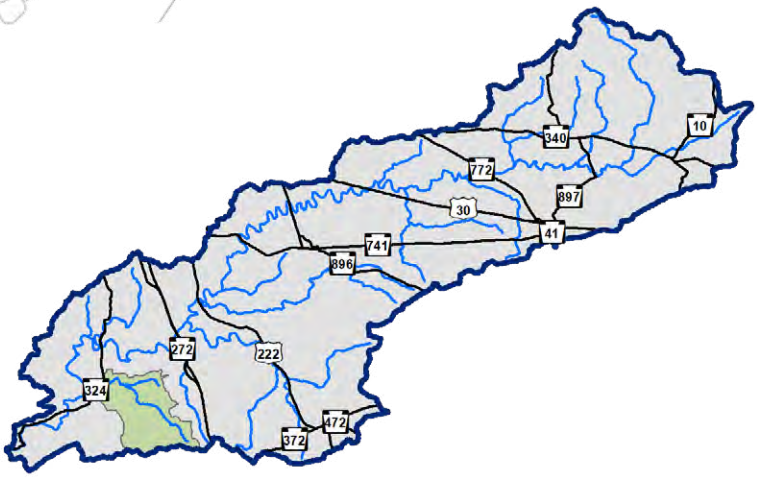
Located in the River Hills region, the Martic Forge Watershed occupies a largely-forested rural area, with minimal development. No stream segments within the watershed are currently listed as impaired and all are considered to be HQ-CWF under Chapter 93. IBI scores are exceptionally high, ranging from the mid 70s (74.5) to the upper 90s (98.1). Significant portions of the watershed fall within Martic Township Park, protecting it from both agricultural and development pressures. A healthy population of wild brook trout can be found in both stems of the creek, owing largely to the high quality waterways. Little work to no restoration work is needed in the area; instead, it is only recommended that the basin is periodically reviewed to confirm its healthy status, and efforts be made to mitigate any future harm from agricultural nutrients and development.

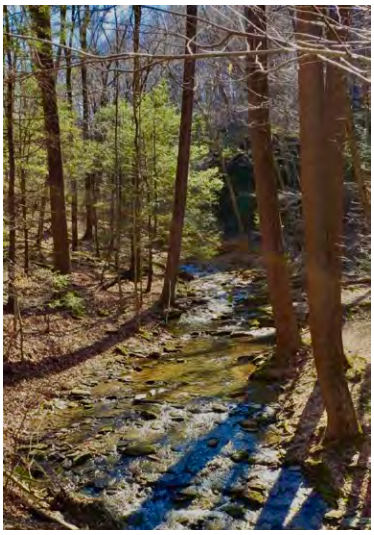
TIER I: CLIMBERS RUN / TROUT RUN

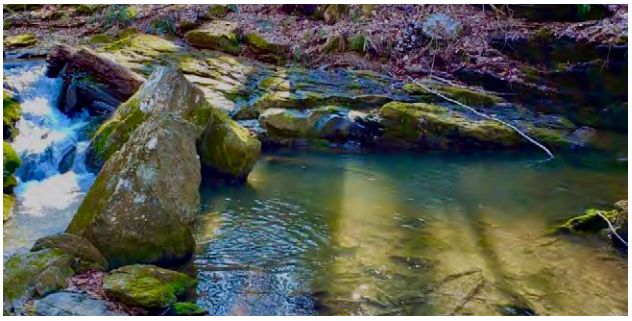
Selection Criteria: Minimal Impairment
Region: River Hills
Area: 6.0 Square Miles, 9.9 Stream Miles









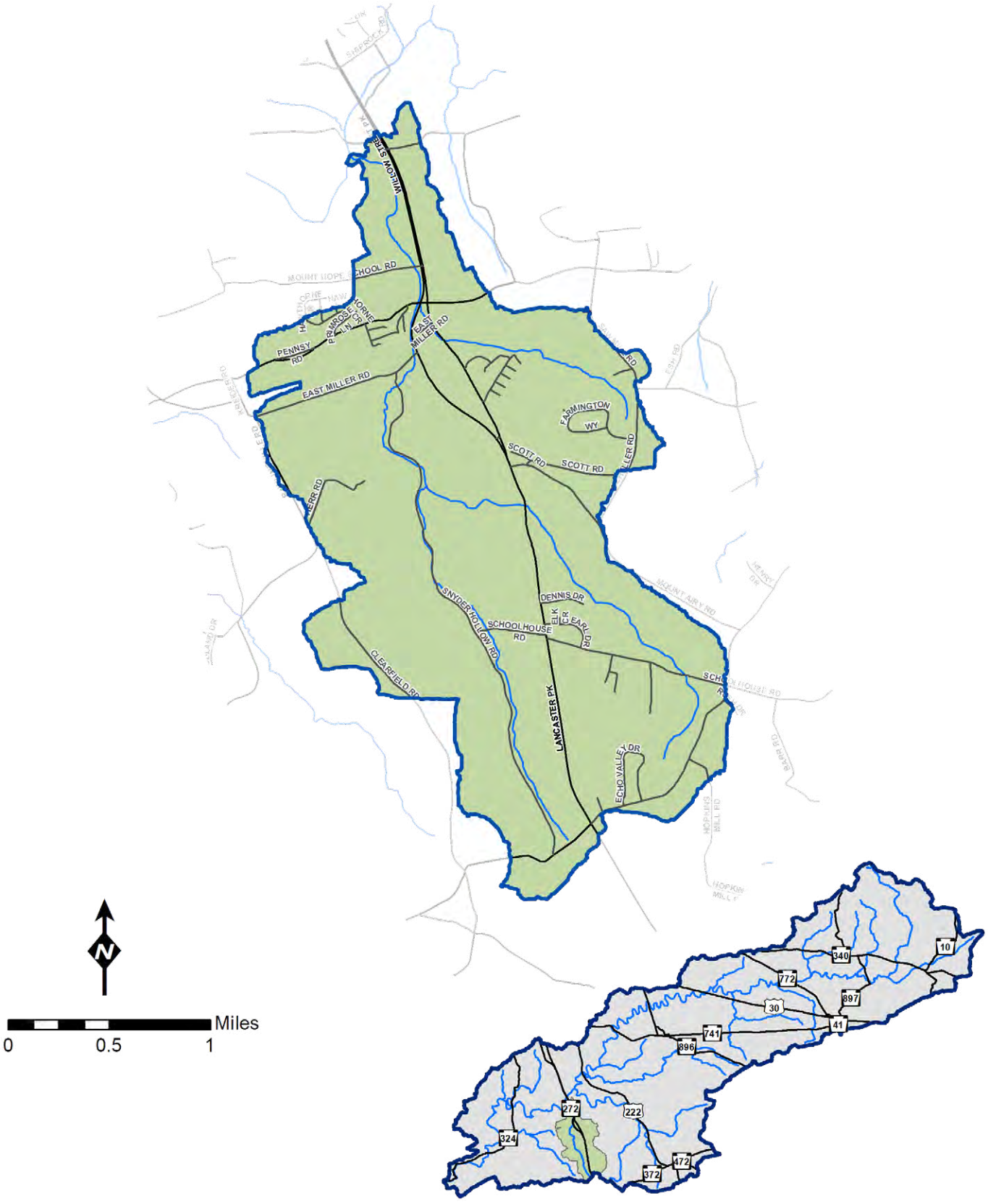


Overview

The second preservation watershed comprises Climbers Run and Trout Run. The watershed contains minimal amounts of development, and a small share of agriculture, relative to the greater Pequea Creek Watershed. The Lancaster Conservancy maintains multiple preserves in the basin, affording a high degree of protection in perpetuity. All streams are listed as CWF under Chapter 93 with Trout Run (including all tributaries) considered HQ-CWF. All water courses in the watershed are listed as unimpaired. With the exception of one station near the mouth of Climbers Run (where the score is 67.2), the lowest IBI score is 75.9, with the bulk in the 80s, up to 89.6. Wild brook and brown trout populations are found within the watershed. By all measures, this portion of the Pequea Creek Watershed is in exceptional health. At this stage, all that is needed is vigilance in maintaining the streams' current status into the future.

TIER I: HUBER RUN

Selection Criteria: Minimal Impairment
Region: River Hills
Area: 4.6 Square Miles, 7.8 Stream Miles

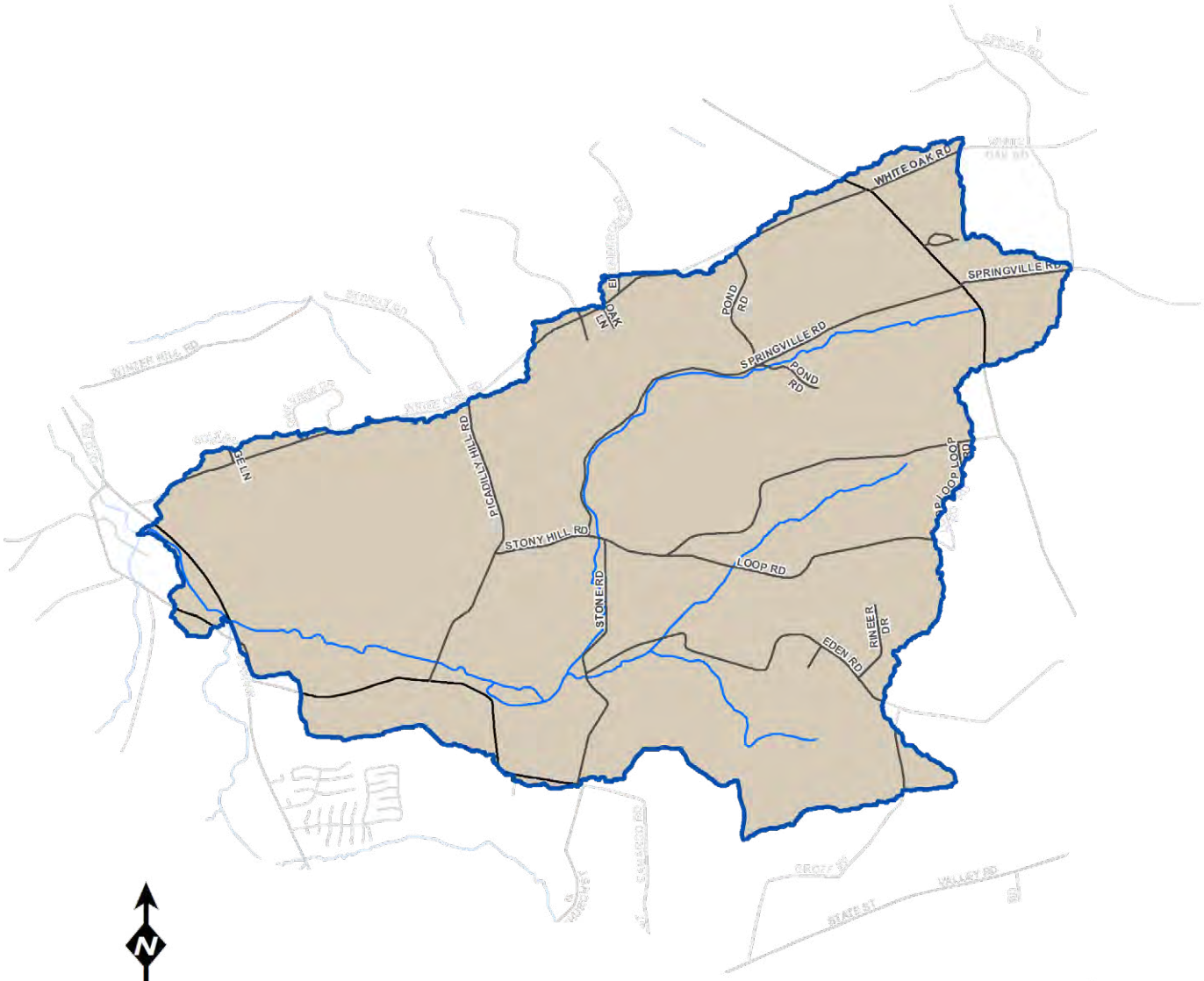


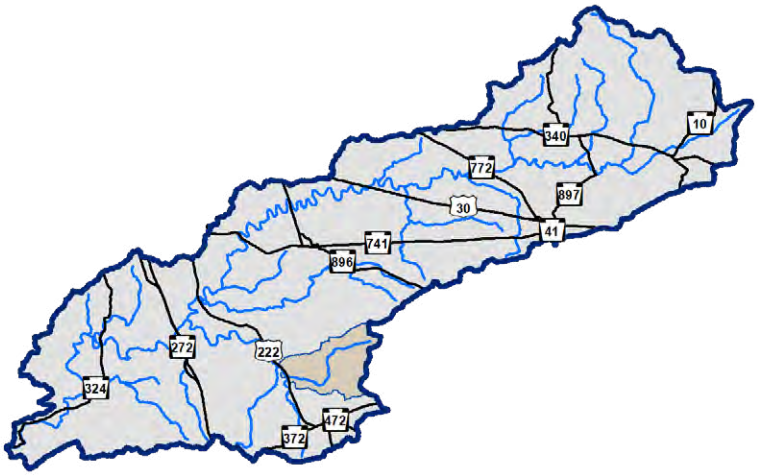
Overview

The last and easternmost of the three preservation areas is the Huber Run Watershed. As was the case for the previous two, no stream segments within the watershed are listed as impaired and all are designated as CWF under Chapter 93. Agricultural and development impacts are minimal. Wild brown trout are found within the watershed and the lone IBI core is 63.2. Modest restoration projects may be of some benefit, though other than lower portions of Huber Run, immediately upstream of the mouth, the stream's overall health indicates that resources would be better allocated to other areas of the Pequea Creek Watershed.

TIER II: BIG BEAVER CREEK (UPPER)

Selection Criteria: Near Delisting, Healthy Headwaters, Existing Initiative
Region: Beaver Valleys
Area: 4.8 Square Miles, 7.4 Stream Miles

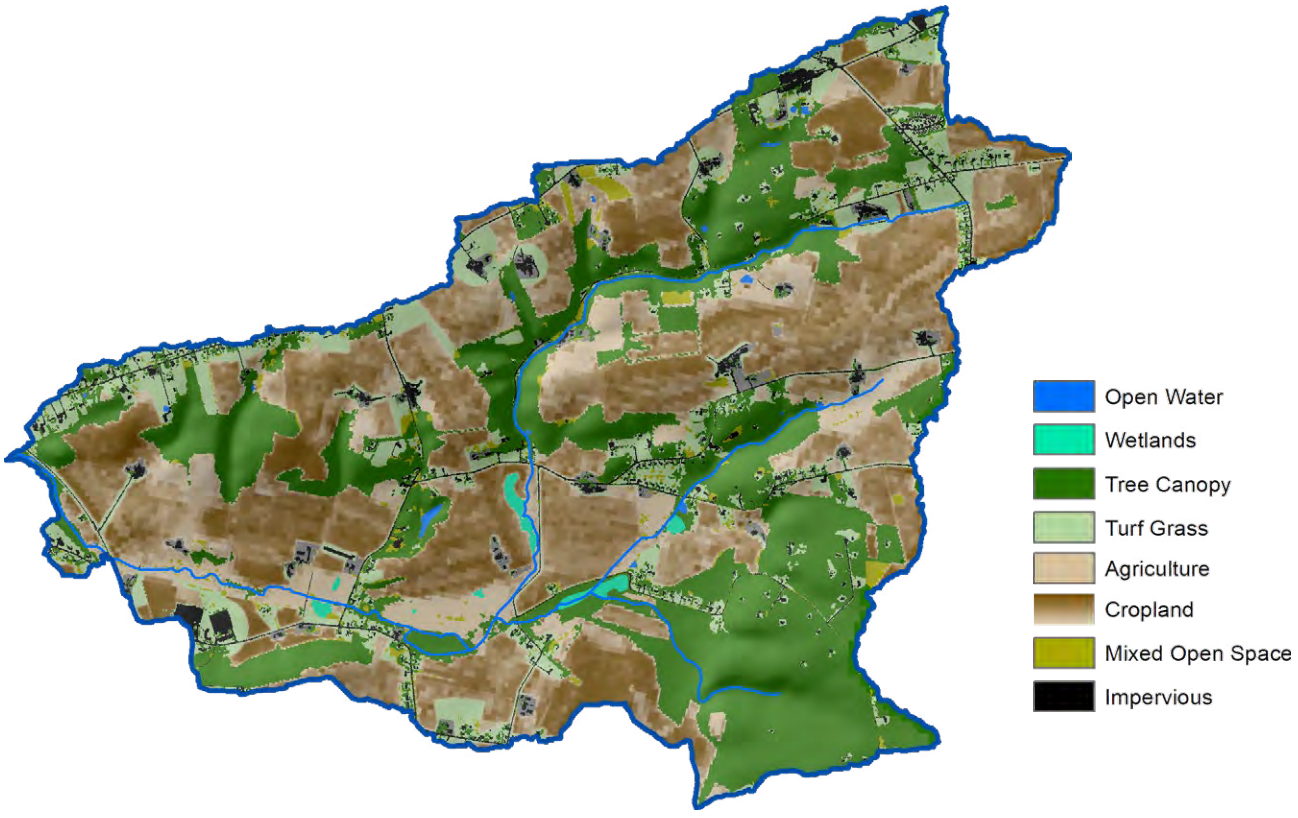




Overview

The upper portion of Big Beaver Creek (headwaters to the confluence with Goff Run, excluding the South Fork Big Beaver Creek watershed) drains roughly five square miles in the area north of Quarryville. There are 7.3 miles of streams in the watershed, including Big Beaver Creek and a significant unnamed tributary to the south. The main stem is stocked with trout by the Fish & Boat Commission, and the entire watershed is designated as a TSF under Chapter 93. Agriculture dominates this landscape, with nearly half of the total area comprising pastures and cropland. Relative to other agricultural areas of the greater Pequea Creek Watershed, however, the Upper Big Beaver Creek Watershed has significant forested areas (29%) and a notable degree of BMP implementation. The Susquehanna River Basin Commission has analyzed three separate sites in the watershed for biological integrity, and resultant scores all approach or exceed DEP's delisting criteria for TSFs. Roughly one mile downstream of the basin, a Governor's Award for Excellence winning restoration project was completed along the stream, adding to the momentum of any future projects. Given conditions in the watershed, near-term delisting is a realistic outcome, making this basin a priority restoration area within the watershed.

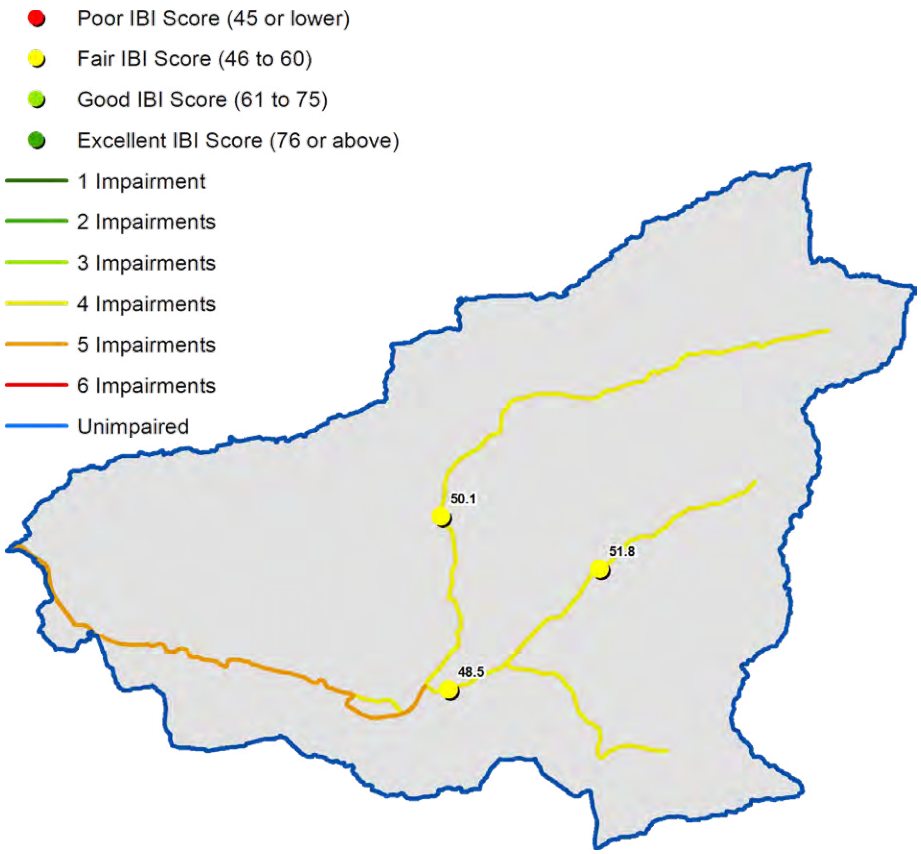
Land Cover & Loading



Big Beaver Creek (Upper)		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	598.6 Acres	19%	46.8	6%	0.1	3%	0.2	0%
Cropland	802.7 Acres	26%	568.5	72%	0.5	17%	1.7	3%
Combined Agriculture	1,401.3 Acres	46%	615.4	78%	0.6	19%	1.9	3%
Wooded Areas	890.6 Acres	29%	2.0	0%	0.0	0%	0.0	0%
Wetlands	16.5 Acres	1%	0.0	0%	0.0	0%	0.0	0%
Open Land	85.8 Acres	3%	3.7	0%	0.0	0%	0.0	0%
Low-Density Mixed	45.8 Acres	1%	0.0	0%	0.0	0%	0.0	0%
Medium-Density Mixed	17.4 Acres	1%	0.0	0%	0.0	0%	0.0	0%
High-Density Mixed	124.8 Acres	4%	0.0	0%	0.0	0%	0.0	0%
Low-Density Open Space	493.1 Acres	16%	0.0	0%	0.0	0%	0.0	0%
Animals	1,962 AUs	N/A	0.0	0%	1.9	67%	7.4	13%
Stream Banks	7.4 Miles	N/A	167.4	21%	0.0	1%	0.1	0%
Groundwater	N/A	N/A	0.0	0%	0.4	12%	47.9	83%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

With the exception of light housing development along some of the basin's roadways, rural land uses prevail. Agriculture comprises 46% of the watershed, with 57% of agricultural land dedicated to crop production and 43% in pasture. As is the case throughout the Pequea Creek Watershed, animal husbandry dominates agricultural operations. Significant portions of the basin's headwaters are forested, with greater encroachment of pastures and cropland downstream. In these lower portions of the basin, agricultural uses often have a direct interface with the stream, coinciding with incised banks and nutrient/sediment movement from adjoining fields/pastures.

Stream Health & Impairments

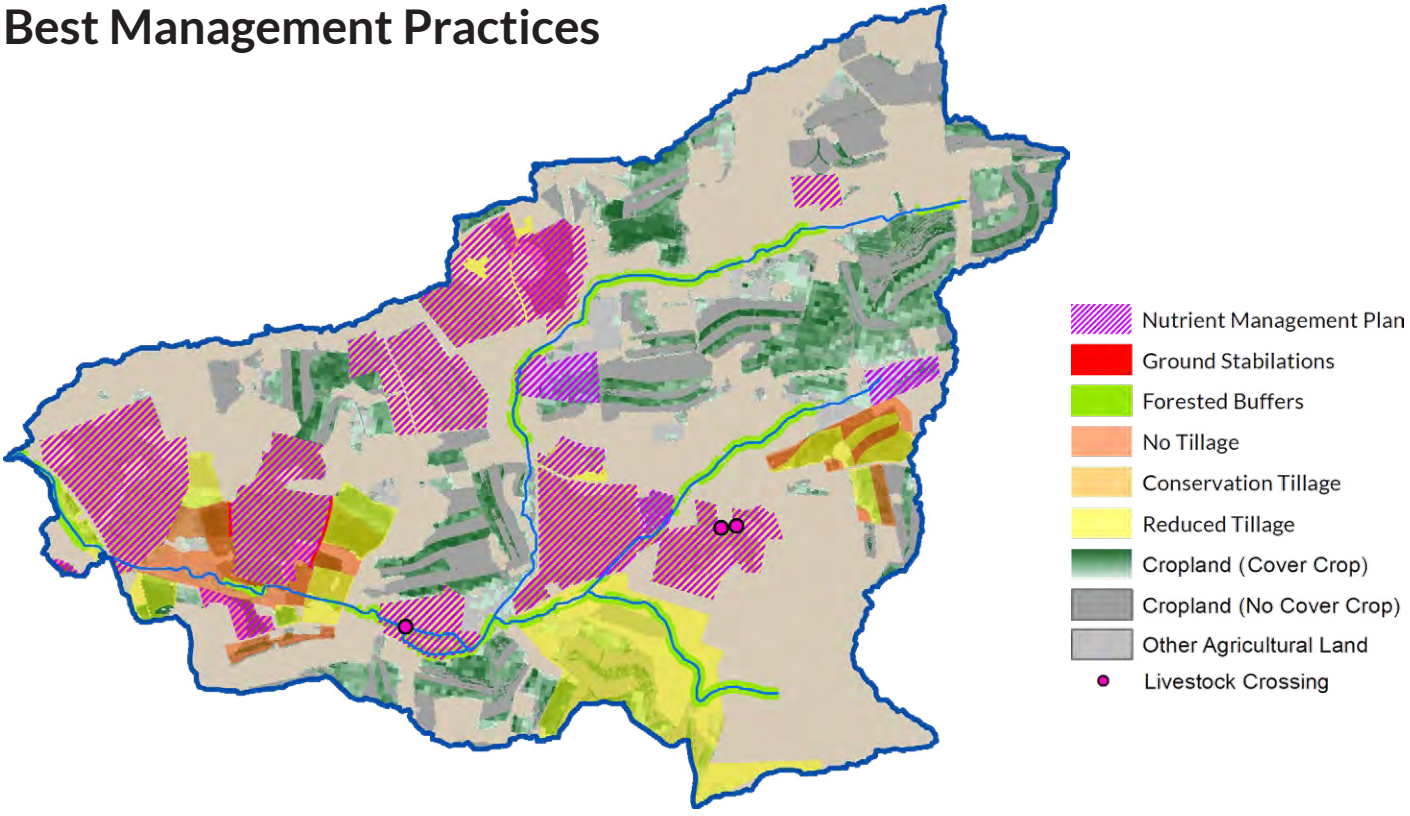


Big Beaver Creek (Upper) - Upstream Portions (7 NHD Segments, 5.3 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	Siltation

Big Beaver Creek (Upper) - Downstream Portions (4 NHD Segments, 2.0 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	pH
Organic Enrichment/Low Dissolved Oxygen	

A variety of impairments are found in the Upper Big Beaver Creek Basin. The primary source of these impairments is agriculture followed by habitat modifications. Despite these impairments, IBI scores are relatively high (ranging between 48.5 and 51.8). These values verge on the attainment level for trout stocked fisheries (score of 50). Secondary criteria, (e.g. Beck's Index scores) lag somewhat farther behind, while others (e.g. Percent Sensitive Individuals scores) can be found both above and below the minimum threshold (25%). All told, this speaks to a watershed with a realistic opportunity for near-term delisting, particularly in the upper portions of the watershed.

Best Management Practices

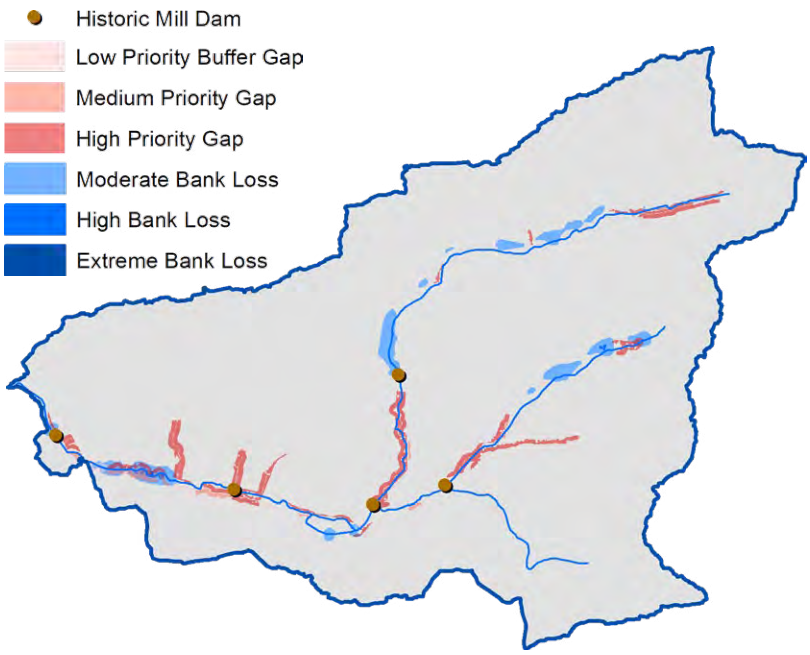


A decent amount of agricultural BMPs are found throughout the watershed, particularly in the downstream portions presenting the biggest challenge to delisting. Unfortunately, three key BMPs (riparian buffers, streambank fencing, and bank stabilization) are missing, providing both a threat and an opportunity. A goal approaching universal implementation of cover crops and improved tillage practices would certainly help relieve sedimentation concerns.

Big Beaver Creek (Upper)				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	441.4 Acres	55%	359.3 Acres	128.5	0.3	0.0
No Tillage	43.1 Acres	5%	757.5 Acres	237.1	0.2	-0.2
Conservation Tillage	0.0 Acres	0%	451.5 Acres	138.2	0.2	-0.2
Reduced Tillage	306.1 Acres	38%	451.5 Acres	106.0	0.1	-0.2
Nutrient Management	228.3 Acres	29%	572.4 Acres	0.0	0.1	5.1
Animal Waste Management	635 AUs	32%	68%	0.0	0.2	1.1
Forested Buffers	3.7 Miles	51%	3.6 Miles	292.9	0.2	5.6
Stream Fencing	0.3 Miles	5%	7.0 Miles	47.0	0.2	0.5
Streambank Stabilization	0.0 Miles	0%	7.4 Miles	692.6	0.7	1.7

Bank Loss & Vegetative Buffer Gaps

As noted under BMPs, bank erosion and buffer gaps represent significant challenges for the lower segment of the watershed. This watershed is a prime candidate for streambank BMPs.



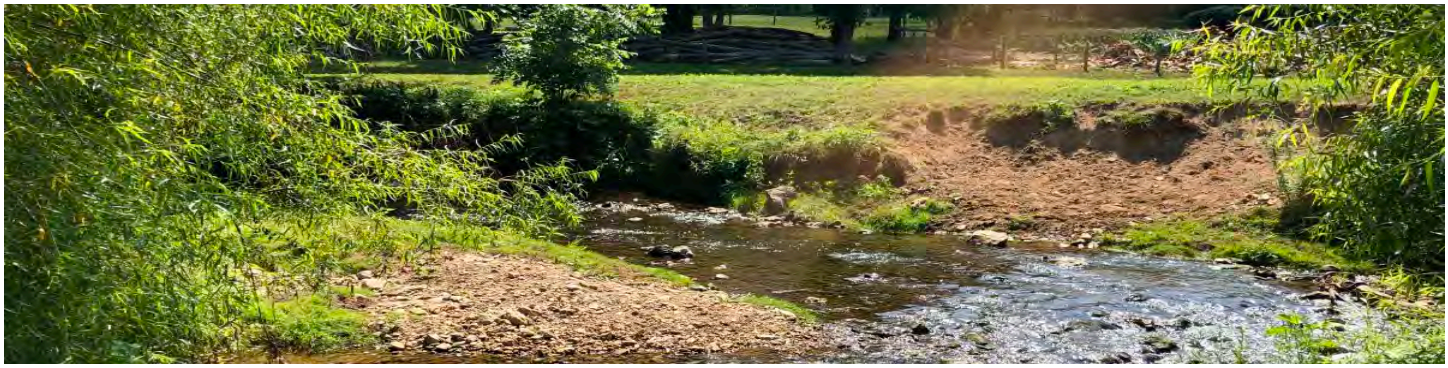
Nutrient/Sediment Loading & Targets

Big Beaver Creek (Upper)	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,071.2	788.5	304.6	61%
Phosphorus	3.5	2.9	1.5	48%
Nitrogen	60.0	57.4	42.5	40%

Recommendations

Stream fencing, forested buffers, and bank stabilization are the top priority in the lower portions of this watershed. Near the confluence with the South Fork Big Beaver Creek may be a prime location for legacy sediment removal, pending further investigation. In upstream areas, increased agricultural BMPs, specifically cover crops and tillage management are recommended. Nutrient management planning is encouraged throughout the watershed, in line with increased NMPs proposed under the CAP, particularly when incorporating sediment-reducing BMPs. In the longer term, animal waste management, primarily in the form of manure storage, should be considered, though other, less expensive BMPs, particularly those related to sediment, should be given priority consideration. Continued outreach to the farming community will be key to implementing these goals. Near-term delisting is certainly a realistic possibility in this area.

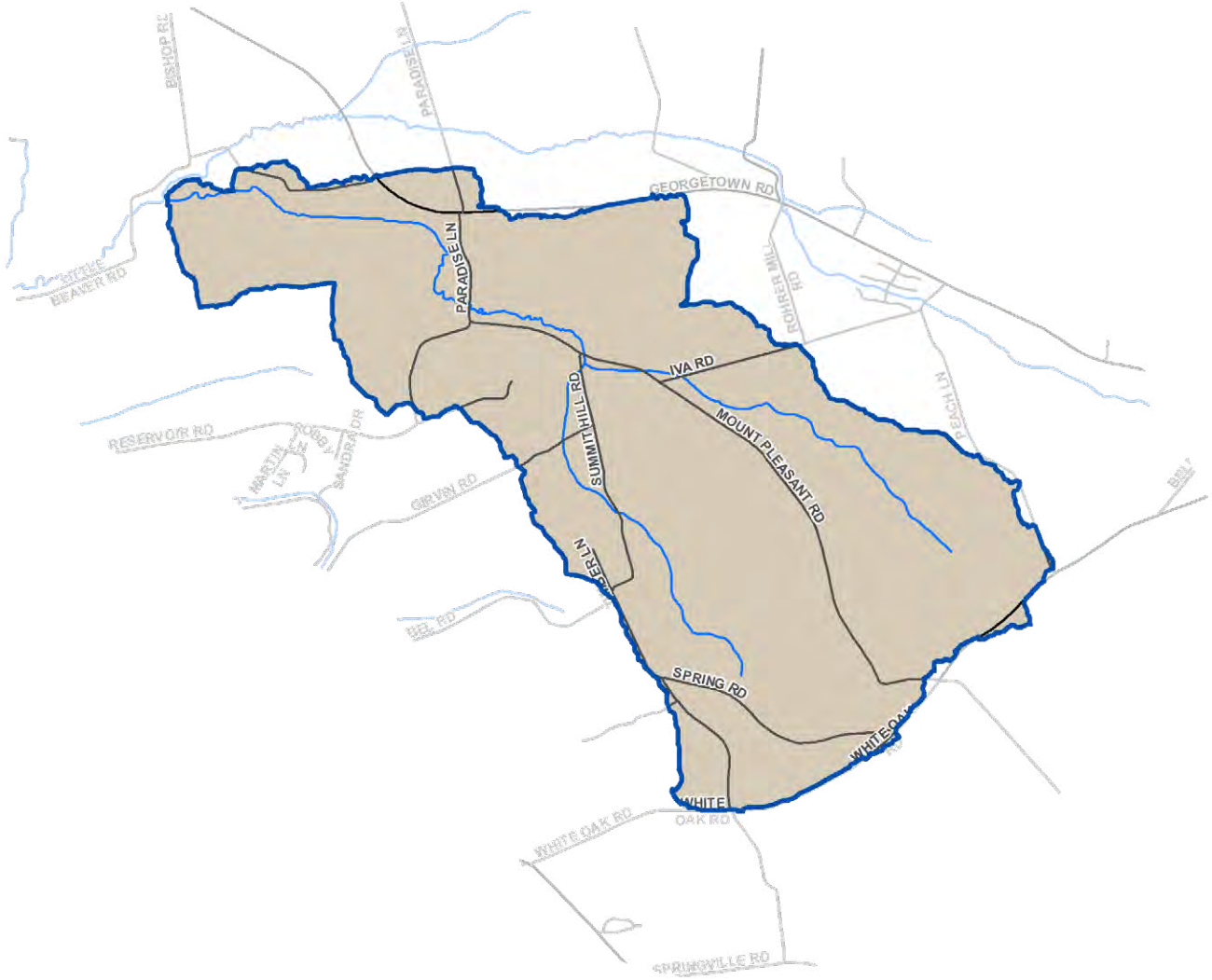
Big Beaver Creek (Upper)			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	287.4 Acres	80%	102.8	0.3	0.0
No Tillage	378.8 Acres	50%	118.5	0.1	-0.1
Nutrient Management	429.3 Acres	75%	0.0	0.1	3.8
Animal Waste Management	796 AUs	60%	0.0	0.1	0.7
Forested Buffers	1.3 Miles	35%	102.5	0.1	2.0
Stream Fencing	2.1 Miles	30%	14.1	0.1	0.2
Streambank Stabilization	0.4 Miles	5%	34.6	0.0	0.1
Legacy Sediment	0.08 Miles	1%	135.3	0.2	0.2
Scenarios			Loading (Tons)		
Total Proposed Reduction			507.9	0.9	6.8
Current Loading			788.5	2.9	57.4
Proposed Loading			280.6	2.0	50.6
Loading Goal			304.6	1.5	34.6
Percent Above/Below Goal			8%	-33%	-46%

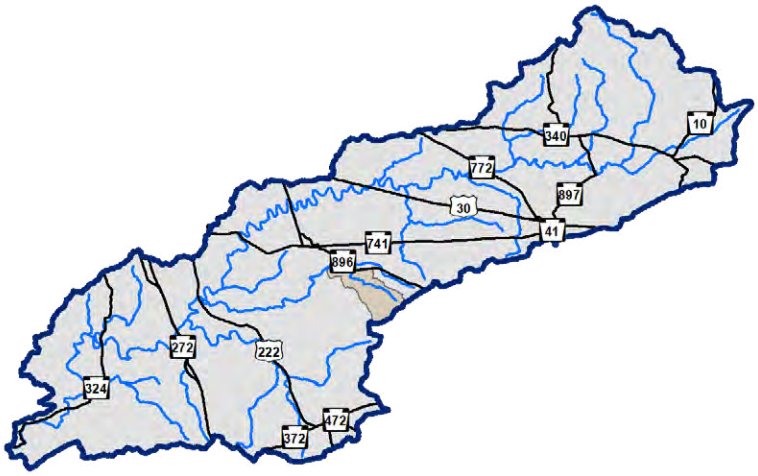


Big Beaver Creek (Upper)					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	287.4 Acres	$47.35/ac/yr	10	$136,095	$0.07	$24.65	-
No Tillage	378.8 Acres	$19.21/ac/yr	10	$72,761	$0.03	$33.15	-
Nutrient Management	429.3 Acres	$22.31/ac/yr	10	$95,782	-	$51.91	$1.25
Planning		$17.73/ac	1	$7,611	-	-	-
Maintenance		$20.54/au/yr	10	$88,171	-	-	-
Animal Waste Management	796 AUs	$117.07/au/yr	10	$931,980	-	$459.00	$69.65
Planning		$901.09/au	1	$717,353	-	-	-
Maintenance		$26.96/au/yr	10	$214,627	-	-	-
Forested Buffers	1.3 Miles	$10,985/mi/yr	10	$138,672	$0.07	$99.40	$3.53
Planning		$49,241/mi	1	$62,163	-	-	-
Maintenance		$6,061/mi/yr	10	$76,509	-	-	-
Stream Fencing	2.1 Miles	$19,958/mi	1	$41,998	$0.15	$31.89	$13.39
Streambank Stabilization	0.4 Miles	$1,995,840/mi	1	$733,704	$1.06	$1,049.69	$428.32
Legacy Sediment	0.08 Miles	$1,848,000/mi	1	$147,840	$0.05	$47.51	$37.77
Total	-	$229,883/yr	10	$2,298,832	$0.23	$57.63	$2.06

TIER II: LITTLE BEAVER CREEK (UPPER)

Selection Criteria: Near Delisting, Healthy Headwaters
Region: Beaver Valleys
Area: 2.2 Square Miles, 4.3 Stream Miles



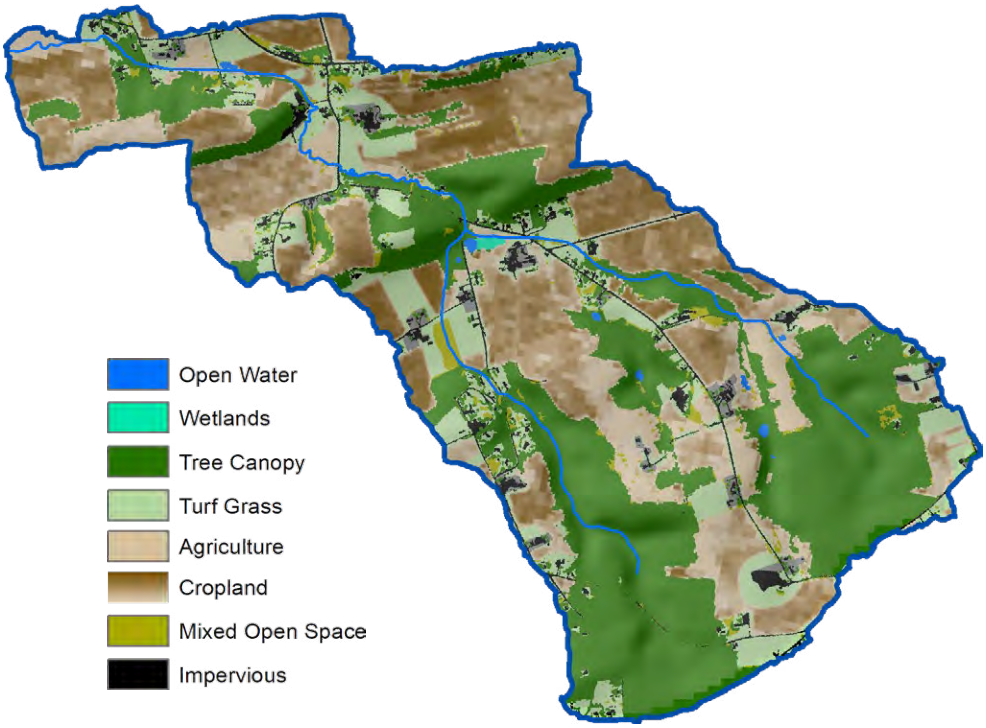


Overview

Located to the southeast of Strasburg, the upper portions of the Little Beaver Creek Watershed extend from the stream's headwaters to the confluence with Calamus Run. From the base of the watershed, the main stem extends 1.8 miles, at which point it forks with an unnamed tributary of roughly equal size. This southwestern tributary is listed as unimpaired, with a relatively high IBI score of 58.3. Nearly half of the stream miles within the watershed have forested buffers, and multiple agricultural BMPs exceed 50% implementation. Though these portions are not stocked, all stream segments are designated as TSF under Chapter 93. Bank erosion is minimal in the watershed. Agricultural uses are dispersed fairly evenly throughout the watershed, in nearly equal proportion to forested areas. Despite accounting for less than 40% of the land, though, three quarters of the sediment entering the streams comes from agriculture. Overall, the watershed sits on a tipping point in terms of impairment, and strategic restoration efforts hold the realistic prospect of delisting the upper portions of the Little Beaver Creek in the near term, especially in the areas immediately below the headwaters. An additional benefit is that at 2.2 square miles, this represents the smallest of the priority restoration areas, affording smaller scale efforts proportionately bigger impacts.

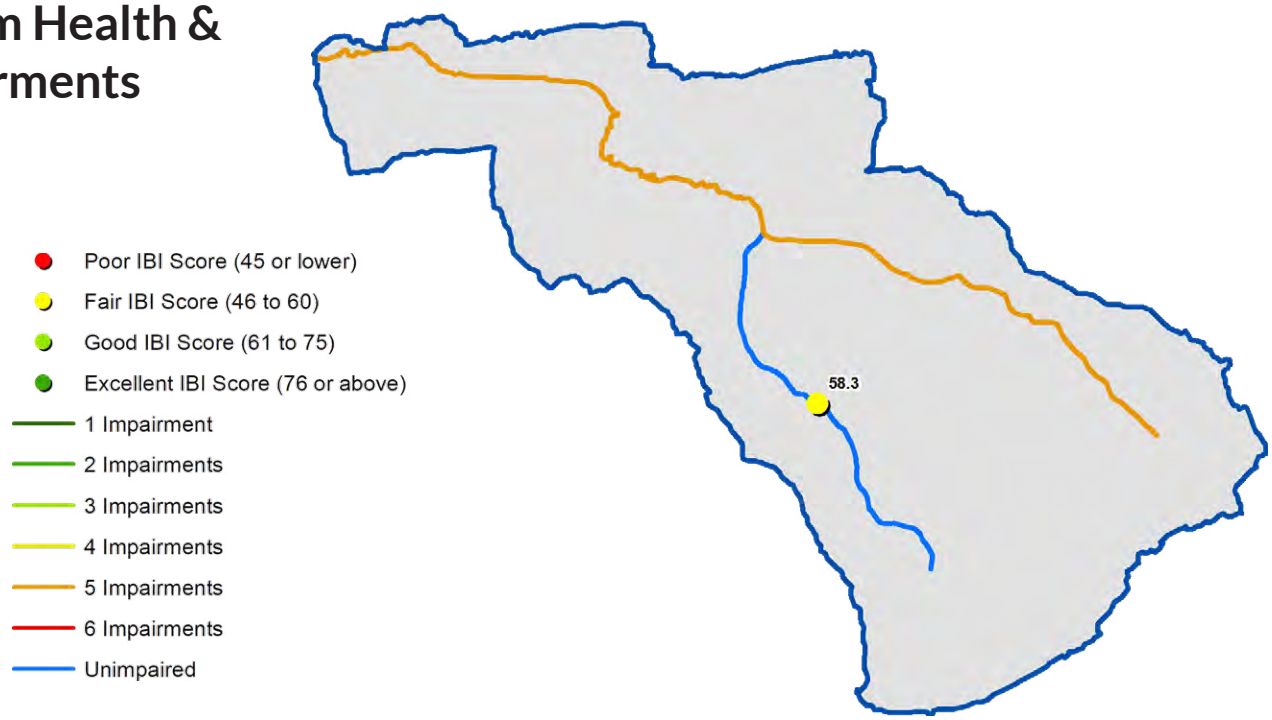
Land Cover & Loading

With the exception of the forested headwater areas (particularly along the unnamed tributary), land uses are much more evenly distributed than in the other priority restoration watersheds. Residential uses are at a very low level of density, comprising mostly large lot development. Though these uses account for nearly a quarter of the land, though their impacts on loading are negligible. Practically all of the sediment loading in the watershed can be attributed to either agriculture or bank erosion. 87% of phosphorus loading is attributable to agriculture (including livestock and fowl) as well. Not surprisingly, agriculture holds the keys to delisting.



Little Beaver Creek (Upper)		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	265.9 Acres	19%	20.7	8%	0.0	3%	0.1	0%
Cropland	267.3 Acres	19%	174.3	66%	0.1	11%	0.5	2%
Combined Agriculture	533.3 Acres	38%	195.0	74%	0.2	13%	0.6	3%
Wooded Areas	508.4 Acres	36%	1.1	0%	0.0	0%	0.0	0%
Wetlands	1.6 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	41.7 Acres	3%	1.8	1%	0.0	0%	0.0	0%
Low-Density Mixed	18.2 Acres	1%	0.0	0%	0.0	0%	0.0	0%
Medium-Density Mixed	7.6 Acres	1%	0.0	0%	0.0	0%	0.0	0%
High-Density Mixed	56.6 Acres	4%	0.0	0%	0.0	0%	0.0	0%
Low-Density Open Space	245.1 Acres	17%	0.0	0%	0.0	0%	0.0	0%
Animals	901 AUs	N/A	0.0	0%	0.9	74%	3.6	16%
Stream Banks	4.3 Miles	N/A	65.8	25%	0.0	1%	0.0	0%
Groundwater	N/A	N/A	0.0	0%	0.1	11%	17.4	80%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

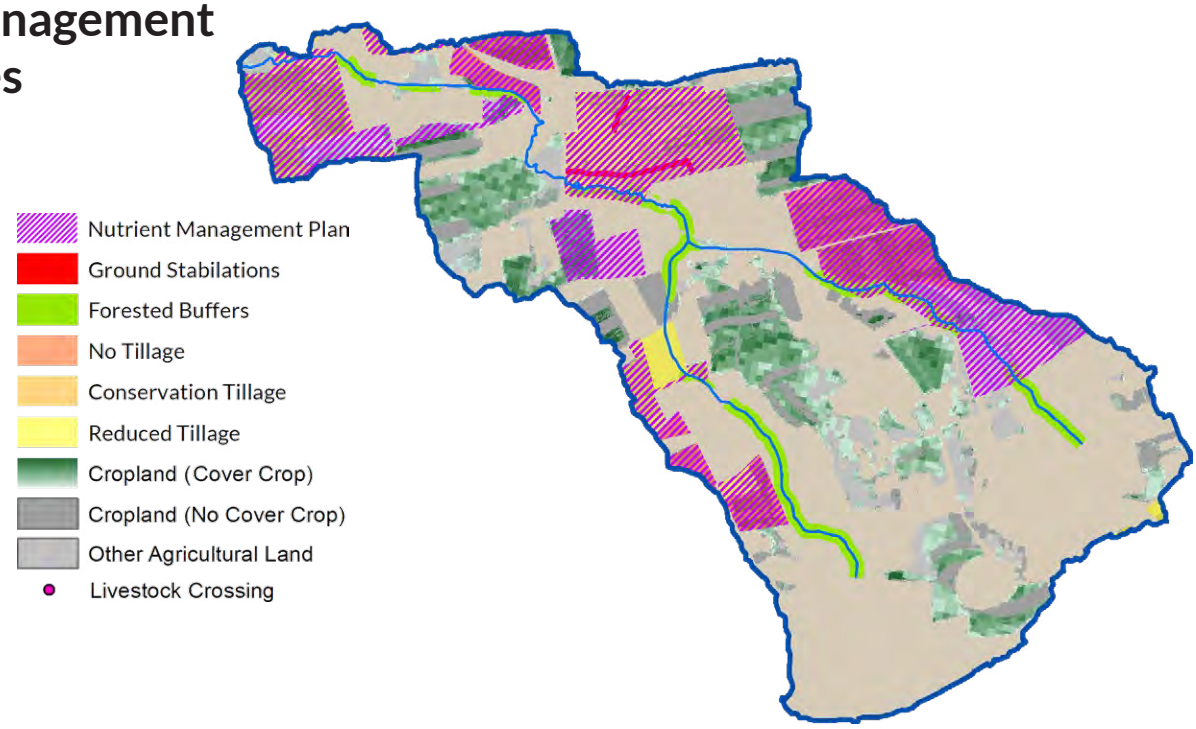
Stream Health & Impairments



Little Beaver Creek (Upper) - Eastern Branch and Main Stem (2 NHD Segments, 3.1 Miles)	
Agricultural Sources	Habitat Modification Sources
Organic Enrichment	Habitat Alterations
Nutrients	Siltation
Siltation	

Little Beaver Creek (Upper) - Western Branch (1 NHD Segment, 1.2 Miles)	
Agricultural Sources	Habitat Modification Sources
Unimpaired	Unimpaired

Best Management Practices

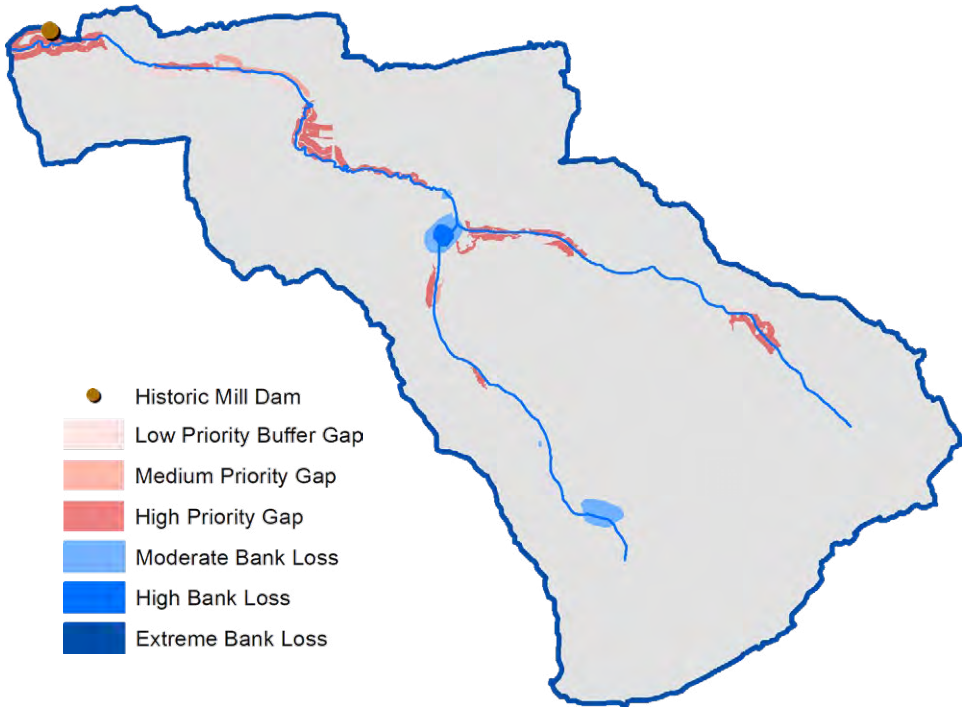


The implementation of both cover crops and nutrient management each exceed 50% of the watershed's cropland and various tillage management practices account for 44%. Other agricultural BMPs such as stream fencing and animal waste management lag in adoption. Though these numbers are respectable, given the outsized role played by agriculture within the watershed, significant increases are required to bring sediment and nutrient loads into check. A particular area of concern lies between the headwaters of the main branch and its tributary. Here, other than cover crops, no agricultural BMPs are in place. Farther downstream, more BMPs are in place. However, impacts of a few agricultural areas directly adjacent to the stream are not being mitigated. Given the high degree of BMP implementation on neighboring farms, there may be an opportunity to capitalize on that momentum via community outreach.

Little Beaver Creek (Upper)				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	157.8 Acres	59%	108.9 Acres	38.0	0.1	0.0
No Tillage	51.1 Acres	19%	215.6 Acres	70.4	0.1	0.0
Conservation Tillage	0.0 Acres	0%	148.5 Acres	44.3	0.1	-0.1
Reduced Tillage	67.1 Acres	25%	148.5 Acres	34.0	0.0	-0.1
Nutrient Management	140.0 Acres	53%	126.7 Acres	0.0	0.1	1.0
Animal Waste Management	105 AUs	12%	88%	0.0	0.0	0.7
Forested Buffers	2.0 Miles	47%	2.3 Miles	88.6	0.1	2.2
Stream Fencing	0.2 Miles	6%	4.1 Miles	25.0	0.1	0.2
Streambank Stabilization	0.0 Miles	0%	4.3 Miles	226.0	0.2	0.5

Bank Loss and Vegetative Buffer Gaps

With the exception of one small area at the confluence with its tributary, the upper portion of the Little Beaver Creek Watershed has minimal bank loss, decreasing the efficacy of those projects. Historic mill dams do not seem to play a meaningful role. The buffer gaps are dispersed, owing largely to the fragmented land use in the area. All in all, the basin is a poor candidate for streambank stabilization and legacy sediment projects, but there is ample opportunity in the elimination of buffer gaps.



Nutrient/Sediment Loading & Targets

Little Beaver Creek (Upper)	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	370.9 Tons	263.7 Tons	139.9 Tons	47%
Phosphorus	1.4 Tons	1.2 Tons	0.7 Tons	42%
Nitrogen	23.1 Tons	21.7 Tons	16.1 Tons	27%

Recommendations

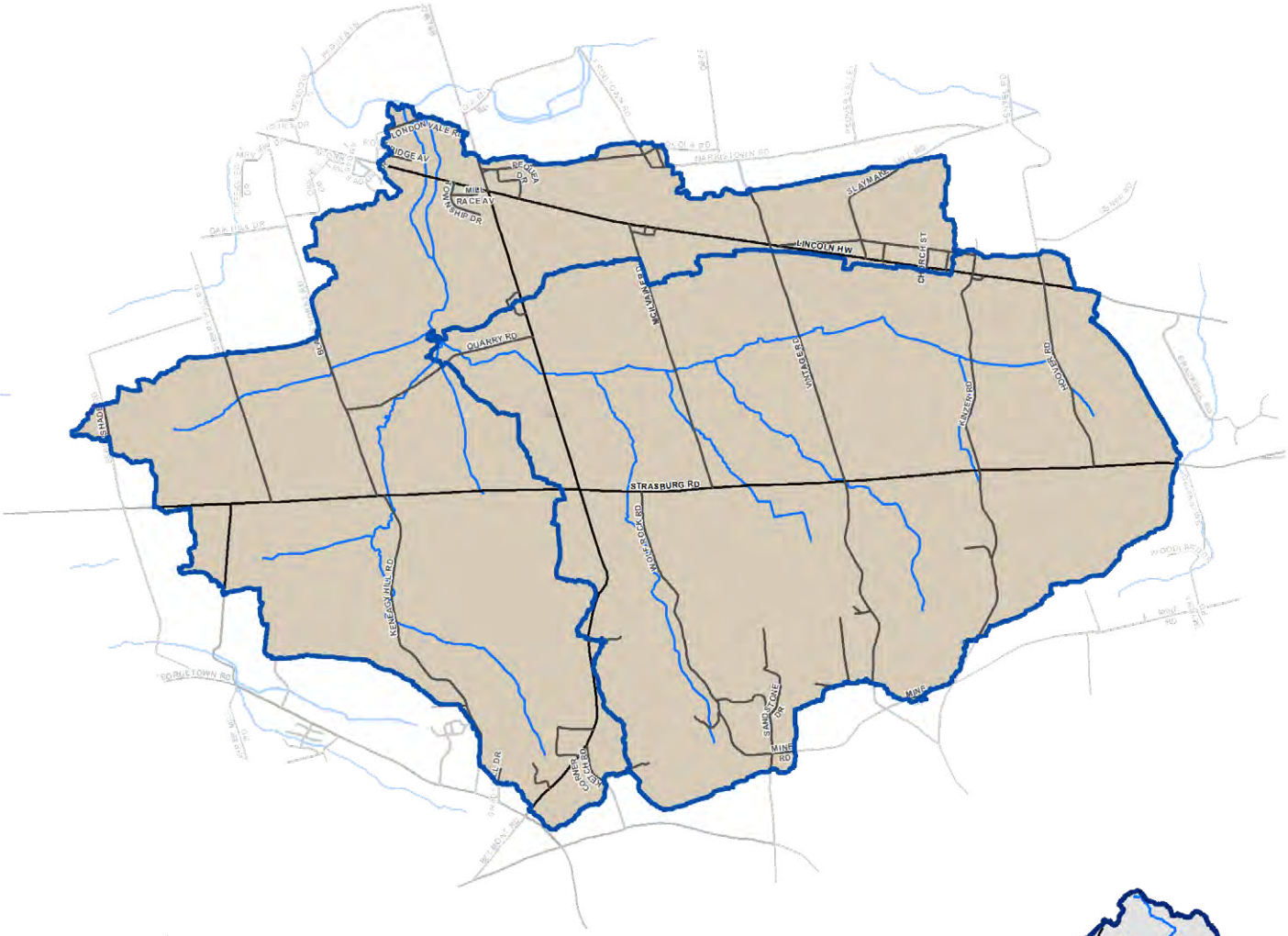
The upper Little Beaver Creek Watershed presents a unique challenge given the diffuse nature of its land use and BMP implementation. This lends work here to favor smaller, more discrete projects. One exception would be the dearth of agricultural BMPs in the southeastern area of the watershed, where aggressive efforts should be made to work with farmers. Bank stabilization and legacy sediment projects will have diminished universal impact here, and accordingly, should only be applied in targeted, high impact areas. Both in terms of cost and impact, the greatest efforts should instead be focused on agricultural BMPs and forested buffers. Efforts should be made to have nearly full implementation of cover crops. Additionally, greater adoption of tillage management, in particular no-till agriculture, should be a priority. Animal waste management and manure storage are beneficial, but should be considered secondary to other more cost-effective techniques. Outreach efforts utilizing local farmer partnerships would benefit these initiatives. Additional monitoring stations will be needed to gauge impacts, and have been proposed as part of the CAP process. Near-term delisting is an achievable goal in this basin.

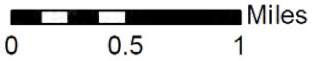
Little Beaver Creek (Upper)			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	87.1 Acres	80%	30.4	0.1	0.0
No Tillage	107.8 Acres	50%	35.2	0.0	0.0
Nutrient Management	95.0 Acres	75%	0.0	0.0	0.8
Animal Waste Management	478 AUs	60%	0.0	0.0	0.4
Forested Buffers	0.8 Miles	35%	31.0	0.0	0.8
Stream Fencing	1.2 Miles	30%	7.5	0.0	0.1
Streambank Stabilization	0.4 Miles	10%	22.6	0.0	0.1
Legacy Sediment	0.00 Miles	0%	0.0	0.0	0.0
Scenarios			Loading (Tons)		
Total Proposed Reduction			126.7	0.2	2.1
Current Loading			263.7	1.2	21.7
Proposed Loading			137.0	1.0	19.6
Loading Goal			139.9	0.7	15.9
Percent Above/Below Goal			2%	-37%	-23%

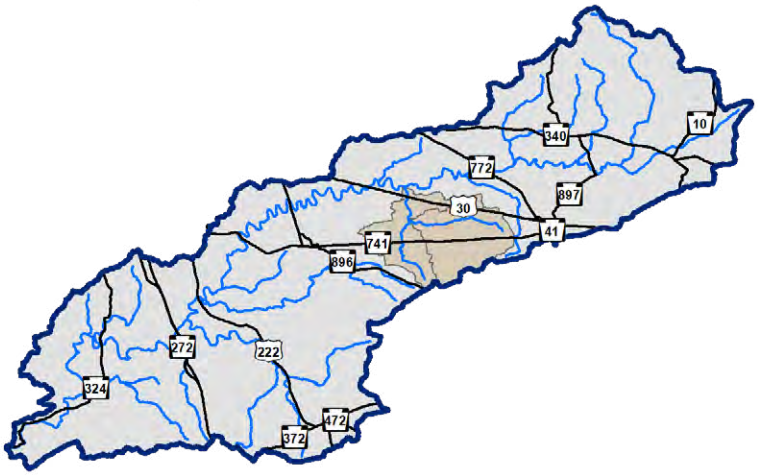
Little Beaver Creek (Upper)					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	87.1 Acres	$47.35/ac/yr	10	$41,261	$0.07	$24.99	$599.87
No Tillage	107.8 Acres	$19.21/ac/yr	10	$20,708	$0.03	$30.60	-
Nutrient Management	95.0 Acres	$22.31/ac/yr	10	$21,201	-	$27.34	$1.35
Planning		$17.73/ac	1	$1,685	-	-	-
Maintenance		$20.54/au/yr	10	$19,516	-	-	-
Animal Waste Management	478 AUs	$117.07/au/yr	10	$559,121	-	$1,164.43	$69.54
Planning		$901.09/au	1	$430,360	-	-	-
Maintenance		$26.96/au/yr	10	$128,761	-	-	-
Forested Buffers	0.8 Miles	$10,985/mi/yr	10	$87,187	$0.14	$208.47	$5.66
Planning		$49,241/mi	1	$39,083	-	-	-
Maintenance		$6,061/mi/yr	10	$48,104	-	-	-
Stream Fencing	1.2 Miles	$19,958/mi	1	$24,369	$0.16	$60.01	$16.32
Streambank Stabilization	0.4 Miles	$1,995,840/mi	1	$861,201	$1.90	$2,148.71	$849.39
Legacy Sediment	0.00 Miles	$1,848,000/mi	1	$0	-	-	-
Total	-	$161,505/yr	10	$1,615,047	$0.38	$84.15	$4.06

TIER II: ESHLEMAN & LONDONLAND RUNS

Selection Criteria: Healthy Headwaters, Region: Central Pequea
Area: 4.8 Square Miles, 7.4 Stream Miles (Eshleman Run)
5.9 Square Miles, 9.5 Stream Miles (Londonland Run)

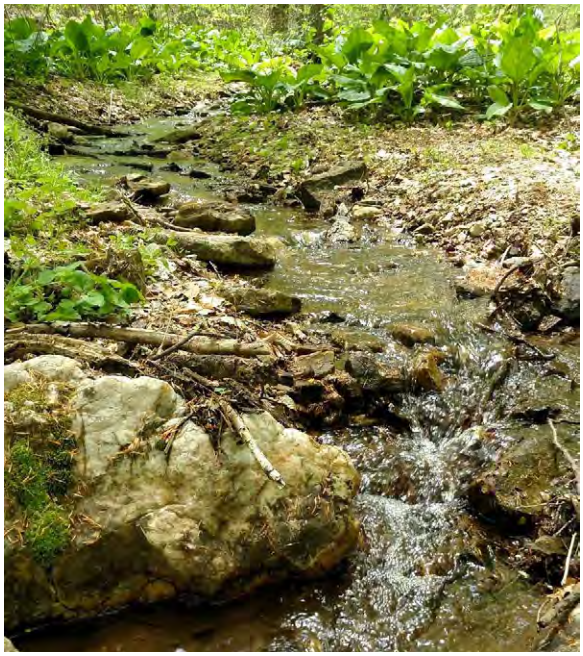




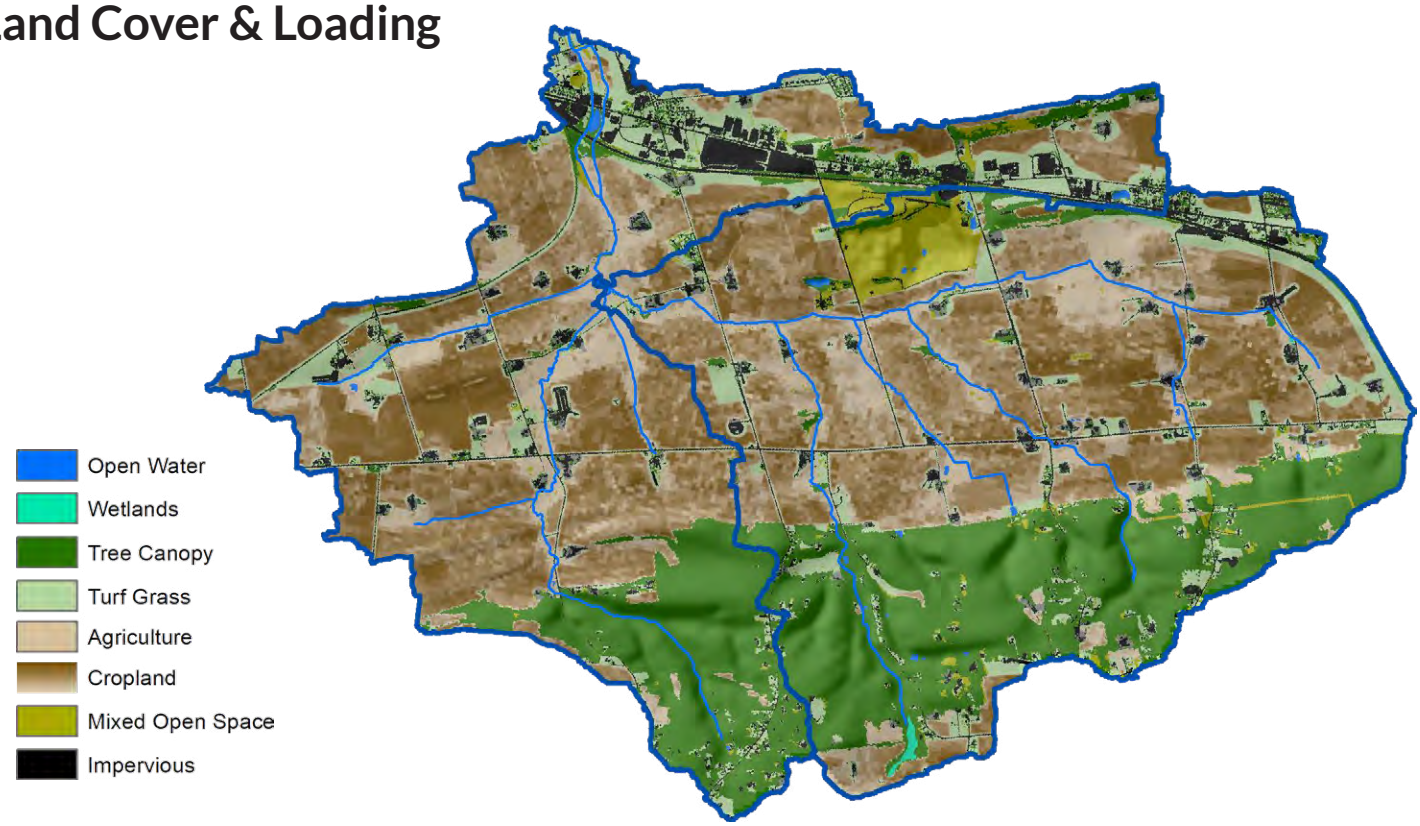


Overview

Eshleman and Londonland Runs form the western and eastern portions (respectively) of a single drainage system. Though the stream formed at the confluence of the two branches is nominally Eshleman Run, Londonland Run drains nearly twice as much land above the merge point. The headwaters of the two streams (and several tributaries) are found on the ridge of metamorphic rock forming running south of and roughly parallel to PA-741. These upland areas are agriculturally marginal, and remain largely forested. To the north of the ridge, the topography and land use is quite different. Other than a large quarry and some urbanized development directly adjacent to US-30, agricultural uses comprise all but the entirety of the basins. Here, the gently rolling limestone plain affords deep, fertile soils, which have sustained area farms for centuries. In contrast to the headwaters, the legacy of agriculture has taken a significant toll on the two streams. Perhaps no better example demonstrates the contrast between these two landscapes than do the IBI scores for the upper and lower portions of Eshleman Run. In just over a mile, scores drop from 66.4 to 24.3. Given the magnitude of the problems in the lower portions of the watersheds and the myriad sources contributing to them, restoring the entirety of these areas will likely take decades of dedicated funding and effort. Though this is indeed a long-term goal, *complete delisting is not the reason for prioritizing these two watersheds*. Rather, these basins represent an opportunity to delist stream segments incrementally, working from the headwaters downward. Projects can build upon the health of headwater areas, moving sequentially into the valley, and delisting these smaller tributaries and headwaters. Ultimately, the initiative would move to the main stems farther downstream, though a realistic assessment would envision any delisting of these stream segments being a number of years in the future.



Land Cover & Loading

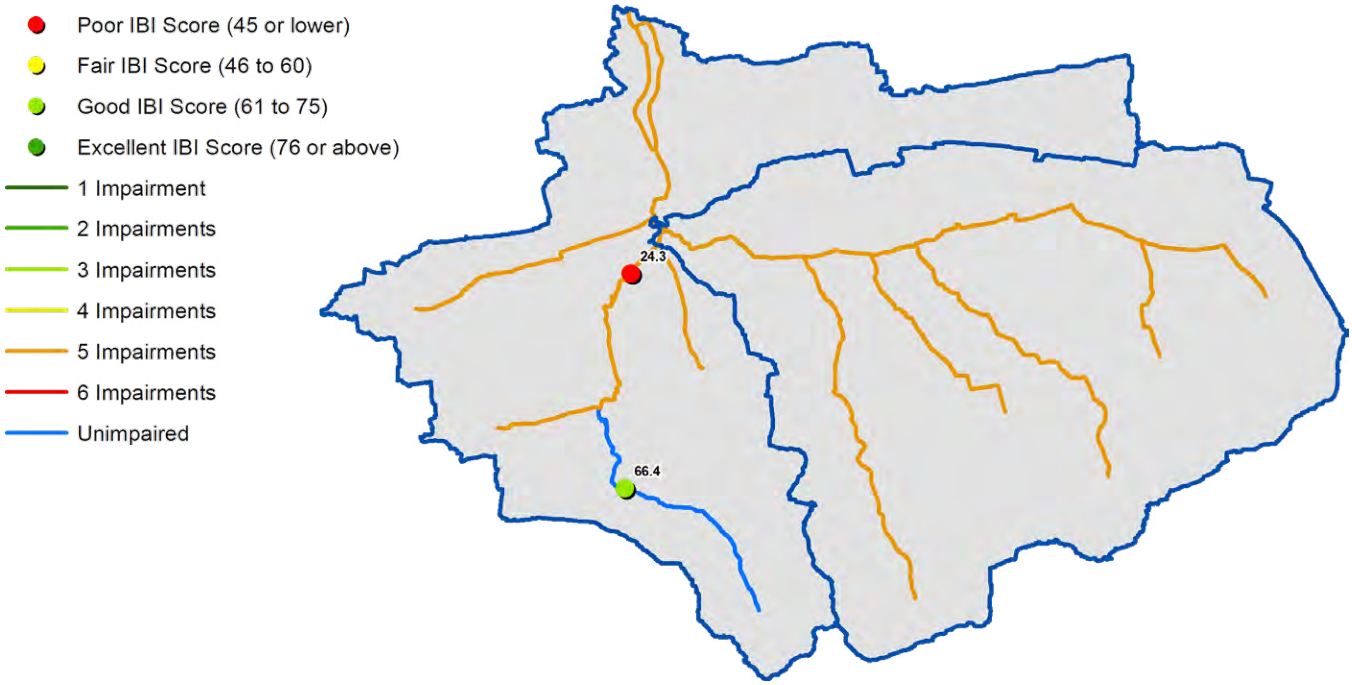


The greater Eshleman Run and Londonland Run watersheds have the most segregated land uses of any of the priority restoration areas. The forests of the highlands give way to intensive agriculture, bounded to the north by a ribbon of development. This is an environment of monocultures, and it has a profound impact on the health of the watersheds' constituent streams. The headwaters are relatively pristine, protected by a rich forest canopy, including preserved land, such as the Homewood Nature Preserve. Below these forested areas, however, biological communities have, in essence, no respite from agricultural sediment and nutrients. This is compounded by a lack of any canopy, exacerbating thermal pollution and eliminating essential forage for macroinvertebrates. A large quarry is situated in the north-central portion of the watershed, and should be of minimal impact, given the nature of the streams' impairments.

Eshleman Run		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	635.4 Acres	21%	49.5	5%	0.1	2%	0.2	0%
Cropland	1,008.5 Acres	33%	840.6	79%	0.8	24%	3.0	6%
Combined Agriculture	1,643.9 Acres	53%	890.1	83%	0.8	26%	3.2	6%
Wooded Areas	498.6 Acres	16%	0.8	0%	0.0	0%	0.0	0%
Wetlands	0.1 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	81.1 Acres	3%	2.8	0%	0.0	0%	0.0	0%
Low-Density Mixed	35.8 Acres	1%	0.1	0%	0.0	0%	0.0	0%
Medium-Density Mixed	15.9 Acres	1%	0.2	0%	0.0	0%	0.0	0%
High-Density Mixed	267.4 Acres	9%	2.8	0%	0.0	0%	0.1	0%
Low-Density Open Space	546.5 Acres	18%	1.3	0%	0.0	0%	0.0	0%
Animals	1,971 AUs	N/A	0.0	0%	2.0	62%	8.0	15%
Stream Banks	7.4 Miles	N/A	171.6	16%	0.0	1%	0.1	0%
Groundwater	N/A	N/A	0.0	0%	0.3	10%	41.8	78%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

Londonland Run		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	819.2 Acres	22%	65.0	7%	0.1	3%	0.3	0%
Cropland	1,034.4 Acres	27%	695.4	74%	0.5	16%	2.2	4%
Combined Agriculture	1,853.6 Acres	49%	760.4	81%	0.6	19%	2.5	4%
Wooded Areas	948.0 Acres	25%	1.7	0%	0.0	0%	0.0	0%
Wetlands	5.7 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	191.6 Acres	5%	6.3	1%	0.0	0%	0.1	0%
Low-Density Mixed	57.4 Acres	2%	0.1	0%	0.0	0%	0.0	0%
Medium-Density Mixed	17.6 Acres	0%	0.1	0%	0.0	0%	0.0	0%
High-Density Mixed	183.1 Acres	5%	1.1	0%	0.0	0%	0.0	0%
Low-Density Open Space	531.1 Acres	14%	0.7	0%	0.0	0%	0.0	0%
Animals	2,417 AUs	N/A	0.0	0%	2.4	70%	9.4	16%
Stream Banks	9.5 Miles	N/A	173.9	18%	0.0	1%	0.1	0%
Groundwater	N/A	N/A	0.0	0%	0.3	10%	44.6	79%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

Stream Health & Impairments



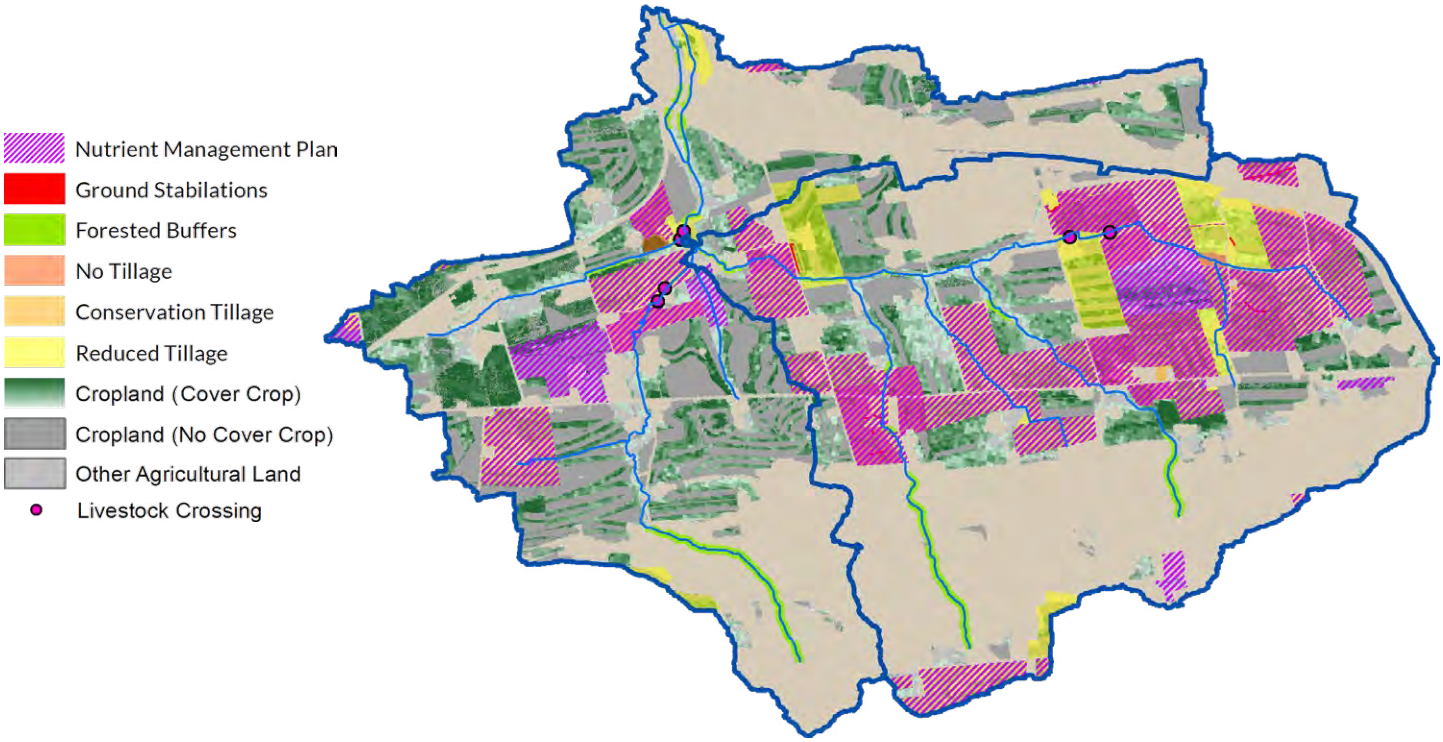
Eshleman Run - Upstream Portions (1 NHD Segment, 1.6 Miles)	
Agricultural Sources	Habitat Modification Sources
Unimpaired	Unimpaired

Eshleman Run - Downstream Portions (11 NHD Segments, 6.0 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	Siltation
Organic Enrichment/Low Dissolved Oxygen	

Londland Run - Entire Watershed (13 NHD Segments, 9.3 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	Siltation
Organic Enrichment/Low Dissolved Oxygen	

As noted, below the headwaters, the streams in these two watersheds are severely impaired. The IBI score of 24.3 near their confluence is emblematic of this. Though the entirety of the Londonland Run Watershed is listed as being impaired, headwaters are likely in attainment, obscured by the fact that entire tributaries are represented by a single stream segment for analysis. (This is especially probable for the westernmost tributary to Londonland Run.) This will need to be examined in greater detail in assessing the impacts of restoration activities. Targeting specific tributaries and focusing on their complete delisting may, however, render this moot. Interestingly, despite their degraded states, all streams in these watersheds are classified as CWF under Chapter 93.

Best Management Practices

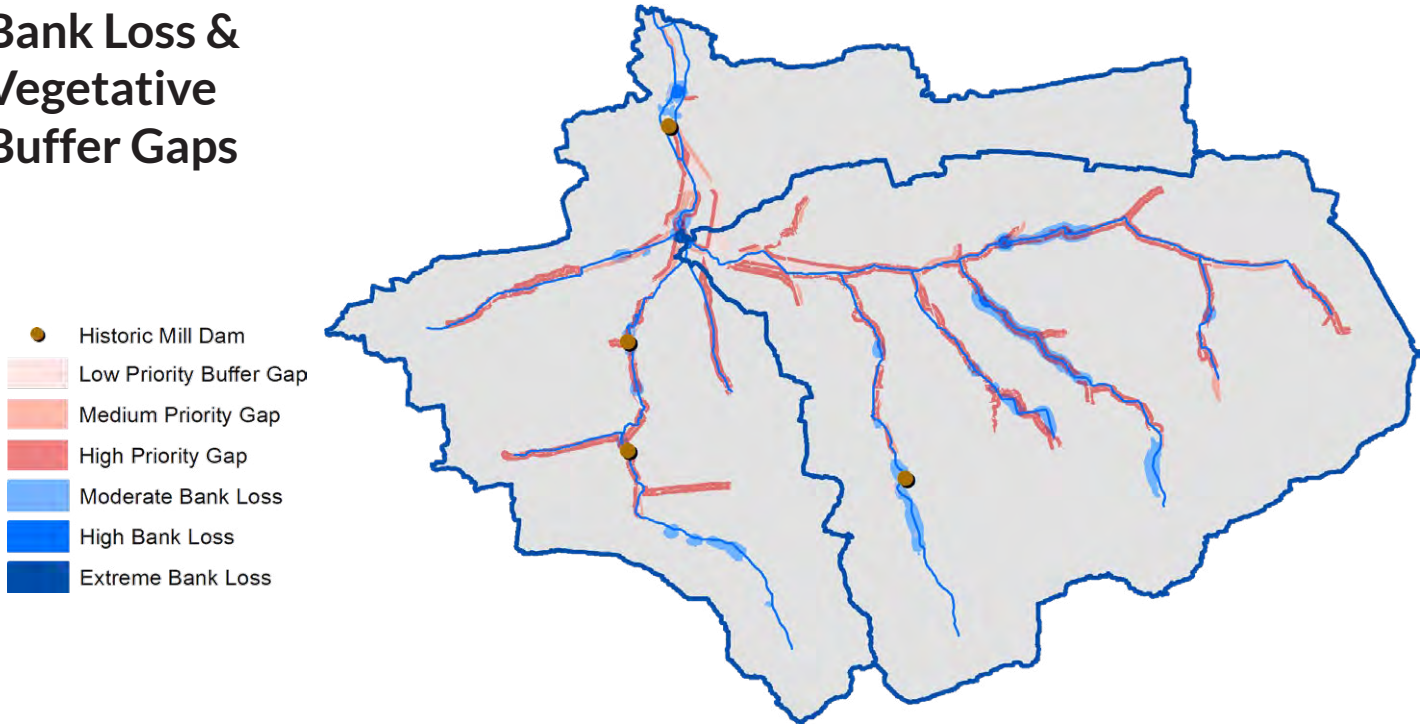


Eshleman Run				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	513.9 Acres	51%	492.6 Acres	181.6	0.6	0.0
No Tillage	15.0 Acres	1%	991.4 Acres	396.1	0.3	-0.4
Conservation Tillage	0.0 Acres	0%	906.4 Acres	285.8	0.3	-0.4
Reduced Tillage	85.0 Acres	8%	906.4 Acres	219.2	0.2	-0.4
Nutrient Management	145.7 Acres	14%	860.8 Acres	0.0	0.3	6.4
Animal Waste Management	76 AUs	4%	96%	0.0	0.3	1.6
Forested Buffers	1.4 Miles	20%	5.9 Miles	448.6	0.3	7.9
Stream Fencing	0.9 Miles	12%	6.5 Miles	57.4	0.3	0.5
Streambank Stabilization	0.0 Miles	0%	7.4 Miles	959.5	1.1	2.9

Londonland Run				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	595.2 Acres	58%	436.0 Acres	160.5	0.4	0.1
No Tillage	79.9 Acres	8%	951.3 Acres	265.9	0.2	-0.1
Conservation Tillage	140.0 Acres	14%	441.6 Acres	139.4	0.2	-0.1
Reduced Tillage	369.7 Acres	36%	441.6 Acres	106.9	0.1	-0.1
Nutrient Management	512.7 Acres	50%	518.5 Acres	0.0	0.2	3.8
Animal Waste Management	544 AUs	23%	77%	0.0	0.3	1.6
Forested Buffers	1.5 Miles	16%	8.1 Miles	369.9	0.2	9.4
Stream Fencing	1.7 Miles	18%	7.8 Miles	79.1	0.3	0.5
Streambank Stabilization	0.0 Miles	0%	9.5 Miles	815.4	0.8	2.2

The most notable absence in terms of BMPs is a near complete lack of forested buffers below the headwaters. Agricultural BMPs are also lacking, especially in Eshleman Run. Of notable concern is that this deficiency is extreme in the areas of Eshleman Run immediately below the headwaters. Other than scattered instances of cover crops, the stream runs nearly a mile without the benefit of any agricultural BMPs. Though some stream fencing, plantings, and cattle crossings have been added below this, these are insufficient to undo the damage upstream of them. Though less severe, lower portions of the westernmost tributary to Londonland Run are similarly "naked," the most glaring deficiency being a near total lack of trees in the riparian corridor. It will be key to bridge these gaps if progress is to be made in extending water quality from the headwaters downstream.

Bank Loss & Vegetative Buffer Gaps



As has been noted, the near complete lack of trees in the agricultural areas of the watersheds is the foremost concern. In essence, both watersheds represent what is, for all intents and purposes, a contiguous, 14-mile buffer gap. This is, by far, the most severe instance of buffer gaps in any of the priority restoration areas. Addressing this deficiency represents the crux of efforts to restore portions of this watershed. Bank loss is a problem of much lower severity in the watersheds, likely owing to relatively flat topography of the agricultural areas. That assessment, however, is purely relative, as bank losses seen here would be of significant note in other priority areas. Simply put, the shear magnitude of the absent buffers overshadows almost all other concerns. Streambank improvements, including both stabilizations and legacy sediment removals are certainly applicable here, and could provide substantial benefits, particularly in lowland areas with high rates of erosion. For better and for worse, there are no shortage of opportunities.

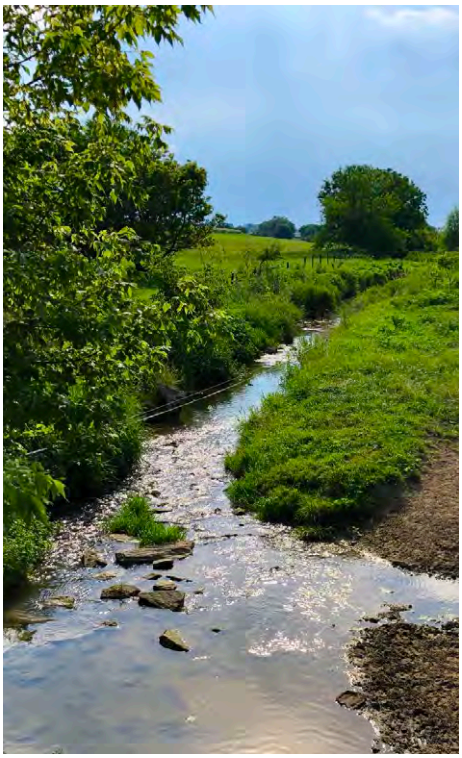
Nutrient/Sediment Loading & Targets

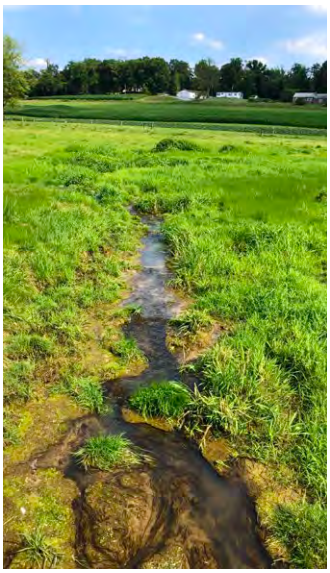
Eshleman Run	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,309.8 Tons	1,068.3 Tons	309.3 Tons	71%
Phosphorus	3.7 Tons	3.2 Tons	1.5 Tons	53%
Nitrogen	54.5 Tons	53.3 Tons	34.8Tons	35%

Londonland Run	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,368.4 Tons	943.6 Tons	379.2 Tons	60%
Phosphorus	4.3 Tons	3.4 Tons	1.9 Tons	44%
Nitrogen	60.9 Tons	56.8 Tons	42.7 Tons	25%

Recommendations

The amount of expenditure to delist both of these watersheds, certainly in the near-term, is prohibitive. It is, however, reasonable to delist segments within these watersheds, given a strategic approach. The top two priorities for delisting are Eshleman Run above the confluence with Londonland Run and the westernmost tributary to Londonland Run. Given successes here, the third tributary from the west to Londonland Run would be the next element. Incremental work from the headwaters is the key to making this work, with a strong focus on riparian buffers. These efforts would be strongest in concert with agricultural BMPs targeting sediment, namely tillage management and cover crops. A scattered approach will squander resources and fail to achieve goals; precision targeting is key. BMPs directed toward nutrient elimination, animal waste management and storage in particular, will be important long-term, especially given countywide reduction goals, but are a secondary concern as it pertains to the proposed delisting strategy (outside of the incorporation of sediment-related BMPs in nutrient management). Farmer participation is critical to implementation. With nearly all of the land in this area under Amish ownership, engaging this community is essential. It is hoped that a community momentum can be built, with successful projects and practices encouraging neighbors to follow suit.





Eshleman Run			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	394.1 Acres	80%	145.2	0.5	0.0
No Tillage	495.7 Acres	50%	198.0	0.1	-0.2
Nutrient Management	645.6 Acres	75%	0.0	0.2	4.8
Animal Waste Management	1,137 AUs	60%	0.0	0.2	1.0
Forested Buffers	2.4 Miles	40%	179.4	0.1	3.1
Stream Fencing	2.3 Miles	35%	20.1	0.1	0.2
Streambank Stabilization	0.4 Miles	5%	48.0	0.1	0.1
Legacy Sediment	0.10 Miles	1%	169.2	0.2	0.2
Scenarios			Loading (Tons)		
Total Proposed Reduction			760.0	1.5	9.3
Current Loading			1,068.3	3.2	53.3
Proposed Loading			308.3	1.7	44.0
Loading Goal			309.3	1.5	34.8
Percent Above/Below Goal			0%	-16%	-26%

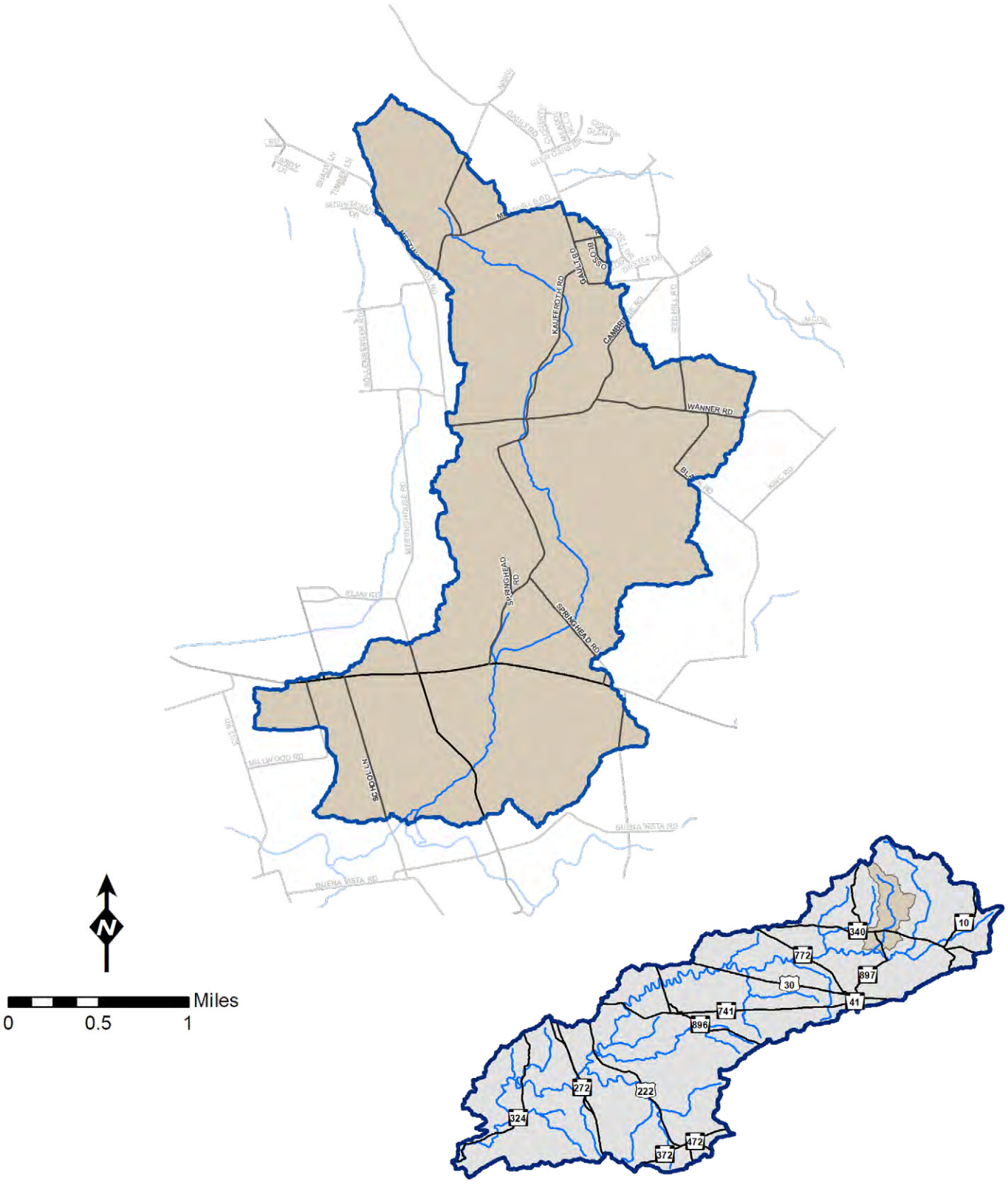
Eshleman Run					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	394.1 Acres	$47.35/ac/yr	10	$186,588	$0.06	$19.93	$377.84
No Tillage	495.7 Acres	$19.21/ac/yr	10	$95,226	$0.02	$31.88	-
Nutrient Management	645.6 Acres	$22.31/ac/yr	10	$144,049	-	$33.43	$1.50
Planning		$17.73/ac	1	$11,446	-	-	-
Maintenance		$20.54/au/yr	10	$132,603	-	-	-
Animal Waste Management	1,137 AUs	$117.07/au/yr	10	$1,331,006	-	$388.35	$69.56
Planning		$901.09/au	1	$1,024,487	-	-	-
Maintenance		$26.96/au/yr	10	$306,519	-	-	-
Forested Buffers	2.4 Miles	$10,985/mi/yr	10	$259,692	$0.07	$127.43	$4.13
Planning		$49,241/mi	1	$116,413	-	-	-
Maintenance		$6,061/mi/yr	10	$143,280	-	-	-
Stream Fencing	2.3 Miles	$19,958/mi	1	$45,124	$0.11	$21.58	$14.23
Streambank Stabilization	0.4 Miles	$1,995,840/mi	1	$734,382	$0.77	$694.63	$249.19
Legacy Sediment	0.10 Miles	$1,848,000/mi	1	$184,800	$0.05	$47.51	$37.77
Total	-	$298,087/yr	10	$2,980,868	$0.24	$85.57	$3.28

Londonland Run			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	348.8 Acres	80%	128.4	0.3	0.1
No Tillage	475.6 Acres	50%	132.9	0.1	0.0
Nutrient Management	388.9 Acres	75%	0.0	0.1	2.9
Animal Waste Management	1,184 AUs	60%	0.0	0.2	0.9
Forested Buffers	2.8 Miles	35%	129.5	0.1	3.3
Stream Fencing	2.7 Miles	35%	27.7	0.1	0.2
Streambank Stabilization	0.5 Miles	5%	40.8	0.0	0.1
Legacy Sediment	0.10 Miles	1%	169.2	0.2	0.2
Scenarios			Loading (Tons)		
Total Proposed Reduction			628.4	1.1	7.7
Current Loading			943.6	3.4	56.8
Proposed Loading			315.2	2.3	49.1
Loading Goal			379.2	1.9	42.7
Percent Above/Below Goal			17%	-19%	-15%

Londonland Run					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	348.8 Acres	$47.35/ac/yr	10	$165,145	$0.06	$26.57	$98.88
No Tillage	475.6 Acres	$19.21/ac/yr	10	$91,370	$0.03	$37.25	-
Nutrient Management	388.9 Acres	$22.31/ac/yr	10	$86,773	-	$30.28	$1.52
Planning		$17.73/ac	1	$6,895	-	-	-
Maintenance		$20.54/au/yr	10	$79,878	-	-	-
Animal Waste Management	1,124 AUs	$117.07/au/yr	10	$1,315,620	-	$420.72	$69.58
Planning		$901.09/au	1	$1,012,644	-	-	-
Maintenance		$26.96/au/yr	10	$302,976	-	-	-
Forested Buffers	2.8 Miles	$10,985/mi/yr	10	$309,842	$0.12	$209.69	$4.73
Planning		$49,241/mi	1	$138,893	-	-	-
Maintenance		$6,061/mi/yr	10	$170,949	-	-	-
Stream Fencing	2.7 Miles	$19,958/mi	1	$54,746	$0.10	$28.57	$14.89
Streambank Stabilization	0.5 Miles	$1,995,840/mi	1	$952,710	$1.17	$1,193.93	$435.87
Legacy Sediment	0.10 Miles	$1,848,000/mi	1	$184,800	$0.05	$47.51	$37.77
Total	-	$316,101/yr	10	$3,161,005	$0.28	$69.84	$3.12

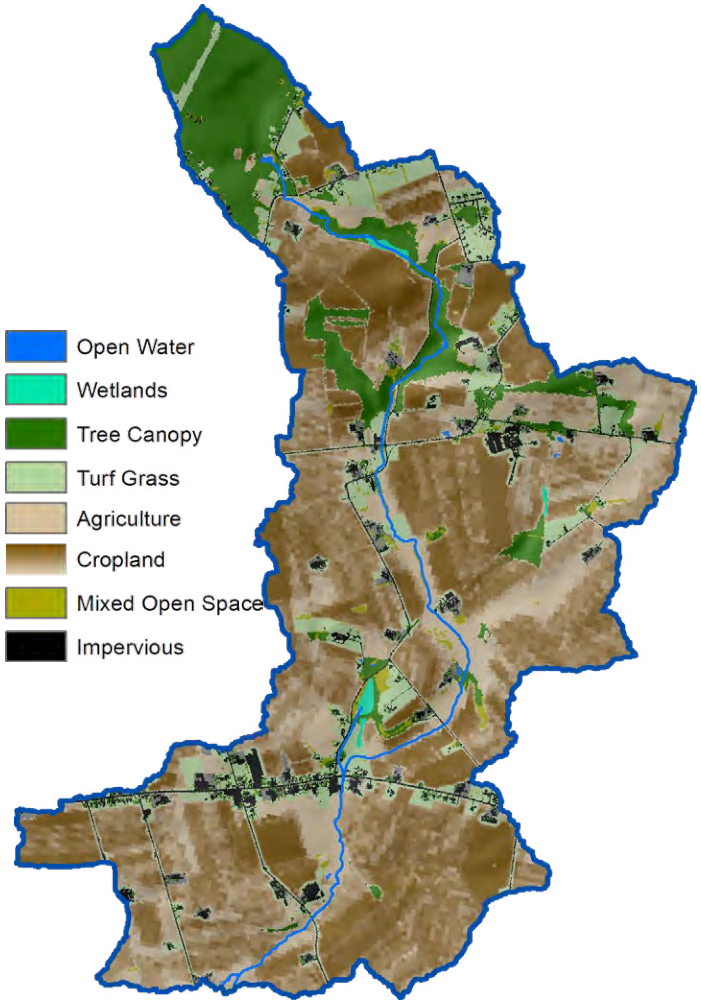
TIER II: WHITE HORSE RUN

Selection Criteria: Healthy Headwaters, Existing Initiative
Region: Pequea Headwaters
Area: 5.0 Square Miles, 5.2 Stream Miles



Overview

To say agriculture is a strong presence in White Horse Run would be an understatement. Farms dominate the landscape and the culture. For all agriculture provides here, a lack of BMPs, particularly on land adjacent to the stream, has caused a significant number of impairments. The stream, however, benefits from near contiguous buffers in its upper reaches. Unique among the priority areas, it is classified as a WWF under Chapter 93, lowering the impairment threshold. It is also located in an area of a intensive, targeted outreach to the agricultural community. A partnership of municipal, non-profit, and business leadership has set a goal of connecting with every farmer in the watershed, and working with them to incorporate conservation practices onto their land and into their operations. *Near-term delisting of the entire watershed is an unlikely outcome in light of the challenges facing White Horse Run*. However, given the condition of headwaters and strong, local conservation initiatives, strategic, incremental delisting, working downstream from White Horse Run's source, is certainly feasible.

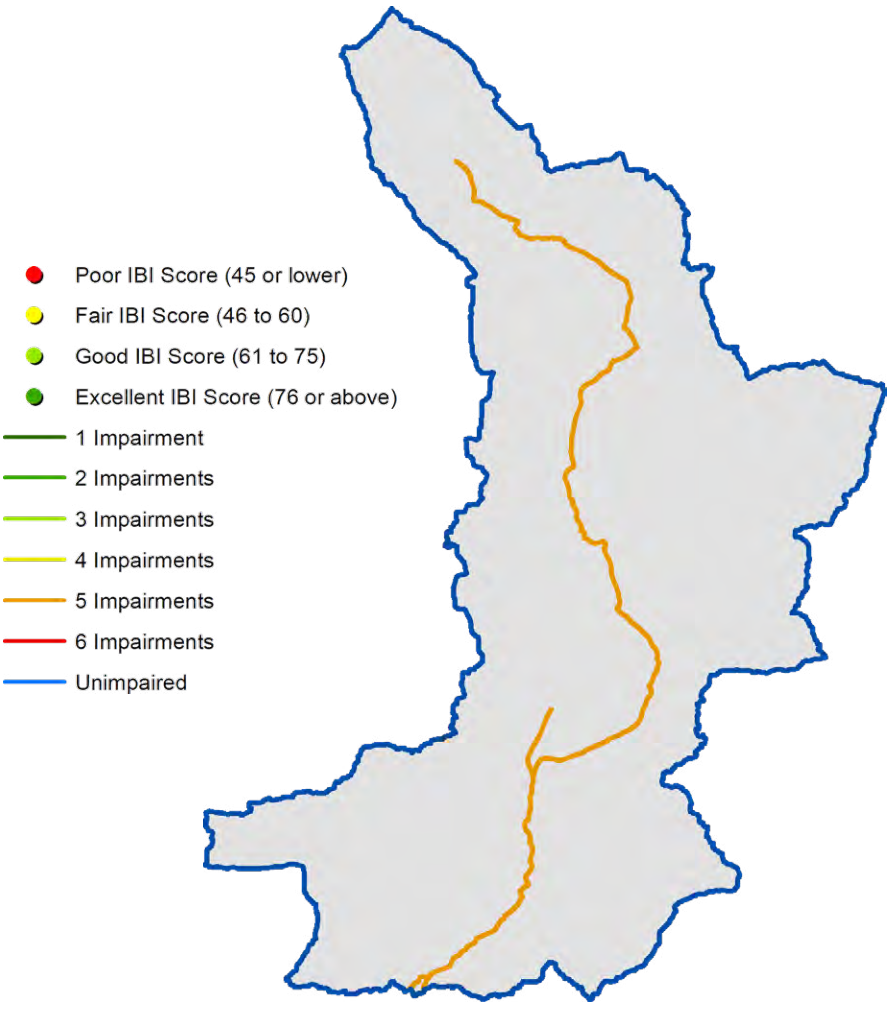


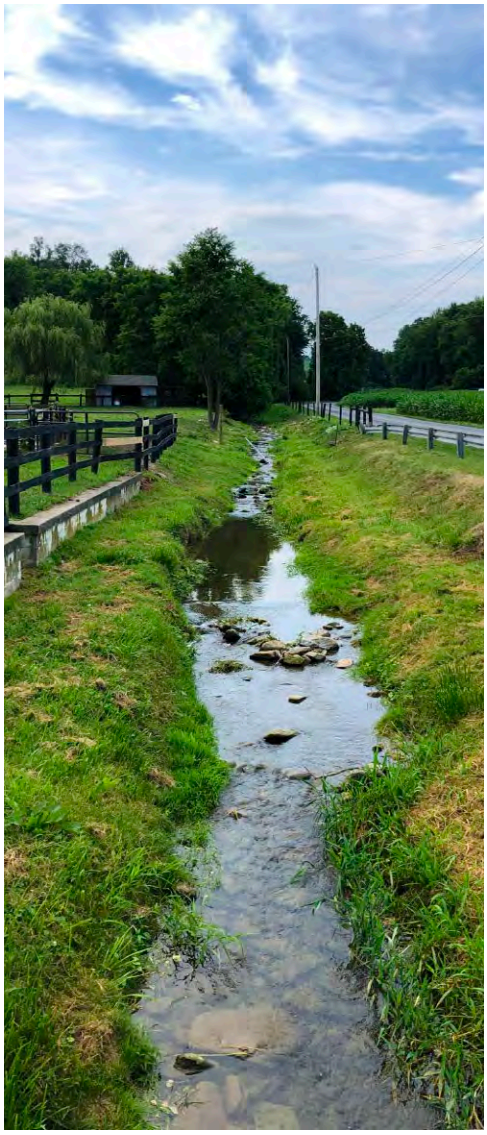
Land Cover & Loading

More than two thirds of the watershed is in agriculture. Combined with minimal forested areas (11%), found almost exclusively in the headwater areas, sediment is a substantial problem. Though the amount of forested land is small, it is located rather fortuitously in the northern half of the watershed, following the stream course from the Welsh Mountains down to Seldomridge Road. Small amounts of residential uses are scattered throughout the watershed but represent a negligible contributor to sediment and nutrient loading.

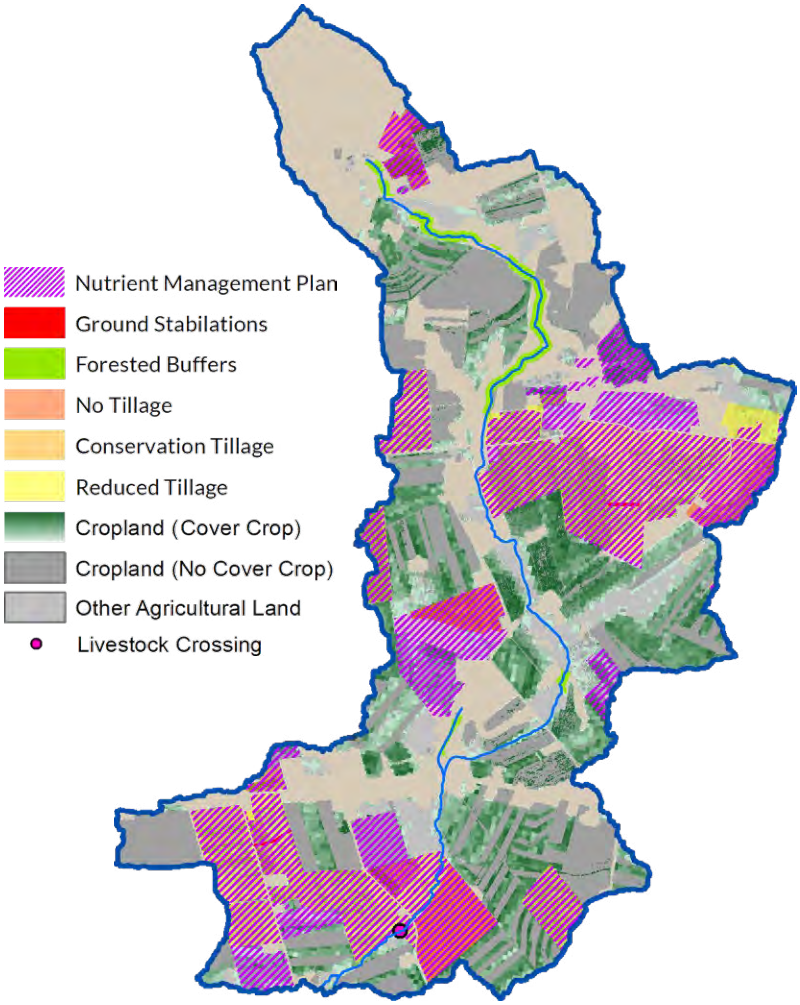
White Horse Run		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	911.1 Acres	29%	85.3	6%	0.1	4%	0.3	1%
Cropland	1,249.7 Acres	39%	1,130.0	84%	1.0	27%	3.0	6%
Combined Agriculture	2,160.9 Acres	68%	1,215.3	90%	1.1	31%	3.4	6%
Wooded Areas	359.7 Acres	11%	0.5	0%	0.0	0%	0.0	0%
Wetlands	11.8 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	66.2 Acres	2%	2.1	0%	0.0	0%	0.0	0%
Low-Density Mixed	48.0 Acres	2%	0.1	0%	0.0	0%	0.0	0%
Medium-Density Mixed	6.6 Acres	0%	0.0	0%	0.0	0%	0.0	0%
High-Density Mixed	131.4 Acres	4%	0.8	0%	0.0	0%	0.0	0%
Low-Density Open Space	391.3 Acres	12%	0.5	0%	0.0	0%	0.0	0%
Animals	2,026 AUs	N/A	0.0	0%	2.1	59%	8.3	16%
Stream Banks	5.2 Miles	N/A	124.9	9%	0.0	1%	0.1	0%
Groundwater	N/A	N/A	0.0	0%	0.3	9%	41.3	78%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

Stream Health & Impairments





White Horse Run - Entire Watershed (8 NHD Segments, 5.3 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	Siltation
Organic Enrichment/Low Dissolved Oxygen	

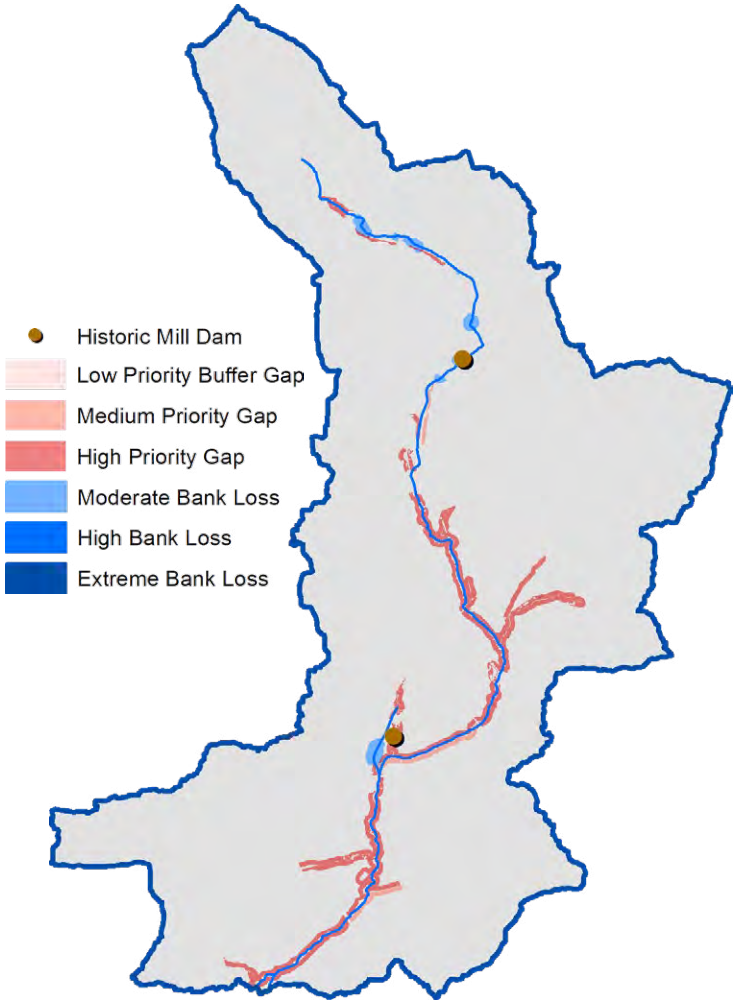


Best Management Practices

With sediment loads over four times the amount established under the TMDL, and agricultural uses accounting for 90% of this loading, it is imperative that agricultural BMPs be employed thoroughly in both scope and scale throughout the watershed. Though cover crops are found on roughly half of the watershed's cropland, greater adoption would be of significant benefit. Improved tillage practices are perhaps even more important, given the low level of implementation. Addressing the dearth of buffers in the lower portions of the watershed also stands to offer substantial nutrient and sediment reductions.

White Horse Run				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	648.4 Acres	52%	598.9 Acres	262.2	0.7	0.1
No Tillage*	93.4 Acres	7%	1,153.8 Acres	479.9	0.4	-0.2
Conservation Tillage	68.4 Acres	5%	839.2 Acres	314.6	0.4	-0.2
Reduced Tillage	246.3 Acres	20%	839.2 Acres	241.4	0.2	-0.2
Nutrient Management	447.1 Acres	36%	800.2 Acres	0.0	0.4	6.3
Animal Waste Management	174 AUs	9%	91%	0.0	0.4	1.6
Forested Buffers	1.3 Miles	24%	4.0 Miles	599.8	0.4	10.5
Stream Fencing	0.2 Miles	4%	5.0 Miles	60.0	0.4	0.6
Streambank Stabilization	0.0 Miles	0%	5.2 Miles	1175.2	1.3	2.9

Bank Loss & Vegetative Buffer Gaps



There are small, discrete areas of bank loss in the watershed, but their size and distribution render them ill-suited for legacy sediment removal. Buffer opportunities, on the other hand, abound throughout the basin. The lower two thirds of the watershed is nearly devoid of trees, and would be a prime location for new plantings.

Nutrient/Sediment Loading & Targets

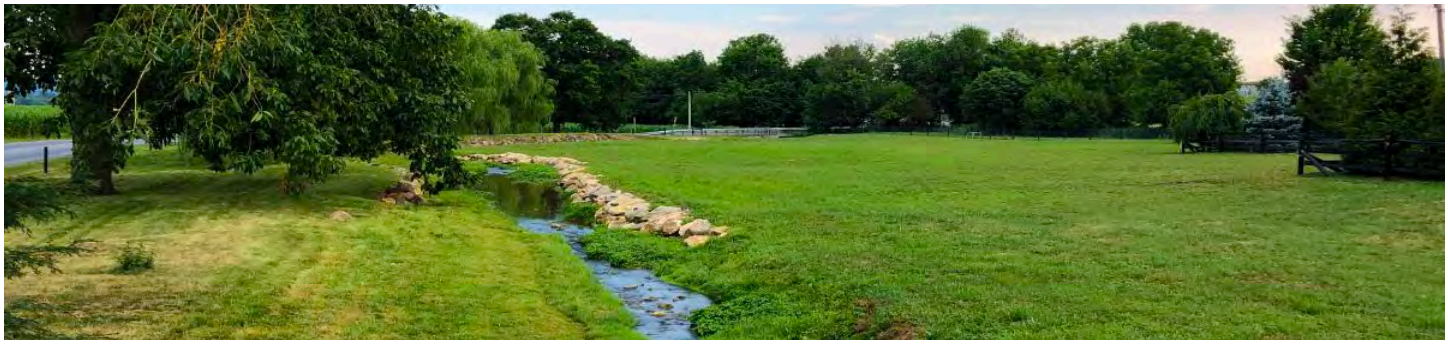
White Horse Run	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,775.6 Tons	1,343.7 Tons	317.9 Tons	76%
Phosphorus	4.5 Tons	3.6 Tons	1.6 Tons	56%
Nitrogen	56.6 Tons	53.1 Tons	35.8 Tons	33%

Recommendations

Given the strong community initiative in the watershed, a more aggressive approach to BMP implementation is proposed. It is hoped that current efforts will bear fruit, providing momentum not found elsewhere in the greater Pequea Creek Watershed. The most glaring deficit in this watershed is the lack of trees below Seldomridge Road. Roughly three miles of stream flow through an area all but devoid of forested buffers. This presents dire consequences for biological communities. For maximum effect, these will need to be paired with stream fencing and bank stabilization, where applicable. It is imperative that greater adoption of agricultural BMPs also take place, especially in areas adjacent to the stream. Cover crop and tillage management is the top priority in these locations, offering added benefits when incorporated into a greater nutrient management strategy. To maximize the impact, implementation should be focused on the headwaters downward. There are simply too many challenges to tackle the entire stream at once. No sites along White Horse Run have been analyzed for biological integrity, though all indications are that they would score low. Adding stations for collecting IBI data has been proposed at the county level to help better define the problem and assess progress. Following a strategic approach, incremental, near-term delisting of the upper portions of White Horse Run is a realizable goal, leading to complete delisting down the road.

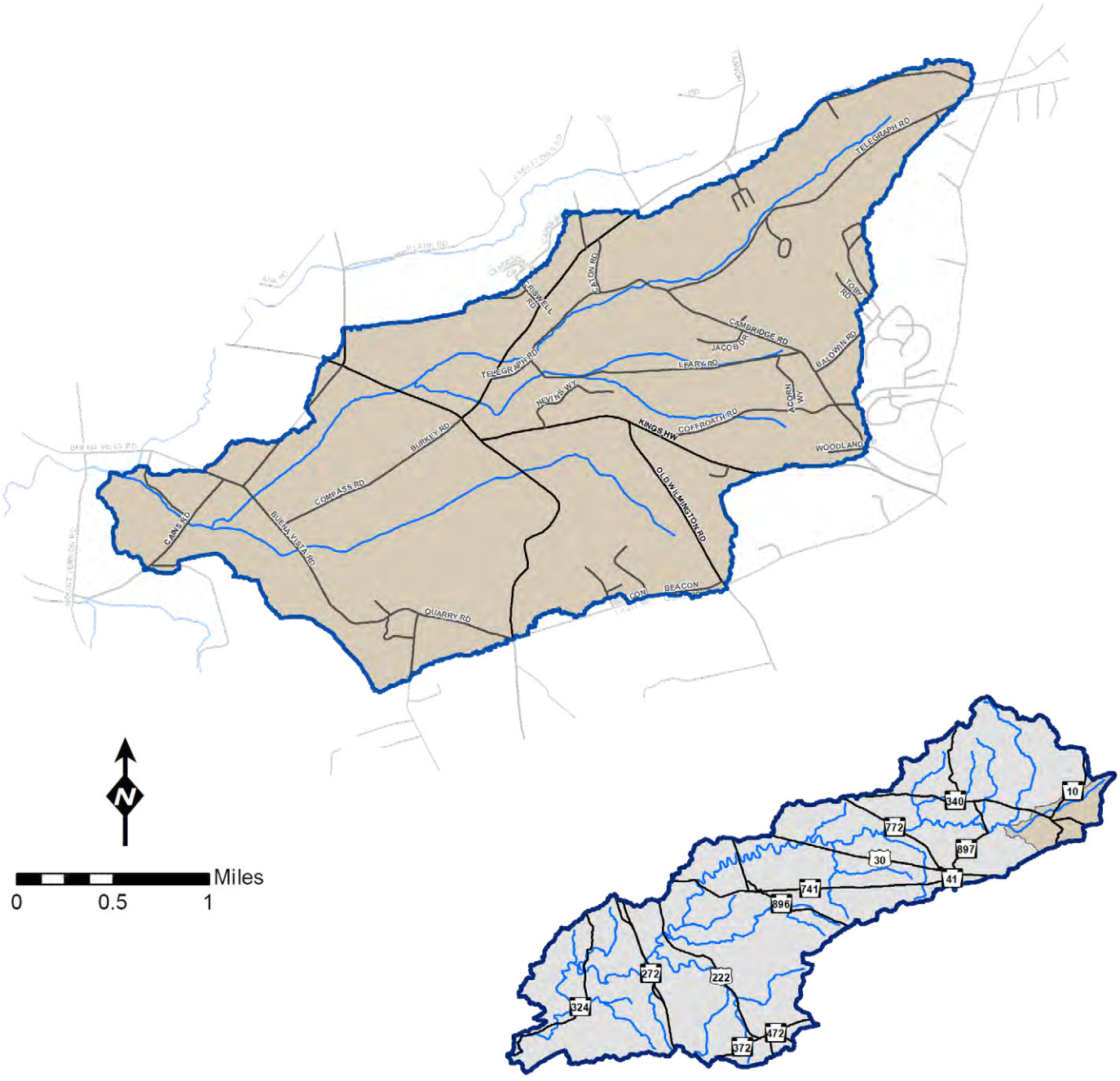
White Horse Run			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	539.0 Acres	90%	236.0	0.6	0.1
No Tillage	576.9 Acres	50%	240.0	0.2	-0.1
Nutrient Management	720.2 Acres	90%	0.0	0.3	5.6
Animal Waste Management	1,297 AUs	70%	0.0	0.3	1.1
Forested Buffers	2.4 Miles	60%	359.9	0.2	6.3
Stream Fencing	2.5 Miles	50%	30.0	0.2	0.3
Streambank Stabilization	0.5 Miles	10%	117.5	0.1	0.3
Legacy Sediment	0.00 Miles	0%	0.0	0.0	0.0
Scenarios			Loading (Tons)		
Total Proposed Reduction			983.3	2.0	13.7
Current Loading			1,343.7	3.6	53.1
Proposed Loading			360.4	1.6	39.4
Loading Goal			317.9	1.6	35.8
Percent Above/Below Goal			-13%	1%	-10%

White Horse Run					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	539.0 Acres	$47.35/ac/yr	10	$255,208	$0.05	$20.24	$100.96
No Tillage	576.9 Acres	$19.21/ac/yr	10	$110,826	$0.02	$28.59	-
Nutrient Management	720.2 Acres	$22.31/ac/yr	10	$160,694	-	$23.50	$1.43
Planning		$17.73/ac	1	$12,769	-	-	-
Maintenance		$20.54/au/yr	10	$147,926	-	-	-
Animal Waste Management	1,297 AUs	$117.07/au/yr	10	$1,518,053	-	$272.64	$68.53
Planning		$901.09/au	1	$1,168,458	-	-	-
Maintenance		$26.96/au/yr	10	$349,595	-	-	-
Forested Buffers	2.4 Miles	$10,985/mi/yr	10	$261,072	$0.04	$54.75	$2.07
Planning		$49,241/mi	1	$117,031	-	-	-
Maintenance		$6,061/mi/yr	10	$144,041	-	-	-
Stream Fencing	2.5 Miles	$19,958/mi	1	$50,330	$0.08	$12.38	$8.54
Streambank Stabilization	0.5 Miles	$1,995,840/mi	1	$1,046,798	$0.45	$391.73	$179.84
Legacy Sediment	0.00 Miles	$1,848,000/mi	1	$0	-	-	-
Total	-	$340,298/yr	10	$3,402,981	$0.24	$107.68	$4.17



TIER 2 - AREA 6: INDIAN SPRING RUN

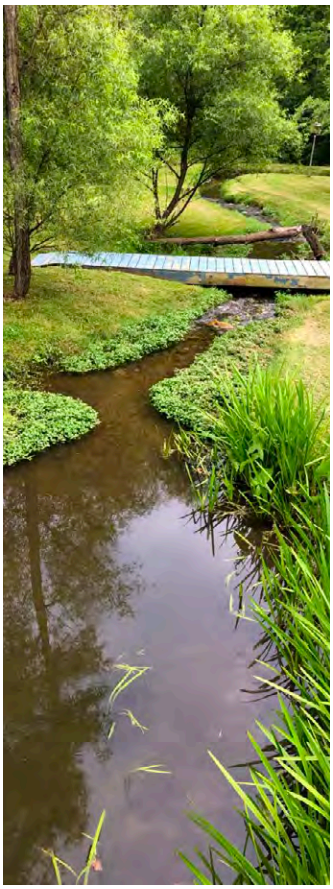
Selection Criteria: Near Delisting, Healthy Headwaters
Region: Pequea Headwaters
Area: 6.3 Square Miles, 11.2 Stream Miles



Overview

Initially, Indian Spring Run was considered for inclusion as a preservation watershed, not a restoration priority. Indeed, by many measures, Indian Spring Run is a very healthy stream. IBI scores in the watershed are notably high (upper 60s to upper 70s), and upper reaches of the watershed are listed as unimpaired. In these areas, there are 2.2 miles of HQ-CWF, and 3.1 miles of EV streams, boasting a population of wild brook trout. A significant portion (42%) of the watershed is wooded, a share which goes up in the headwater areas. Lower portions of the watershed, however, are not as healthy. In the downstream reaches of the stream, a number of impairments are listed. The landscape is dominated by agriculture, and much of the course lacks riparian buffers. It is this dichotomy that provides an opportunity. With targeted application of BMPs, the entirety of the watershed has the potential to be delisted in a relatively short period of time.

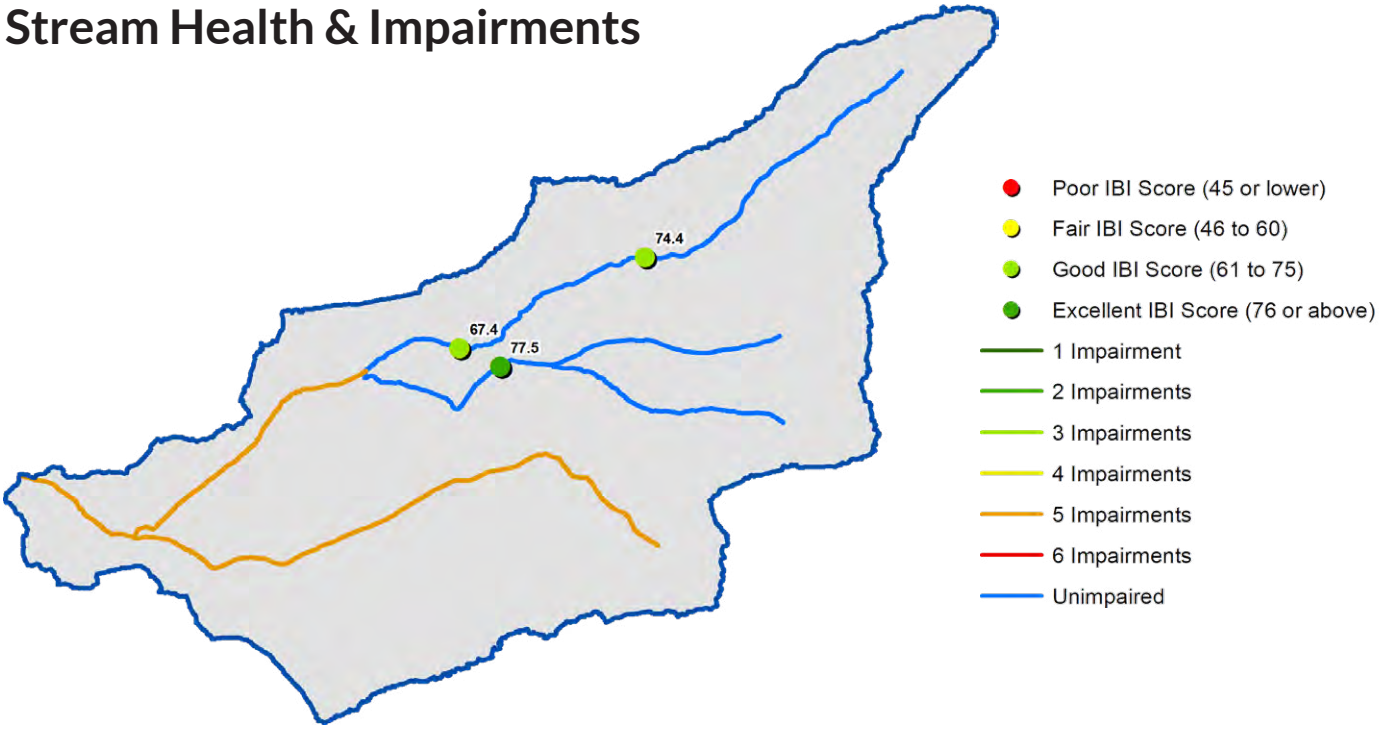
Land Cover & Loading



Despite occupying only 30% of the watershed, agriculture (including associated livestock) is the dominant cause of sediment (60%) and phosphorus (79%) loading in the watershed. These uses are highly concentrated in the eastern portion of the watershed, where the metamorphic uplands give way to limestone valleys. Small amounts of residential uses are spread throughout the watershed. Actual loading is likely lower than modeled, given data gaps in Chester County.

Indian Spring Run		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	456.9 Acres	11%	26.1	3%	0.0	3%	0.1	0%
Cropland	747.0 Acres	19%	494.2	57%	0.4	30%	1.4	6%
Combined Agriculture	1,203.9 Acres	30%	520.3	60%	0.5	34%	1.5	6%
Wooded Areas	1,684.6 Acres	42%	2.1	0%	0.0	0%	0.0	0%
Wetlands	8.9 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	69.1 Acres	2%	2.6	0%	0.0	0%	0.0	0%
Low-Density Mixed	13.8 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Medium-Density Mixed	36.7 Acres	1%	0.1	0%	0.0	0%	0.0	0%
High-Density Mixed	174.1 Acres	4%	0.3	0%	0.0	0%	0.0	0%
Low-Density Open Space	806.8 Acres	20%	0.3	0%	0.0	0%	0.0	0%
Animals	2,551 AUs	N/A	0.0	0%	0.7	45%	2.8	12%
Stream Banks	11.2 Miles	N/A	341.4	39%	0.1	6%	0.2	1%
Groundwater	N/A	N/A	0.0	0%	0.2	14%	19.4	81%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.1	0%

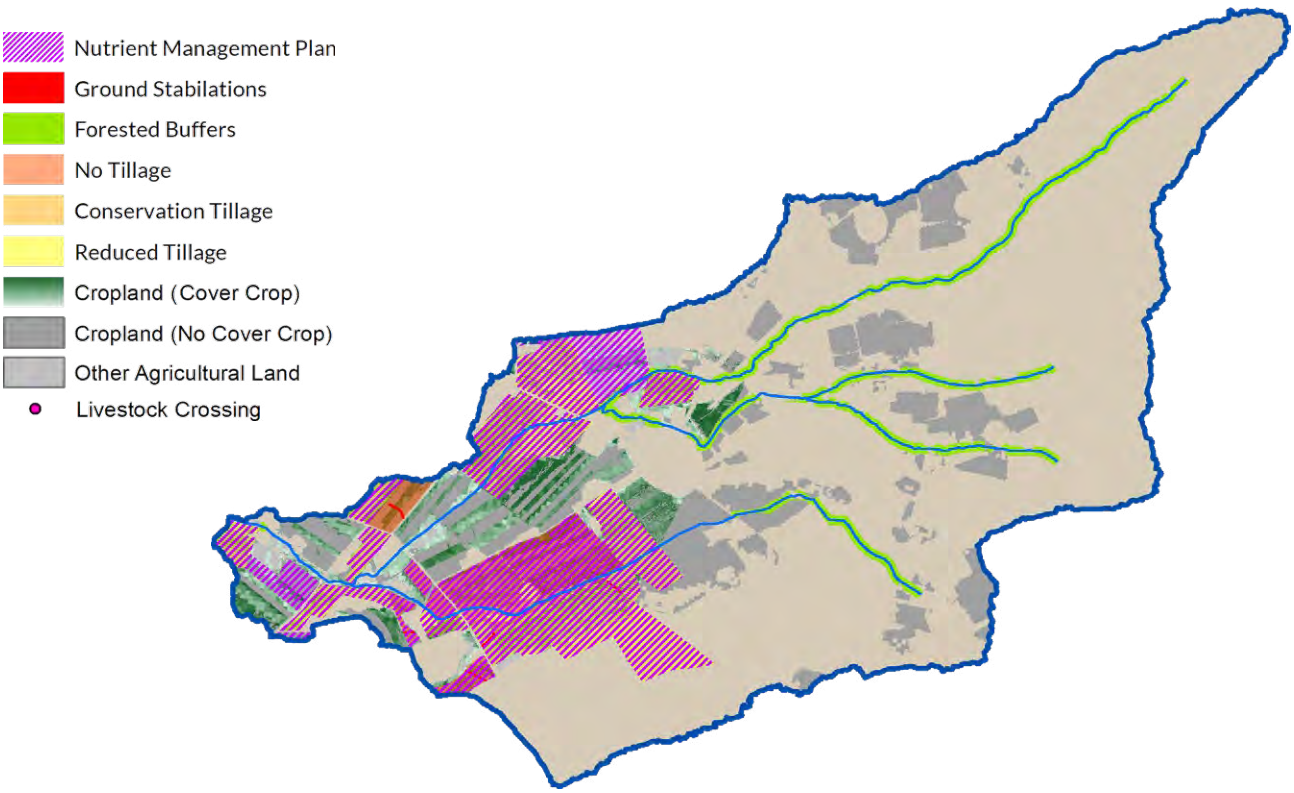
Stream Health & Impairments



Indian Spring Run - Upstream Portions (12 NHD Segments, 6.4 Miles)	
Agricultural Sources	Habitat Modification Sources
Unimpaired	Unimpaired

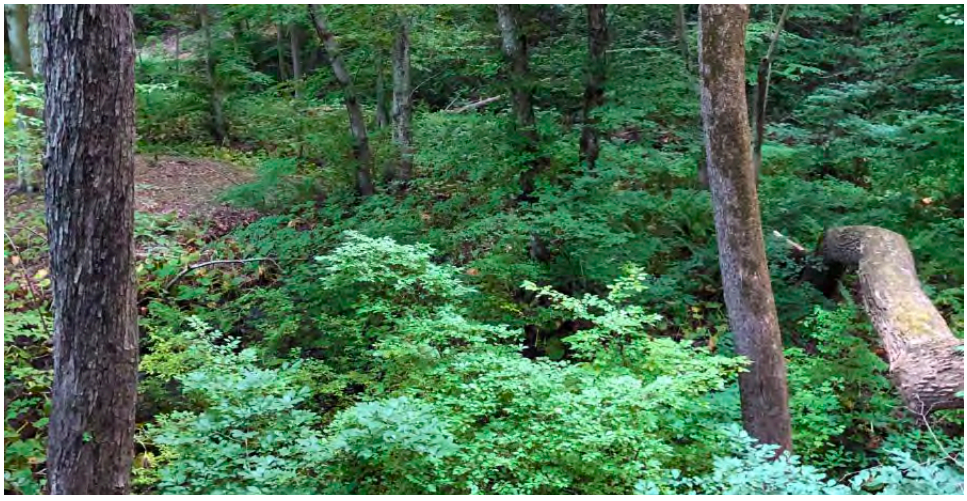
Indian Spring Run - Downstream Portions (5 NHD Segments, 4.8 Miles)	
Agricultural Sources	Habitat Modification Sources
Nutrients	Habitat Alterations
Siltation	Siltation
Organic Enrichment/Low Dissolved Oxygen	

Best Management Practices

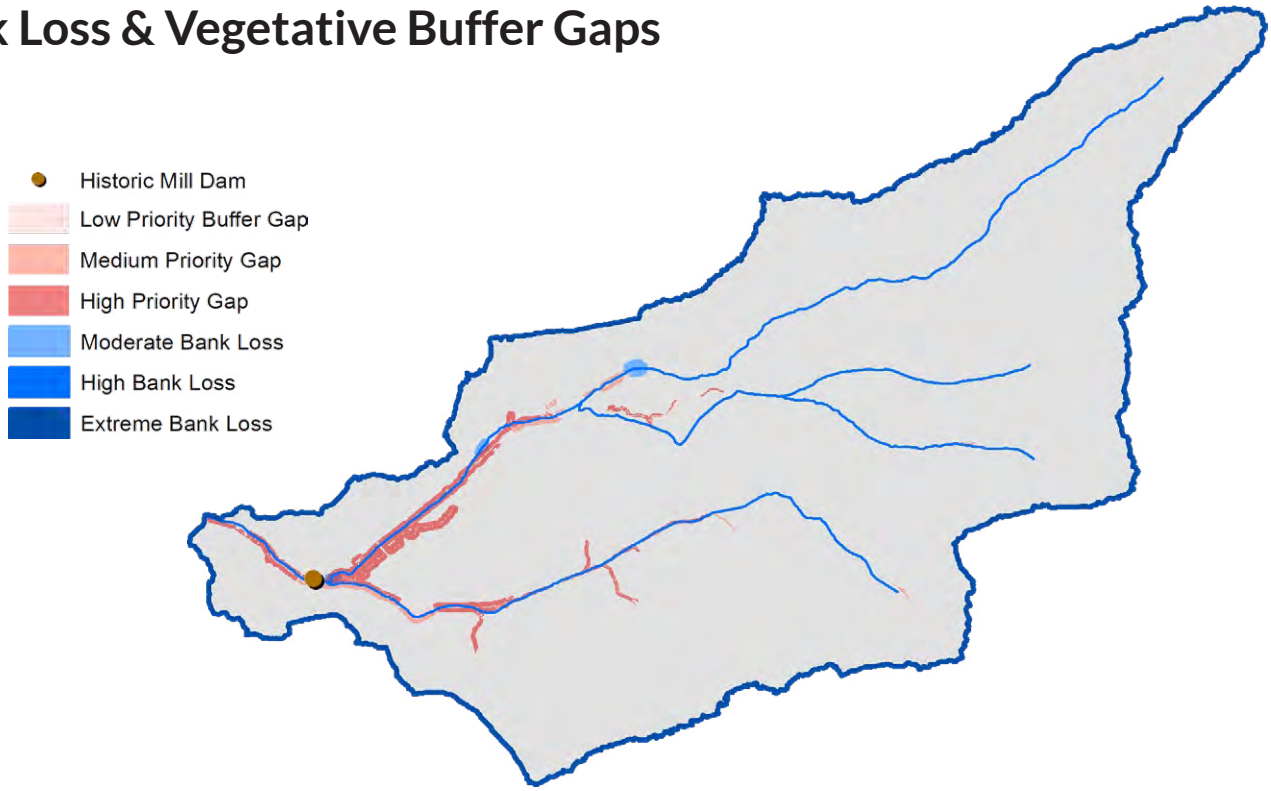


Indian Spring Run				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	291.6 Acres	39%	453.7 Acres	143.5	0.2	0.2
No Tillage	120.0 Acres	16%	625.2 Acres	184.1	0.1	0.1
Conservation Tillage	0.0 Acres	0%	424.5 Acres	115.1	0.1	0.0
Reduced Tillage	200.6 Acres	27%	424.5 Acres	88.3	0.0	0.0
Nutrient Management	329.1 Acres	44%	416.1 Acres	0.0	0.1	1.2
Animal Waste Management	68 AUs	3%	97%	0.0	0.1	0.6
Forested Buffers	5.7 Miles	51%	5.5 Miles	262.3	0.1	2.0
Stream Fencing	0.0 Miles	0%	11.2 Miles	99.9	0.1	0.3
Streambank Stabilization	0.0 Miles	0%	11.2 Miles	783.3	0.6	1.5

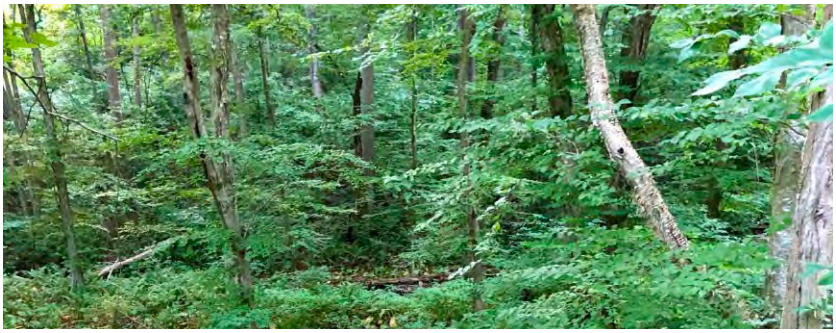
The forested upland areas of the watershed result in a large portion of the watershed having mature buffers. In this section of the watershed, the actual presence of BMPs may exceed figures here substantially, owing to data gaps in Chester County. In the lower reaches of Indian Spring Run, key areas are missing cover crops and tillage management, which will need to be addressed. This is especially important, as these are impaired portions of the watershed.



Bank Loss & Vegetative Buffer Gaps



Gaps in vegetated buffers are largely relegated to the lower third of the watershed. In this area, there is virtually no coverage. Despite this lack of vegetation, there is minimal bank loss, which extends throughout the watershed. This is certainly beneficial in terms of sediment loading, though it does limit options as it pertains to BMPs. With negligible bank losses, legacy sediment removals would not be cost effective. The single historic mill dam seems to have little effect on localized bank losses. Streambank stabilization is also limited in its application, though it could be of some benefit when paired with agricultural BMPs and vegetated buffers. Working in concert, these BMPs could serve to limit sediment migration across the landscape substantially.



Nutrient/Sediment Loading & Targets

Indian Spring Run	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,048.4 Tons	866.8 Tons	401.7 Tons	54%
Phosphorus	1.8 Tons	1.5 Tons	2.0 Tons	-33%
Nitrogen	25.5 Tons	24.0 Tons	45.2 Tons	-88%

Recommendations

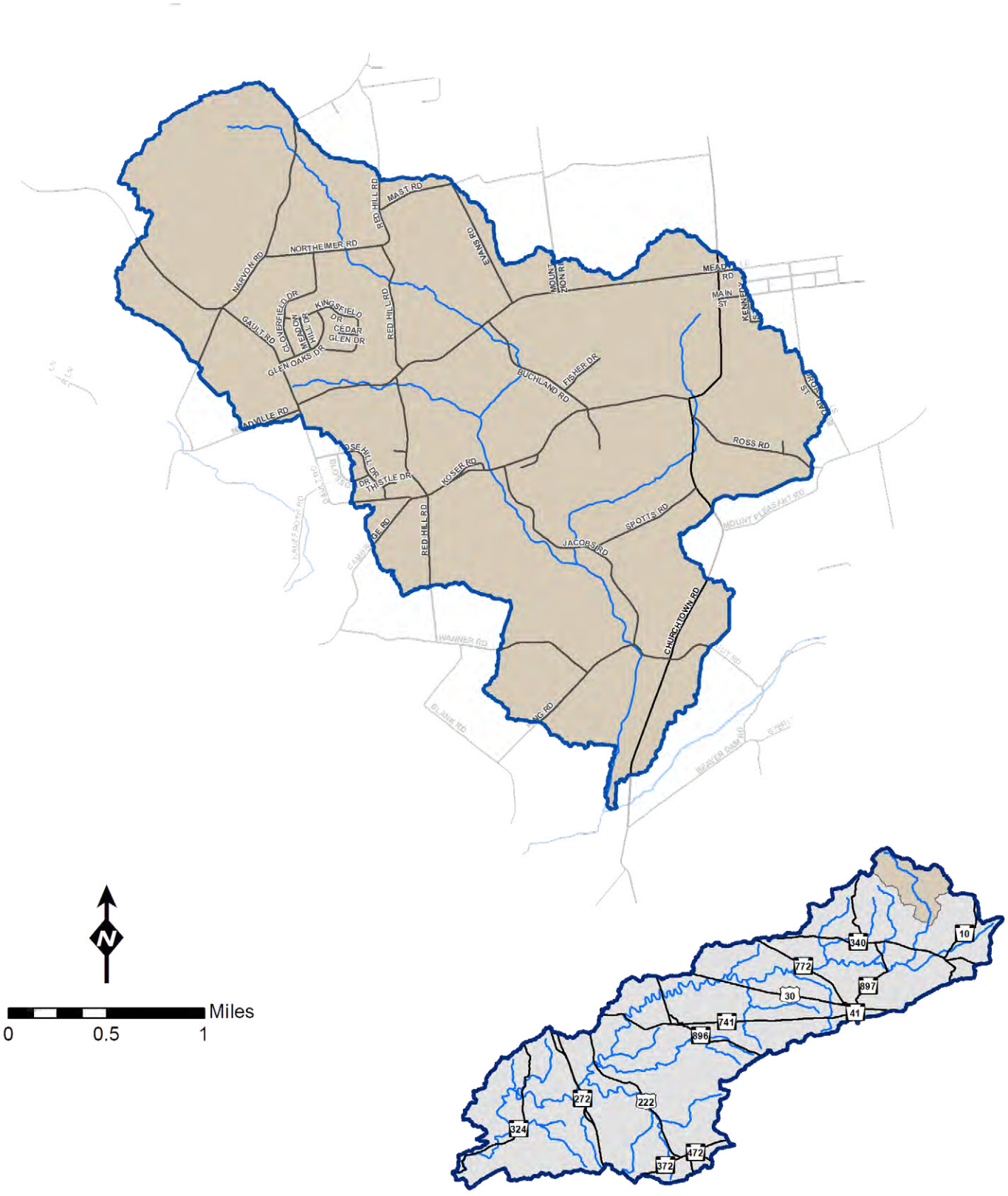
Indian Spring Run may hold the best opportunity of near-term delisting in the entire Pequea Creek Watershed. Nearly all of the watershed's loading occurs in the lower portions of the stream. Here, targeted BMPs, particularly forested buffers and stream fencing would be highly beneficial. Agricultural BMPs, notably improved tillage management (specifically no-till agriculture) and near universal adoption of cover crops would be key to immobilizing sediment, and should be incorporated into the nutrient management process. As noted, BMP implementation in Chester County is all but certainly higher than indicated in the data, likely bringing sediment in line with TMDL amounts, and reducing total BMP implementation needs. As is the case throughout the priority areas, animal waste management, while necessary for broader reduction goals, is seen as a secondary BMP in delisting this watershed.

Indian Spring Run			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	408.3 Acres	90%	129.1	0.2	0.2
No Tillage	312.6 Acres	50%	92.0	0.1	0.0
Nutrient Management	312.1 Acres	75%	0.0	0.1	0.9
Animal Waste Management	1,495 AUs	60%	0.0	0.1	0.4
Forested Buffers	2.8 Miles	50%	131.1	0.1	1.0
Stream Fencing	3.4 Miles	30%	30.0	0.0	0.1
Streambank Stabilization	1.1 Miles	10%	78.3	0.1	0.2
Legacy Sediment	0.00 Miles	0%	0.0	0.0	0.0
Scenarios			Loading (Tons)		
Total Proposed Reduction			460.6	0.6	2.8
Current Loading			866.8	1.5	24.0
Proposed Loading			406.2	0.9	21.2
Loading Goal			401.7	2.0	45.2
Percent Above/Below Goal			-1%	54%	53%

Indian Spring Run					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	362.9 Acres	$47.35/ac/yr	10	$171,849	$0.07	$44.23	$44.68
No Tillage	312.6 Acres	$19.21/ac/yr	10	$60,048	$0.03	$45.17	$70.38
Nutrient Management	312.1 Acres	$22.31/ac/yr	10	$69,639	-	$35.78	$3.72
Planning		$17.73/ac	1	$5,534	-	-	-
Maintenance		$20.54/au/yr	10	$64,105	-	-	-
Animal Waste Management	1,495 AUs	$117.07/au/yr	10	$1,750,204	-	$1,247.06	$231.40
Planning		$901.09/au	1	$1,347,147	-	-	-
Maintenance		$26.96/au/yr	10	$403,057	-	-	-
Forested Buffers	2.2 Miles	$10,985/mi/yr	10	$242,777	$0.12	$228.28	$14.92
Planning		$49,241/mi	1	$108,830	-	-	-
Maintenance		$6,061/mi/yr	10	$133,947	-	-	-
Stream Fencing	2.8 Miles	$19,958/mi	1	$55,858	$0.11	$84.04	$39.60
Streambank Stabilization	1.1 Miles	$1,995,840/mi	1	$2,234,313	$1.43	$1,797.89	$738.41
Legacy Sediment	0.00 Miles	$1,848,000/mi	1	$0	-	-	-
Total	-	$458,469/yr	10	$4,584,688	$0.31	$248.30	$10.70

TIER II: PEQUEA CREEK HEADWATERS (UPPER)

Selection Criteria: Near Delisting, Healthy Headwaters, Existing Initiative
Region: Pequea Headwaters
Area: 6.3 Square Miles, 7.9 Stream Miles



Overview

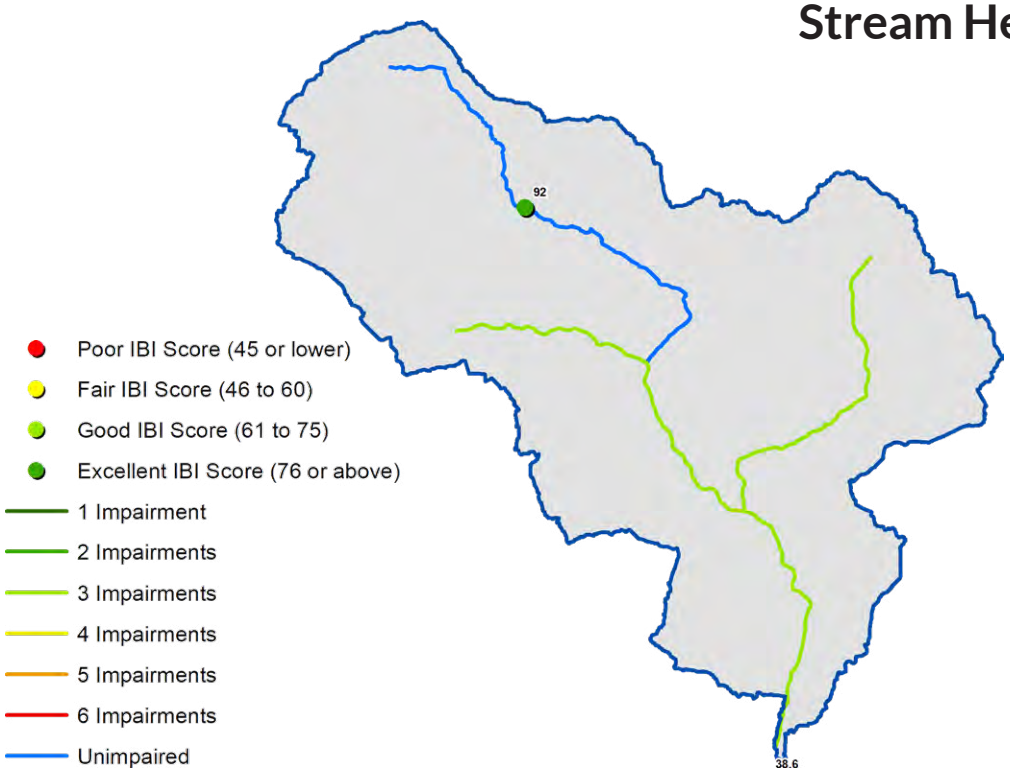
There is a poetic logic in healing a broken stream at its source. Beginning in the Welsh Mountains, the upper reaches of the Pequea are the start of its 49.2-mile journey to the Susquehanna and the farthest point of any branch from its mouth. The entirety of this portion of the watershed is classified as HQ-CWF under Chapter 93. The upper reaches are unimpaired (boasting an IBI score of 92.1), and lower portions are dominated by a single impairment: sediment. This provides additional focus to restoration efforts. However, understanding the scope and scale of a restoration puzzle only goes so far in solving it. Key to any solution is implementation. This is where the Pequea Creek's headwaters (along with White Horse Run) hold a strategic advantage. The degree of outreach and engagement in this portion of the watershed is unrivaled elsewhere in the Pequea. This partnership of municipal, non-profit, and business leadership has another distinct advantage: its focus is on the agricultural community, with a special connection to Amish landowners. The rare nexus of three Tier II criteria not just meeting, but also being in this level of balance, are an ideal restoration framework. This is a stream on the cusp of delisting, and the strategic funding and implementation of proposed BMPs will achieve this goal.

Land Cover & Loading

Agriculture is dominant (roughly half of all land cover), and not surprisingly, the driving force behind stream loading. This single category holds the key to over three quarters of the sediment and 85% of the phosphorus entering this length of the Pequea. Though forested land accounts for just over on quarter of the watershed, it is distributed in a manner that delivers more mileage than its share might imply. Half of the stream is buffered, a very high proportion in the watershed. The remaining quarter of the basin's land is residential, contributing minimally to loading. Other than a single development (bounded roughly by Narvon, Gault, and Meadville roads), this use is rather diffuse, comprising mostly low-density residential housing. Other than its lowermost regions, the watershed is underlain with metamorphic rock (primarily quartzite and gneiss). Unusual for the subwatersheds of the Pequea, the majority of this land with metamorphic foundations is in agricultural use.

Pequea Headwaters (Upper)		Land	Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	998.0 Acres	25%	90.8	8%	0.1	4%	0.3	0%
Cropland	861.0 Acres	22%	805.9	69%	0.8	19%	2.1	2%
Combined Agriculture	1,859.0 Acres	46%	896.8	77%	0.9	22%	2.5	3%
Wooded Areas	1,112.2 Acres	28%	2.0	0%	0.0	0%	0.1	0%
Wetlands	13.7 Acres	0%	0.0	0%	0.0	0%	0.0	0%
Open Land	98.8 Acres	2%	4.1	0%	0.0	0%	0.0	0%
Low-Density Mixed	53.5 Acres	1%	0.0	0%	0.0	0%	0.0	0%
Medium-Density Mixed	16.8 Acres	0%	0.0	0%	0.0	0%	0.0	0%
High-Density Mixed	184.8 Acres	5%	0.2	0%	0.0	0%	0.0	0%
Low-Density Open Space	661.5 Acres	17%	0.2	0%	0.0	0%	0.0	0%
Animals	2,552 AUs	N/A	0.0	0%	2.6	63%	10.3	12%
Stream Banks	7.9 Miles	N/A	259.7	22%	0.1	2%	0.1	0%
Groundwater	N/A	N/A	0.0	0%	0.5	13%	72.6	85%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

Stream Health & Impairments

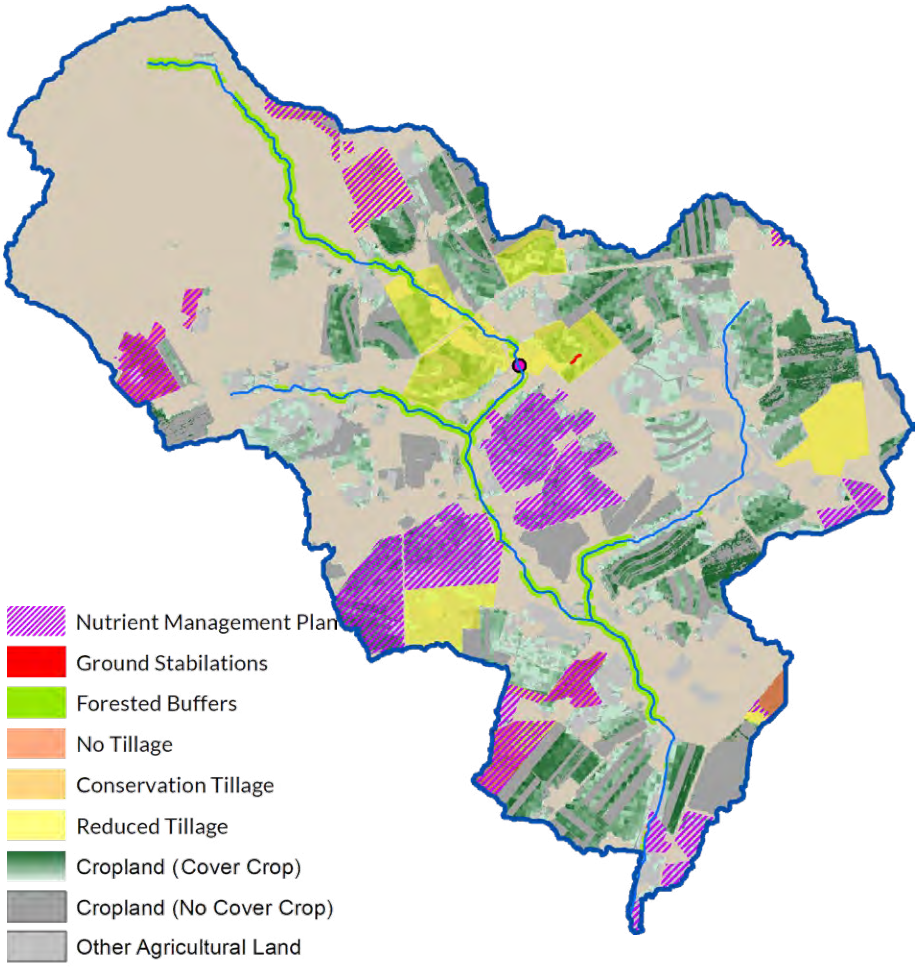


Pequea Headwaters (Upper) - Upstream Portions (1 NHD Segment, 2.6 Miles)	
Agricultural Sources	Habitat Modification Sources
Unimpaired	Unimpaired

Pequea Headwaters (Upper) - Downstream Portions (5 NHD Segments, 5.4 Miles)	
Agricultural Sources	Habitat Modification Sources
Siltation	Habitat Alterations
	Siltation

As noted in the overview, the headwaters are considered unimpaired, with a very high IBI score of 92.1, owing largely to undeveloped, preserved land (Welsh Mountain Nature Preserve and Money Rocks County Park). The lower reaches contain three separate impairments, two of which relate to sediment. These impairments are also found on two unnamed tributaries to the Pequea, one entering from the west and one from the east.

Best Management Practices

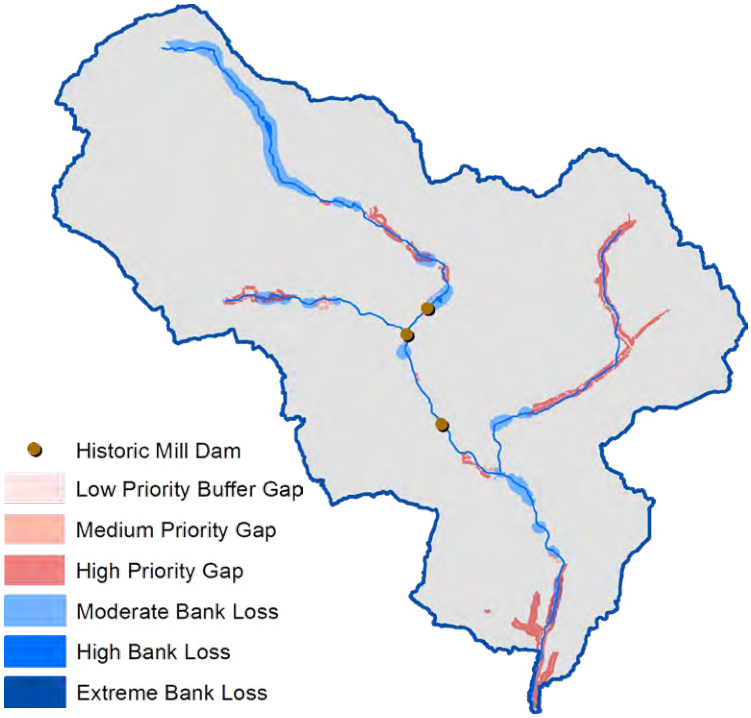


BMPs are somewhat scattered throughout the watershed, diminishing their efficacy. Of additional concern is a lack of BMPs which significantly limits their impacts on sediment reductions. Cover crops are employed at a rate of 55%, leaving ample room for further implementation. Tillage management practices fall far below this, accounting for only 17% of cropland. An aggressive implementation of these practices would provide substantial benefits in sediment loading. Both of the unnamed tributaries, as well as the final mile of the Pequea itself, represent the greatest BMP deficiencies. Other than a haphazard implementation of buffers and cover crops, these areas are essentially devoid of practices to manage sediment. When this is combined with deficiencies in buffers and fencing, there is, in essence, a perfect storm to facilitate sediment's entry into streams. There is a paradoxical benefit in this, however. With BMP gaps concentrated as they are, individual landowners can play outsized roles in restoration efforts.

Pequea Headwaters (Upper)				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	471.8 Acres	55%	386.6 Acres	168.4	0.6	-0.1
No Tillage	50.5 Acres	6%	808.0 Acres	373.2	0.3	-0.4
Conservation Tillage	0.0 Acres	0%	712.2 Acres	265.0	0.3	-0.5
Reduced Tillage	95.7 Acres	11%	712.2 Acres	203.2	0.2	-0.4
Nutrient Management	180.6 Acres	21%	677.8 Acres	0.0	0.3	8.5
Animal Waste Management	49 AUs	2%	98%	0.0	0.3	2.1
Forested Buffers	4.0 Miles	50%	4.0 Miles	427.4	0.3	9.2
Stream Fencing	0.2 Miles	2%	7.8 Miles	87.3	0.3	0.7
Streambank Stabilization	0.0 Miles	0%	7.9 Miles	1004.8	1.1	2.1

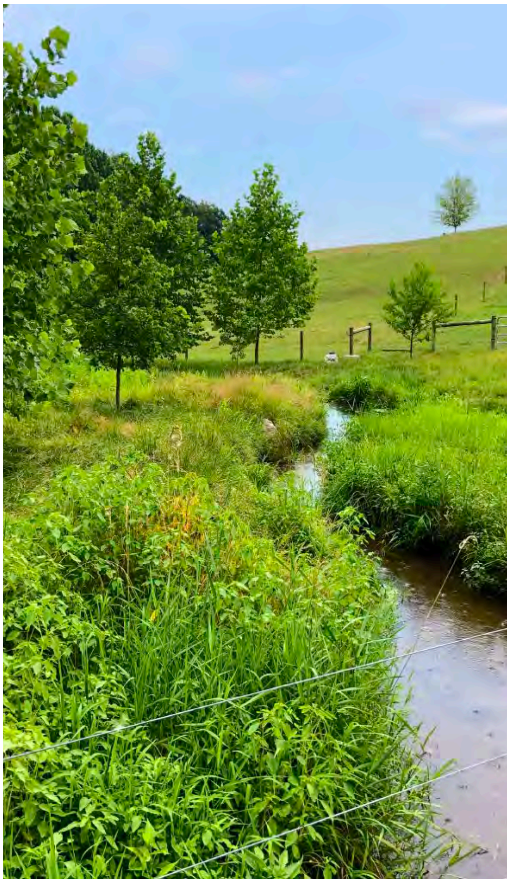
Bank Loss & Vegetative Buffer Gaps

As noted, buffer gaps are a specific concern, especially along the eastern tributary. Legacy sediment opportunities are present, but do not abound, necessitating very precise application, if they're to be effective. Bank stabilizations opportunities are found throughout the watershed, though those shown in headwater areas are not likely to be especially fruitful in terms of reductions. Historic mill dams do not seem to play a significant role in sediment loading here.



Nutrient/Sediment Loading & Targets

Pequea Headwaters (Upper)	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	1,428.3 Tons	1,163.0 Tons	400.5 Tons	66%
Phosphorus	4.6 Tons	4.1 Tons	2.0 Tons	51%
Nitrogen	87.5 Tons	85.6 Tons	45.1 Tons	47%



Recommendations

The recommendations for the Pequea's headwaters are relatively aggressive. Similar to White Horse Run, the strong local initiative in this area offers a momentum which is lacking in other portions of the Pequea Creek Watershed. It is crucial to capitalize on this, and ambitious yet realistic goals are a key part. First and foremost, sediment reduction is the objective for BMPs in this watershed. While this can be said throughout Tier II areas, it is explicitly the case here. Among Tier II watersheds, this basin is the only one where nutrients have not been determined to be a cause of impairment. This is not to say nutrients are irrelevant, particularly in the context of regional planning goals. However, when weighed against sediment, there is no question as to where priorities need to lie. Cover crops, no-till farming, forested buffers and stream fencing are all very cost-effective vehicles for this, with a price tag of only pennies per pound of sediment reduced. Streambank stabilizations and legacy sediment removal play a smaller role in this, but are key components when applied with precision. Reduction yields from these BMPs are highly dependent upon local conditions, and investments need to be made with this in mind. Nutrient management planning should be employed in a catalytic role, promoting greater implementation of other practices, such as cover crops and tillage management. Finally, animal waste management, particularly in this watershed, represents the lowest implementation priority. To put it succinctly, when sediment is managed, this stream will be healthy.

Pequea Headwaters (Upper)			Reductions (Tons)		
BMPS	Additional Amount Proposed		Sediment	Phosphorus	Nitrogen
Cover Crops	348.0 Acres	90%	151.5	0.5	-0.1
No Tillage	484.8 Acres	60%	223.9	0.2	-0.3
Nutrient Management	610.0 Acres	90%	0.0	0.3	7.6
Animal Waste Management	1,878 AUs	75%	0.0	0.2	1.6
Forested Buffers	1.8 Miles	45%	192.3	0.1	4.2
Stream Fencing	3.1 Miles	40%	34.9	0.1	0.3
Streambank Stabilization	0.4 Miles	5%	50.2	0.1	0.1
Legacy Sediment	0.08 Miles	1%	135.3	0.2	0.2
Scenarios			Loading (Tons)		
Total Proposed Reduction			788.3	1.7	13.6
Current Loading			1,163.0	4.1	85.6
Proposed Loading			374.7	2.4	72.0
Loading Goal			400.5	2.0	45.2
Percent Above/Below Goal			6%	-18%	-60%

Pequea Headwaters (Upper)					Cost / Pound / Year		
BMPS	Proposed	Cost per Unit	Years	Total Cost	S	P	N
Cover Crops	348.0 Acres	$47.35/ac/yr	10	$164,762	$0.05	$15.26	-
No Tillage	484.8 Acres	$19.21/ac/yr	10	$93,125	$0.02	$23.76	-
Nutrient Management	610.0 Acres	$22.31/ac/yr	10	$136,113	-	$23.68	$0.89
Planning		$17.73/ac	1	$10,816	-	-	-
Maintenance		$20.54/au/yr	10	$125,297	-	-	-
Animal Waste Management	1,878 AUs	$117.07/au/yr	10	$2,198,061	-	$472.41	$70.90
Planning		$901.09/au	1	$1,691,866	-	-	-
Maintenance		$26.96/au/yr	10	$506,195	-	-	-
Forested Buffers	1.8 Miles	$10,985/mi/yr	10	$197,101	$0.05	$68.96	$2.37
Planning		$49,241/mi	1	$88,355	-	-	-
Maintenance		$6,061/mi/yr	10	$108,746	-	-	-
Stream Fencing	3.1 Miles	$19,958/mi	1	$62,097	$0.09	$23.77	$10.60
Streambank Stabilization	0.4 Miles	$1,995,840/mi	1	$792,863	$0.79	$722.89	$370.65
Legacy Sediment	0.08 Miles	$1,848,000/mi	1	$147,840	$0.05	$47.51	$37.77
Total	-	$379,196/yr	10	$3,791,962	$0.19	$80.33	$2.45

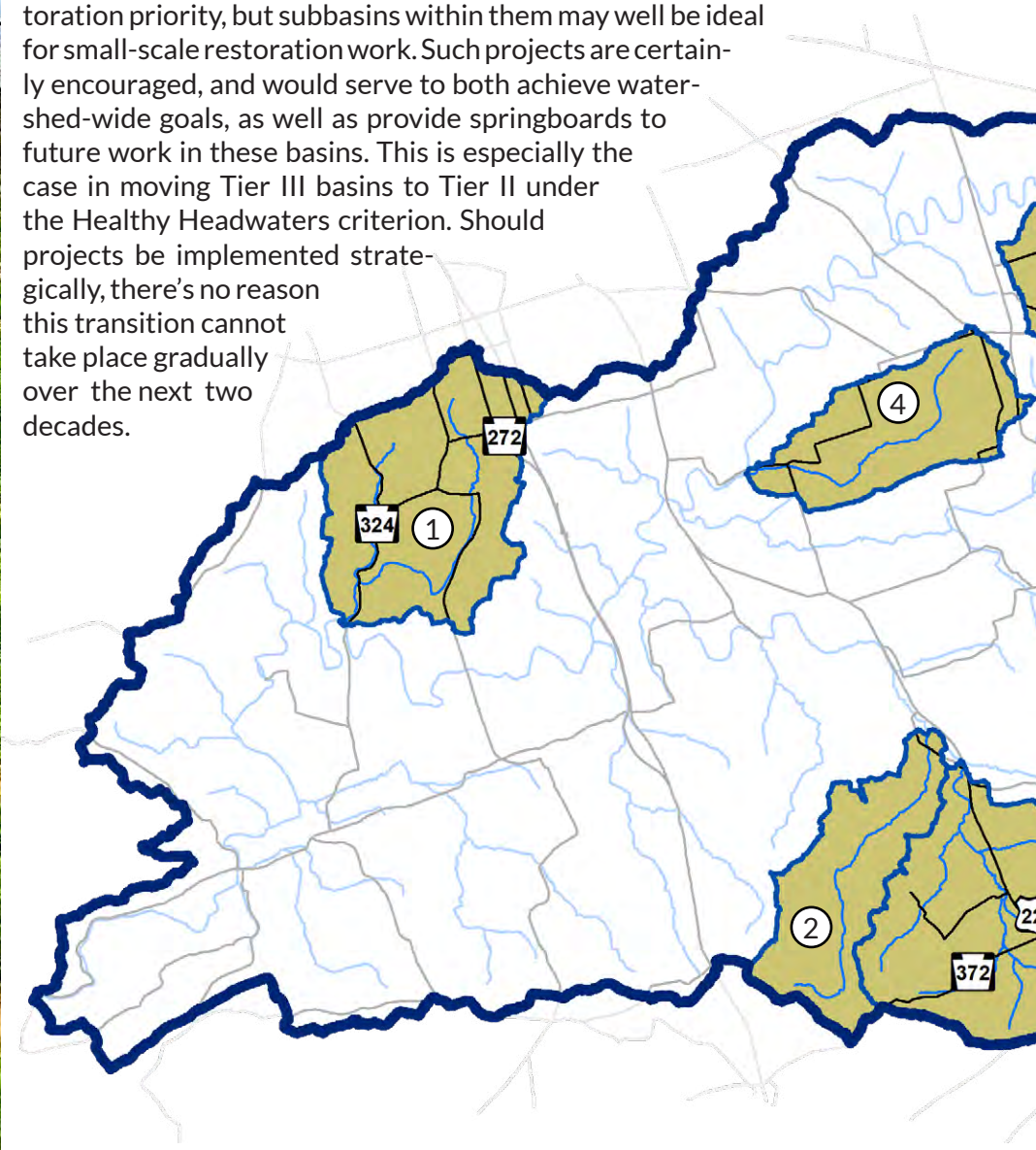
TIER III: OTHER HEADWATER AREAS

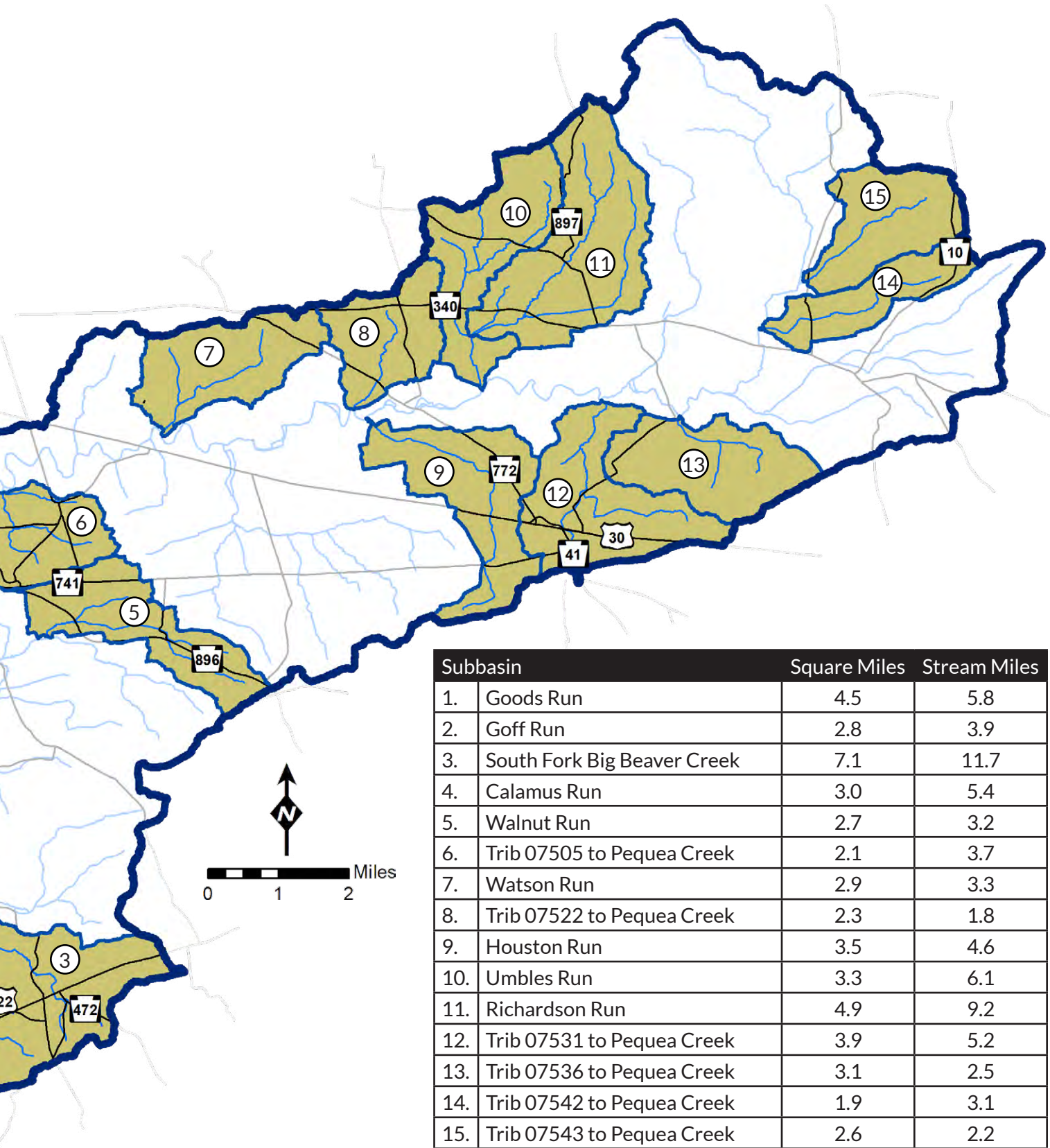
Selection Criteria: Long-Term Restoration Areas
Region: All Regions
Area: 50.6 Square Miles, 71.9 Stream Miles

Overview

As has been noted throughout this plan, fixing the Pequea is first and foremost about fixing headwaters. In Tier III, there are 15 headwater basin, occupying 50.6 square miles and containing 71.9 stream miles. These areas account for roughly a third of the entire watershed, and can be found in each of its four regions. Each of these basins was considered for inclusion in Tier II, but failed to meet the more stringent selection criteria for that level of prioritization.

Of the streams in the area, 38.3 miles are unnamed tributaries. There is an irony in this fact, however: in many ways, these anonymous streams often hold more of the keys to unlocking water quality in these areas than their named counterparts. Basin-wide, none of these areas are a near-term restoration priority, but subbasins within them may well be ideal for small-scale restoration work. Such projects are certainly encouraged, and would serve to both achieve watershed-wide goals, as well as provide springboards to future work in these basins. This is especially the case in moving Tier III basins to Tier II under the Healthy Headwaters criterion. Should projects be implemented strategically, there's no reason this transition cannot take place gradually over the next two decades.

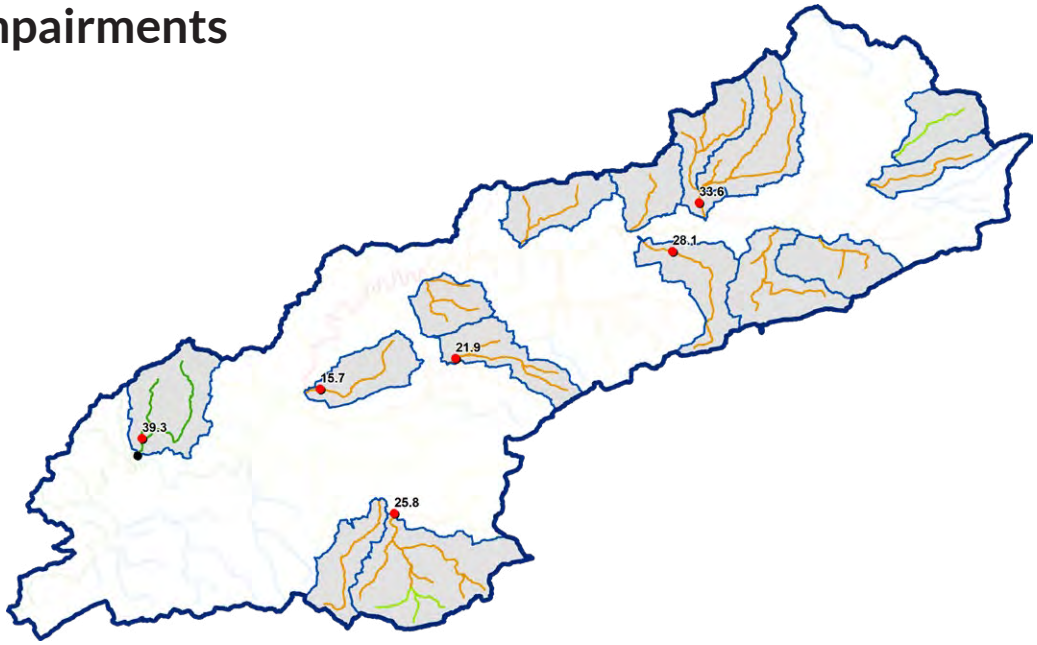




Subbasin		Square Miles	Stream Miles
1.	Goods Run	4.5	5.8
2.	Goff Run	2.8	3.9
3.	South Fork Big Beaver Creek	7.1	11.7
4.	Calamus Run	3.0	5.4
5.	Walnut Run	2.7	3.2
6.	Trib 07505 to Pequea Creek	2.1	3.7
7.	Watson Run	2.9	3.3
8.	Trib 07522 to Pequea Creek	2.3	1.8
9.	Houston Run	3.5	4.6
10.	Umbles Run	3.3	6.1
11.	Richardson Run	4.9	9.2
12.	Trib 07531 to Pequea Creek	3.9	5.2
13.	Trib 07536 to Pequea Creek	3.1	2.5
14.	Trib 07542 to Pequea Creek	1.9	3.1
15.	Trib 07543 to Pequea Creek	2.6	2.2
	Total	50.6	71.9

Stream Health & Impairments

- Poor IBI Score (45 or lower)
- Fair IBI Score (46 to 60)
- Good IBI Score (61 to 75)
- Excellent IBI Score (76 or above)
- 1 Impairment
- 2 Impairments
- 3 Impairments
- 4 Impairments
- 5 Impairments
- 6 Impairments
- Unimpaired



Impairment Source	Impairment Cause	Stream Segments	Stream Length (Miles)
Agriculture	Siltation	77	71.7
Agriculture	Nutrients	64	60.5
Agriculture	Low Dissolved Oxygen	64	60.5
Agriculture	Organic Enrichment	64	60.5
Habitat Modification	Habitat Alterations	77	71.7
Habitat Modification	Siltation	61	57.3
Habitat Modification	pH	12	8.6
None	Unimpaired	1	0.2

Recommendations

Improvements in this portion of the watershed are of lower priority than Tier I and Tier II, though higher than the remaining portions of Tier III. Of the 15% of total resources dedicated to Tier III in the first 10 years of restoration work, it is recommended that two thirds of that (10% of total project resources) go to these headwater areas. Projects should be given priority by meeting one or more of these criteria:

1. Projects with a high likelihood of delisting stream segments
2. Projects with high reduction-to-cost ratios
3. Projects addressing headwaters within these basins
4. Projects building upon existing restoration work
5. Showcase projects to facilitate outreach
6. Projects likely to move basin from Tier III to Tier II

In these areas, as is the case elsewhere in the watershed, sediment is the primary load reduction of interest. Accordingly, cost-effective sediment reducing BMPs such as cover crops, no-till, forested buffers, and fencing will likely be the most efficient allocation of project resources. In gearing up for the next phases of the plan in the coming years, outreach with the community in these areas is critical, particularly with the agricultural community, and younger residents, who will be inheriting these watersheds.

Headwater Areas	Land		Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	6,768.1 Acres	21%	586.4	6%	0.9	3%	2.5	1%
Cropland	10,231.3 Acres	32%	8,147.5	77%	6.9	22%	26.3	5%
Combined Agriculture	16,999.3 Acres	53%	8,733.8	83%	7.8	25%	28.8	6%
Wooded Areas	5,077.6 Acres	16%	10.6	0%	0.0	0%	0.1	0%
Wetlands	46.9 Acres	0%	0.1	0%	0.0	0%	0.0	0%
Open Land	850.7 Acres	3%	35.5	0%	0.0	0%	0.3	0%
Low-Density Mixed	445.3 Acres	1%	1.0	0%	0.0	0%	0.0	0%
Medium-Density Mixed	182.2 Acres	1%	1.5	0%	0.0	0%	0.1	0%
High-Density Mixed	2,271.3 Acres	7%	21.7	0%	0.1	0%	0.8	0%
Low-Density Open Space	6,495.7 Acres	20%	13.6	0%	0.0	0%	0.3	0%
Animals	20,651 AUs	N/A	0.0	0%	19.3	63%	76.5	16%
Stream Banks	71.9 Miles	N/A	1,702.4	16%	0.4	1%	1.2	0%
Groundwater	N/A	N/A	0.0	0%	2.9	10%	376.5	78%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.3	0%
Point Sources	N/A	N/A	0.0	0%	1.1	4%	0.3	0%

Headwater Areas				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	5,213.4 Acres	51%	5,017.8 Acres	1,972.4	2.6	1.4
No Tillage	912.9 Acres	9%	9,318.4 Acres	3,302.2	2.2	-1.1
Conservation Tillage	165.9 Acres	2%	5,740.4 Acres	2,183.2	1.5	-1.7
Reduced Tillage	3,412.2 Acres	33%	5,740.4 Acres	1,549.7	1.1	-1.7
Nutrient Management	3,903.0 Acres	38%	6,328.3 Acres	0.0	2.6	44.1
Animal Waste Management	24 AUs	0%	100%	0.0	2.6	14.3
Forested Buffers	16.2 Miles	23%	55.7 Miles	4,266.2	7.0	79.7
Stream Fencing	6.8 Miles	9%	65.1 Miles	696.0	1.3	5.0
Streambank Stabilization	0.0 Miles	0%	71.9 Miles	8,990.1	7.6	38.5

Headwater Areas	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	13,984,872 Tons	10,506 Tons	3,229 Tons	69%
Phosphorus	36,982 Tons	31 Tons	23 Tons	26%
Nitrogen	518,009 Tons	486 Tons	365 Tons	25%

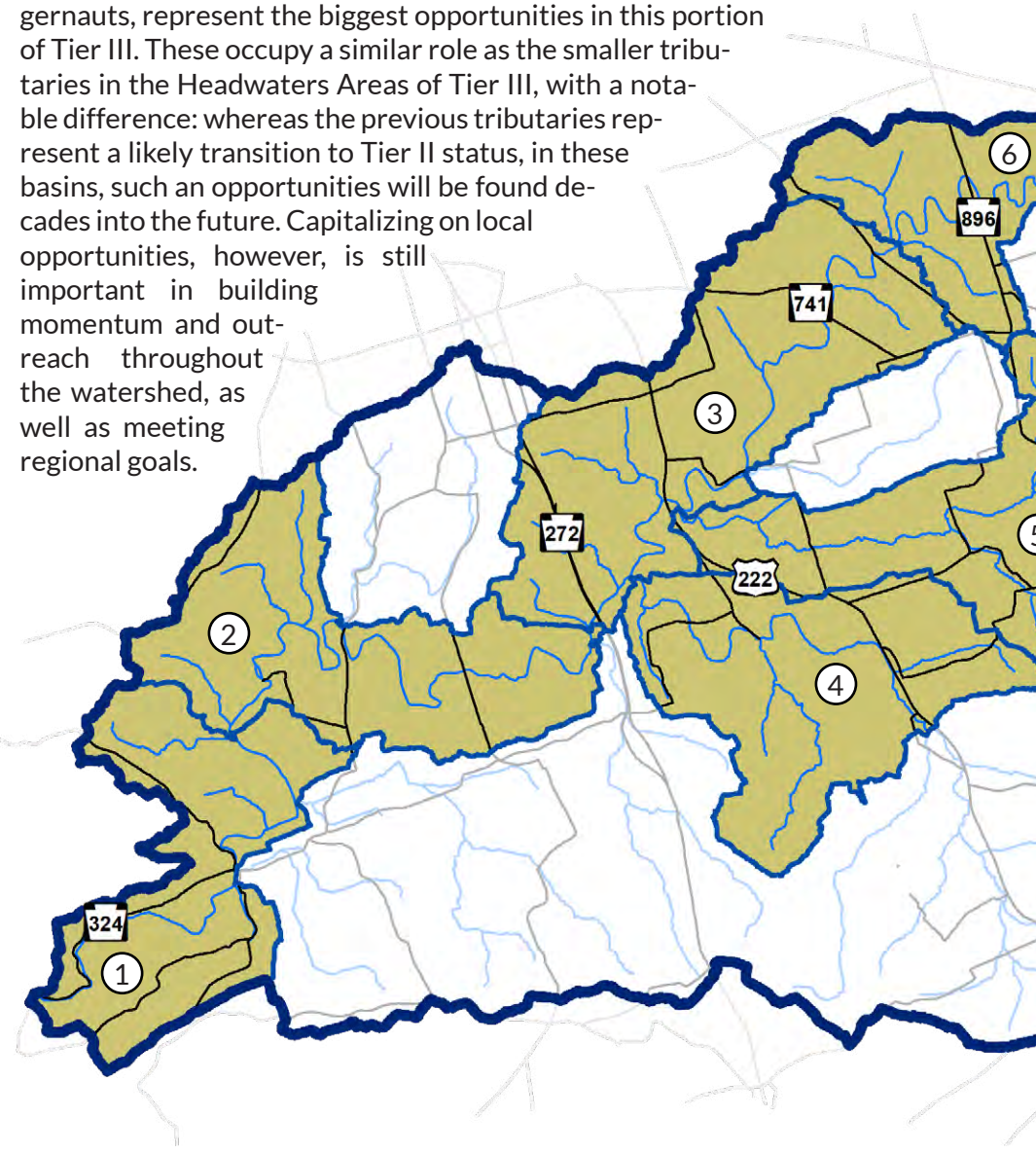
TIER III: MAIN STEM AREAS

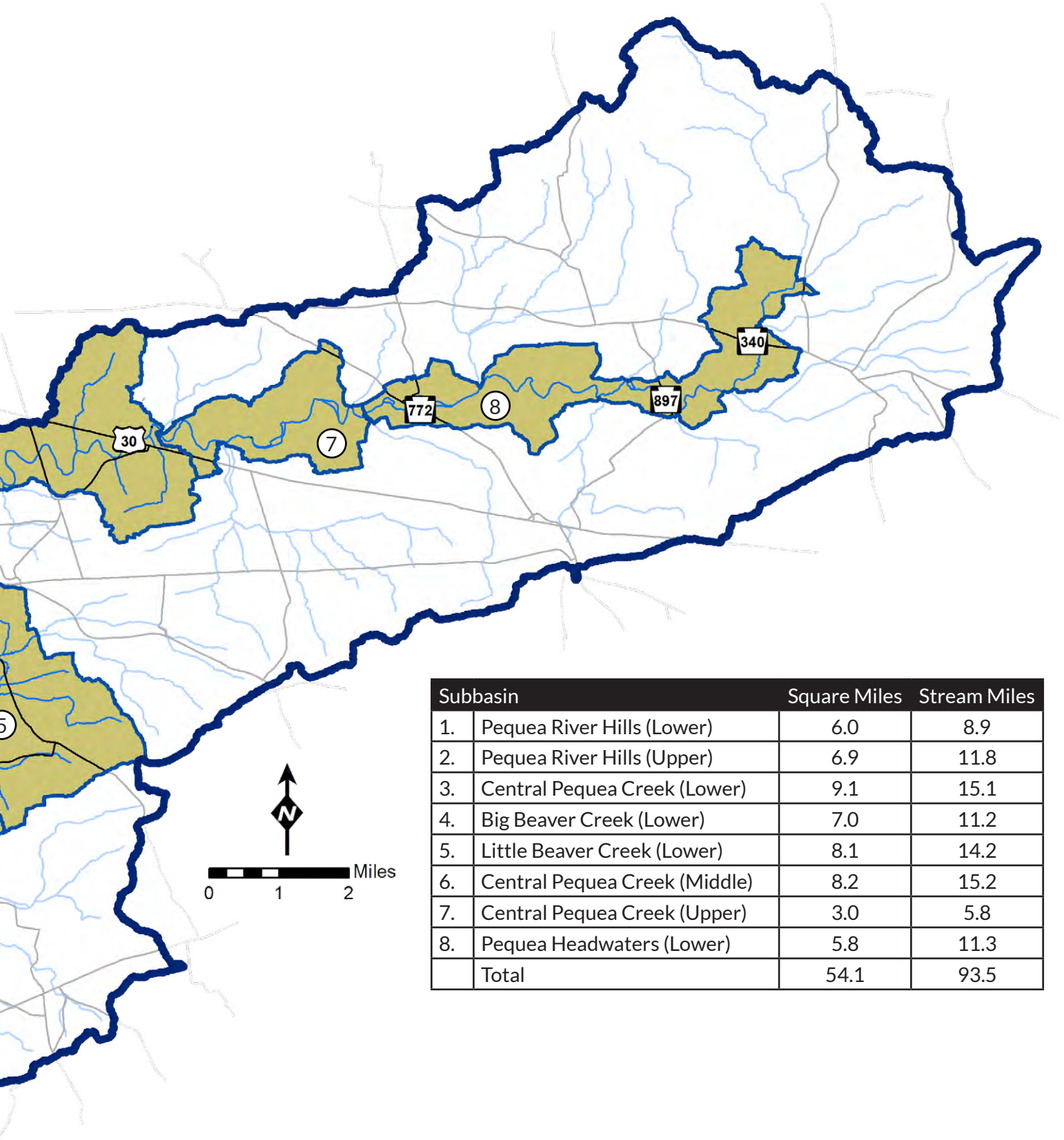
Selection Criteria: Long-Term Restoration Areas
Region: All Regions
Area: 54.1 Square Miles, 93.5 Stream Miles

Overview

The final pieces of the Pequea puzzle are the eight main stem subbasins. Collectively, they account for 35% of entire watershed, and 39% of its stream miles. In many ways, these main-stem portions of the watershed are a collective reflection of the other areas, receiving water of varying quality. Though they do drain significant areas, two thirds of the water here starts somewhere else. Fixing headwaters, therefore, is a prerequisite to success here. Accordingly, these areas represent the lowest restoration priority.

The actual main stems (Pequea Creek, Big Beaver Creek, and Little Beaver Creek) comprise 58.5 miles of streams. Tributaries (all unnamed, with the exception of Silver Mine Run) account for the remaining 35 miles of streams in these watersheds. These smaller headwaters, nestled within these juggernauts, represent the biggest opportunities in this portion of Tier III. These occupy a similar role as the smaller tributaries in the Headwaters Areas of Tier III, with a notable difference: whereas the previous tributaries represent a likely transition to Tier II status, in these basins, such an opportunities will be found decades into the future. Capitalizing on local opportunities, however, is still important in building momentum and outreach throughout the watershed, as well as meeting regional goals.

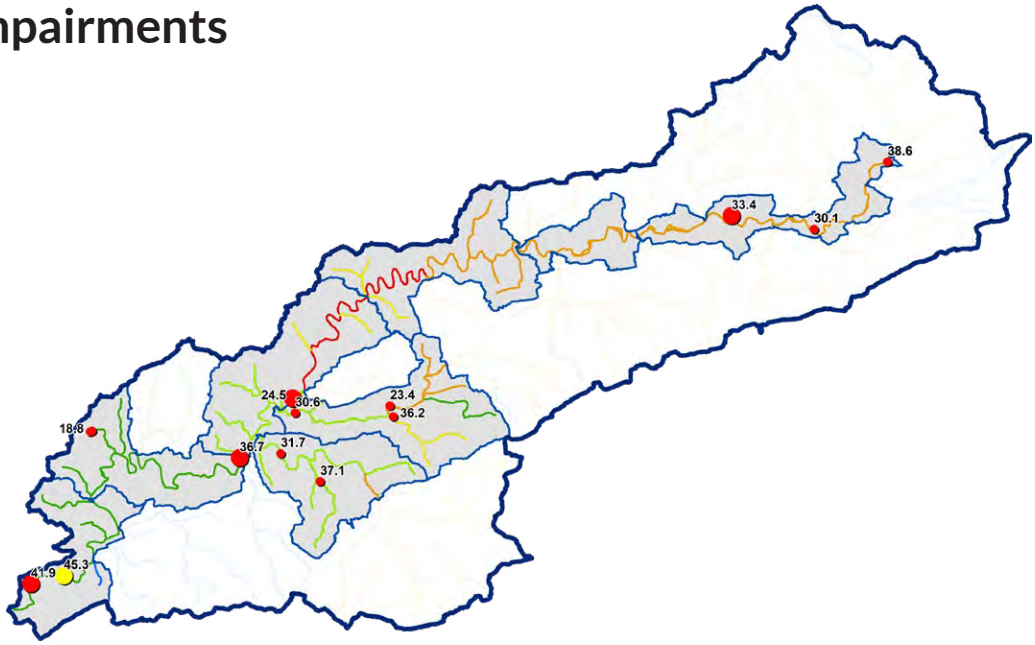




Subbasin		Square Miles	Stream Miles
1.	Pequea River Hills (Lower)	6.0	8.9
2.	Pequea River Hills (Upper)	6.9	11.8
3.	Central Pequea Creek (Lower)	9.1	15.1
4.	Big Beaver Creek (Lower)	7.0	11.2
5.	Little Beaver Creek (Lower)	8.1	14.2
6.	Central Pequea Creek (Middle)	8.2	15.2
7.	Central Pequea Creek (Upper)	3.0	5.8
8.	Pequea Headwaters (Lower)	5.8	11.3
	Total	54.1	93.5

Stream Health & Impairments

- Poor IBI Score (45 or lower)
- Fair IBI Score (46 to 60)
- Good IBI Score (61 to 75)
- Excellent IBI Score (76 or above)
- 1 Impairment
- 2 Impairments
- 3 Impairments
- 4 Impairments
- 5 Impairments
- 6 Impairments
- Unimpaired

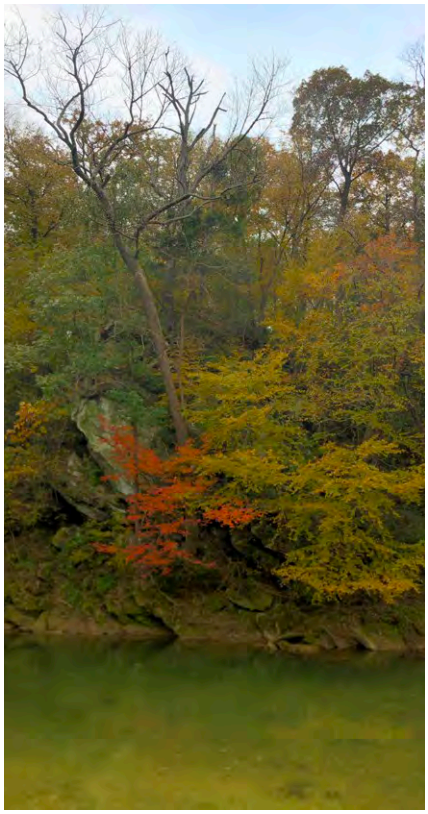


Impairment Source	Impairment Cause	Stream Segments	Stream Length (Miles)
Agriculture	Siltation	179	93.2
Agriculture	Nutrients	105	47.7
Agriculture	Low Dissolved Oxygen	69	27.1
Agriculture	Organic Enrichment	81	39.6
Habitat Modification	Habitat Alterations	178	90.9
Habitat Modification	Siltation	144	70.8
Habitat Modification	pH	0	0.0
None	Unimpaired	1	0.3

Recommendations

Improvements in these portions of the watershed are the plan's lowest priorities. Of the 15% of total resources dedicated to Tier III in the first 10 years of restoration work, it is recommended that one third of that (5% of total project resources) go to these areas, and even then, be restricted largely to outreach and physical projects in headwater tributaries. Projects should be given priority by meeting one or more of these criteria:

1. Projects with a high likelihood of delisting stream segments
2. Projects with high reduction-to-cost ratios
3. Projects addressing headwaters within these basins
4. Projects building upon existing restoration work
5. Showcase projects to facilitate outreach



In these areas, as is the case elsewhere in the watershed, sediment is the primary load reduction of interest. Accordingly, cost-effective sediment reducing BMPs such as cover crops, no-till, forested buffers, and fencing will likely be the most efficient allocation of project resources. In gearing up for the next phases of the plan in the coming years, outreach with the community in these areas is critical, particularly with the agricultural community, and younger residents, who will be inheriting these watersheds. In these areas more than others, outreach and education will be the primary emphasis of investment, rather than load reductions and delisting.

Main Stem Areas	Land		Sediment		Phosphorus		Nitrogen	
Land Cover / Source	Amount	Percent	Tons	Percent	Tons	Percent	Tons	Percent
Hay/Pasture	6,331.2 Acres	18%	495.8	4%	0.8	2%	2.2	0%
Cropland	11,302.1 Acres	33%	8,111.5	69%	6.3	19%	27.7	5%
Combined Agriculture	17,633.4 Acres	51%	8,607.2	73%	7.1	21%	29.9	6%
Wooded Areas	6,129.7 Acres	18%	15.3	0%	0.0	0%	0.2	0%
Wetlands	40.8 Acres	0%	0.1	0%	0.0	0%	0.0	0%
Open Land	1,120.8 Acres	3%	48.9	0%	0.1	0%	0.4	0%
Low-Density Mixed	443.0 Acres	1%	0.6	0%	0.0	0%	0.0	0%
Medium-Density Mixed	190.3 Acres	1%	1.0	0%	0.0	0%	0.0	0%
High-Density Mixed	2,166.8 Acres	6%	14.7	0%	0.1	0%	0.5	0%
Low-Density Open Space	6,878.4 Acres	20%	9.7	0%	0.0	0%	0.2	0%
Animals	22,077 AUs	N/A	0.0	0%	22.6	67%	89.5	17%
Stream Banks	93.5 Miles	N/A	3,047.7	26%	0.7	2%	2.3	0%
Groundwater	N/A	N/A	0.0	0%	3.1	9%	415.0	77%
Septic	N/A	N/A	0.0	0%	0.0	0%	0.3	0%
Point Sources	N/A	N/A	0.0	0%	0.0	0%	0.0	0%

Main Stem Areas				Potential Additional Reductions (Tons)		
	Implemented		Available	Sediment	Phosphorus	Nitrogen
Cover Crops	5,740.1 Acres	51%	5,468.5 Acres	2,050.5	2.0	0.2
No Tillage	1,193.0 Acres	11%	10,015.6 Acres	3,222.4	2.0	-1.5
Conservation Tillage	200.5 Acres	2%	6,081.5 Acres	1,913.8	1.2	-1.9
Reduced Tillage	3,733.6 Acres	33%	6,081.5 Acres	1,290.8	0.8	-1.8
Nutrient Management	4,855.8 Acres	43%	6,352.8 Acres	0.0	2.2	43.4
Animal Waste Management	23 AUs	0%	100%	0.0	3.0	16.7
Forested Buffers	34.5 Miles	37%	59.0 Miles	4,306.6	7.8	64.3
Stream Fencing	3.3 Miles	4%	90.2 Miles	609.0	1.3	5.2
Streambank Stabilization	0.0 Miles	0%	93.5 Miles	10,501.1	6.4	28.0

Main Stem Areas	No BMPs (Tons)	Current BMPs (Tons)	TMDL/CAP Target (Tons)	Required Reduction
Sediment	30,831,328 Tons	11,736 Tons	3,443 Tons	71%
Phosphorus	81,530 Tons	34 Tons	25 Tons	26%
Nitrogen	1,142,013 Tons	538 Tons	390 Tons	27%

WATERSHED-WIDE GOALS AND INITIATIVES

So far, all of the proposals outlined in this plan have been targeted toward specific subbasins within the watershed. Each set of BMPs was tailored to the individual needs and opportunities to that area. There are, however, goals and initiatives that transcend these boundaries and regions. This goes back to the goals established in the beginning of the plan. In abridged form, they are:

1. Decrease the amount of nonpoint pollutants
2. Engage the agricultural community in new and innovative ways to promote stream health
3. Restore aquatic and riparian habitat in degraded areas
4. Preserve ecologically critical landscapes that currently exist in the Pequea Creek Watershed
5. Advance the goals of the Lancaster and Chester County CAPs
6. Foster stewardship of the Pequea Creek Watershed within the local community

Additional BMPs

In the watershed, there are four key BMPs that are some of the most cost effective ways to manage nonpoint pollutants: cover crops, no-till agriculture, forested buffers, and stream fencing. Though their application in Tier II areas is the top priority, implementing them throughout the other portions of the watershed is also a goal. There are the obvious benefits of sediment and nutrient reduction. Regardless of the location in the watershed, these BMPs move the greater watershed to its TMDL and CAP goals. However, that is not the main benefit of these. Scattered BMPs in and of themselves do far less in meeting specific water quality goals than do equal amounts of concentrated, strategically placed ones. The real benefit in these is in their value as flagships for water quality. These projects serve as gateways to engage landowners and the public. Seeing the benefits of BMPs on a neighbor's property is one of the best ways to spark an interest. In a best case scenario, practices such as these spread to the point that they become self-sustaining.

Proposed Watershed-Wide BMPs			Annual	Ten-Year	Load Reduction (Tons)		
BMP	Amount	Cost per Unit	Cost	Cost	S	P	N
Cover Crops	2,500 Acres	$47.35/ac/yr	$118,375	$1,183,750	942.0	1.3	0.0
No Tillage	2,500 Acres	$19.21/ac/yr	$48,025	$480,250	1,047.1	0.7	-1.1
Forested Buffers	10.0 Miles	$10,985/mi/yr	$109,848	$1,098,475	56.8	0.1	1.3
Stream Fencing	20.0 Miles	$19,958/mi	$39,917	$399,168	468.9	0.9	3.5
Total	N/A	N/A	$316,164	$3,161,643	2,514.8	3.0	3.6

Total proposed annual reductions under the plan are admittedly aggressive. Given its degree of impairment, anything short of a full court press will not put the Pequea Creek Watershed on a path to recovery. Should the proposed loading reductions be achieved, it would place the entire watershed a third of its way to the TMDL target for sediment, a quarter of way to the TMDL target for phosphorus. In some ways, these gains may seem modest. However, when viewed in the context of the Pequea's loading, it's substantial, especially given the targeted application of the reductions.

Total Proposed Annual Reductions (Tons)		
Sediment	Phosphorus	Nitrogen
6,724.4	11.1	59.3

Engaging the Agricultural Community

Finding common ground with the agricultural community is central to making this plan succeed. Shared goals aren't hard to find. No farmer is interested in seeing precious topsoil wash away, or valuable nutrients leave the fields. Keeping things on the farm is everyone's goal.

Farm field days are one of the most successful and cost effective ways to reach farmers on matters of water quality. With the ever-changing landscape of agriculture, connecting the agricultural community with experts and innovations is critical. These events often offer hands-on experiences, showcasing equipment and techniques that a given farmer may not otherwise encounter. Though field days are valuable in a variety of venues, hosting them within the watershed would be of added benefit, capitalizing on existing trust and relationships within the community.

A partnership between Salisbury Township, the Lancaster Farmland Trust, TeamAg and the Environmental Defense Fund has led to a comprehensive community initiative to engage the local agricultural community. Their goal is to visit all 450 farms in the township (95% Plain Sect owned) to discuss conservation planning and manure management. They assist landowners in getting funding for conservation work, as well as host field days at "learning farms," demonstrating implementation of conservation practices. It is hoped this can serve as a model, and be adopted by other municipalities in the watershed.

Connecting farmers to the water can be as valuable as connecting them to practices. The Chesapeake Bay Foundation's "Farmers to the Bay" program is a creative approach to doing just that. The program gives farmers the opportunity to go out with watermen and experience the Chesapeake firsthand. These outings illustrate just how much those working the land have in common with those working the water. Farmers bring the lessons from their trips home with them, seeing the connections to their own land, and sharing the experience with their community.

Pocketbook issues always resonate in agriculture. Preparing literature detailing the financial benefits of land management is nothing new, but targeted content could be advantageous in soliciting greater participation in conservation practices. Of particular note is the Amish community. Owning the majority of agricultural land in the Pequea Creek Watershed, getting the messages about BMPs to them is of the utmost importance. Rather than simply create literature for this population, working with Amish farmers who have expressed interest in environmental stewardship to develop custom documents could increase their efficacy. Translating the publications into Pennsylvania German could have additional benefits. While Amish farmers would have no difficulty with English pamphlets, putting information in the dialect sends a message that their community and traditions are valued.

Restoring Aquatic and Riparian Habitat

Few partners are as enthusiastic about restoring aquatic and riparian habitats as the trout angling community. The Donegal Chapter of Trout Unlimited has done countless restoration projects throughout Lancaster County. Paired with willing landowners, organizations such as these are the best vehicle for completing these types of projects.

Full-scale stream restorations are not casual undertakings. In addition to project funding, the planning, permitting, and installation all require massive amounts of effort. A team of dedicated individuals with an experienced ground game is necessary.

An example can be found in the watershed itself. The Lancaster Conservancy's Climbers Run Nature Preserve is a showcase of numerous BMPs including a rain garden, meadows, riparian buffers, and a stream restoration project. The Conservancy partnered with Donegal Trout Unlimited who led the restoration, investing over $140,000 to restore 2,400 feet of stream and managing more than 16 acres of invasive understory.

Projects such as these will be crucial in creating the aquatic habitats needed for delisting within the watershed. This is of particular importance in the near-term delisting areas, where these types of projects can yield results quickly. In addition to restoration work within the stream itself, the incorporation of BMPs like streambank stabilizations, vegetated buffers, and streamside fencing all contribute to improved aquatic health as well as reduced sediment and nutrient loading. Combined, stream conditions are far more compatible with macroinvertebrate life, leading to higher IBI scores and eventually, stream delistings.

There is no shortage of sites where these projects could be of great benefit. That being said, incorporating this kind of work into the priority subbasins would be a value-added proposition, capitalizing on other work in those areas. The key is partnering willing landowners with organizations ready, willing, and able to bring these restorations to life, and securing the funding for them to do the job.

At the moment, only a small fraction of the watershed's streams host self-sustaining populations of wild trout. Given implementation of proper projects, there's no reason those numbers cannot increase. Every bit of work making a stream more hospitable to trout moves a stream closer to delisting. Capitalizing on relationships, local initiative, and ideal project sites, this type of restoration work represents one of the best ways to allocate resources in the watershed.

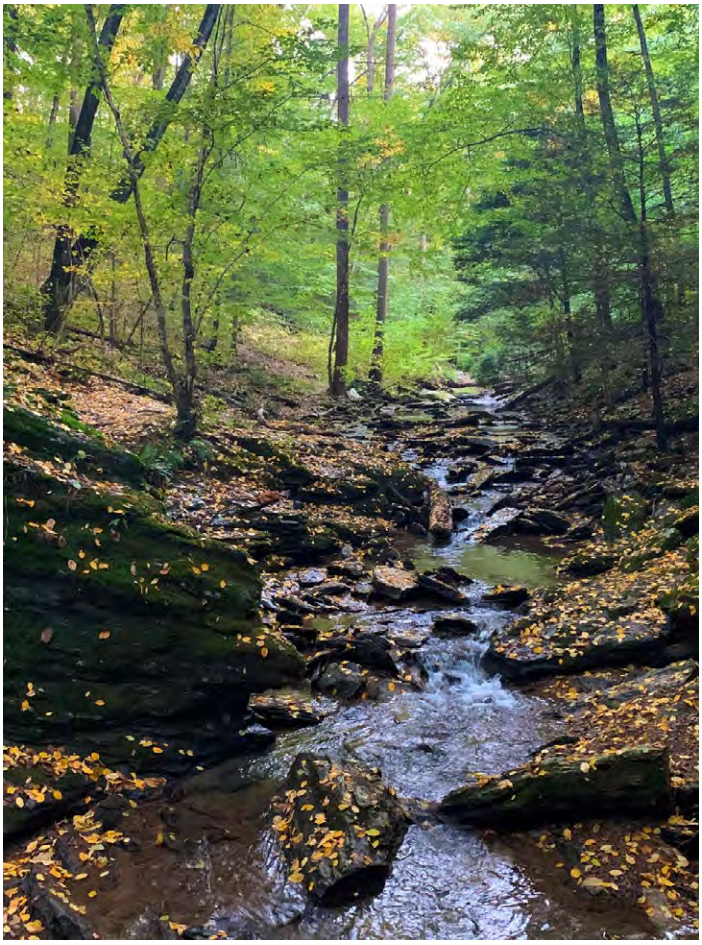
Photo Credits: Donegal Trout Unlimited

Photo Credit: Derek Eberly, TRCP

Preserve Ecologically Critical Landscapes

As noted in the background section, very little natural land in the Pequea Creek Watershed is preserved. Thankfully, in many of the more pristine natural environments such as the River Hills and Welsh Mountains, there are notable tracts of protected land, held by various local governments and the Lancaster County Conservancy. Still, there could always be more.

Municipalities play an important role here. First, there is the option to acquire land for preservation, but that is not an opportunity that always presents itself. Far more practical is addressing local ordinances. Adapting zoning regulations offers a strategy for protecting these spaces. Overlays dealing with riparian or otherwise sensitive environmental areas are an effective tool that does not necessitate altering the underlying zoning districts (See appendix for model ordinance). Subdivision and land development ordinances (SaLDOs) are another opportunity, particularly where there is a likelihood that larger natural lots will be carved into smaller ones. Not often used, official maps are an additional tool at municipalities' disposal. The plan recommends such changes, but also appreciates the political and legal challenges inherent in these sorts of solutions. Where there is community will, though, these avenues of preservation should be explored.



Advancing CAP Goals

Meeting the goals of their respective CAPs will be a significant challenge for both Lancaster and Chester counties. This plan's focus is first and foremost the delisting of streams within the Pequea Creek Watershed. That being said, that is a goal entirely compatible with greater implementation of the CAPs, especially Lancaster's.

During the WIP3 process, Lancaster County's team developing implementation goals had a guiding philosophy: ambitious but realistic. Nowhere was this more challenging than in addressing nitrogen loading. This plan has included nitrogen elements, but recognizes proposals here fall far short of the CAP.

Rather than reinvent the wheel, the plan advocates implementing CAP recommendations throughout the watershed, with the Lancaster Clean Water Partners taking the leading role in addressing those nutrient issues. With all other things being equal in restoration work within the Pequea Creek Watershed, preference should be given to projects that reduce nutrient loading as well as sediment (though not at the expense of it). Given the tight timelines for CAP implementation, meeting targets necessitates work in the Pequea, and this plan fully supports those initiatives.

Fostering Stewardship of the Pequea Creek Watershed

Connecting the community with the watershed is an important step in ensuring the long-term success of this plan. This was the philosophy from the start of the plan-writing process, inviting a large cross section of the watershed community to participate in this document's development.

Perhaps the most notable presence in this effort is the Pequea Creek Watershed Association. The group has championed the watershed, and in no small way. This is exemplified by one of their restoration projects on Big Beaver Creek, which received a Governor's Award of Excellence.

The work comprised 2,700 linear feet of stabilized stream banks on a Plain Sect farm. The project has served as a showcase to others of what can be done to solve known nutrient and sedimentation issues in an agricultural area. This section of the Big Beaver Creek is heavily trafficked by anglers every year during trout season. Seeing the transformation that's taken place, these local sportsmen and women in turn become advocates for similar projects elsewhere. The effort has also demonstrated how a restoration can be done on an Amish farm without infringing upon their religious and cultural beliefs.

In addition to restoration projects, the Association is active in the community. The group regularly attends community events and produces a newsletter detailing developments in the watershed. As new projects are implemented, it's hoped that the membership and impacts continue to grow.

As a compliment to these traditional means of outreach, other outside-of-the-box approaches could serve to increase engagement in the community. These could include activities such as contests to name the unnamed tributaries within the watershed. Partnerships could be formed with art galleries in Downtown Lancaster, hosting art either sourced from or inspired by the Pequea Creek. Local breweries have produced beer with (filtered) water from local streams as a promotion, something that could easily be paired with an effort to increase community involvement. Lancaster's annual Water Week presents another opportunity to foster connections with the Pequea though its numerous events.

In essence, the only limit on how connections can be formed with the watershed is human imagination. The key is to continually explore new approaches and capitalize on opportunities as they present themselves. As people develop a sense of ownership in the Pequea, their stewardship will increase.

Photo Credit: Pequea Creek Watershed Association

Education

Education is perhaps the single most valuable tool in promoting the long-term health of the Pequea Creek Watershed. Knowledge guides sound decisions, forges connections, and challenges us to improve upon current conditions. Viewing education beyond the strict confines of formal learning environments is important to this process, and should be embraced.

For more than 40 years, the Chesapeake Bay Foundation has provided meaningful watershed experiences to more than one million students. Teachers within the watershed have gone through the CBF's development programs, taking watershed education back to their classrooms. Student programs explore the watershed's natural environment, including everything from riparian habitat to stream ecology and macroinvertebrates. In the wake of the COVID-19 pandemic, the education staff has developed a program of online and virtual learning to continue their mission. Going forward, the staff will continue to engage the students and teachers of the Pequea Creek Watershed to foster a greater understanding and appreciation of this local environmental asset.

Education, however, is not just for teachers and students. Numerous and varied opportunities will need to be offered throughout the watershed. Along with the field days mentioned earlier, other forms of agricultural education should be offered. Community events such as fairs and expositions provide opportunities to discuss a variety of BMPs and conservation practices. Another important segment of the population to reach is government officials. Presentations at supervisors' meetings, planning commissions, and other relevant municipal bodies are ideal for speaking to individuals with the ability to effect fundamental change, and should be sought out. Civic and religious organizations are another venue where watershed education may be welcomed, whether in formal or informal settings. Key to all of this is seizing opportunities as they arise.

COST ESTIMATES AND IMPLEMENTATION TIMELINE

There is no way around it: restoring a waterway with the level of impairments seen on the Pequea Creek is a very expensive proposition. Based on current BMP proposals, the total ten-year cost is roughly $31M. Broken out over the course of a decade, the annual cost is one tenth of this.

It is important to note some things about these figures. First is that they represent full implementation of all proposals (rounded to the nearest thousand dollar). As has been noted, full implementation is not necessarily required for delisting in specific areas. Rather, these figures represent targets to reach TMDL and CAP goals, specifically for sediment.

Figures here represent gross costs, not net. A variety of BMPs (notably cover crops and tillage management) are likely to yield savings over time, not additional costs. In the case of legacy sediment projects, sediment moved off-site can often be sold as clean fill, reducing the cost.

A large portion of these costs ($9,604,000 or 31%) relate to animal waste management, specifically manure storage facilities. These represent a significant expense with no benefits to sediment loading. This fact coupled with expense relegates these to a secondary priority.

Money allocated to individual subbasins is meant to be interpreted in a flexible manner. If there are opportunities to implement BMPs in different ratios than prescribed while achieving similar goals, this is not cause for concern. Rather, it's an acceptance that the real world does not always fit into the neat boundaries of a plan, and adaptation is necessary for success.

Several BMPs found in the CAP were not addressed in the proposals, for reasons detailed earlier in the plan. These include prescribed grazing, land retirement, soil and water conservation plans, stream restoration, barnyard runoff controls, manure transport, precision dairy feeding, stormwater management and dirt and gravel road erosion and sedimentation controls. Where it can be demonstrated that these BMPs accomplish the goals outlined in the plan, substitution is not a concern.

Restoration Costs

Tier I	Annual Cost	Ten-Year Cost
Combined Tier I Areas	***$136,000***	***$1,365,000***
Tier II	Annual Cost	Ten-Year Cost
Big Beaver Creek (Upper)	$230,000	$2,299,000
Little Beaver Creek (Upper)	$162,000	$1,615,000
Eshleman Run	$298,000	$2,981,000
Londonland Run	$316,000	$3,161,000
White Horse Run	$340,000	$3,403,000
Indian Spring Run	$458,000	$4,585,000
Pequea Headwaters (Upper)	$379,000	$3,792,000
Combined Tier II Areas	***$2,184,000***	***$21,835,000***
Tier III	Annual Cost	Ten-Year Cost
Headwater Areas	$273,000	$2,729,000
Main Stem Areas	$136,000	$1,365,000
Combined Tier III Areas	***$409,000***	***$4,094,000***
All Tiers	Annual Cost	Ten-Year Cost
Combined Tier I, II & III Areas	***$2,729,000***	***$27,294,000***

Watershed Wide	Annual Cost	Ten-Year Cost
Cover Crops: 2,500 Acres	$118,000	$1,184,000
No Tillage: 2,500 Acres	$48,000	$480,000
Forested Buffers: 20 Miles	$110,000	$1,098,000
Stream Fencing: 20 Miles	$40,000	$399,000
Combined	***$316,00***	***$3,161,000***

Monitoring

Watershed Wide	Annual Cost	Ten-Year Cost
Monitoring	***$20,000***	***$200,000***

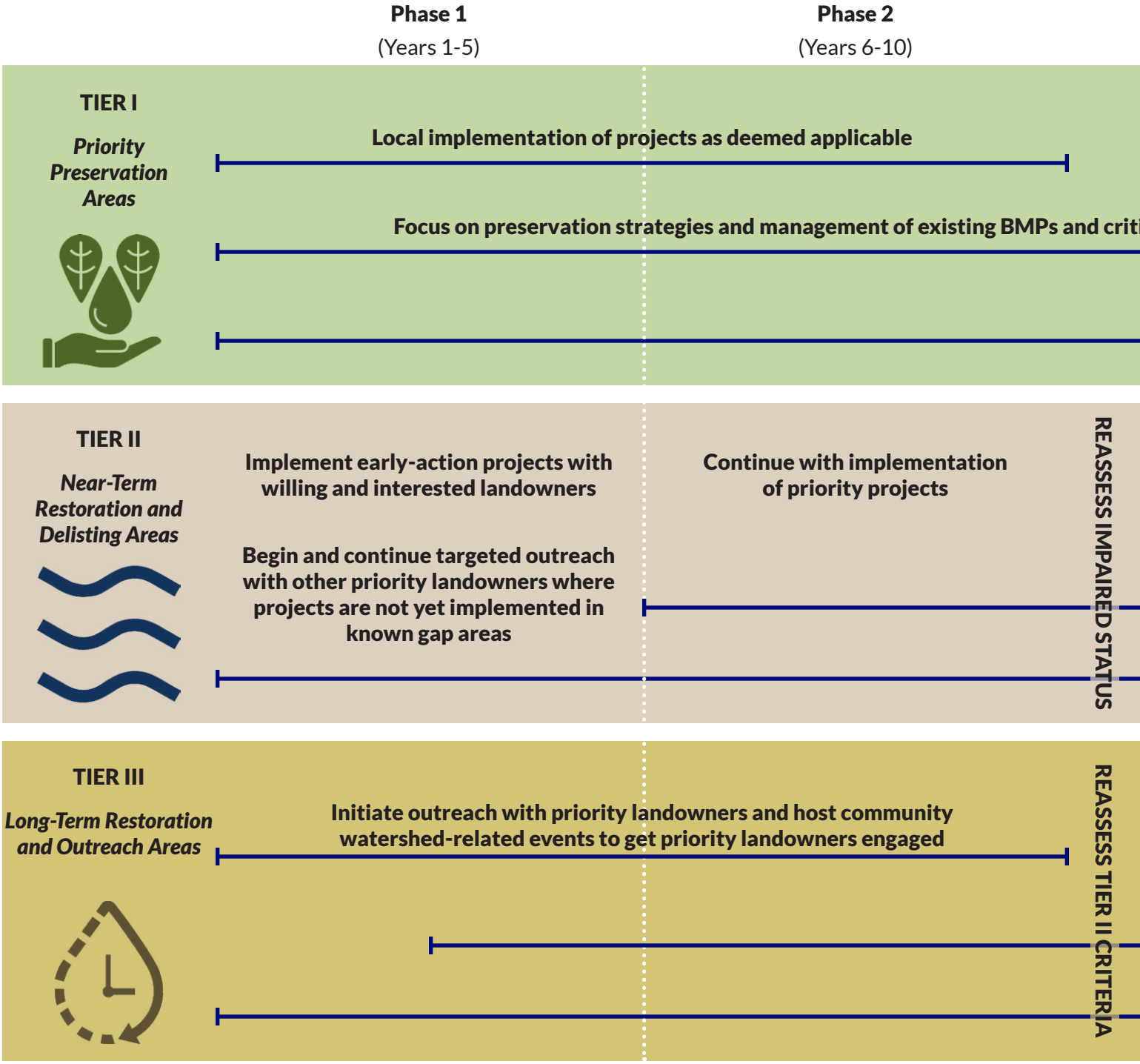
Education & Outreach

Watershed Wide	Annual Cost	Ten-Year Cost
Education	$20,000	$200,000
Outreach	$20,000	$200,000
Combined	***$20,000***	***$400,000***

Total

Watershed Wide	Annual Cost	Ten-Year Cost
Total	***$3,105,000***	***$31,055,000***

PRIORITIZED IMPLEMENTATION TIMELINE



* *Reduction indicator is a calculation of anticipated reductions according to our modeling - not based upon measured reductions in-stream.*

PHASE 1 MILESTONES:

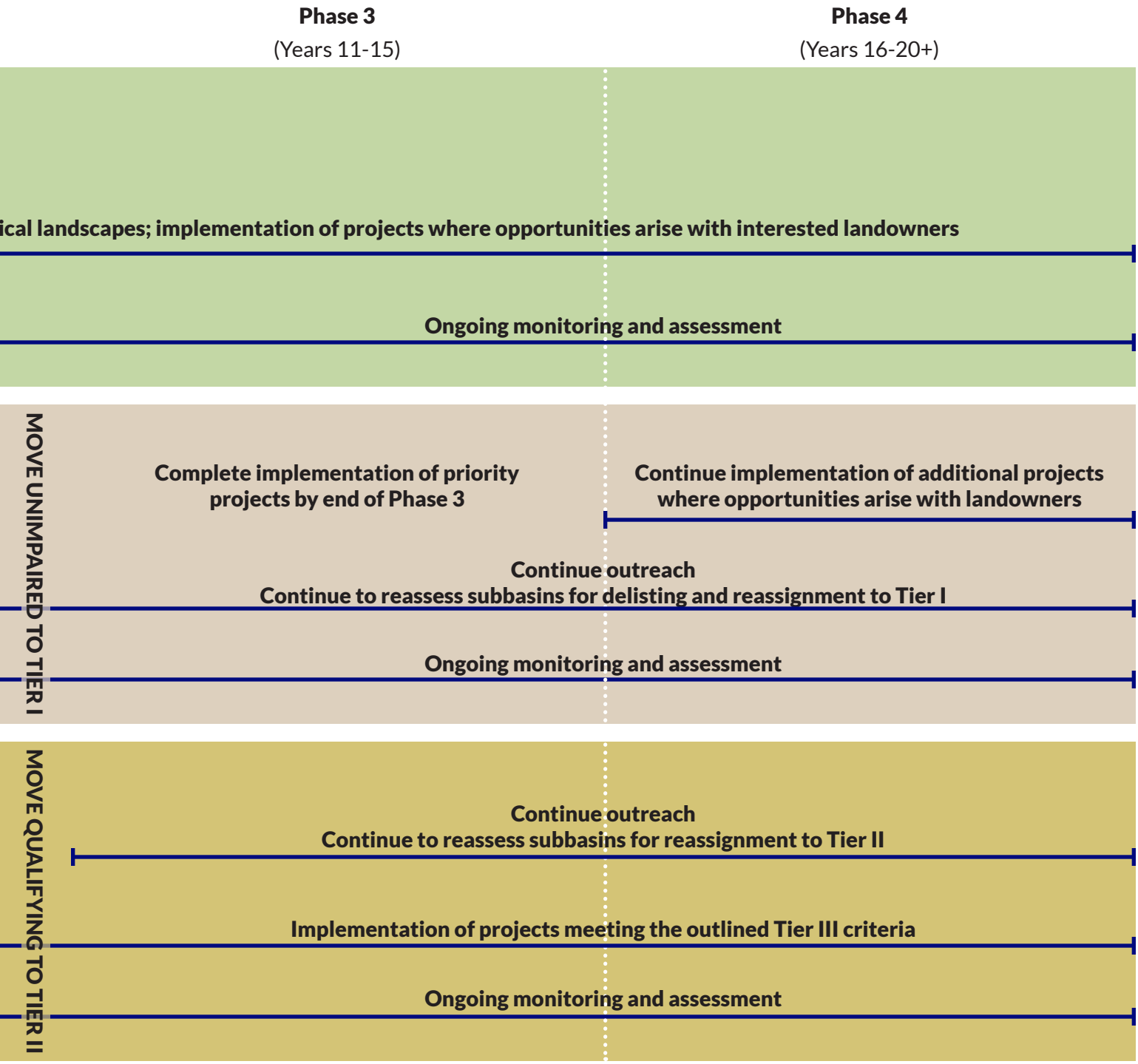
- Completion of website
- Tier II outreach events
- Completion of early-action projects in Tier II region

SEDIMENT REDUCTION: 842 tons/yr*
(20% of Tier II Sediment Targets)
PHOSPHORUS REDUCTION: 0.8 tons/yr*
(10% of Tier II Phosphorus Targets)

PHASE 2 MILESTONES:

- Continued implementation of targeted project goals for Tier II region
- Tier III outreach events
- Reassessment of Tier II and Tier III for delisting/reclassification

SEDIMENT REDUCTION: 2,104 tons/yr*
(50% of Tier II Sediment Targets)
PHOSPHORUS REDUCTION: 2.0 tons/yr*
(25% of Tier II Phosphorus Targets)



PHASE 3 MILESTONES:

- Completion of Tier II sediment project goals
- 75% completion Tier II phosphorus reduction goals
- Tier III outreach events
- Reassessment of Tier II and Tier III for delisting/ reclassification

SEDIMENT REDUCTION: 4,210 tons/yr*
(100% of Tier II Sediment Targets)

PHOSPHORUS REDUCTION: 6.1 tons/yr*
(75% of Tier II Phosphorus Targets)

PHASE 4 MILESTONES:

- Completion of targeted project goals for Tier I, II, and III regions
- Reassessment of Tier II and Tier III for delisting/ reclassification

SEDIMENT REDUCTION: 6,724 tons/yr*
(100% of Tier II and Watershed-Wide Sediment Targets)

PHOSPHORUS REDUCTION: 8.1 tons/yr*
(100% of Tier II Phosphorus Targets)

PLAN ROLES

Within the Pequea Creek Watershed, there are numerous partners dedicating to promoting and implementing clean water strategies. As noted earlier in the plan, the intention of this plan is not to reinvent the wheel. Rather, the goal is to capitalize on existing initiatives and assets, and direct efforts toward implementing plan objectives.

Plan Administration

Lancaster Clean Water Partners (LCWP)

With their lead role in administering the CAP, the LCWPs' role will be to integrate the recommendations of this 319 plan into the broader CAP objectives, and steer planning efforts towards their realization. The LCWP will also direct relevant partners to the plan as opportunities and resources arise within the watershed.

Lancaster County Conservation District (LCCD)

The LCCD is the primary access point to both the agricultural and watershed implementation communities. Accordingly, the role of the LCCD will be to prioritize outreach and efforts towards implementing identified BMPs in the priority areas.

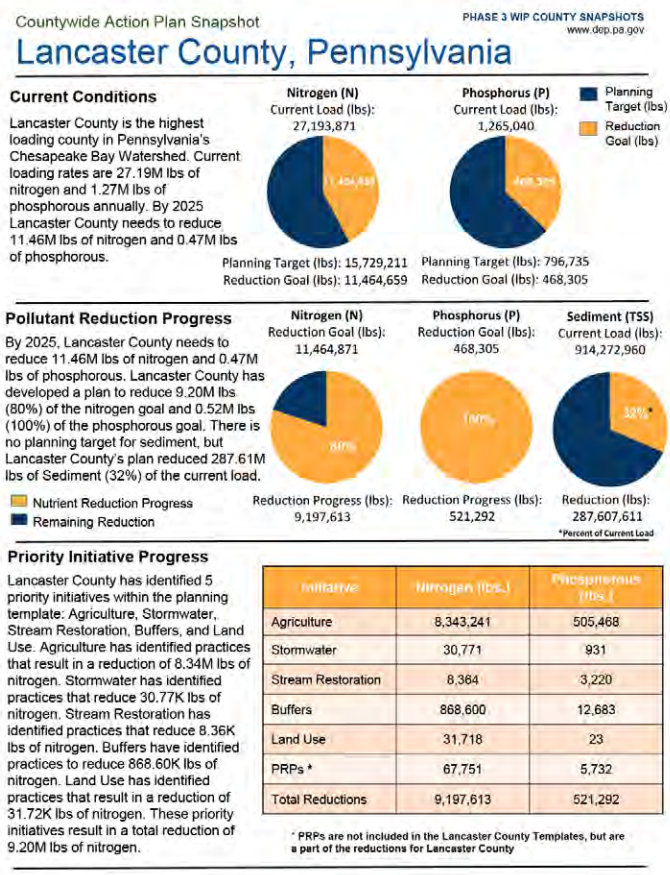
Pequea Creek Watershed Association (PCWA)

The PCWA is the "boots on the ground" organization, in the watershed, and their role will be to bring the plan and its recommendations directly to the community.

Chesapeake Bay Foundation (CBF)

As the author of the plan, the CBF will be in charge of maintaining the plan document, and amending it as necessary. The CBF will also create and maintain the plan's website and provide continued access to the document by the wider community.

Photo Credit: Lancaster Newspapers



Countywide Action Plan Snapshot

PHASE 3 WIP COUNTY SNAPSHOTS
www.dep.pa.gov

Lancaster County, Pennsylvania

Current Conditions

Lancaster County is the highest loading county in Pennsylvania's Chesapeake Bay Watershed. Current loading rates are 27.19M lbs of nitrogen and 1.27M lbs of phosphorous annually. By 2025 Lancaster County needs to reduce 11.46M lbs of nitrogen and 0.47M lbs of phosphorous.

Nitrogen (N)
Current Load (lbs): 27,193,871
Planning Target (lbs): 15,729,211
Reduction Goal (lbs): 11,464,659

Phosphorus (P)
Current Load (lbs): 1,265,040
Planning Target (lbs): 796,735
Reduction Goal (lbs): 468,305

Planning Target (lbs)
Reduction Goal (lbs)

Pollutant Reduction Progress

By 2025, Lancaster County needs to reduce 11.46M lbs of nitrogen and 0.47M lbs of phosphorous. Lancaster County has developed a plan to reduce 9.20M lbs (80%) of the nitrogen goal and 0.52M lbs (100%) of the phosphorous goal. There is no planning target for sediment, but Lancaster County's plan reduced 287.61M lbs of Sediment (32%) of the current load.

Nitrogen (N)
Reduction Goal (lbs): 11,464,871
Reduction Progress (lbs): 9,197,613

Phosphorus (P)
Reduction Goal (lbs): 468,305
Reduction Progress (lbs): 521,292

Sediment (TSS)
Current Load (lbs): 914,272,960
Reduction (lbs): 287,607,611
*Percent of Current Load

Nutrient Reduction Progress
Remaining Reduction

Priority Initiative Progress

Lancaster County has identified 5 priority initiatives within the planning template: Agriculture, Stormwater, Stream Restoration, Buffers, and Land Use. Agriculture has identified practices that result in a reduction of 8.34M lbs of nitrogen. Stormwater has identified practices that reduce 30.77K lbs of nitrogen. Stream Restoration has identified practices that reduce 8.36K lbs of nitrogen. Buffers have identified practices to reduce 868.60K lbs of nitrogen. Land Use has identified practices that result in a reduction of 31.72K lbs of nitrogen. These priority initiatives result in a total reduction of 9.20M lbs of nitrogen.

Initiative	Nitrogen (lbs.)	Phosphorous (lbs.)
Agriculture	8,343,241	505,468
Stormwater	30,771	931
Stream Restoration	8,364	3,220
Buffers	868,600	12,683
Land Use	31,718	23
PRPs *	67,751	5,732
Total Reductions	9,197,613	521,292

* PRPs are not included in the Lancaster County Templates, but are a part of the reductions for Lancaster County

Plan Implementation

Lancaster Clean Water Partners (LCWP)

As the CAP is implemented, LCWP's role will be to direct partners toward projects outlined in this plan. They will also play a key role in providing funding resources.

Lancaster County Conservation District (LCCD)

LCCD's will take the lead role in promoting and implementing agricultural BMPs in the watershed. LCCD staff will also be engaged directly in restoration projects.

Pequea Creek Watershed Association (PCWA)

The PCWA will work with land owners to secure projects, and work directly with their implementation. This will be done in coordination with LCCD staff.

Landowners

None of the plans objectives will be implemented without willing landowners. The plan seeks their active engagement in the implementation of BMPs.

Municipalities

Municipalities will facilitate projects through the various permitting processes, and where applicable through their MS4 obligations and ordinance amendments

Plan Implementation (continued)

Partner Organizations and Individuals

Numerous organizations, businesses, and government entities/agencies will have a role in implementing this plan.

Outreach

Lancaster Clean Water Partners (LCWP)

LCWP outreach efforts will be incorporated into initiatives taking place under the CAP.

Lancaster County Conservation District (LCCD)

LCCD will be the lead organization in outreach to the agricultural community.

Pequea Creek Watershed Association (PCWA)

The PCWA will play the lead role in outreach to the local community.

Chesapeake Bay Foundation (CBF)

The CBF will maintain the plan's print and digital presence.

Education

Chesapeake Bay Foundation (CBF)

The CBF will promote programs within the watershed and engage educators to enhance their curricula.

Local School Districts

Local school districts will play a key role in bringing watershed education to their students.

Lancaster County Conservation District (LCCD)

LCCD will continue to educate the agricultural community through direct engagement, literature, and events.

Monitoring

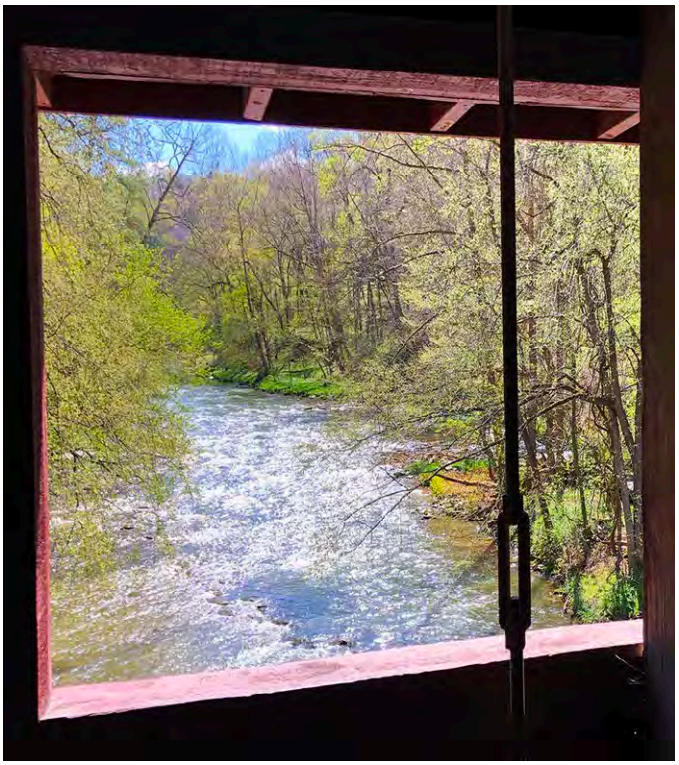
Lancaster Clean Water Partners (LCWP)

As part of the CAP, a detailed monitoring structure is in place to track progress implementing BMPs and reducing nutrient /sediment loading. These structures will be utilized to follow plan implementation and environmental changes. Additionally, the LCWP will serve as an advocate for increased monitoring within the watershed, particularly in Tier II areas.

Chesapeake Bay Foundation (CBF)

As the plan arrives at timeline benchmarks, the CBF's role will be to adapt the plan, recognizing successes and shortcomings of the plan per stated objectives.

TECHNICAL & FINANCIAL ASSISTANCE



A wide range of funding and expertise will be required to implement the recommendations in this plan. And though approval of this plan will make grants available through the EPA's 319 Program, the scope and scale of restoration work in the Pequea far exceeds resources available from this one source. For this plan's goals to become realities, numerous programs and partnerships will need to leveraged.

To aid in implementation of the Lancaster CAP, as well as achieving the Lancaster Clean Water Partners' goal of "clean and clear local streams by 2040," the Pennsylvania State University did a comprehensive funding and resource analysis for projects and BMPs in local watersheds. Their report detailed both funding and technical resources currently being utilized, as well a comprehensive list of additional opportunities. This chapter contains an abridged list from the report, with more detailed information found in the complete report, included in the plan appendix. (See "Collective Action for Clean Water: A Partners & Resources Inventory, Analysis, and Recommended Integrated Funding Delivery Strategy for Lancaster County," Penn State Agriculture & Environment Center, March 2021.)

Currently Utilized Technical Assistance & Funding Resources

Partners (Staff Capacity)

- Lancaster Clean Water Partners
- Lancaster Farmland Trust
- Chesapeake Bay Foundation
- Chesapeake Conservancy
- Alliance for the Chesapeake Bay
- Pequea Creek Watershed Assoc.
- Lancaster County Conservation District
- TeamAg
- Red Barn
- Stroud Water Research Center
- Salisbury Township
- Other Pequea municipalities
- Lancaster Conservancy
- Donegal TU
- US Fish & Wildlife Service

Photo Credit: Lancaster Newspapers

Funding Programs

- USDA Natural Resource Conservation Service Programs (NRCS)
  Environmental Quality Incentives Program (EQIP)
  Conservation Stewardship Program (CSP)
  Wetland Reserve Easement Program (WRE)
- USDA Farm Service Agency Conservation Service Programs
  Conservation Reserve Enhancement Program
- DCNR Lancaster County Buffers Partnership
- Lancaster County Buffer Bonus (Growing Greener)
- Multifunctional Buffers (PACD)
- CBF Keystone Ten Million Trees (K10) Partnership
- Ag Planning Reimbursement
- PA Infrastructure Investment Authority (PENNVEST)
- Resource Enhancement and Protection Program (REAP)
- Dirt & Gravel Road Program
- Conservation Excellence Grants
- PA Soil Health Coalition (National Fish & Wildlife Federation)
- Subsurface Application of Manure
- Lancaster Farmland Trust (LFT) Farm Conservation Grants
- Farm Stewardship Program (FSP) Buffer Programs (Stroud)
- EPA Most Effective Basin Funding
- Capital Resource Conservation & Protection Grazing Program
- CBF Accelerating Buffers (National Fish & Wildlife Federation)

Potential Technical Assistance & Funding Resources

Resources for Agricultural Best Management Practices

Partners (Staff Capacity)

- USDA NRCS
- USDA FSA
- US EPA
- PA DEP
- State Conservation Commission
- PENNVEST
- Lancaster County Conservation District
- Lancaster Farmland Trust
- Alliance for the Chesapeake Bay
- Chesapeake Bay Foundation
- Stroud Water Research Center
- Penn State University
- TeamAg, Inc.
- Red Barn Consulting

Funding Programs

- NRCS Environmental Quality Incentives Program (EQIP)
- NRCS Conservation Innovation Grants (CIG)
- NRCS Conservation Stewardship Program (CSP)
- Section 319 Program
- EPA Chesapeake Bay Program Funds (CBIG & CBRAP)
- Clean Water State Revolving Loan Fund
- EPA Most Effective Basin Funding
- EPA's SWG and INSR grants (currently administered by NFWF)
- Growing Greener
- Ag Planning Reimbursement Program (APRP)
- REAP
- PENNVEST
- Act 13 Watershed Restoration and Protection Program
- Exelon Habitat Improvement Project Program (PFBC)
- Exelon Habitat Improvement Project Program (LCCD)
- Conservation Excellence Grants (CEG)
- Susquehanna Riverlands Mini Grants (Lancaster Conservancy)
- Lancaster Clean Water Fund
- Campbell Foundation Grants

Funding from Programmatic Grants

- PA Soil Health Coalition (Stroud NFWF, GG Grants)
- Capital RC&D Grazing Management Program (RC&D NFWF)
- Lancaster County Buffer Bonus Program (ACB GG Grant)
- Farm Stewardship Program (Stroud NFWF Grant)
- LFT Farm Conservation Grants (LFT various funding sources)
- Subsurface Application of Manure (LCCD Campbell Grant)
- Turkey Hill Clean Water Partnership

Resources for Stormwater Best Management Practices

Funding Programs

- Section 319 Program
- EPA Chesapeake Bay Program Funds (CBIG & CBRAP)
- EPA's SWG and INSR grants (currently administered by NFWF)
- Clean Water State Revolving Loan Fund
- Community Development Block Grants
- Growing Greener
- TreeVitalize
- DCNR C2P2
- PENNVEST
- Act 13 Watershed Restoration and Protection Program
- Dirt & Gravel/Low Volume Road Program
- Smart Growth Transportation Program
- LCCWC Stormwater Mini Grants
- Susquehanna Riverlands Mini Grants (Lancaster Conservancy)
- Lancaster Clean Water Fund

Funding from Programmatic Grants

- Lancaster County Buffer Bonus Program (ACB GG Grant)

Partners (Staff Capacity)

- US EPA
- PA DEP
- PA DCNR
- PENNVEST
- PA DCED
- Lancaster County Conservation District
- Lancaster County Planning Department
- Lancaster County Clean Water Consortium
- Lancaster Conservancy
- Alliance for the Chesapeake Bay
- Chesapeake Bay Foundation
- Penn State University
- LandStudies, Inc.
- RETTEW
- C.S. Davidson
- David Miller/Associates
- Earthbound Artisan

Resources for Riparian Buffers

Partners (Staff Capacity)

- USDA NRCS
- USDA FSA
- PA DEP
- PA DCNR
- Lancaster County Conservation District
- Lancaster Conservancy
- Donegal Trout Unlimited
- Alliance for the Chesapeake Bay
- Chesapeake Bay Foundation
- Stroud Water Research Center
- Penn State University
- LandStudies, Inc.
- Crow & Berry Land Management
- Earthbound Artisan
- RETTEW

Funding Programs

- Partners for Fish and Wildlife Program
- Section 319 Program
- EPA Chesapeake Bay Program Funds (CBIG & CBRAP)
- Clean Water State Revolving Loan Fund
- EPA Most Effective Basin Funding
- Growing Greener
- DCNR Riparian Buffer Grant Program
- DCNR C2P2
- TreeVitalize
- REAP
- PENNVEST
- Act 13 Watershed Restoration and Protection Program
- Exelon Habitat Improvement Project Program (PFBC)
- CREP
- Conservation Excellence Grants (CEG)
- Exelon Habitat Improvement Project Program (LCCD)
- LCCWC Stormwater Mini Grants
- Susquehanna Riverlands Mini Grants (Lancaster Conservancy)
- EPA's SWG and INSR grants (currently administered by NFWF)
- Lancaster Clean Water Fund
- CBF Keystone Ten Million Trees (K10) Partnership

Funding from Programmatic Grants

- Lancaster County Buffers Partnership (ACB DCNR Grants)
- Multifunctional Riparian Buffers (PACD DCNR Grant)
- CBF Accelerating Riparian Buffers NFWF Grant
- Stroud Forest Riparian Buffer Program (DCNR, others)
- LFT Farm Conservation Grants (LFT various funding sources)

Resources for Restoration Best Management Practices

Funding Programs

- NRCS Environmental Quality Incentives Program (EQIP)
- NRCS Conservation Innovation Grants (CIG)
- NRCS Wetland Reserve Easement Program (WRE)
- NRCS Watershed Protection & Flood Prevention Program (PL-566)
- Partners for Fish and Wildlife Program
- Section 319 Program
- EPA's SWG and INSR grants (currently administered by NFWF)
- EPA Chesapeake Bay Program Funds (CBIG & CBRAP)
- Clean Water State Revolving Loan Fund
- Growing Greener
- DCNR C2P2
- PENNVEST
- Exelon Habitat Improvement Project Program (PFBC)
- Exelon Habitat Improvement Project Program (LCCD)
- Conservation Excellence Grants (CEG)
- Susquehanna Riverlands Mini Grants (Lancaster Conservancy)
- Lancaster Clean Water Fund

Partners (Staff Capacity)

- USDA NRCS
- US Fish and Wildlife Service
- US EPA
- PA DEP
- PA Fish & Boat Commission
- Lancaster County Conservation District
- Donegal Trout Unlimited
- Penn State University
- Water Science Institute
- LandStudies, Inc.
- RETTEW

Funding from Programmatic Grants

- Lancaster County 319 Stream Restoration TA (LCCD 319 Grant)
- LFT Farm Conservation Grants (LFT various funding sources)
- Lancaster County Buffer Bonus Program (ACB GG Grant)

Selected Resource Acronyms

ACB	Alliance for the Chesapeake Bay
APRP	Agricultural Planning Reimbursement Program
C&B	Crow & Berry Land Management LLC
C2P2	Community Conservation Partnerships Program
CBIG	Chesapeake Bay Implementation Grants
CBRAP	Chesapeake Bay Regulatory and Accountability Program
CDBG	Community Development Block Grant
CEG	Conservation Excellence Grant
CIG	Conservation Innovation Grants
CREP	Conservation Reserve Enhancement Program
CSD	C.S. Davidson, Inc.
D&G	Dirt & Gravel/Low Volume Road Program
DCED	Department of Community and Economic Development
DM/A	David Miller/Associates, Inc.
DTU	Donegal Chapter of Trout Unlimited
EA	Earthbound Artisans
EQIP	Environmental Quality Incentives Program
FSA	USDA Farm Service Agency
FSP	Farm Stewardship Program
GG	Growing Greener
INSR	Innovative Sediment and Nutrient Reduction Grants
K10	Keystone 10 Million Trees Partnership
LCCF	Lancaster County Community Foundation
LCCWC	Lancaster County Clean Water Consortium
LCWF	Lancaster Clean Water Fund
LFT	Lancaster Farmland Trust
LSI	LandStudies, Inc.
NFWF	National Fish and Wildlife Foundation
NRCS	USDA Natural Resources Conservation Service
PENNVEST	PA Infrastructure Investment Authority
PL-566	Watershed Protection and Flood Prevention Program
RC&D	Resource Conservation and Development Council
RCPP	Regional Conservation Partnership Program
REAP	Resource Enhancement and Protection Program
SGTP	Smart Growth Transportation Program
SWG	Small Watershed Grants
THCWP	Turkey Hill Clean Water Partnership
USFWS	US Fish & Wildlife Service
WRE	Wetland Reserve Easement Program
WSI	Water Science Institute

MONITORING PROGRESS

IMPLEMENTATION TRACKING

Our phased schedule, as shown in the Implementation Plan section, will be our guide to ensure our project goals are achieved, interim progress is made, and revisions are completed when needed. Incremental milestones set along the way will help us track interim progress, and these milestones can be quantified in terms of the amount of BMPs implemented. This can then be modeled using MMW to calculate the anticipated annual sediment reduction in pounds per year. Where applicable, these numbers can be augmented with figures from CAST for BMPs not included in MMW. Given the broad assortment of BMPs prescribed, and the desired flexibility in their implementation, goals are set it terms of load reduction, rather than specific BMP implementation. The implementation portion of the plan offers a more detailed breakdown and quantification of project metrics per subbasin, which can be used for more precise project tracking. Additionally, as progress is made, subbasins will be reassessed. Tier III watersheds meeting Tier II criteria will be reassigned and analyzed based upon the plan's established methodologies. Tier II watersheds fully delisted by the Commonwealth of Pennsylvania will be moved into Tier I.

Phase One (Years 1-5)	Phase Two (Years 6-10)	Phase Three (Years 11-15)	Phase Four (Years 16-20)
Milestones:	**Milestones:**	**Milestones:**	**Milestones:**
• Completion of website • Tier II outreach events • Completion of early-action projects in Tier II region	• Continued implementation of targeted project goals for Tier II region • Tier III outreach events • Reassessment of Tier II and Tier III for delisting/ reclassification	• Completion of Tier II sediment project goals • 75% completion Tier II phosphorus reduction goals • Tier III outreach events • Reassessment of Tier II and Tier III for delisting/ reclassification	• Completion of targeted project goals for Tier I, II, and III regions • Reassessment of Tier II and Tier III for delisting/ reclassification
Sediment Reduction:	**Sediment Reduction:**	**Sediment Reduction:**	**Sediment Reduction:**
842 tons per year	2,104 tons per year	4,210 tons per year	6,724 tons per year
Phosphorus Reduction:	**Phosphorus Reduction:**	**Phosphorus Reduction:**	**Phosphorus Reduction:**
0.8 tons per year	2.0 tons per year	6.1 tons per year	8.1 tons per year

Tracking BMP implementation throughout the watershed will be integrated with the CAP monitoring process. Under their CAPs, counties are required to track progress in meeting their load reduction goals. This is done through the inventorying of implemented BMPs and resultant load reductions. Lancaster County (under the leadership of the LCWP) has developed a thorough process for tracking this progress, with a detailed data acquisition and storage framework. This information utilizes the FieldDocs software package, and records detailed information pertaining to type, location, and extent of BMP implementation throughout the county. In the Pequea, this system will be utilized, both for recording BMPs and subsequent tracking and analysis.

STREAM MONITORING

Quantifying the state of the Pequea's health is a key component in assessing progress made in the watershed. The primary tool utilized in the watershed is the regular determination of IBI scores. The Susquehanna River Basin Commission (SRBC) maintains 40 monitoring sites throughout the watershed where IBI scores are collected. At these locations, a full array of analyses is conducted, including large/small stream IBI scores and Becks, Hilsenhoff, and Shannon Indices, as well as a variety of taxonomic and tolerance assessments. These will be the benchmarks by which progress is measured.

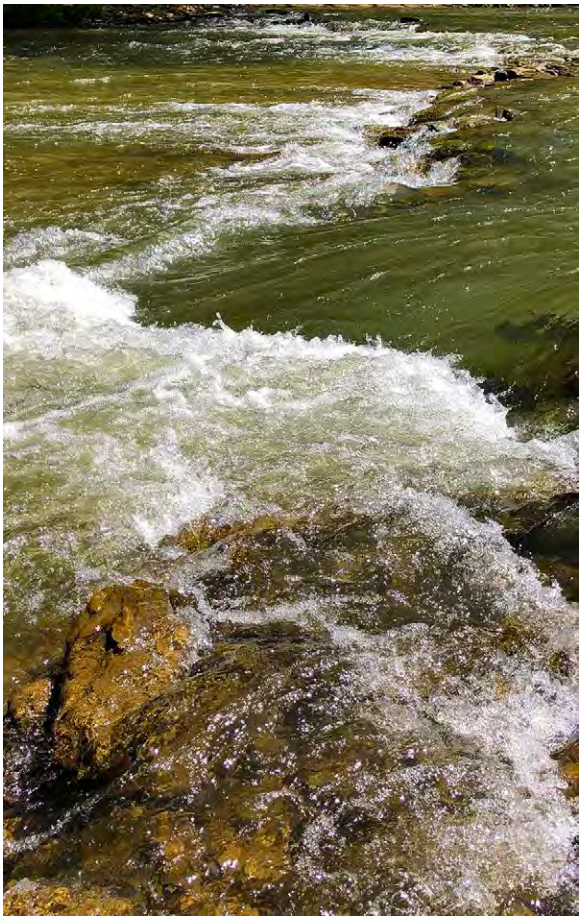
Coverage gaps exist in the IBI data for the Pequea Creek Watershed. This has relevance not only to the work of this plan, but to that of water quality initiatives throughout the region. The CAP team has been working with SRBC to increase the number of IBI sites, and establish a monitoring schedule. Working with the Chesapeake Conservancy, we have proposed new sites in all of the Tier II priority areas, as well as a monitoring schedule which would see every subbasin visited during each five-year phase of the plan. Additionally, we are also coordinating to increase continuous, mechanical measurement of various stream data in the watershed. As implemented, these additional data points will be incorporated into progress monitoring.

Finally, going forward, we aim to promote greater citizen monitoring in the watershed. The purpose of this is two-fold. The first and obvious value is in the data itself. This may entail specific training to ensure quality. The second and equally valuable aspect to this is greater community investment and engagement in the process. Having residents in the field, understanding and interacting with the Pequea will benefit the implementation of this plan in many ways.

CONCLUSION

"In rivers, the water that you touch is the last of what has passed, and the first of that which comes; so with present time."

Leonardo da Vinci

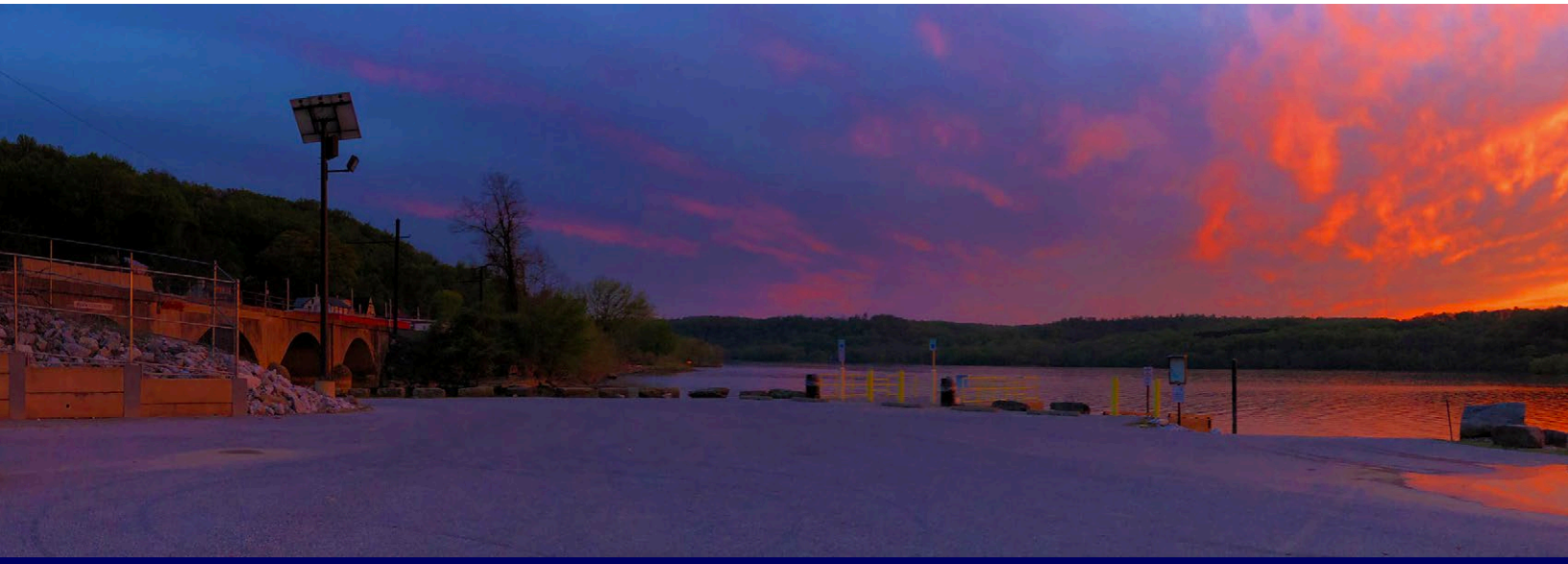


Pictured below is the sun setting on the Susquehanna at the mouth of the Pequea. For millennia, water has made its way from the Welsh Mountains to this confluence. Joined by flows collected over thousands of square miles, it journeys on to the Chesapeake, the Atlantic, and eventually the great hydrological cycle that is the very birth of the Pequea itself. The process is as near to eternal as most can imagine. There is an order, an elegance, and a beauty. It is perfect. And it's tempting to end on that note.

But we know all is not perfect. Over the course of the last three centuries, the Pequea has experienced a tragic decline. Gone are the historic forests of Penn's Woods. Streams, once teaming with brook trout, eels and spawning shad, have given way to struggling ecological communities. Clear waters have given way to excessive sediment and nutrients, a turbid remnant of a once noble past.

These two diametrically opposed perspectives exist simultaneously. This paradox is in many ways at the center of this plan. How do we reconcile the past with the present, the ideal with the reality?

The truth is that the Pequea will never be the stream that the first European immigrants encountered upon entering the watershed. But if it were possible, would we want it to be? Over the last three centuries, communities were born of this watershed. Generations have been sustained by the fruits of its abundant land. Cultural, economic, religious, and individual expressions have flourished.



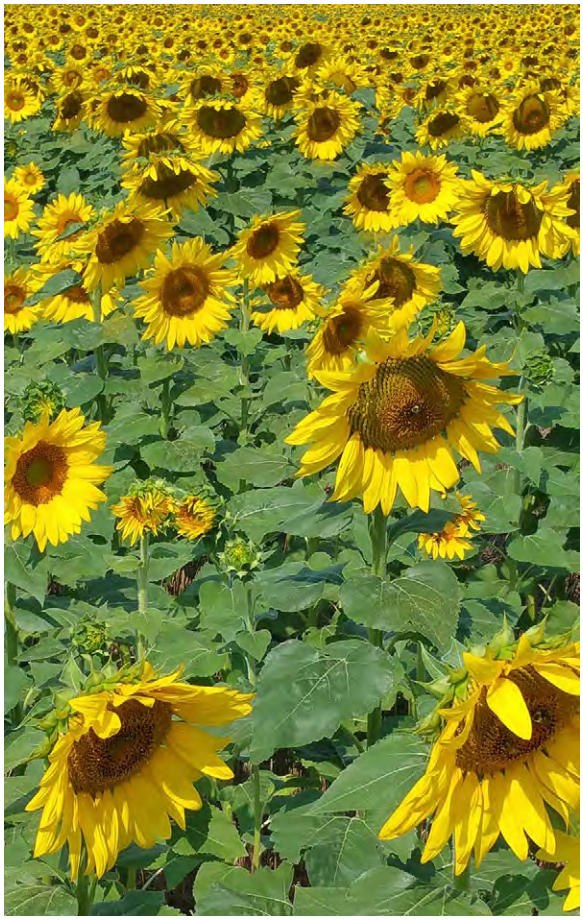
And there, on its eternal journey, was always the Pequea. Amazing things have come to be in this watershed. But they were purchased on loan. It's time to start repaying that debt.

Attitudes have changed. Where a notion of conquering the environment was once the dominant paradigm, society has come to embrace a philosophy of symbiosis, a reality in which the human and natural worlds exist in harmony. This latter ethos is the Pequea's future.

Contained in this plan is the road map to building that harmony. Fulfilling the plan's objectives will demand significant amounts of human effort, technical expertise, and financial support. It will require an embrace of different approaches and a willingness to break with longstanding practices. And it will necessitate bridging communities and generations, cultures and perspectives.

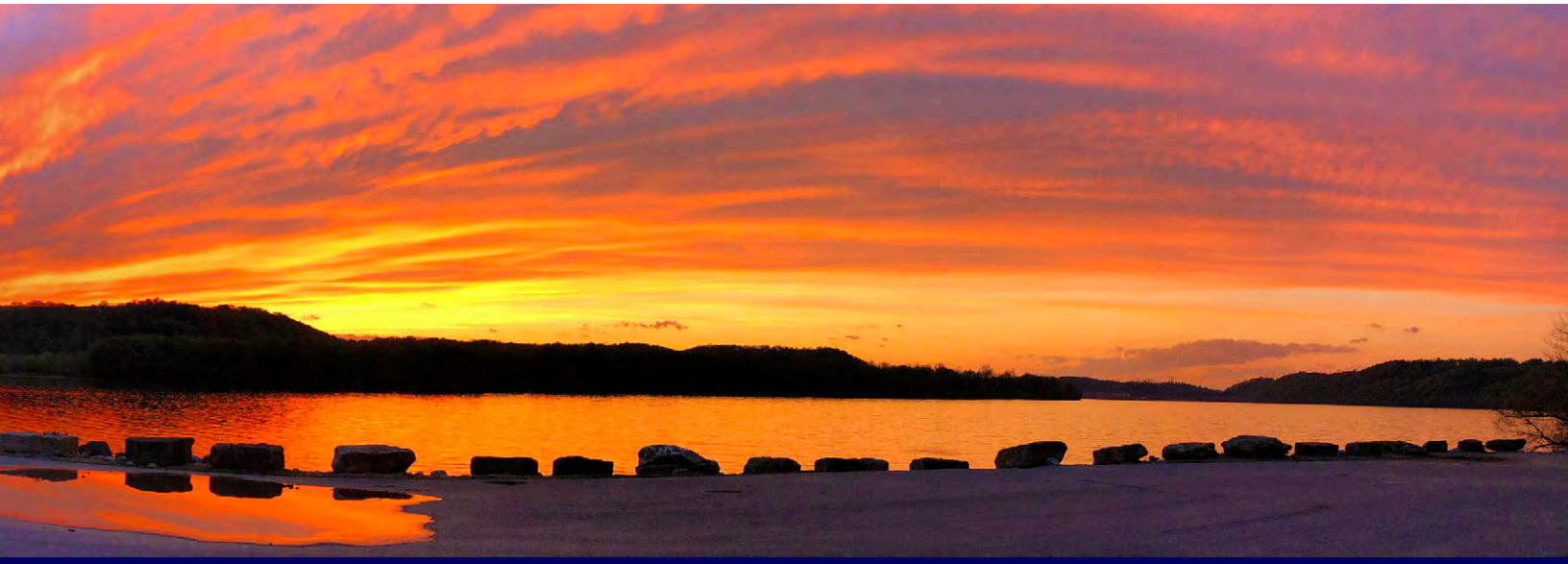
These are all ambitious goals. They are also realistic ones. There is a tremendous opportunity to facilitate lasting and substantial changes in this watershed, ones that see human potential, economic vibrance, and environmental quality arrive at the same place. This plan outlines these first steps, the incremental successes that will build upon one another until the Pequea is once again a healthy stream, from its headwaters to its mouth. We owe this to our past, our present, and our future. We owe it to ourselves.

It's up to us to translate this vision into a reality. Now is the time.



"Harmony with land is like harmony with a friend; you cannot cherish his right hand and chop off his left."

Aldo Leopold



APPENDIX

OVERVIEW

This appendix contains additional material referenced throughout the report produced by partners. Where applicable, the contents of these documents may be abridged to include only that which is relevant to the Pequea Creek Watershed. For specific questions regarding content found here, please contact the respective authors.

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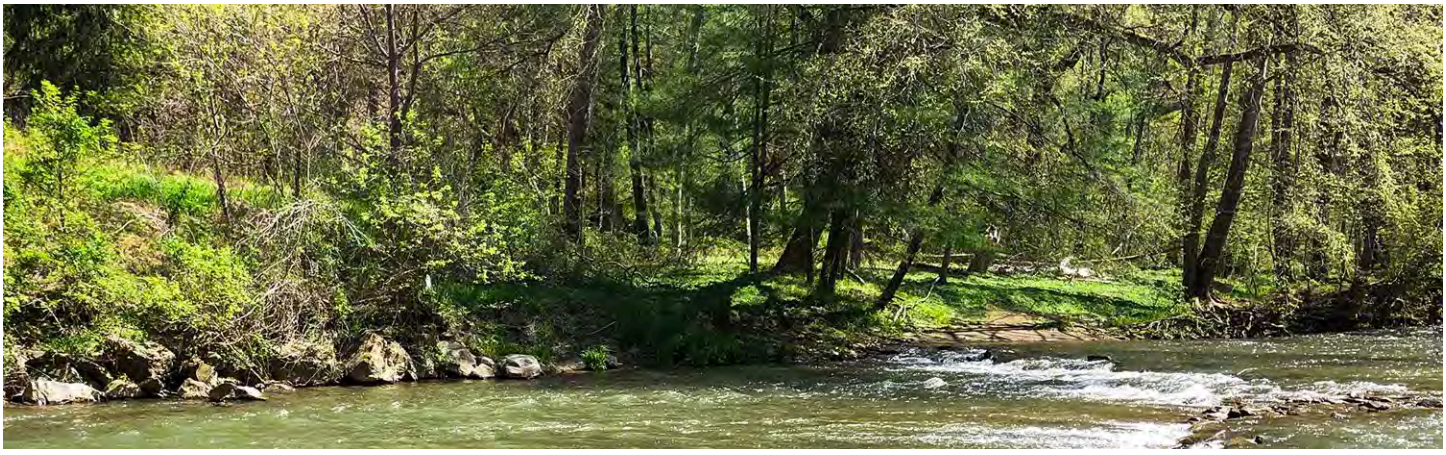
A. Pennsylvania Phase III Watershed Implementation Plan
Lancaster Countywide Action Plan Snapshot
Pennsylvania Department of Environmental Protection
January 2019

B. Lancaster Countywide Action Plan
A Strategy for Restoring Lancaster's Waterways
Plan Narrative
Lancaster Clean Water Partners
October 2020

C. Collective Action for Clean Water: A Partners & Resources Inventory, Analysis, and Recommended Integrated Funding Delivery Strategy for Lancaster County
Penn State University, College of Agricultural Sciences
Penn State Agriculture & Environment Center
March 2021
(Profiles for Lancaster County watersheds, other than the Pequea, have been removed.)

D. Model Riparian Buffer Protection Overlay District
Proposed Regulations for Use in a Municipal Zoning Ordinance, Second Edition
Brandywine Conservancy, Pennsylvania Land Trust Association
March 2016



APPENDIX A

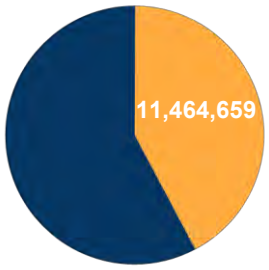
Pennsylvania Phase III Watershed Implementation Plan
Lancaster Countywide Action Plan Snapshot
Pennsylvania Department of Environmental Protection
January 2019

Lancaster County, Pennsylvania

Current Conditions

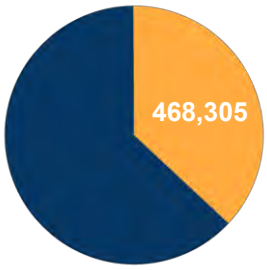
Lancaster County is the highest loading county in Pennsylvania's Chesapeake Bay Watershed. Current loading rates are 27.19M lbs of nitrogen and 1.27M lbs of phosphorous annually. By 2025 Lancaster County needs to reduce 11.46M lbs of nitrogen and 0.47M lbs of phosphorous.

Nitrogen (N)
Current Load (lbs): 27,193,871



Planning Target (lbs): 15,729,211
Reduction Goal (lbs): 11,464,659

Phosphorus (P)
Current Load (lbs): 1,265,040



Planning Target (lbs): 796,735
Reduction Goal (lbs): 468,305

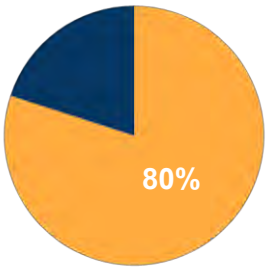
Planning Target (lbs)
Reduction Goal (lbs)

Pollutant Reduction Progress

By 2025, Lancaster County needs to reduce 11.46M lbs of nitrogen and 0.47M lbs of phosphorous. Lancaster County has developed a plan to reduce 9.20M lbs (80%) of the nitrogen goal and 0.52M lbs (100%) of the phosphorous goal. There is no planning target for sediment, but Lancaster County's plan reduced 287.61M lbs of Sediment (32%) of the current load.

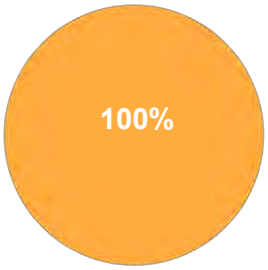
Nutrient Reduction Progress
Remaining Reduction

Nitrogen (N)
Reduction Goal (lbs): 11,464,871



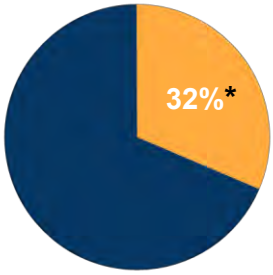
Reduction Progress (lbs): 9,197,613

Phosphorus (P)
Reduction Goal (lbs): 468,305



Reduction Progress (lbs): 521,292

Sediment (TSS)
Current Load (lbs): 914,272,960



Reduction (lbs): 287,607,611

*Percent of Current Load

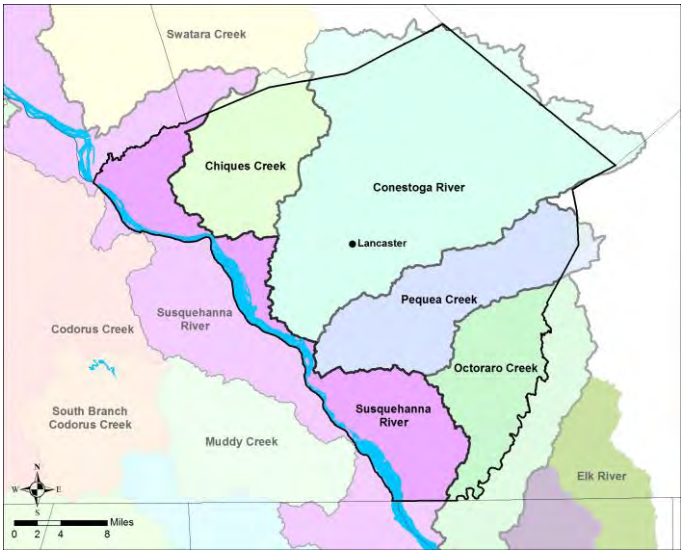
Priority Initiative Progress

Lancaster County has identified 5 priority initiatives within the planning template: Agriculture, Stormwater, Stream Restoration, Buffers, and Land Use. Agriculture has identified practices that result in a reduction of 8.34M lbs of nitrogen. Stormwater has identified practices that reduce 30.77K lbs of nitrogen. Stream Restoration has identified practices that reduce 8.36K lbs of nitrogen. Buffers have identified practices to reduce 868.60K lbs of nitrogen. Land Use has identified practices that result in a reduction of 31.72K lbs of nitrogen. These priority initiatives result in a total reduction of 9.20M lbs of nitrogen.

Initiative	Nitrogen (lbs.)	Phosphorous (lbs.)
Agriculture	8,343,241	505,468
Stormwater	30,771	931
Stream Restoration	8,364	3,220
Buffers	868,600	12,683
Land Use	31,718	23
PRPs *	67,751	5,732
Total Reductions	9,197,613	521,292

*** PRPs are not included in the Lancaster County Templates, but are a part of the reductions for Lancaster County**

Lancaster County Watershed Map



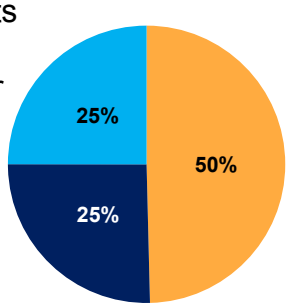
Information About the Watersheds

Lancaster County contains four major watersheds: Chiques Creek, Conestoga River, Pequea Creek, and Octoraro Creek. These watersheds are some of the highest loading watersheds for nitrogen and phosphorous in Pennsylvania's Chesapeake Bay Watershed. However, monitoring shows that conditions for nitrogen have been improving which means nitrogen levels are decreasing. Conditions for phosphorous are improving except for Pequea Creak and Conestoga Creek Watersheds where conditions are degrading. Of the 1,499 total stream miles in Lancaster County, approximately 50% are impaired.

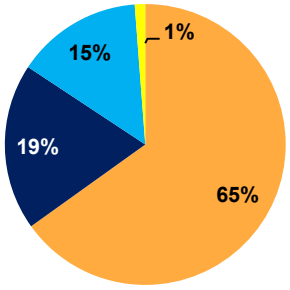
County Land Use:

Lancaster County has a total acreage of 629,631 acres. Agricultural land represents 50% of the total land with 312,353 total acres. Developed land represents another 25% of the total land in Lancaster County. Natural land, which is made up of forests, stream, and wetlands, represents the remaining 25% of the land in Lancaster County. Cropland makes up a majority of the Ag sector with 203,361 acres. The developed sector is over half (53%) Municipal Separate Storm Sewer Systems (MS4s) with 84,471 acres and the remaining 75,469 acres (47%) is Non-MS4.

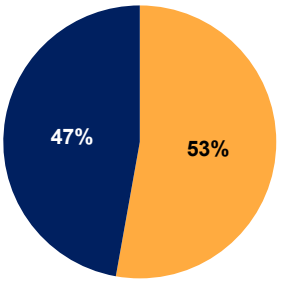
Lancaster County:
Total Acres: 629,631



Agriculture:
Total Acres: 312,353



Developed:
Total Acres: 159,940



Local Benefits

To restore the health of our watersheds and streams, we all need to work harder than ever to address pollution. Collaboration between groups will increase the pace as well as the collective impact of our work. Increased support for restoration efforts will improve habitat for fish and waterfowl, prevent erosion, improve soil quality, and provide recreational and economic opportunities to all Lancaster County residents.

Flooding affects safety, property, infrastructure, and economics.

Lancaster County relies on local water sources to supply drinking water to its residents.

Just like humans, Lancaster County's livestock depend on clean water.

Learn more and Get Involved

To get involved with the Watershed Implementation Plan (WIP) please visit: https://bit.ly/2RE7Dzb

Clean water: Great for PA Good for the Bay

APPENDIX B
Lancaster Countywide Action Plan
A Strategy for Restoring Lancaster's Waterways
Plan Narrative

Lancaster Clean Water Partners

October 2020

Lancaster Countywide Action Plan

A Strategy for Restoring Lancaster's Waterways

Lancaster
CLEAN WATER PARTNERS

More than half of Lancaster County's 1,400 miles of streams and much of its groundwaters are unhealthy. Because of this, it is a priority area designated by the Environmental Protection Agency to reduce nitrogen and phosphorus pollutants by 2025.

The Lancaster Countywide Action Plan (CAP) outlines Lancaster's path for reducing 11 million pounds of nitrogen and 500,000 pounds of phosphorus for clean and clear water throughout the county.

It was developed through a significant and collaborative grassroots approach with local partner organizations, experts, community members, and state agencies.

In addition to the Lancaster Clean Water Partners and the Lancaster County Conservation District, the Lancaster CAP is managed by the CAP Coordinator Team, including:

Lancaster Farmland Trust

Land Studies

DM/A

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PLAN HIGHLIGHTS

Executive Summary

The Lancaster Countywide Action Plan (Lancaster CAP) was originally developed in 2018 through a significant and collaborative grassroots approach with local partner organizations, experts, community members, and state agencies. Now, with nearly two years of implementation efforts, this version of the plan is the first significant update to the original document.

Revisions include consolidating several initiatives to eliminate redundancy and duplicative efforts. The updated plan now reflects a more distinct, iterative process set in place as the plan and structure provides an ability to adequately respond to new opportunities, funding streams, and changing conditions.

The Lancaster CAP is centered around the following four priority initiatives:

1. Agriculture
2. Stormwater
3. Riparian buffers
4. Data management and monitoring

Each initiative (available in appendix) has an Action Team focused on that specific work. Additional teams and working groups exist to support individual or multiple priority initiatives (e.g. Watersheds and Communication Action Teams). In addition, the plan now calls out programmatic and policy elements that are necessary at a state level for success in multiple areas at the local level.

The Lancaster CAP implementation is led by the Lancaster Clean Water Partners (the Partners) and the Lancaster County Conservation District with administrative and technical support provided by the CAP Coordinator Team. The Partners Steering Committee provides over-arching guidance for CAP implementation.

Additionally, the Steering Committee and/or the CAP Coordinator Team will provide oversight to and management of related Lancaster CAP considerations and functions including, but not limited to:

- Identify and secure long-term dedicated funding for CAP management
- Coordination and collaboration opportunities for partners
- Programmatic and policy change needs
- Project implementation funding management
- Action Team administrative support
- Communications and outreach management
- General CAP management (FieldDoc, etc.)

Key goals for 2020-2021

- Continue building capacity by using the CAP Coordinator Team's strengths and skills
- Identify and secure long-term dedicated funding for CAP implementation
- Continue to work within and implement the stream de-listing strategy, which has already collected extremely useful data for priority work and local demand
- Ensure all partner organizations can and do use custom tools like the Collaborative Mapping Tool and FieldDoc for better collaboration and crediting
- Plant and maintain 1000 new acres of riparian buffer every year and bring on the appropriate staff capacity to do so across partner organizations
- Use the pre-application meeting opportunity on a regular basis to support an increased pace for permits and project implementation
- Lean on local expertise to align ordinance and easements across the county
- Publish the Resource Inventory, produced by Penn State, of all partner organizations across the county
- Successfully manage the CAP Implementation Grants
- Document and share success stories

KEY FINDINGS

One of Lancaster County's strengths is that teamwork and a sense of community are plentiful. Lancastrians are eager to work together to achieve the necessary nutrient and sediment reductions set in the Lancaster CAP.

In our collaborative Lancaster CAP efforts since 2018, we've identified the following factors that will influence our success through 2025 and beyond:

- The need to have diverse and sustained funding for increased BMP implementation
- Extending MS4 flexibility and offset possibilities: With a focus on getting sediment and nutrient reductions from agricultural land and not exclusively agricultural practices, we have to support and make it possible for all partner organizations to do work beyond current MS4 boundaries. The switch in late 2019 to a one-mile radius flexibility offers some opportunity, but there is a need for more. Cost effectiveness rates show us that municipal and private support for work on agricultural lands within a watershed will help the entire county (and Commonwealth) more effectively meet reduction goals.
- Coordinated agriculture outreach staff: We have seen the success of peer-to-peer outreach with a focus in a single municipality and/or watershed. It is based on a local trusted professional, collaboration among the many who play that role, and clear

communication between partners gathering information and those walking landowners from interest through implementation.

- Riparian buffer outreach and implementation staff need to have a wide knowledge base to effectively work with diverse landowners, pull funding options together, address local municipal requirements, and manage multi-year maintenance needs. Finding enough capacity with this skill set is essential for us to meet our goals, but can be difficult as we need to expand the outreach work quickly. The Buffer Action Team has had tremendous success coordinating event schedules to best reach the volunteer audiences across the county and keeping track of match for multi-organization grants associated with those events.
- The Data Management Team has coordinated a comprehensive water quality monitoring approach to pull together as many sources of data as possible. The team identified gaps in current data in order to focus on getting monitoring in priority areas that support all partner organizations. The team is continuing to build upon existing and develop additional layers for the Collaborative Mapping Tool so it is accessible to multiple audiences.
- The Stormwater Action Team has maintained a strong focus on synchronizing multiple regulatory and planning approaches and requirements – such as land use planning, Act 167 plans, and hazard mitigation plans – to ensure all efforts complement each other in lieu of competing with each other. The team will continue to focus on watershed management, municipal education and outreach, along with prioritization of resources.

OPPORTUNITIES FOR SUCCESS

Continued collaboration with organizations and dedicated individuals throughout Lancaster County is our most significant opportunity for successful implementation. Large, watershed-scale projects in addition to regional collaboration with our county comprehensive plan, Places2040, are opportunities where we can grow. In addition to our dedicated Steering Committee and multi-sector partner organizations, we are bringing new organizations and individuals to the table to increase diversity across our work.

With support from the CAP Implementation Grants in early 2020, we're getting dollars in the ground quickly with the following partner organizations leading the way:

- James Street Mennonite Church
- Urban tree planters with Lancaster City
- Alliance for the Chesapeake Bay
- Lancaster Farmland Trust
- David Miller Associates
- Donegal Trout Unlimited
- Lancaster County Community Foundation
- Municipalities like West Hempfield, Salisbury, West Lampeter, and Paradise Townships
- Lancaster County Conservation District
- Watershed associations
- LandStudies
- Woerth It Hollow, LLC

"I asked myself **why we were putting stormwater runoff directly into the headwaters of a stream.** By treating that runoff, we would be able to enhance the stream, make use of some underutilized property and then add educational and recreational opportunities for township residents to enjoy."
– Dwayne Steager, West Hempfield Township

Multiple funding opportunities have grown or taken shape as a result of the Lancaster CAP highlighting Lancaster's bias towards action. Action requires funding, so the Partners have provided shared language for partner organizations to use in grant applications to demonstrate our collective approach. These funding opportunities, among others, are examples of ways Lancaster groups use funds to get projects on the ground quickly. And they can easily show how projects in an application will support the Lancaster CAP.

Funding opportunities include the following:

- Conservation Excellence Grant
- EPA/Bay Program
- Department of Environmental Protection
- Department of Conservation and Natural Resources
- 319 Program
- Local family foundations
- National Resources Conservation Services
- Lancaster's Clean Water Fund with the Lancaster County Community Foundation
- PENNVEST

CHALLENGES

- Such a large nitrogen and phosphorus reduction goal
- Limited capacity until February 2020 when the CAP Coordinator Team, a Senior Adviser, and Communications and Program Manager started, which gave our implementation efforts a boost
- As we worked to create buy-in for the updated plan and engagement from local stakeholders, we did not have the official list of details or status of specific BMPs that will go into the state's tracking tool, FieldDoc.
    - Action Teams ran into hurdles to confidently update the progress templates because we were unaware of the numbers associated with progress already made. With a planned spring 2021 release of the tool, we can better address this.
- A global pandemic put all field and in-person work on hold in spring 2020. The ripple effects of the shutdown continue, delaying certain aspects of work.
- A strained state budget raises concerns about the availability of traditional funding avenues for conservation work going forward.
- Historic state funding streams do not reflect the favorable, flexible conditions and timelines associated with the CAP Implementation Grants
- Because each situation, region, and landowner's needs are different, determining ways to engage the non-regulated community can be challenging
- In 2018-19, the downturn in the agricultural commodity markets and the downright collapse of the dairy industry severely hampered landowner willingness and capacity to participate in projects and programs.
- Extreme weather events impact project sustainability and budgets that did not account for multiple 100-year storm events
- Dam removals with no restoration work and dam breaches that contribute hundreds of thousands of pounds of unplanned sediment to our creeks

Resource Gaps

The largest resource gap is funding and exists across the priority initiatives outlined in the templates. At the on-the-ground implementation level, the gaps show up in various ways: administrative time for overall implementation, grant management at a countywide level for multiple organizations, equipment, maintenance, and policy/programmatic management.

Schedules and Timelines

With the COVID-19 outbreak in March 2020, field work and project implementation were put on hold or had drastically shifted schedules and timelines. When the CAP Coordinator Team started in February 2020, we took time to establish processes and systems. CAP Implementation Grant dollars were allotted in early 2020, and projects will be complete by July 2021.

Policy and/or Programmatic Hurdles

A big part of our local plan's success depends on the fertilizer bill passing. Due to COVID-19, state-level funding is a huge threat. In early 2020, we saw a threat to the loss of Keystone Funds and expect another budget battle in fall 2020. Additionally, the verification process for BMP implementation remains unclear.

The Lancaster CAP includes several programmatic or policy recommendations to remove hurdles or improve the success of implementation efforts including:

- **Dam removal notification system**: Provide the ability to incorporate significant water quality improvement projects in conjunction with removals.
- **Long-term funding streams for Act 537 plans and Act 167 plan updates:** Help align or incorporate water quality components related to local stream health and Lancaster CAP efforts.
- **Statewide academic assessment of monitoring protocols:** Alignment of parameters, equipment, processes, etc. to ensure we are measuring apples-to-apples across sectors and areas.
- **Watershed permitting:** Flexibility in permitting approaches removes consistent hurdle for implementation of projects.

PLAN SUMMARY

Priority Initiatives

Agriculture: The agricultural sector will be a key driving factor for significant BMP implementation and long-term success of pollutant reductions. Implementation of agricultural sector BMPs is captured by this initiative. The Agriculture Priority Initiative will be managed by the Agriculture Action Team.

Focus Areas

- Conservation plan and/or agriculture-related BMP reductions captured across platforms into PracticeKeeper
- Eliminate the need for winter spreading
- Explore digesters/manure treatment technologies at a variety of scales, learning from the current success models as well as research done previously
- Work in priority areas for contiguous projects that will improve local water quality and promote economic stability for the farmers
- Promote and assist with implementation of agricultural compliance, soil health, nutrient management, and manure management BMPs
- Education and outreach focused in flood control public health benefits, herd health, building legacy options for families, economics, and achieving compliance (including engagement and outreach activities with the plain sect community)

Proposed BMPs

- Proposed BMPs (Agriculture Compliance)
    - *Soil Conservation and Water Quality Plans (200,000 total acres)*
        - *Plans are a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Plans must meet technical standards.*
    - *Barnyard Runoff Controls (100 new acres)*
        - *This includes practices such as roof runoff control, diversion of clean water from entering the barnyard and control of runoff from barnyard areas.*
- Proposed BMPs (Soil Health)
    - *High Residue Tillage Management (110,000 acres/year)*
        - *A conservation tillage routine that involves the planting, growing and harvesting of crops with minimal disturbance to the soil in an effort to maintain at least 60 percent crop residue coverage immediately after planting each crop.*
    - *Conservation Tillage Management (80,000 acres/year)*
        - A *conservation tillage routine that involves the planting, growing and harvesting of crops with minimal disturbance to the soil in an effort to maintain 30 to 59 percent crop residue coverage immediately after planting each crop.*
    - *Traditional Cover Crops (2,500 acres/year)*
        - *A short-term crop grown after the main cropping season to reduce nutrient losses to ground and surface water by sequestering nutrients.*

This type of cover crop may not receive nutrients in the fall, and may not be harvested in the spring.

- *Traditional Cover Crops with Fall Nutrients (100,000 acres/year)*
  - *A short-term crop grown after the main cropping season to reduce nutrient losses to ground and surface water by sequestering nutrients. This type of cover crop is planted upon cropland where manure is applied following the harvest of a summer crop and prior to cover crop planting. The crop may not be harvested in the spring.*
- *Commodity Cover Crops (11,000 acres/year)*
  - *A winter cereal crop planted for harvest in the spring which does not receive nutrient applications in the fall. Any winter cereal crop which did receive applications in the fall is not eligible for nutrient reductions.*
- *Prescribed Grazing (10,000 total acres)*
  - *This practice utilizes a range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas.*

- Proposed BMPs (Expanded Nutrient Management)
  - *Core Nitrogen Nutrient Management (150,000 acres)*
    - *Applications of nitrogen are made in accordance with certain elements as applicable (e.g. land-grant university recommendations, spreader calibration, manure analysis, etc.)*
  - *Core Phosphorus Nutrient Management (150,000 acres)*
    - *Applications of phosphorus are made in accordance with certain elements as applicable (e.g. land-grant university recommendations, spreader calibration, manure analysis, etc.)*
  - *Nutrient Management-Nitrogen Rate (6,661 acres)*
    - *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice and an additional element from a list of options (e.g. Nitrogen applications are made using variable rate goals)*
  - *Nutrient Management-Phosphorus Rate (6,661 acres)*
    - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice and an additional element from a list of options (e.g. Phosphorus applications are made using variable rate goals)*
  - *Nutrient Management-Nitrogen Placement (6,661 acres)*
    - *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice and an additional element from a list of options (e.g. Applications of inorganic nitrogen are injected into the subsurface or incorporated into the soil)*
  - *Nutrient Management-Phosphorus Placement (6,661 acres)*
    - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice and an additional element from a list of options (e.g. Applications of inorganic phosphorus are injected into the subsurface or incorporated into the soil)*
  - *Nutrient Management-Nitrogen Timing (6,661 acres)*

        - *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice, and are split across the growing season into multiple applications*
    - *Nutrient Management-Phosphorus Timing (6,661 acres)*
        - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice, and are split across the growing season into multiple applications*
- Proposed BMPs (Manure)
    - *Manure Storage Facilities (100,000 New Animal Units (AUs))*
        - *Any structure designed for collection, transfer and storage of manures and associated wastes generated from the confined portion of animal operations and complies with NRCS 313 (Waste Storage Facility) or NRCS 359 (Waste Treatment Lagoon) practice standards.*
    - *Manure Incorporation (10,000 acres)*
        - *Manure is incorporated into the soil within a certain timeframe after application, and is dependent on level of soil disturbance (high vs. low).*
- Proposed BMPs (Integrated System for Elimination of Excess)
    - *Manure Transport out of Lancaster County (150,000 dry tons/year)*
        - *Transport of excess manure in or out of a county. Manure may be of any type—poultry, dairy, or any of the animal categories. Transport should only be reported for county to county transport.*
    - *Manure Treatment Technologies (20,000 tons/year)*
        - *Thermochemical conversion (TCC) processes involving either combustion, gasification, and/or pyrolysis for livestock or poultry manure.*
- Proposed BMPs (Agriculture Riparian Zone)
    - *Grass Buffer with Streamside Exclusion Fencing (2,500 new acres)*
        - *Linear strips of grass or other non-woody vegetation with fencing installed to prevent livestock from grazing and trampling the buffer or entering the stream and is maintained to help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for buffers is 100 feet, with a 35 feet minimum width required.*

Implementation Considerations

- Challenges
    - Farmer buy-in or resistance (cultural shifts necessary)
    - BMP implementation funding
    - Conservation Plan capture and long-term verification processes
    - Over 2,000 farms requiring conservation plans
    - Increase in extreme weather events
    - Limited technical staff resources
    - Shifts from dairy farming to other focus
- Opportunities for Success
    - One-on-one farmer engagements
    - Available acreage for increased cover crops, no-till/conservation tillage, and riparian buffers in agricultural areas
    - Manure digester technology advancements
    - Develop a local incentive program(s)

    - Improved manure transport reporting
    - Balance the need for no-till along with increased organic production practices
- Resources for Implementation
    - Conservation District staff
    - Lancaster Farmland Trust
    - NRCS staff
    - Penn State Extension
    - Penn State Agriculture and Environment Center
    - Private consultants (TeamAg, Red Barn, etc.)
    - Non-profit partners (Alliance for the Chesapeake Bay, Lancaster Farmland Trust, Stroud, No Till Alliance, Ag Council, etc.)
    - State and federal agencies (PA Dept. of Agriculture, USDA, EPA, etc.)

Stormwater: Lancaster County includes urban/suburban, rural, forested, industrial/commercial, and open spaces not related to agricultural operations. Implementation of non-agricultural sector or non-agricultural related operations BMPs is captured by this initiative. Municipalities with issued MS4 permits are required to implement BMPs with the intent to reduce nutrients and sediment in their jurisdictions. These efforts are captured by the Lancaster CAP to help ensure total reductions are tracked and reduce the potential of duplicative efforts. The Stormwater Priority Initiative will be managed by the Stormwater Action Team, which empowers municipalities to address stormwater through cost-effective and locally relevant practices, including management and considerations related to watershed management (Watersheds Action Team), land use, and stream restoration.

Focus Areas

- Urbanized Areas (MS4 municipalities), impaired streams, and watersheds/catchments
- Alternative stormwater BMP implementation approaches
- Act 167 and Act 537 planning, funding, and related considerations
- State agency (e.g. PennDOT) and legislator outreach and coordination
- Model ordinances as it relates to water resources, land use, etc.
- Watershed/catchment prioritization
- Stream de-listing strategies
- Growth management (including integrated water resource planning)
- Natural lands and open space preservation and conservation
- Conservation landscaping
- Education and outreach with municipalities, local consultants, and the general public

Proposed BMPs

- Proposed BMPs (Riparian Zone)
    - *Forest Buffer (211.31 new acres)*
        - *Linear wooded areas that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required.*
- Proposed BMPs (Urban Tree Canopy)
    - *MS4 Urban Tree Canopy (50 new acres)*
        - Includes trees over roads and non-road impervious surfaces such as buildings and parking lots; and includes trees within 30'-80' of non-road

impervious surfaces where the understory is assumed to be turf grass or otherwise altered through compaction, removal of surface organic material and/or fertilization.

- Proposed BMPs (Forest, Farm, and Natural Areas Conservation)
  - *Land Retirement to Ag Open Space (500 acres)*
    - *Converts land area to hay without nutrients. Agricultural land retirement takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses and/or trees.*
- Proposed BMPs (Stream and Wetland Restoration)
  - *Urban Stream Restoration (29,146 new linear feet)*
    - *Refers to any Natural Channel Design (NCD), Regenerative Stream Channel (RSC), Legacy Sediment Removal (LSR), or other restoration project in an urban/suburban environment that meets the qualifying conditions for credits, including environmental limitations and stream functional improvements.*
  - *Non-urban Stream Restoration (63,900 new linear feet)*
    - *Refers to any Natural Channel Design (NCD), Regenerative Stream Channel (RSC), Legacy Sediment Removal (LSR), or other restoration project in non-urban/suburban environments that meets the qualifying conditions for credits, including environmental limitations and stream functional improvements.*
  - *Wetland Restoration (52 acres)*
    - *The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former wetland.*
- Proposed BMPs (Control Measures for Illicit Discharges)
  - *Advanced Grey Infrastructure for IDD&E Control (23,772 acres treated)*
    - *Illicit discharge detection and elimination credits are only available to localities that show empirical monitoring for each eligible individual discharge.*
- Proposed BMPs (Industrial Stormwater)
  - *Impervious Surface Reduction (50 acres)*
    - *Reducing impervious surfaces to promote infiltration and percolation of storm water runoff.*
- Proposed BMPs (Fertilizer Legislation)
  - *Urban Nutrient Management (10,577 acres)*
    - *The proper management of major nutrients for turf and landscape plants on a property to best protect water quality.*
- Proposed BMPs (Street Sweeping)
  - *Street Sweeping (155 acres treated)*
    - *Street cleaning practices through mechanical broom technology, vacuum assisted sweepers, regenerative air sweepers, or an advanced technology demonstrating greater abilities to remove solids and finer particles from street surfaces.*
- Proposed BMPs (Stormwater Control Measures)
  - *Wet Ponds and Wetlands (290 acres treated)*
    - *A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These*

structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. There is little or no vegetation living within the pooled area. Outfalls are not directed through vegetated areas prior to open water release.

- *Stormwater Performance Standards-Runoff Reduction (892.44 acres treated)*
  - *The total post-development runoff volume that is reduced through canopy interception, soil amendments, evaporation, rainfall harvesting, engineered infiltration, extended filtration or evapo-transpiration.*
- *Stormwater Performance Standards-Stormwater Treatment (118.34 acres treated)*
  - *Stormwater practices applied to post-development run-off that employ a permanent pool, constructed wetlands or sand filters.*
- *Bioretention/Raingardens (202 acres treated)*
  - *An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants.*
- *Bioswale (1998.50 acres treated)*
  - *Channels designed to concentrate and convey stormwater runoff while removing debris and pollution. Bioswales can also be beneficial in recharging groundwater.*
- *Vegetated Open Channels (384 acres treated)*
  - *Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils.*
- *Filtering Practices (610.10 acres treated)*
  - *Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter.*
- *Filter Strip Runoff Reduction (10 acres treated)*
  - *Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media.*
- *Storm Drain Cleanout (29,610 lbs. sediment/annual)*
  - *Mechanical (or similar) removal of collected sediment and debris in storm sewer systems*
- *Dry Ponds (312 acres treated)*
  - *Dry ponds control peak flows of runoff, help improve water quality and lessen the effects of erosion. Between rain events, a dry pond looks like a large, grassy low area. When it rains, the pond fills with water. They hold water for 48-72 hours to allow sediment and pollutants to settle out.*

    - *Infiltration Practices (70 acres treated)*
        - *Infiltration practices utilize porous materials to facilitate infiltration of stormwater into soils.*
    - *Dry Extended Detention Ponds/Basin (301.79 acres treated)*
        - *Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms.*
    - *Infiltration Basin (18.60 acres treated)*
        - *A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. A sand layer and vegetation is required. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration.*
    - *Hydrodynamic Structures (74.10 acres treated)*
        - *Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.*
    - *Permeable Pavement (0.89 acres treated)*
        - *Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms.*
- Proposed BMPs (Septic Systems)
    - *Septic Connections (3,000 systems)*
        - *This is when septic systems get converted to public sewer and are connected to a wastewater treatment plant.*
    - *Septic Pumpout (10,000 systems)*
        - *Septic systems achieve nutrient reductions through several types of management practices, including frequent maintenance and pumping. On average, septic tanks need to be pumped once every three to five years to maintain effectiveness. The pumping of septic tanks is one of several measures that can be implemented to protect soil absorption systems from failure.*
- Proposed BMPs (Other)
    - *Erosion and Sediment Control-Level 2 (500 acres)*
        - *Includes ESC practices implemented under historical performance standards from approximately 2000 or before.*
    - *Dirt and Gravel Roads (158,000 feet)*
        - *Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).*

Implementation Considerations

- Challenges
    - General public buy-in or resistance
    - Municipal buy-in or resistance
    - BMP implementation and maintenance funding

    - Local landowner willingness to participate (private land BMP implementation)
    - Resources for long-term verification processes
    - Project capture and reporting (FieldDoc)
    - Programmatic consistency
    - Permit specifics
    - Expense per pound for gray infrastructure upgrades
- Opportunities for Success
    - New and innovative stormwater management approaches that achieve both economic development improvements and protect local natural resources
    - Update Lancaster County Act 167 Plan(s) that also includes compatibility or consistency with the Bay Model and/or water quality considerations
    - Integrated planning approaches for better growth management, capital improvements, source water protection, etc.
    - Combine considerations for aquifer protection, source water protection, and sinkhole remediation along with economic development opportunities, transportation initiatives, and agricultural preservation for a more fully integrated approach
    - Regional MS4/watershed-based permitting and/or collaboration
    - Identification of BMPs that may not traditionally receive credit for NPS reductions (or may not be captured for reductions) including from hazard mitigation plans, municipal capital improvement plans, and similar
    - Local Engineers roundtable discussions
    - Stream restoration approaches tied to dam removals
    - Contiguous projects in priority watersheds
    - Projects incorporating floodplain restoration, in-stream habitat restoration, and wetland restoration that not only provides NPS reductions; but also provides improved flooding conditions, stream uses attainment, and other related benefits
    - Preserve, conserve, and restore natural resources and open space
- Resources for Implementation
    - Local environmental and engineering experts, groups, and consultants
    - Lancaster Clean Water Consortium (LCCWC)
    - Watershed groups
    - NFWF, Growing Greener, etc. funding streams
    - Local agencies and governments (LCPC, townships, LCCD, etc.)
    - State and federal agencies (SRBC, DCNR, PAFBC, etc.)
    - Academic supported entities (WSI, Academy of Natural Science, etc.)
    - Non-profit partners (Stroud, Alliance for the Chesapeake Bay, Center for Watershed Protection, etc.)
    - Penn State Agriculture and Environment Center
    - Developers and the business community
    - Engaged and receptive landowners

Riparian Buffers: The Riparian Buffers Priority Initiative will be managed by the Buffer Action Team, which implements new and maintains existing buffers and documents progress towards the county's 6,000 acre goal.

Focus Areas

- Creation of a Lancaster County buffer maintenance program
- Model ordinance language or modifications to require buffers in new development and re-development projects.
- Prioritize specific watersheds and headwaters for BMP implementation (along with agricultural areas).
- Education and outreach communicating the benefits, successes, lessons learned, maintenance requirements, and similar considerations for buffers in general.

Proposed BMPs

- Proposed BMPs (Agriculture Riparian Zone)
    - *Forest Buffer (6,000 new acres)*
        - *Linear wooded areas that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required.*
    - *Forest Buffer - Narrow (100 new acres)*
        - *Linear strips of wooded areas maintained on agricultural land between the edge of fields and streams, rivers or tidal waters that help filter nutrients, sediment and other pollutants from runoff. Narrow forest buffer strips are between 10 and 35 feet in width.*

Implementation Considerations

- Challenges
    - Public buy-in and extent of local landowner willingness to participate.
    - Not enough boots on the ground for outreach and maintenance
    - BMP implementation funding
    - Culturally appropriate outreach to the plain sect community
- Opportunities for Success
    - Buy-in for buffers on all public and semi-public lands
    - Tie incentives with buffer implementation and maintenance.
    - A growing emphasis on buffers from multiple funding sources
    - We have a strong Buffer Action Team of local partners organizations
    - Care establishment program
    - Demonstration projects in every municipality in the county
    - CBF's K10 campaign
- Resources for Implementation
    - Non-profit partners (Alliance for the Chesapeake Bay, Chesapeake Bay Foundation, Stroud, Lancaster Farmland Trust, etc.)
    - Conservancy partners (Chesapeake Conservancy, Lancaster County Conservancy, etc.)
    - Penn State Agriculture and Environment Center
    - Local and state agencies (Lancaster County Conservation District, DCNR, etc.)
    - Groundwater and sourcewater collaboratives
    - Lancaster Clean Water Consortium (LCCWC)
    - Municipal partners
    - Extensive and compassionate volunteers

Data Management and Monitoring: The Data Management and Monitoring Priority Initiative will be managed by the Data Management Action Team, which works to develop a shared measurement system that has access for multiple sources of data. A current focus area has been assembling water quality monitoring and planning data and information from multiple agencies, in both tabular and spatial formats.

Focus Areas

- Establish a central location (or complementary systems) for conservation plans, restoration project permits, grant applications, etc.
- Create better documentation system of currently implemented practices.
- Increase in-stream water quality monitoring to establish baselines, and identify the best tools needed to achieve the goals and to measure progress/success.

There are no BMPs for implementation captured by this initiative.

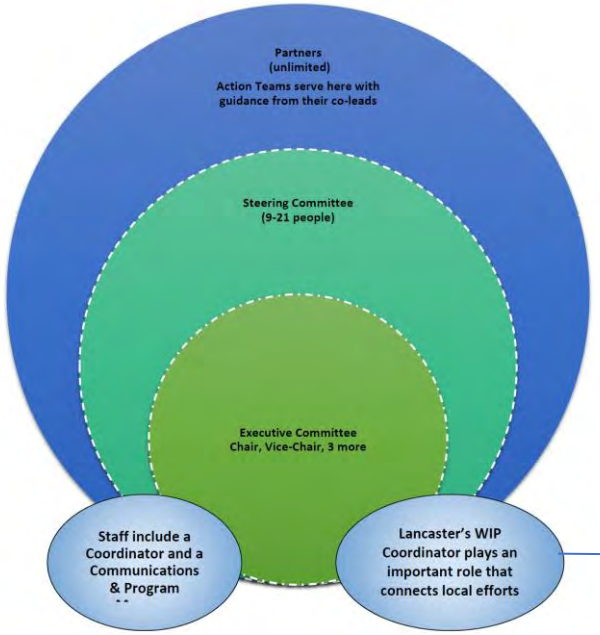
Implementation Considerations

- Challenges
    - Funding for equipment, analyses, staff support, equipment maintenance, etc.
    - Not all partners, agencies, etc. are ready or allowed to share data
- Opportunities for Success
    - Central system for tracking manure transport
    - Alignment of multiple platforms where data can transfer (FieldDoc, Collaborative Mapping Tool, PracticeKeeper, consultant GIS databases, etc.)
    - Aligned data management structures centered around watershed and catchment units
- Resources for Implementation
    - Existing databases (SRBC portal, PADEP, local (e.g. CSDatum), etc.)
    - PSU-NFWF macro sampling teams
    - Volunteer sampling (WQVC)
    - Local agency/government sampling
    - County GIS resources and staff

Appendix

- Organizational chart
- Action Team one-pager
- Common Agenda

DRAFT CAP Implementation Organizational Chart



LandStudies, Inc. (LSI)
(team lead)

David Miller/ Associates (DM/A)

Management Team

Project Team
Lancaster CCWAP Coordinator

Lancaster Farmland Trust (LFT)

Agriculture
Action Team Liaison
LFT

Buffers
Action Team Liaison
LFT

Data Management
Action Team Liaison
DM/A

Stormwater
Action Team Liaison
DM/A

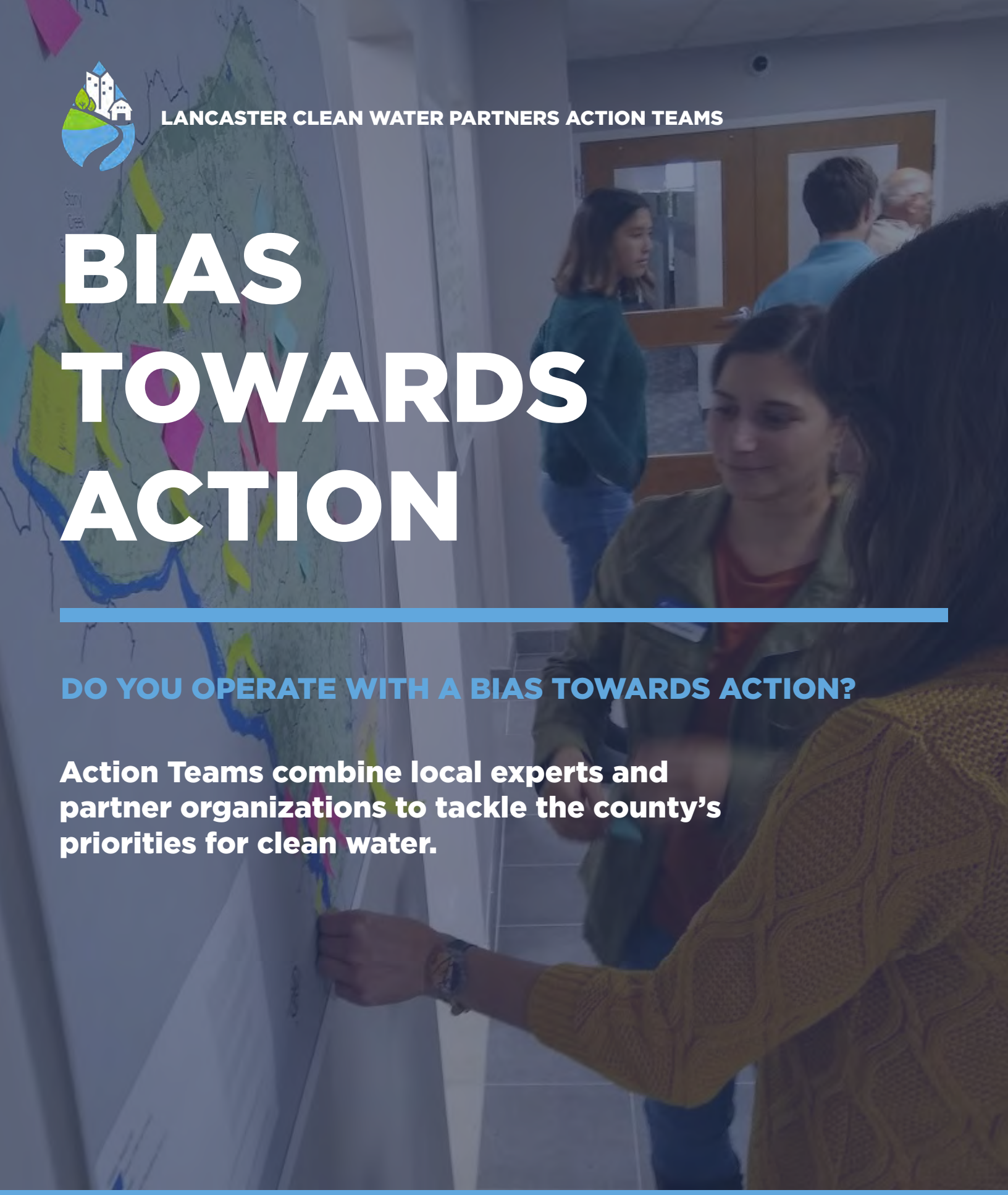
Watersheds
Action Team Liaison
DM/A

LANCASTER CLEAN WATER PARTNERS ACTION TEAMS

BIAS TOWARDS ACTION

DO YOU OPERATE WITH A BIAS TOWARDS ACTION?

Action Teams combine local experts and partner organizations to tackle the county's priorities for clean water.



Join a team! LancasterCleanWaterPartners.com/action-teams

ACTION TEAMS

The Partners' Common Agenda acts as the foundation to ensure all teams are moving in the same direction – and the bias towards action results in clean and clear water.

The Agriculture Action Team develops and implements strategies for accelerating conservation on county farms to achieve baseline compliance and beyond.

Meetings scheduled as needed.

The Buffer Action Team focuses on the county's objective of 6,000 new acres of riparian forest buffer by 2025. The team works on issues of capacity, funding, public awareness, and other barriers to accomplishing this goal.

Third Friday every other month from 9 – 11 a.m.

The Communications Action Team creates and deploys consistent messaging to empower all partners to tell the story of clean water using common talking points.

Meetings scheduled as needed.

The Data Management Action Team monitors, coordinates, and organizes data to produce a shared measurement system that supports the Partners' decisions and promotes public awareness of clean water goals.

First Monday of every month from 3 – 4:30 p.m.

The Stormwater Action Team empowers municipalities to address stormwater through cost-effective and locally relevant practices.

Meetings scheduled as needed.

The Watershed Action Team develops tools and resources to facilitate and support collaborative watershed-based restoration efforts in Lancaster County.

First Friday of every other month from 10 – 11:30 a.m.

Contact Emily with questions: esmedley@lancastercleanwaterpartners.com

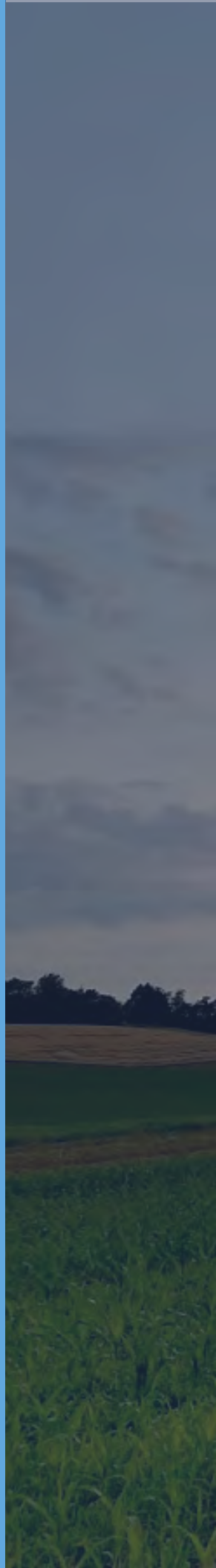


Photo: Will Parson, Chesapeake Bay Program

COMMON AGENDA

OUR PATH TO CLEAN AND CLEAR STREAMS BY 2040

Lancaster
CLEAN WATER PARTNERS

The Lancaster Clean Water Partners brings together a diverse group of partner organizations – local leaders in business, municipal public service, higher education, conservation planning, and non-profit management – with a **shared vision** of clean and clear water in Lancaster County by 2040.

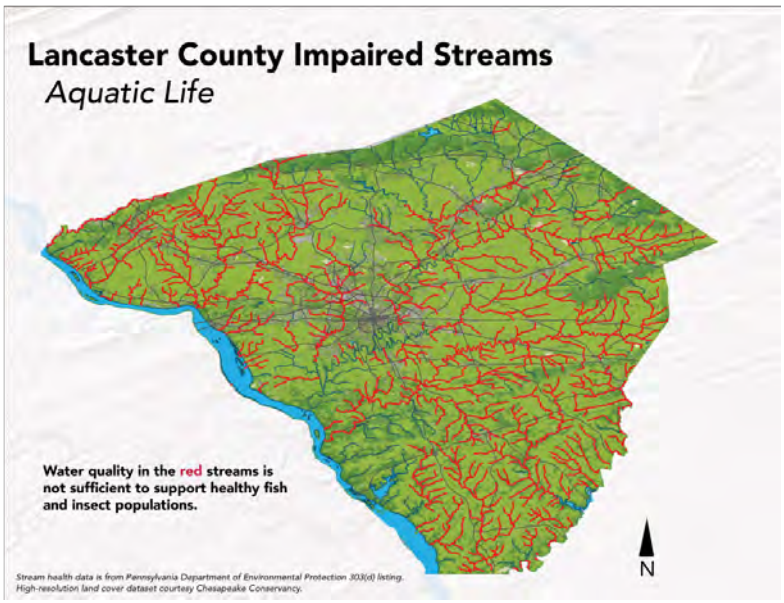
Our **shared mission** is to rapidly accelerate and expand the ability of the partner organizations to restore and sustain healthy Lancaster County waterways.

The Common Agenda outlines how we'll get there.

THE PROBLEM

More than half of Lancaster County's 1,400 miles of streams are impaired.

Lancaster County streams have the highest amount of nitrogen, phosphorus, and sediment in monitored areas of the Chesapeake Bay Watershed. With a mixture of rural, suburban, and city landscapes, the source for water pollution is broad – but so is the opportunity for conservation and restoration.



THE SOLUTION

Build and sustain a local multi-sector collaboration, supported by a strong backbone organization, to advance a community-led Common Agenda toward a shared result.

Photo: Will Parson, Chesapeake Bay Program

"The demand for clean water brings many different people to the table. We facilitate this collaborative effort with experts and community members to improve the health of our local streams **to make Lancaster a better place to live and work.**"

—— Allyson Gibson, Coordinator

PRIORITIES

Photo: Michelle Johnsen Photography

- Through a backbone organization with strong, local leadership mobilize a collaborative, broad, and diverse partnership
- Leverage Lancaster County's role in the Chesapeake Bay watershed to acquire adequate, sustained resources
- Share monitoring data on a common platform available to partners to prioritize resources and assess BMP effectiveness
- Implement an effective, equitable communications plan to educate and empower partners and all County residents to take action
- Focus on development and installation of BMPs with highest ROI and greatest potential for achieving clean and clear water
- Work directly with state and federal agencies to make adjustments to policies and processes needed for the CAP Lancaster Countywide Action Plan
- Engage the business community to support the Partners by adopting internal policies and providing financial support

STRATEGIES

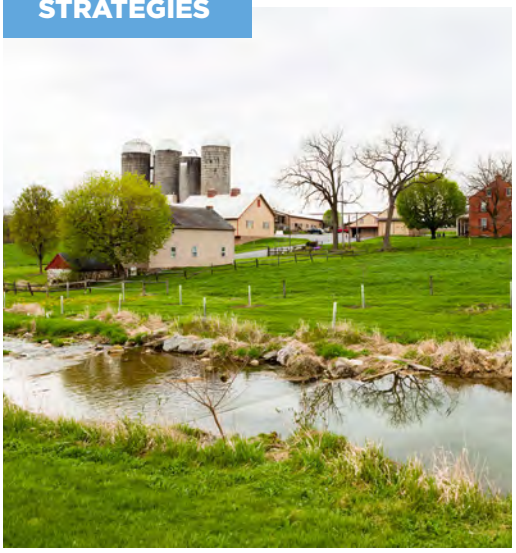


Photo: Will Parson, Chesapeake Bay Program

- Sustainable restoration of priority streams through regional collaboration and watershed approaches
- Use of data to consistently track progress, drive decision-making, and foster collaboration
- Acquisition of realistic, adequate funding for well-coordinated, common sense solutions
- Scaled use of sustainable, proven and promising practices (BMPs) at adequate levels for rapid success with the Lancaster Countywide Action Plan
- Achieve policy and process changes that facilitate the needs of Lancaster County efforts
- Deploying an active communication plan to raise awareness that leads to behavioral change

PROGRESS INDICATORS

- BMPs in place for 7.14 million pounds of nitrogen reduced by 2025
- BMPs in place for 540,000 pounds of phosphorus reduced by 2025
- BMPs in place for 222.7 million pounds of sediment reduced by 2025
- Net reduction of impaired streams to 350 miles by 2030
- 75% of adult county residents familiar with the issue, supportive, and actively engaged personally

STATUS OF EACH PROGRESS INDICATOR
www.lancastercleanwaterpartners.com/common-agenda

Shared Value to Diversity, Equity, Inclusion, and Justice

We believe equal access to justice and clean water are human rights. Our vision of clean and clear waterways means healthy local streams for all Lancastarians, but particularly those that have historically had unequal access to it.

Our collaborative work is intended to amplify the diverse voices in our community demanding environmental and social equality.

Without justice a community's thirst cannot be satisfied. Without clean water our community will not thrive. Both require constant commitment and renewal of purpose.

READ MORE ABOUT OUR SHARED VALUES
https://rb.gy/vuat9e

Photo: Michelle Johnsen Photography

CONTACT US
LancasterCleanWaterPartners.com
Facebook: @LancasterCleanWaterPartners

APPENDIX C

Collective Action for Clean Water: A Partners & Resources Inventory, Analysis, and Recommended Integrated Funding Delivery Strategy for Lancaster County

Penn State University, College of Agricultural Sciences

Penn State Agriculture & Environment Center

March 2021

(Profiles for Lancaster County watersheds, other than the Pequea, have been removed.)

Collective Action for Clean Water:
A Partners & Resources Inventory, Analysis, and Recommended Integrated Funding Delivery Strategy for Lancaster County

PennState
College of
Agricultural Sciences

Penn State Agriculture & Environment Center

March 2021

TABLE OF CONTENTS

ACKNOWLEDGMENTS

Numerous staff members at the Penn State Agriculture and Environment Center had a hand in developing this document. Primary drafting and analysis were conducted by Matt Royer, director, and Allyson Ulsh, intern (ERM ’20). Many of the concepts in this inventory were incorporated into Allyson’s outstanding Schreyer Honors College thesis, “Analysis of the Legal Framework & Policies Driving Nutrient Reductions in Agriculture: How Restoration Efforts in the Chesapeake Bay Compare to Restoration Efforts in the Baltic Sea” (Spring 2020). Additional assistance was provided by AEC interns English Dawson, Amanda Grube, Ryan Hill (ERM ’18) and Bill Ryan (ERM ’20), and AEC staff Kristen Koch and Sarah Xenophon.

The development of this plan would not have been possible without the support and funding for the Lancaster Clean Water Partners through the “Pennsylvania in Balance: Focus Lancaster” grant provided to the Conservation Foundation of Lancaster County by the National Fish and Wildlife Foundation.

Special thanks to Lancaster Clean Water Partners staff Allyson Gibson, coordinator, and Emily Smedley, communications and program manager, for their careful review and comments on drafts of the document, and the commitment to take the torch to make this a living, breathing document that benefits clean water partners across the county.

Finally, thanks to the many partners for clean water who are listed in this document for the time they provided in interviews and responding to questions, reviewing drafts, and all of the terrific work being done across Lancaster County to achieve collaborative clean water goals.

PennState
College of
Agricultural Sciences

Lancaster
CLEAN WATER PARTNERS

NFWF

LIST OF FIGURES AND TABLES

FIGURES

TABLES

LIST OF ACRONYMS

319	Section 319 Nonpoint Source Pollution Control Program
ACB	Alliance for the Chesapeake Bay
AEC	Agriculture and Environment Center
APRP	Agricultural Planning Reimbursement Program
BEST	Buffer Establishment Support Team
BMPs	Best Management Practices
C&B	Crow & Berry Land Management LLC
C2P2	Community Conservation Partnerships Program
C3RP	Chiques-Conoy-Conewago Regional Partnership
CBF	Chesapeake Bay Foundation
CBIG	Chesapeake Bay Implementation Grants
CBLP	Chesapeake Bay Landscape Professional Certification Program
CBP	Chesapeake Bay Partnership
CBRAP	Chesapeake Bay Regulatory and Accountability Program
CCC	Chiques-Conoy-Conewago
CCWA	Cocalico Creek Watershed Association
CDBG	Community Development Block Grant
CEG	Conservation Excellence Grant
CFA	Commonwealth Financing Authority
CIG	Conservation Innovation Grants
CREP	Conservation Reserve Enhancement Program
CSD	C.S. Davidson, Inc.
CSP	Conservation Stewardship Program
D&G	Dirt & Gravel/Low Volume Road Program
DCED	PA Department of Community and Economic Development
DCNR	PA Department of Conservation and Natural Resources
DEP	PA Department of Environmental Protection
DM/A	David Miller/Associates, Inc.
DTU	Donegal Chapter of Trout Unlimited
E&S	Erosion and Sedimentation Control
EA	Earthbound Artisans
EPA	US Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERM	Environmental Resource Management
FA	Financial Assistance
FSA	USDA Farm Service Agency
FSP	Farm Stewardship Program
GG	Growing Greener
HUD	US Department of Housing and Urban Development
INSR	Innovative Sediment and Nutrient Reduction Grants
K10	Keystone 10 Million Trees Partnership
LC	Lancaster Conservancy
LCCD	Lancaster County Conservation District
LCCF	Lancaster County Community Foundation
LCCWC	Lancaster County Clean Water Consortium
LCPD	Lancaster County Planning Department
LCRA	Lancaster County Redevelopment Authority
LCWF	Lancaster Clean Water Fund

LFT	Lancaster Farmland Trust
LSI	LandStudies, Inc.
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer System
NFWF	National Fish and Wildlife Foundation
NRCS	USDA Natural Resources Conservation Service
OWA	Octoraro Watershed Association
PACD	PA Association of Conservation Districts
PASA	PASA Sustainable Agriculture
PENNDOT	PA Department of Transportation
PENNVEST	PA Infrastructure Investment Authority
PFBC	PA Fish & Boat Commission
PFW	Partners for Fish and Wildlife Program
PL-566	Watershed Protection and Flood Prevention Program
PSU	Pennsylvania State University
RC&D	Resource Conservation and Development Council
RCPP	Regional Conservation Partnership Program
REAP	Resource Enhancement and Protection Program
RFP	Request for Proposals
SCC	State Conservation Commission
SGTP	Smart Growth Transportation Program
SWG	Small Watershed Grants
TA	Technical Assistance
THCWP	Turkey Hill Clean Water Partnership
TCCCA	Tri-County Conewago Creek Association
USDA	US Department of Agriculture
USFWS	US Fish & Wildlife Service
WIP	Watershed Implementation Plan
WRE	Wetland Reserve Easement Program
WSI	Water Science Institute

EXECUTIVE SUMMARY

The Lancaster Clean Water Partners (Partners) is a countywide, collaborative partnership of diverse partner organizations – local leaders in business, municipal public service, higher education, conservation planning, and non-profit management – that come together with shared vision of clean and clear local streams by 2040.

Cross-sector collaboration is essential to achieving this goal. The Partners believe that an organized, collaborative effort with a bias toward action is the best way to move the needle and make a lasting, positive impact on Lancaster County. Among the baseline activities necessary for these action-oriented collaborative efforts is a comprehensive understanding of the many partners working successfully on clean water across the county and the resources and expertise that are available from and for these partners.

Through support from the National Fish and Wildlife Foundation, the Penn State Agriculture and Environment Center (AEC) has undertaken an inventory and assessment of existing partners and resources available to implement conservation practices in Lancaster County. The inventory concentrated on those partners and funding resources necessary to implement conservation practices on the ground, considering a continuum of services from outreach-to-technical assistance (TA)-to-implementation assistance. Conservation practices were organized by practice type (agricultural best management practices (BMPs), stormwater BMPs, riparian buffers, and restoration practices). A total of 36 partners were inventoried from federal, state and county and local government, academia, and the non-profit and private sectors. A total of 49 funding sources, many provided by these partners, were also inventoried across government, county, nonprofit and foundations, and private sectors. Summaries of each partner and funding source are provided.

Partners and resources were analyzed and organized by critical categories, including conservation practice type and services funded, funding source or sector, funding sources requiring matching funds, and available resources by watershed. Summary charts and graphics showing the partners and resources by critical categories are provided.

Our analysis found that, given the plethora of partners and resources available in Lancaster County, it is critical to develop and deploy a strategy that integrates partners and funding to take full advantage of specific and collective strengths and identify and address weaknesses, thus enhancing the delivery of conservation on the ground. The following recommendations are provided to achieve ***integrated funding delivery*** for maximum collective impact:

1. Strategically match and leverage different funding sources to stretch limited dollars for maximum impact.
2. Recognize the importance of maintaining and growing a diversity of funding sources.
3. Determine and utilize core funding sources for specific conservation practice types.
4. Use flexible funding sources to gap-fill and match.
5. Use a strategic mix of partner skills and funding resources to maximize outreach and TA capacity and deliver the dollars for implementation.
6. Develop and deploy customized strategies that work best for specific watersheds and communities.
7. Seek to develop common standards and approaches to funding conservation across all partners and, to the extent possible, programs.
8. Centralize administration and coordination of funding to streamline integrated funding delivery processes for all.

SECTION 1: PROJECT OVERVIEW

The Lancaster Clean Water Partners

Formed in 2017, the Lancaster Clean Water Partners (Partners) is a countywide, collaborative partnership of diverse partner organizations – local leaders in business, municipal public service, higher education, conservation planning, and non-profit management – that come together with shared vision of clean and clear local streams by 2040.

Lancaster County faces a significant set of challenges, but also is presented with significant opportunities. The county boasts a mix of urban and rural assets, representing a vibrant city, unique towns and suburbs, and some of the most productive farmland in the United States. Its residents are as diverse as the land on which they live. The goal of the Partners is to unite these perspectives and use Lancaster County's diversity to fuel innovative and effective solutions to environmental challenges facing land and water.

The Partners believe that an organized, collaborative effort with a bias toward action is the best way to move the needle and make a lasting, positive impact on Lancaster County. Among the baseline activities necessary for these action-oriented collaborative efforts is a comprehensive understanding of the many partners working successfully on clean water across the county and the resources and expertise that are available from and for these partners. That is, what partners are doing work that helps put conservation practices on the ground to improve water quality, where are they concentrating their efforts, what skills and resources do they offer, what funding resources do they bring and are otherwise available to them and—perhaps most critical—how can they work together to achieve greater results more cost effectively than they would be able to do on their own?

The Partners and Resources Inventory

Through support from the National Fish and Wildlife Foundation, the Penn State AEC has undertaken an inventory and assessment of existing partners and resources available to implement conservation practices in Lancaster County. Our inventory consisted of developing a list of partners doing this work in Lancaster County and conducting interviews in person, by phone, or through email to learn about the capacity of each partner and the funding resources available. A total of 36 partners were inventoried from federal, state and county and local government, academia, and the non-profit and private sectors.

Consistent with the Partners' bias toward action, this inventory focuses on the skills and resources necessary to **implement conservation practices** on the ground on farms, residential lands, commercial and institutional properties, and municipal and other publicly owned lands.

In using the term "conservation practice," we mean a change in land management or land use that is implemented on the landscape to improve water quality. For purposes of this report, we organize the types of conservation practices in to **four categories**:

Agricultural Best Management Practices (Ag BMPs), which are conservation practices implemented on farms, such as stream bank fencing, grassed waterways, nutrient management, no-till, cover crops, grazing management, loafing lot management, barnyard runoff controls, and manure storages.

Stormwater Best Management Practice (Stormwater BMPs), which are practices to manage stormwater runoff from developed lands, including rain gardens, stormwater basin retrofits, bioswales, and urban tree planting.

Riparian Buffers, the establishment of permanent vegetative cover along streams, which can occur on both agricultural and developed lands. Our focus in this inventory is on forest riparian buffers.

Restoration Practices, including wetland restoration, stream restoration and floodplain restoration. These can also occur on both agricultural and developed lands.

In order to implement these conservation practices, certain **services** are required. These services are often provided by partners and the cost of providing them can be funded by funding resources. We organized and considered these necessary services as **a continuum of outreach-to-technical assistance-to-implementation assistance**, each of these having several components that roughly fit along this continuum (see Figure 1).

Figure 1. The continuum of activities necessary to achieve successful adoption of conservation practices on the ground. The red-yellow-green color scheme represents the outreach-TA-implementation assistance continuum and is used throughout this document.

Outreach activities would include holding workshops and events with targeted audiences of farmers and other landowners and/or municipalities where partners share information on conservation and the resources available to implement practices on the ground. These activities would also include landowner visits, where knowledgeable partners are available to meet with farmers and other landowners or municipal staff to walk the property and discuss opportunities and options for conservation and build positive relationships and trust.

Technical assistance (TA) activities are those specialized professional services that are needed to plan and design conservation practices that are often complex and require trained professionals to develop and design. These services include developing conservation and nutrient management plans for farm operations, or stormwater management plans for urban lands, or planting plans for riparian buffers, rain gardens, and other green infrastructure practices. They also include design and engineering and developing applications and obtaining permits necessary to implement a project. These types of services often need professionals in trained scientific disciplines including soil science, hydrology, agronomy, environmental sciences, landscape architecture, forestry, ecology, and engineering.

Implementation assistance refers to the assistance—most directly funding—that is needed to construct and implement a conservation project. This is sometimes also referenced as financial assistance, or "FA," but in the context of this inventory, it can mean both the funding and partner support for implementation. Funding is necessary to pay for materials, excavation and other construction costs, plants and planting labor for vegetative-based practices like buffers, project management, and construction oversight to ensure the practice is implemented and constructed as designed and to existing technical standards for the practice. (It should be noted that funding is often also needed to provide the necessary technical assistance for a project, particularly if that TA is not being provided by a public agency.) Finally, in order to ensure long term success of a conservation project, operation and maintenance (O&M) is critical. The cost and implementation of O&M often falls upon the landowner, but there are funding resources and technical assistance partners to support certain necessary maintenance services, particularly for riparian buffers and other green infrastructure practices.

With these important categories of conservation practice types and services in mind, we organized and present the partners and resources inventory in Sections 2 and 3 as follows.

Section 2 is our partner inventory. In this section we provide a one-page summary assessment of each partner and the skills and resources the partner provides related to the outreach/TA/implementation continuum. While summaries are provided for 36 partners, it must be noted that our assessment is not an exhaustive list of every entity, organization or business providing skills and resources helpful in implementing conservation practices to improve water quality in Lancaster County. For example, while we highlight eight private sector firms that are active in the Partners in this report, there are many more such firms that provide technical support and services to make clean water projects possible, some of which are listed following the individual firm profiles. Similarly, many local volunteer watershed groups provide valuable volunteer labor and support for such projects, and Lancaster County's 60 municipalities are critical local partners and often champions in clean water efforts. We list the watershed groups and municipalities at the end of Section 2. The focus of our inventory was largely on those entities with technical capacity and/or funding resources to accelerate implementation. These are primarily government agencies, foundations, and nonprofit organizations eligible for grants. Accordingly, we are certain there are many clean water partners working in the county who are adding tremendous value to the collective effort but are not listed in this inventory.

Section 3 is the inventory of the funding resources available in Lancaster County, many of them offered by partners inventoried in Section 2. An impressive array of such resources exists in the county, consisting of federal, state, and local government funding, foundations, and private sector funding in the form of grants, loans, tax credits and mitigation funds. All told, 49 funding resources that support conservation practice implementation are identified and inventoried. Some are funding sources that allow landowners to apply directly (like NRCS programs and REAP), some are grant programs that allow eligible partners to apply during open application periods (like Growing Greener and NFWF grants); many are existing grants that a variety of partners have secured and are administering to implement conservation practices in certain watersheds or across the county.

Regarding the latter, we should explain that there are also many grants that have been obtained by partners (including many by municipalities and watershed groups) that are funding the implementation of specific pre-identified projects. These grants represent an entirely other set of funding resources being put to good use for clean water, but they were not inventoried specifically in Section 3, since they are already earmarked or being spent for specific projects. The inventory in Section 3 is focused more on resources that provide programmatic support not already allocated to

specific projects, and therefore can provide opportunities for strategic and integrated action moving forward. A list of some of these grants where we became aware of them through our research are listed in the excel spreadsheet of available grants that accompany this report.

For each funding resource inventoried a summary description is provided, indicating the types of services funded along the outreach/technical assistance/implementation assistance continuum, and what types of conservation practices are funded (ag BMPs, stormwater BMPs, buffers, restoration practices), as discussed above. Details on cost share amounts provided and other funding specifications are also summarized for each funding resource.

An Analysis and Recommendations for Integrated Funding Delivery

Following our inventory of partners and funding resources, in **Section 4** we undertook an analysis of these assets across the county.

By assessing assets cumulatively and collectively, we were able to identify areas of high capacity and gaps, areas of natural synergies and collaboration, opportunities for leveraging, and strategies for integrating capacity and funding to accelerate conservation.

As we inventoried the many partners and funding resources for implementing conservation practices, we noticed variability in the types of services and the types of practices funded. We analyzed the resources by **critical categories** and provide summary charts organizing the resources by these categories. A more elaborate and dynamic spreadsheet that organizes partners and resources in this manner is also provided.

In addition, as we inventoried available partners and resources across the county, it became clear that certain partners or resources are focused in specific watersheds or regions of the county. Accordingly, one of the critical categories of our analysis is by the watersheds of Lancaster County. We subdivide the county into 16 major watersheds and provide specific summary profiles for each watershed that include a list of partners and resources available and what type of services they provide in support of acceleration conservation practice implementation.

Finally, we end by providing a set of eight specific recommendations for how best to integrate the many funding and partner resources available in Lancaster County for maximum collective impact. Ultimately, we recommend an **integrated funding delivery approach** whereby existing resources are "knitted" together to achieve higher levels of implementation of higher priority conservation practices across the county. We offer recommendations for a strategic approach toward use of these resources where different funding sources can fund types of projects or project services, or target the type of landowner for which particular funding sources are best suited. We also recommend a high degree of leveraging of different funding resources, so that funding programs and funders are not in competition with one another, but jointly can make higher impact projects happen and accelerate conservation adoption. This approach can be scaled up countywide or downscaled to specific priority areas, such as watersheds.

SECTION 2: PARTNERS INVENTORY

A total of 36 partners were inventoried, all providing some level of support for implementation of conservation in Lancaster County. The 36 partners include federal and state agencies, county entities, nonprofit and academic organizations, foundations, and private sector businesses. For each partner, a summary description of the skills and resources offered is provided, as well as geographic scope. An additional 10 private sector partners which provide support to clean water efforts in the county are also listed.

In addition, Lancaster County is home to 14 watershed groups and 60 municipalities, all of which may be critical local partners in providing resources and leadership to implement conservation in their local watersheds and communities. Watershed groups and municipalities are listed at the end of this section, with contact information provided.

Federal Partners

Susquehanna River Basin Commission (SRBC)

USDA Farm Service Agency (FSA)

USDA Natural Resources Conservation Service (NRCS)

US Fish and Wildlife Service (USFWS)

US Environmental Protection Agency (EPA)

Susquehanna River Basin Commission

www.srbc.net
Contact: Josh Brengel, 4423 North Front Street, Harrisburg PA 17110,
(717) 238-0423, jbrengel@srbc.net

SRBC is a federal-interstate coordinating agency established by the Susquehanna River Basin Compact that seeks to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin.

Resources and Expertise

Outreach

SRBC staff are available to speak at meetings and outreach events on a variety of water resources, water quality and conservation topics.

Technical Assistance

SRBC's technical assistance capacity includes water quality monitoring, modeling and scientific analysis in support of watershed planning to guide implementation strategies locally.

Implementation Assistance

While SRBC does not traditionally provide implementation funding or assistance, SRBC is available to support implementation efforts through the outreach and technical assistance services outlined above.

Geographic Focus

Countywide

USDA Farm Service Agency

www.fas.usda.gov
Contact: Kimberly Merlau, Lancaster County Executive Director, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2500, kimberly.merlau@usda.gov

FSA provides technical and financial assistance to help farmers implement riparian buffers and other wildlife-related conservation practices under the Conservation Reserve Enhancement Program (CREP), and provides a wide variety of other funding and loan opportunities to farmers.

Resources and Expertise

Outreach

FSA can work with the broader CREP partnership to provide educational materials in support of outreach to farmers and landowners about CREP.

Technical Assistance

FSA technicians provide assistance in processing applications, contracts and other administrative services necessary to administer the CREP program, as well as other funding and loan opportunities available to farmers.

Implementation Assistance

Funding available through CREP for implementation of riparian buffers and other conservation practices on farms. Other FSA funding programs may also be of interest to farmers.

Geographic Focus

Countywide

USDA Natural Resources Conservation Service

www.nrcs.usda.gov
Contact: Heather Grove, District Conservationist, Lancaster Office, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2530,
heather.grove@usda.gov

NRCS provides technical and financial assistance to help farmers implement conservation practices on working lands.

Resources and Expertise

Outreach

NRCS staff from the Lancaster and PA state office are frequent speakers at farmer meetings and field days on a variety of conservation topics. NRCS technicians are also available for farm visits to discuss NRCS programs, assess conservation needs and priorities for farmers, and determine how NRCS funding can best meet the goals of the farmer.

Technical Assistance

NRCS technicians provide full service technical assistance for farmers, including conservation plan writing and design, engineering and permitting services for a wide variety of agricultural and restoration-based conservation practices.

Implementation Assistance

Funding is available through NRCS for implementation of agricultural conservation practices and restoration of natural lands and wildlife habitat on farms. Major programs include the Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and the Wetland Reserve Easement Program (WRE).

Geographic Focus in Lancaster County

Countywide

US Fish and Wildlife Service

www.fws.gov
Contact: Mark Roberts, 110 Radnor Rd, Suite 101, State College PA 16801, (814) 234-4090 ext. 7457, mark_roberts@fws.gov

USFWS administers the Partners for Fish and Wildlife Program, which provides technical and financial assistance to private landowners to restore, enhance, and manage private land to improve fish and wildlife habitats. Projects typically include stream restoration, wetland restoration, riparian buffer installation, and stream bank fencing.

Resources and Expertise

Outreach
Staff are available to meet with landowners interested in stream or wetland restoration projects to assess the site and discuss the program.

Technical Assistance
Technical assistance in survey, design, engineering and permitting for stream and wetland restoration projects. Project management and construction oversight is also provided.

Implementation Assistance
External funding is required to implement projects, but financial assistance can be contributed to a project through in-kind matching funds.

Geographic Focus in Lancaster County

Countywide

US Environmental Protection Agency

www.epa.gov
Contact: Kelly Shenk, 410 Severn Ave, Suite 112, Annapolis MD 21403, (410) 267-5728, shenk.kelly@epa.gov;
Other points of contact vary by EPA grant program, and are provided in Section 3 under "Federal Funding Programs."

EPA is a federal agency with the mission of protecting human health and the environment. There are two divisions in EPA Region 3 that are relevant to providing resources to help implement conservation practices in Lancaster County, PA. One is the Water Division, which manages, among many other Clean Water Act (CWA) programs, the nonpoint source pollution program (CWA Section 319 Program) and Clean Water State Revolving Loan Fund (SRF). The other is the Chesapeake Bay Program Office, which manages the Chesapeake Bay Program partnership, a federal-state partnership to restore the Chesapeake Bay and its watershed.

Resources and Expertise

Outreach

EPA resources and materials are available for use in outreaching to farmers and landowners about the benefits of implementing conservation practices. EPA funding programs (see below) can also help fund outreach work by partners. EPA staff and grantees in the Chesapeake Bay Program Office are available to participate in outreach events or efforts.

Technical Assistance

Some of EPA funding programs can fund technical assistance necessary to implement agricultural conservation practices, such as conservation district staff, State agriculture department staff, land grant universities, NGOs who work with farmers to implement conservation practices.

Implementation Assistance

Financial assistance to implement conservation practices is available through a variety of EPA funding programs. Most notably are the Section 319 Program, CWA Section 117(e)(1)(A) Chesapeake Bay Implementation Grants (CBIG) and Chesapeake Bay Regulatory and Accountability Program (CBRAP) Grants, administered by the Pennsylvania Department of Environmental Protection, Fish and Boat Commission, Department of Conservation and Recreation, and State Conservation Commission; and the Clean Water State Revolving Loan Fund, which award funding to state partner agencies (i.e., PENNVEST) for a wide variety of water quality protection efforts. Additionally, substantial EPA CWA Section 117(d)(1) funds support EPA's Innovative Nutrient and Sediment Reduction (INSR) Grants and CWA Section 117 (g)(2) Small Watershed Grants (SWG) that are currently administered by the National Fish and Wildlife Foundation (NFWF).

Geographic Focus in Lancaster County

Varies by grant program

State Partners

PA Department of Community and Economic Development (DCED)

PA Department of Conservation and Natural Resources (DCNR)

PA Department of Environmental Protection (DEP)

PA Fish and Boat Commission (PFBC)

PENNVEST

State Conservation Commission (SCC)

PA Department of Community and Economic Development

www.dced.pa.gov
Contact: Aliyah Furman, Southeast Regional Office, 110 North 8th Street, Suite 505, Philadelphia PA 19107-2471, (215) 560-5822, alifurman@pa.gov

DCED's mission is to encourage the shared prosperity of all Pennsylvanians by supporting good stewardship and sustainable development initiatives across our commonwealth.

Resources and Expertise

Outreach
DCED's resources related to implementing conservation practices are primarily financial assistance (see below)

Technical Assistance
DCED's resources related to implementing conservation practices are primarily financial assistance (see below)

Implementation Assistance
Funding is available through a variety of DCED programs. The most relevant to clean water initiatives are the Watershed Restoration and Protection Program and the Flood Mitigation Program through Act 13, which are administered by the Commonwealth Financing Authority.

Geographic Focus in Lancaster County

Countywide

PA Department of Conservation and Natural Resources

www.dcnr.pa.gov
Contact: Teddi Stark, 400 Market Street, 6th Floor, Harrisburg PA 17105, (717) 787-0656, (814) 335-5665, c-tstark@pa.gov

DCNR provides staff and resources for outreach, technical assistance and funding to implement forest riparian buffers on public and private lands and other conservation implementation, planning and capacity building projects.

Resources and Expertise

Outreach

DCNR has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of planting riparian buffers, technical aspects of planning, planting and maintaining buffers, and the funding resources available for implementing riparian buffers.

Technical Assistance

DCNR technicians will develop riparian buffer planting plans, can provide project coordination and management, and can assist in buffer planting (often through volunteer coordination) and buffer maintenance. DCNR grant programs can also provide planning and capacity building assistance on a variety of conservation initiatives.

Implementation Assistance

Funding is available through DCNR grant programs to fund technical assistance, planting and maintenance of riparian buffers. Riparian buffer grants are available through the Community Conservation Partnerships Program (C2P2). Several DCNR grants are currently funding buffer implementation and maintenance throughout Lancaster County. DCNR grant programs can also support other conservation projects (such as stream and floodplain restoration and green infrastructure implementation at recreation sites).

Geographic Focus in Lancaster County

Countywide

PA Department of Environmental Protection

www.dep.pa.gov
Contact: Kristen Wolf, PA Chesapeake Bay Office, 400 Market Street, Harrisburg PA 17101, (717) 772-1675, kwolf@pa.gov

DEP's mission is to protect Pennsylvania's air, land and water from pollution and to provide for the health and safety of its citizens through a cleaner environment. DEP partners with individuals, organizations, governments and businesses to prevent pollution and restore our natural resources. DEP is Pennsylvania's lead agency in developing and implementing the Phase 3 Chesapeake Bay Watershed Implementation Plan (Phase 3 WIP).

Resources and Expertise

Outreach

DEP has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of actions to improve water quality through implementing the Phase 3 WIP and about the resources and opportunities available to implement conservation practices.

Technical Assistance

Particularly for projects that require permitting, DEP is available for pre-application site meetings to assess the project and discuss permitting expectations and options.

Implementation Assistance

DEP provides a variety of funding assistance for implementation of conservation projects, These include grant opportunities through Growing Greener Plus and PA's Nonpoint Source Pollution Management (Section 319) Program Other funding in provided through the Chesapeake Bay Program funding (particularly Chesapeake Bay Implementation Grants (CBIG) and Chesapeake Bay Regulatory and Accountability Program (CBRAP). One specific Chesapeake Bay funding program is the Agricultural Plan Reimbursement Program, which reimburses farmers the cost of preparing ag erosion and sediment control and manure/nutrient management plans.

Geographic Focus in Lancaster County

Countywide

PA Fish and Boat Commission

www.fishandboat.com
Contact: Tyler Neimond, Chief, Division of Habitat Management, 595 East Rolling Ridge Drive, Bellefonte PA 16823, (814) 359-5185, tneimond@pa.gov

PFBC's mission is to protect, conserve, and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities. PFBC resources are available to improve aquatic habitat through restoration efforts.

Resources and Expertise

Outreach

PFBC has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of habitat restoration to improve fisheries and water quality. Staff are also available to meet with landowners who may be candidates for PFBC restoration projects.

Technical Assistance

PFBC staff can provide design and construction oversight for stream restoration projects.

Implementation Assistance

PFBC receives $100,000 annually for habitat improvement projects in York and Lancaster Counties. These may include agricultural conservation practices, restoration projects, and riparian buffers. Funds are awarded for projects through an RFP process typically on a semi-annual basis. A maximum of $75,000 per project is awarded. Match is not required but is encouraged.

Geographic Focus

Countywide

PENNVEST

www.pennvest.pa.gov
Contact: Tesra Schlupp, 333 Market Street 18th Floor, Harrisburg PA 17101,
(717) 713-8618, tschlupp@pa.gov

PENNVEST serves communities and the citizens of Pennsylvania through capital funding for drinking water, sewer, storm water, non-point source pollution prevention and other related projects that benefit the health, safety, environment, promote economic development, and improve water quality.

Resources and Expertise

Outreach

PENNVEST's resources are primarily financial assistance and staff is available to speak at workshops or events about PENNVEST funding and implementation of water quality improvement projects.

Technical Assistance

PENNVEST's resources are primarily financial assistance and can cover the costs of technical assistance associated with implementing water quality improvement projects.

Implementation Assistance

The PENNVEST Clean Water State Revolving Fund (CWSRF) program provides affordable financing for wastewater and certain other projects throughout Pennsylvania for the construction, improvement, extension, expansion, repair or rehabilitation of wastewater collection, treatment or disposal facilities, storm water management, nonpoint source pollution controls including but not limited to agricultural best management practices and watershed and estuary management. The program offers low interest loans with flexible terms and principal forgiveness funds where applicable and available.

PENNVEST performs similarly to a bank for the CWSRF program in Pennsylvania and manages the financial aspects of the fund, while the Department of Environmental Protection is the technical arm for the program. The seed money for the CWSRF has been distributed to states annually under Congressional authorization pursuant to the Clean Water Act of 1987. The funds and the program are administered nationally by United States Environmental Protection Agency (EPA).

Geographic Focus in Lancaster County

Countywide

State Conservation Commission

www.agriculture.pa.gov
Contact: Joel Semke, REAP Coordinator, 2301 N Cameron St, Harrisburg PA 17110, (717) 705-4032, jsemke@pa.gov

SCC is a 14-member commission with a mission to ensure the wise use of Pennsylvania's natural resources and to protect and restore the natural environment through the conservation of its soil water and related resources. The commission provides support and oversight to the state's 66 county conservation districts for the implementation of conservation programs and is responsible for administering several state conservation programs including the Nutrient Management and Odor Management Program, the Dirt and Gravel Program, Resource Enhancement and Protection (REAP Tax Credit) Program, and the new Conservation Excellence Grant Program.

Resources and Expertise

Outreach

SCC has staff capacity to speak at events and trainings relating to its conservation programs, particularly nutrient management, REAP and the Conservation Excellence Grant Program.

Technical Assistance

Technical guidance on REAP is available on its website and staff can answer questions about the program and application process. REAP will pay for the full range of TA associated with implementing agricultural conservation practices, including conservation planning (including conservation/ag E&S plans and manure/nutrient management plans, design, engineering and permitting, and project management.

Implementation Assistance

Funding is available through REAP and the Conservation Excellence Grants to fund implementation of agricultural conservation practices (including riparian buffers) on farms. REAP can also fund equipment purchases that allow farmers to implement conservation practices, such as no till planters. REAP is administered by the SCC, while Conservation Excellence Grants are administered by the Lancaster County Conservation District.

Geographic Focus in Lancaster County

Countywide

County Partners

Lancaster County Clean Water Consortium (LCCWC)

Lancaster County Conservation District (LCCD)

Lancaster County Planning Department (LCPD)

Lancaster County Redevelopment Authority (LCRA)

Lancaster County Clean Water Consortium

www.lccwc.com
Contact: Joellyn Warren, Chair, 1383 Arcadia Road, Lancaster PA 17601,
lancasterccwc@gmail.com

The Lancaster County Clean Water Consortium provides resources for municipalities and community stakeholders to assist with local, state, and federal stormwater permit requirements.

Resources and Expertise

Outreach

The Consortium provides educational seminars, workshops, and training, such as the first annual Municipal Stormwater Forum (MSForum) that focused on providing municipalities with the information they need to achieve MS4 compliance and manage their stormwater operations and maintenance responsibilities. Other training topics have included stream restoration, MS4 audits, and technological resources for managing stormwater. The Consortium also develops resources to help municipalities such as the BMP Maintenance Guide. The Consortium provides leadership for the Clean Water Partner's Stormwater Action Team and every other month offers an educational event held in different locations in the county and focused on new topics that relate to clean water issues that impact municipalities.

Technical Assistance

The Consortium has been the recipient of grants to support communities in watershed and community planning, and Consortium members provide technical assistance with project implementation, including design and engineering services.

Implementation Assistance

The Consortium provides $10,000 annually for stormwater mini grants to fund implementation of stormwater BMPs. One or more projects may be awarded per year.

Geographic Focus in Lancaster County

Countywide

Lancaster County Conservation District

www.lancasterconservation.org
Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road,
Lancaster PA 17601, (717) 299-5361 ext. 2523,
mattkofroth@lancasterconservation.org

LCCD promotes stewardship of the land, water, and other natural resources; to make all citizens aware of the interrelationships between human activities and the natural environment; to provide assistance for current efforts in natural resource conservation; and to develop and implement programs which promote the stewardship of natural resources; while enlisting and coordinating help from public and private sources in accomplishing this mission.

Resources and Expertise

Outreach

LCCD has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of the full range of conservation practices and how to take advantage of the technical and financial assistance resources available for implementing such practices. LCCD staff will also conduct farmer and landowner visits to discuss specific conservation goals and needs of the landowner.

Technical Assistance

LCCD staff provide a variety of technical assistance to help farmers and other landowners implement conservation practices, including conservation plan and manure management plan development, agricultural conservation practices and stream restoration design and permitting, construction oversight, and technical assistance for stormwater and erosion control projects through the Dirt & Gravel/Low Volume Roads Program.

Implementation Assistance

LCCD administers several funding sources for implementing conservation practices. These include the Dirt & Gravel/Low Volume Roads Program, Exelon funding for stream restoration and agricultural conservation practices, and the Conservation Excellence Grant program. The district also has a fundraising arm, the Conservation Foundation of Lancaster County, which is a tax exempt 501(c)(3) nonprofit organization that can apply for and administer grants to implement conservation practices in the County.

Geographic Focus in Lancaster County

Countywide

Lancaster County Planning Department

www.lancastercountyplanning.org
Contact: Mark Huber, Senior Planner, 150 N. Queen St., Ste. 320, Lancaster, PA 17603, (717)299-8333, mhuber@co.lancaster.pa.us

The Lancaster County Planning Department (LCPD) seeks to be the leader and catalyst for innovative planning and placemaking in Lancaster County. Its purpose is to ensure that Lancaster County remains a special place in the future, and it achieves this by facilitating inclusive dialogue, creating shared visions and plans, and helping communities achieve results.

Resources and Expertise

Outreach

LCPD has staff capacity to participate in public outreach with the core goals of managing growth and preserving large spaces of contiguous agricultural and natural areas, preserving both farmland and the farmer, and improving water quality and encouraging stakeholders to work together on stormwater management.

Technical Assistance

Places2040, the county's new comprehensive plan, provides a framework for conservation implementation, by encouraging implementation of two of the plan's big ideas: Taking Care of What We Have and Growing Responsibly. These goals call for efforts to improve water quality, and to work together on stormwater management. Additional supporting plans include two elements from the previous Lancaster County Comprehensive Plan: *Greenscape*s, the green infrastructure element, and *Blueprints*, the integrated water resources planning element. Mapping and GIS support are other technical resources that LCPD offers to assist with conservation practice implementation.

Implementation Assistance

LCPD administers the Smart Growth Transportation program, which funds transportation projects and studies that build infrastructure for safer, more walkable, bikeable and transit-friendly communities. Such projects can align with improved stormwater management infrastructure.

Geographic Focus in Lancaster County

Countywide

Lancaster County Redevelopment Authority

www.lchra.com
Contact: Justin Eby, Deputy Executive Director, 28 Penn Square, Suite 200, Lancaster, PA 17603, (717) 394-0793 ext. 225, jeby@lchra.com

The Lancaster County Redevelopment Authority (LCRA) is a public authority chartered by the state that works independent of county government. It promotes redevelopment of underutilized properties and development of affordable housing. LCRA focuses on planning and developing balanced mixed-use communities to create thriving, well-served neighborhoods, boroughs, and municipalities.

Resources and Expertise

Outreach

LCRA has staff capacity to participate in public outreach to teach municipalities and county residents about its priority programs that administer HUD funding in support of affordable housing, bond financing for economic development and housing, and economic development in borough downtowns.

Technical Assistance

Technical assistance is provided in the form of planning and administration of various funding programs to support redevelopment of underutilized properties and development of affordable housing in communities across the county.

Implementation Assistance

Among other funding programs, LCRA administers the Community Development Block Grant (CDBG) program, which is a direct allocation from HUD. CDBG can fund a variety of improvements in a community's low-to-moderate income areas, including street repairs, improved water and sewer infrastructure to reduce inflow and infiltration (I&I), or stormwater management improvements.

Geographic Focus in Lancaster County

Countywide

Nonprofit and Academic Partners

Alliance for the Chesapeake Bay

Capital RC&D

Chesapeake Bay Foundation

Chesapeake Conservancy

Donegal Trout Unlimited

Lancaster Conservancy

Lancaster Farmland Trust

Penn State University

Stroud Water Research Center

Water Science Institute

Alliance for the Chesapeake Bay

www.allianceforthebay.org
Contact: Jenna Mitchell, PA Director, 37 East Orange St, Suite 302,
Lancaster PA 17602, (717) 517-8698, jmitchell@allianceforthebay.org

The Alliance brings together communities, companies, and conservationists to improve the lands and waters of the Chesapeake Bay watershed.

Resources and Expertise

Outreach

The Alliance has staff capacity to provide events and workshops for landowners on water quality and conservation. Education and outreach capacity extends into sportsman groups and business sector. The Alliance has particular expertise and experience in engaging the agricultural business sector regarding market-based approaches to conservation, the best example of this being the Turkey Hill Clean Water Partnership. Staff conduct farm visits, with a focus on farms in the Octoraro Creek watershed and those supplying milk to Turkey Hill, and outreach visits to landowners interested in riparian buffers countywide.

Technical Assistance

Staff can develop planting plans, project management, and planting of riparian buffers, and help provide overall project management for agricultural conservation practices projects. The Alliance also coordinates many volunteer planting events to plant buffers and other green infrastructure practices. Staff provides technical assistance for green infrastructure implementation with a focus on the City of Lancaster. Through its Restoring the Environment and Developing Youth (READY) initiative, the Alliance has a crew of 4-5 trainees who can assist in green infrastructure maintenance.

Implementation Assistance

The Alliance has a variety of grants that fund implementation of riparian buffers and other conservation practices, and buffer maintenance countywide. A Growing Greener grant provides “buffer bonus” funding to implement agricultural conservation practices, stormwater BMPs, and stream restoration on lands where new forest riparian buffers are also implemented. Buffer bonus funds are earned at $4,000/acre, capped at $20,000. This grant also funds buffer maintenance. The Alliance also provides DCNR funding for implementation and maintenance of forest riparian buffers in Lancaster County. In addition, the Alliance is always willing to work with interested landowners and partners to explore and secure funding sources to support implementation. NFWF grants were recently awarded to the Alliance to fund ag BMP implementation on Turkey Hill farms and farms in the Octoraro Creek watershed.

Geographic Focus in Lancaster County

Countywide

Focus Watersheds: Octoraro Creek

While the Alliance works countywide, aspects of the Alliance’s farmer outreach and implementation work is focused in Octoraro Creek.

Capital RC&D

www.capitalrcd.org
Contact: Susan Richards, 401 East Louther Street, Suite 307, Carlisle PA 17013, (717) 241-4361, srichards@capitalrcd.org

The Capital Resource Conservation and Development (RC&D) Area Council is a locally led nonprofit with a mission to network people, resources and projects to promote responsible use and conservation of our region's natural, community and economic resources. Serving South Central Pennsylvania in Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, and York counties, Capital RC&D's members bring a variety of perspectives to developing and implementing the organization's work, as well as providing an important network to link resources and programs that support Capital RC&D's vision and mission.

Resources and Expertise

Outreach

RC&D has staff capacity to host or contribute to a variety of workshops and events that outreach to farmers and landowners about agricultural conservation practices. In particular, RC&D's participation in the PA Soil Health Coalition supports farmer to farmer networking, mentoring and training for soil and stream health, with a particular emphasis on grazing management for improved soil health of pasture lands and use of cover crops and cover crop grazing on cropland.

Technical Assistance

RC&D's farmer-to-farmer grazing program provides technical assistance for farmers interested in implementing improved grazing management systems by linking interested farmers with experienced graziers.

Implementation Assistance

Through a NFWF grant administered by RC&D, funding is available for farmers to implement rotational grazing management systems. Grazing management infrastructure is cost shared at 50%. Costs of developing grazing management plans are fully covered.

Geographic Focus in Lancaster County

Countywide

Chesapeake Bay Foundation

www.cbf.org
Contact: Harry Campbell, 1426 North 3rd Street, Harrisburg PA 17102, (717) 234-5550, hcampbell@cbf.org

CBF is the largest non-profit organization dedicated to protection and restoration of the Chesapeake Bay, its tributaries, and its resources.

Resources and Expertise

Outreach

CBF has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of planting riparian buffers and implementing conservation practices. Staff also are available to visit landowners to discuss riparian buffer and conservation practice implementation opportunities and programs. CBF outreach staff are also available to provide outreach to urban and suburban municipalities and communities relevant to green infrastructure stormwater practices and programs.

Technical Assistance

CBF buffer specialists provide technical assistance in developing riparian buffer plans and applying for program funding, including CREP. CBF science, community outreach and watershed planning staff also have capacity to assist communities and watershed partners in developing strategies and plans for community green infrastructure and stormwater management and comprehensive watershed plans to guide strategic watershed restoration implementation. CBF also leads the Keystone 10 Million Trees Partnership (K10 Partnership), which provides trees, supplies and other necessary support to implement riparian buffer projects.

Implementation Assistance

The K10 Partnership provides funding for trees, tree tubes and stakes for riparian buffer restoration projects. In addition, CBF has other funding resources that can help pay for implementation of forest-based conservation practices, particularly forest riparian buffers and reforestation of upland flow path contributing areas.

Geographic Focus in Lancaster County

Countywide

Chesapeake Conservancy

www.chesapeakeconservancy.org
Contact: Carly Dean, 716 Giddings Ave, Suite 42, Annapolis MD 21401,
(443) 321-3610, cdean@chesapeakeconservancy.org

Chesapeake Conservancy is a non-profit organization based in Annapolis, Maryland. We are a team of conservation entrepreneurs. We believe that the Chesapeake is a national treasure that should be accessible for everyone and a place where wildlife can thrive. We use technology to enhance the pace and quality of conservation, and we help build parks, trails and public access sites.

Resources and Expertise

Outreach

Conservancy staff are available to speak at meetings and outreach events on a variety of water quality and conservation topics, particularly related to the services of its Conservation Innovation Center, described below.

Technical Assistance

The Conservancy's Conservation Innovation Center uses cutting cutting-edge GIS technology and other technical resources to empower data-driven conservation and restoration. Just as the use of technology changed the corporate world and made it more efficient, technology can do the same for the conservation movement. Through national and international partnerships, the CIC makes this data accessible for restoration professionals to practice precision conservation, yielding greater impact with less resources. The Conservancy has worked with the Lancaster Clean Water Partners to create the Lancaster Watershed Collaborative Mapping Tool to help partners make strategic decisions about restoration and implementation of conservation practices. The Conservancy provides other technical services to partners seeking precision in conservation implementation.

Implementation Assistance

The Conservancy is happy to work with partners to explore funding opportunities for implementation of conservation practices in Lancaster County, providing the technical resources described above in support of these efforts.

Geographic Focus in Lancaster County

Countywide

Donegal Trout Unlimited

www.donegaltu.org
Contact: Greg Wilson, Conservation Co-Chairman, P.O. Box 8001, Lancaster PA 17604 (717) 587-8351, gregsfish@gmail.com

The Donegal Chapter of Trout Unlimited's mission is to conserve, protect and restore Lancaster County's cold water resources.

Resources and Expertise

Outreach

Donegal TU holds several workshops and volunteer opportunities annually to educate landowners on a variety of conservation and restoration practices to improve water quality and habitat. Chapter members are available to meet with landowners interested in improving cold water habitat on their properties.

Technical Assistance

Donegal TU provides project coordination and oversight on a variety of partnership-based restoration efforts, including in Fishing Creek and Conowingo Creek watersheds. Members coordinate many volunteer efforts across the county's watersheds to plant riparian buffers and implement stream habitat improvements. Trees are provided for project implementation from TU's volunteer nursery at Millport Conservancy.

Implementation Assistance

Donegal TU is the recipient of many grants from a variety of funding sources to implement conservation practices, riparian buffers and stream restoration in several county watersheds, including Donegal Creek, Lititz Run, Fishing Creek, Conowingo Creek, Climbers Run, Hammer Creek, and Peters Creek.

Geographic Focus in Lancaster County

Countywide

Focus Watersheds: Donegal Creek, Lititz Run, Fishing Creek, Conowingo Creek, Climbers Run, Hammer Creek, Peters Creek

Donegal TU has focused their restoration work on cold water fisheries in Lancaster County.

Lancaster Conservancy

www.lancasterconservancy.org
Contact: Fritz Schroeder, 117 S West End Ave, Lancaster PA 17603, (717) 392-7891, fschroeder@lancasterconservancy.org

The Lancaster Conservancy mission is to provide wild and forested lands and clean waterways for our community, forever.

Resources and Expertise

Outreach

The Conservancy leads "Lancaster Water Week," the preeminent outreach event in the county which engages citizens and partners through a week of water-related events and activities.

Technical Assistance

The Conservancy provides technical assistance related to finding and preserving natural lands in Lancaster and York Counties through acquisition and conservation easements.

The Conservancy also runs Community Wildlife Habitat a group of trained volunteers that advise property owners on how to improve their landscape through the use of native plants and trees as well as gardens that reduce stormwater runoff while providing habitat that will benefit wildlife and attract pollinators.

Implementation Assistance

The Conservancy contributes to the Lancaster Clean Water Fund, administered by the Community Foundation of Lancaster County, which provides grant funding to accelerate implementation of conservation projects to improve water quality. Community Conservation grants of $2500-$5000 are awarded to assist smaller, implementable projects led by local watershed groups, municipalities, or community groups. Water Quality Impact Grants of $10,000-$50,000 support implementation of larger-scale projects. The Conservancy also administers the Susquehanna Riverlands Conservation Landscape Program, which provides $50,000 annually in mini grants for non-profits and municipalities that border the Susquehanna, to conserve and protect the river lands.

Geographic Focus in Lancaster County

Countywide

Lancaster Farmland Trust

www.lancasterfarmlandtrust.org
Contact: Jeff Swinehart, 125 Lancaster Ave, Strasburg PA 17579, (717) 687-8484, jswinehart@lancasterfarmlandtrust.org

LFT seeks to preserve and steward the beautiful, productive farmland of Lancaster County that reflects our heritage, supports our economy, protects our environment, nourishes our health, and enhances our quality of life.

Resources and Expertise

Outreach
LFT has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of preserving farmland and implementing conservation practices on farms. Staff also conduct farmer visits to assess current conservation status and willingness to develop conservation plans and implement conservation practices.

Technical Assistance
LFT outreach staff can provide concept plans and mapping for farmers interested in implementing conservation practices.

Implementation Assistance
LFT administers several grants that provide funds for conservation practice implementation on farms.

Geographic Focus in Lancaster County

Countywide

Focus Watersheds: Pequea Creek, Mill Creek
While LFT's scope is generally countywide, farmer outreach, technical assistance and funding for implementation of conservation practices has focused most recently in the Pequea and Mill Creek watersheds, particularly Salisbury, Paradise and Leacock Townships.

Penn State University

www.psu.edu
Contact: Matt Royer, 111 Ferguson Building, University Park PA 16802,
(814) 863-8756, mroyer@psu.edu

Pennsylvania's land-grant university is active in clean water initiatives in Lancaster County. Through its Agriculture and Environment Center (AEC), Penn State provides research-based information to help landowners and communities implement conservation practices to improve water quality. Through Penn State Extension, a variety of science-based educational information is disseminated to farmers, residents and communities. The AEC and Extension facilitate the Greening the Lower Susquehanna program countywide and watershed-based partnerships in the Chiques, Conewago and Conoy watersheds to increase knowledge and awareness of clean water and help accelerate adoption of conservation practices.

Resources and Expertise

Outreach

The AEC facilitates watershed partnerships in Chiques, Conoy, Conewago and north River Hills tributaries, and provides landowner visits in this region to explore conservation implementation opportunities. Extension-based programming is offered countywide for farmers, residents, municipalities and other clean water partners, in the form of field days, winter meetings, workshops, and trainings. The Greening the Lower Susquehanna program coordinates and engages volunteers in implementing and maintaining riparian buffers and other green infrastructure practices.

Technical Assistance

Penn State staff and student interns can provide assistance in writing manure management plans for small farms. Through the Greening the Lower Susquehanna Program, assistance can be offered to develop riparian buffer planting plans and volunteer assistance in planting and maintaining buffers, rain gardens and other green infrastructure practices.

Implementation Assistance

Funding is available for implementation of conservation projects in Chiques-Conoy-Conewago region through a NFWF grant. Free trees are available for small riparian buffer and upland forest planting projects through Greening the Lower Susquehanna.

Geographic Focus in Lancaster County

Countywide

Greening the Lower Susquehanna program and Extension-based programs and activities are offered countywide.

Focus Watersheds: Chiques, Conoy, Conewago, River Hills Tributaries North

AEC watershed partnership facilitation, farmer outreach, technical assistance and funding for implementation is focused in these watersheds.

Stroud Water Research Center

www.stroudcenter.org
Contact: Lamonte Garber, 970 Spencer Road, Avondale PA 19311, (610) 268-2153, lgarber@stroudcenter.org

Stroud Water Research Center seeks to advance knowledge and stewardship of freshwater systems through global research, education, and watershed restoration.

Resources and Expertise

Outreach

Stroud has staff capacity to host or contribute to a variety of workshops and events that outreach to farmers and landowners about riparian buffers, stream ecology, agricultural conservation practices, tree establishment, and soil health. Stroud's partnership with the PA No Till Alliance and Cover Crop Coaching supports farmer to farmer networking, mentoring and training for soil and stream health. Stroud also hosts trips and tours to the Stroud Center. Finally, Stroud's staff are available to visit farms and discuss opportunities for riparian buffer restoration and implementation of conservation practices.

Technical Assistance

Stroud staff can provide riparian buffer plans for buffer restoration outside of the CREP program. Free technical assistance to advise landowners on maintenance and replacement trees are also provided during the establishment period. Through the PA Soil Health Partnership, technical assistance opportunities include participation in PASA Soil Health Benchmark Program, nitrogen modeling by Penn State Extension researchers, and grazing mentoring through the PA Grazing Lands Coalition

Implementation Assistance

Stroud's Farm Stewardship Program offers funding to farmers to plan and implement agricultural conservation practices on farms where farmers are willing to install forest buffers. Vouchers of $4,000/acre can be earned up to $20,000 based on acres of forest buffers planted. These funds can be used on their own or combined with other funding to pay for other conservation practices on the farm. Among the priority focuses of this program is converting wet croplands to buffers.

Geographic Focus in Lancaster County

Countywide

Soil health outreach and technical assistance programs available countywide

Focus Watersheds: Conewago, Chiques, Cocalico, Pequea and Octoraro

Initial focus of Farm Stewardship Program funding is these watersheds, but funding is made available countywide if funds are not spent in focus watersheds

Water Science Institute

www.waterscienceinstitute.org
Contact: Joe Sweeney, joe@waterscienceinstitute.org

DATA DRIVEN, SCIENCE BASED, VALUE ADDED

MAP, MODEL, MEASURE is how WSI promotes the sustainable, science-based benefits of projects that provide available clean water through conservation, restoration and exploration. This is accomplished through the funding and administration of education, policy development and applied and academic research projects that study the interrelationship of water and its surroundings. WSI's primary focus is the support and use of innovative technologies to identify nutrient and sediment reduction opportunities for public and private partners. A key aspect of our work is to raise public and practitioner awareness of the impact of past environmental practices, such as mill dams and legacy sediment, on today's landscape and provide practical approaches for cost effective water quality improvement. We promote and utilize rigorous economic analysis to promote taxpayer value and transparency in conservation programs.

Resources and Expertise

Outreach

WSI has staff capacity to speak at any event that provides farmers, landowners, policy makers and funders with the benefits of flood plain and wetland restoration projects through the identification and removal of legacy sediment and other historic practices that are a key component of current water quality impairment. WSI also offers tours and field events at the Big Spring Run wetland complex restoration project in Lancaster County as well as at mill dam sites that are a significant cause of legacy water quality impairment throughout the region.

Technical Assistance

WSI develops and applies mapping and modeling technology that examines opportunities across Lancaster County and the Chesapeake Bay watershed for removal of legacy sediment impairments to promote improved ground and surface water quality. WSI staff are available to consult with private landowners and public agencies interested in utilizing desk top technologies and innovative field practices that address legacy sediment, dam removal and flood plain restoration practices. We apply rigorous cost effectiveness analysis to examine best practices across watershed sectors engaged in nutrient and credit reduction practices.

Implementation Assistance

WSI welcomes and regularly partners with public, private and non-profit institutions and organizations to support research, development and restoration opportunities that promote clean, clear water throughout the Chesapeake Bay watershed.

Geographic Focus in Lancaster County

Countywide

Foundation Partners

Campbell Foundation

Lancaster County Community Foundation (LCCF)

National Fish and Wildlife Foundation (NFWF)

Campbell Foundation

www.campbellfoundation.org
Contact: Alex Echols, Program Director, Agriculture, 410 Severn Ave, Suite #210, Annapolis MD 21403, (410) 990-0900, aechols@campbellfoundation.org

The Campbell Foundation is a family foundation that believes in strategic infusions of funding, with nearly 100% of grant dollars dedicated to the environment. Among its primary funding geographies is the Chesapeake Bay and its watershed. Within the Bay watershed, Lancaster County is a priority focus region for its funding efforts.

Resources and Expertise

Outreach

Campbell's Chesapeake Bay grant funding can help fund outreach work by partners. Building capacity of partners to accelerate conservation efforts is a high priority for the Foundation.

Technical Assistance

Campbell's Chesapeake Bay grant funding can also help fund technical assistance necessary to implement conservation practices, though building capacity for broader implementation of conservation is the primary focus.

Implementation Assistance

Implementation funding generally is leveraged from other grants and programs, but Campbell grant funding can also help to fund implementation in certain instances, particularly if it will help advance broader adoption.

Geographic Focus in Lancaster County

Countywide

Lancaster County Community Foundation

www.lancfound.org
Contact: Ashlinn Masland-Sarani, 24 W King Street, Suite 201, Lancaster PA 17603, (717) 397-1629, amaslandsarani@lancfound.org

LCCF is a community foundation that manages more than $115 million in community assets and is involved in championing the extraordinary community of Lancaster County in a variety of ways. It impacts the quality of life in Lancaster County by improving health, education, youth programs, environment, neighborhoods, and access to arts and culture. In partnership with the Partners and funded by seed money from NFWF and Lancaster Conservancy Water Week giving, it has established the Lancaster Clean Water Fund, which funds conservation implementation projects in Lancaster County.

Resources and Expertise

Outreach

The smaller “Community Grants” (see below) may include some project elements that provide outreach to farmers and landowners about implementation of conservation practices.

Technical Assistance

Both “Community Grants” and “Water Quality Impact Project” grants (see below) may fund technical assistance necessary to implement conservation practices.

Implementation Assistance

Financial assistance to fund conservation practice implementation is provided by the Clean Water Fund through a grant application process by the Community Foundation. Grants can either be a "Community Grant" of $2,500-$5,000, or a "Water Quality Impact Project" of $10,000-$50,000. Both grant categories required 1:1 match.

Geographic Focus in Lancaster County

Countywide

National Fish and Wildlife Foundation

www.nfwf.org
Contact: Jake Reilly, Chesapeake Bay Stewardship Fund Director, 1133 Fifteenth St, N.W., Suite 1000, Washington, DC 20005, (202) 595-2610, jake.reilly@nfwf.org

NFWF administers the Chesapeake Bay Stewardship Fund, which provides resources for outreach, technical assistance and financial assistance to implement conservation.

Resources and Expertise

Outreach
NFWF's Chesapeake Bay funding programs (see below) can also help fund outreach work by partners.

Technical Assistance
NFWF's Chesapeake Bay funding programs (see below) can fund technical assistance necessary to implement conservation practices.

Implementation Assistance
Financial assistance to implement conservation practices is available through the Chesapeake Bay Stewardship Fund's two grant programs, Innovative Nutrient and Sediment Reduction Grants (INSR) and Small Watershed Grants (SWG) which are federally funded by the U.S. EPA.

Geographic Focus in Lancaster County

Countywide

Private Sector Partners

C.S. Davidson, Inc.

Crow & Berry Land Management

David Miller/Associates, Inc.

Earthbound Artisan

LandStudies, Inc.

Red Barn Consulting

RETTEW

TeamAg, Inc.

Other Private Sector Partners

C.S. Davidson, Inc.

www.csdavidson.com
Contact: Jordan Good, 315 West James Street, Suite 102, Lancaster PA 17603, (717) 481-2991, jtg@csdavidson.com

C.S. Davidson is a full-service engineering firm based in Lancaster.

Resources and Expertise

Outreach

C.S. Davidson has staff capacity to speak at a variety of workshops and events that outreach to and landowners and municipalities about the benefits of implementing conservation practices

Technical Assistance

C.S. Davidson provides planning, design, engineering and permitting services for implementing stormwater BMPs. C.S. Davidson also provides support to municipalities in MS4 permit compliance and developing and implementing MS4 Pollutant Reduction Plans. In particular, through its GIS-based data platform, CSDatum, it can provide data management for all of a municipality's MS4 permit needs.

Implementation Assistance

C.S. Davidson can work with interested landowners and partners to explore and secure funding sources to implement conservation projects.

Geographic Focus in Lancaster County

Countywide

Crow & Berry Land Management

www.crowandberry.com
Contact: Austin Unruh, Owner, 2860 Best Rd, Morgantown, PA 19543,
484-364-0315, austin@crowandberry.com

Crow & Berry restores economies and ecologies by planting hard-working trees at scale on farms, in pastures, and along streams. We research, trial, and learn how best to integrate trees with active pastures for profit and conservation, and advance that through creative education and partnerships. We're committed to helping farmers add trees in such a way that they increase profits, resiliency, and their positive impact on the land.

Resources and Expertise

Outreach

Our outreach is particularly focused on silvopasture, the planting of trees in pastures. It is proving to be of real interest to farmers.

Technical Assistance

Crow & Berry provides technical assistance on the aforementioned silvopasture, but also in the practical establishment of riparian buffers, with particular expertise in multifunctional buffers.

Implementation Assistance

We can design, plant, and perform ongoing post-planting care for buffers. For silvopasture, we can locate funding, manage the installation, and perform follow-up care.

Geographic Focus in Lancaster County

Countywide

David Miller/Associates, Inc.

www.dmai.com
Contact: Scott Hain, 1076 Centerville Road, Lancaster PA 17601, (717) 898-3402 x116, shain@dmai.com

DM/A is a full-service consulting firm with expertise in civil engineering, landscape architecture, planning, geology and surveying.

Resources and Expertise

Outreach

DM/A has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of implementing conservation and restoration practices.

Technical Assistance

DM/A can provide planning, design and engineering services for implementing stormwater BMPs. DM/A also provides support to municipalities in MS4 permit compliance and developing and implementing MS4 Pollutant Reduction Plans, and provides coordination support for implementing Lancaster County's Phase 3 Watershed Implementation Plan (Phase 3 WIP) County Action Plan (CAP).

Implementation Assistance

DM/A can work with interested landowners and partners to explore and secure funding sources to implement conservation projects.

Geographic Focus in Lancaster County

Countywide

Earthbound Artisan LLC

www.earthboundartisan.com
Contact: Tim Seifarth, Owner, 175 East King Street Suite #4 Ephrata,17522
(717) 507-6267, tim@earthboundartisan.com

Earthbound Artisan is a social enterprise with a focus on ecological land care, in design, construction, management and consultation that relies on natural systems and processes. That means we prefer using native plants and ecological benefactors in design and construction. And we only hand-weed and use organic soil amendments in management.

Resources and Expertise

Outreach

Earthbound Artisan works primarily with private landowners to help stabilize and maintain productive ecosystems while avoiding inorganic chemicals and reducing fossil fuel use (for more details on services, see Technical Assistance below).

Technical Assistance

Earthbound Artisan is a garden and stonework construction company that is fully committed to weighing the environmental impact of each action. We provide design, consultation, and implementation of conservation landscaping, rainwater BMPs, organic land management, stonework, riparian buffers and restoration projects. Our staff has certifications in Arboriculture (ISA) and Permaculture, is Landscape Industry Certified (CLT-E) and has certified Chesapeake Bay Landscape Professionals (CBLP).

Implementation Assistance

Earthbound Artisans works with clients to explore grant opportunities and secure funding to implement water quality and conservation projects.

Geographic Focus in Lancaster County

Countywide

LandStudies, Inc.

www.landstudies.com
Contact: Kelly Gutshall, President, 315 North Street, Lititz PA 17543, (717) 627-4440, kelly@landstudies.com

LandStudies, Inc. is a design-build ecological restoration firm located in Lititz, Lancaster County. We believe that by properly restoring and managing our natural resources, we improve their function while maximizing their economic potential.

Resources and Expertise

Outreach

LandStudies staff has experience speaking at a variety of workshops and events that educates both the public and private sectors on the benefits of Economic Ecology – the symbiotic relationship between the environment and economics. LandStudies' Healthy Watershed Tours are another way that they provide educational opportunities through first-hand observations of their implemented projects in Lancaster County.

Technical Assistance

LandStudies has assisted thousands of clients on projects throughout the Mid-Atlantic region, specifically focusing on ecological restoration that addresses water resource issues and the challenges facing the Chesapeake Bay Watershed. Examples includes design, permitting, construction and maintenance for stream and floodplain restoration, stormwater management BMPs, watershed restoration, riparian buffers, native landscapes (meadows, reforestation, wetlands, etc.) and forest / tree preservation.

Our diverse and talented design and environmental professionals provide a range of services related to the interaction of land and water systems. As a design- build company, we boast an ecological construction division comprised of experienced construction managers and field operations crew who provide the licensure, materials, personnel and skills necessary to produce quality naturalized landscapes. We also offer monitoring and maintenance services to ensure that our projects continue to be successful after construction. Our services include: water resources engineering; municipal services related to MS4, land management and stormwater management; watershed planning and assessment; landscape architecture; construction management; maintenance and monitoring; and urban forestry.

Implementation Assistance

LandStudies provides construction and construction oversight, planting and maintenance services to implement conservation projects, and can work with interested landowners and partners to explore and secure funding sources to support implementation.

Geographic Focus in Lancaster County

Countywide

Red Barn Consulting

www.redbarnag.com
Contact: Peter Hughes, 3050 Yellow Goose Road, Lancaster PA 17601-1818, (717) 393-2176, peterh@redbarnag.com

Red Barn Consulting is a full-service agricultural consulting firm providing permitting, planning, design and engineering services for farmers.

Resources and Expertise

Outreach

Red Barn has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of conservation. Red Barn staff will also visit farms to discuss conservation practice implementation goals and needs.

Technical Assistance

Red Barn develops conservation and nutrient management plans, provides assistance with CAFO permitting, and provides full-service design and engineering to implement conservation projects.

Implementation Assistance

Red Barn can assist farmers in assessing and obtaining funding sources for implementation of conservation practices on farms, and provide construction oversight, inspections, and post-construction certifications.

Geographic Focus in Lancaster County

Countywide

RETTEW

www.rettew.com
Contact: Kara Kalupson, RLA, MS4 Coordinator, 3020 Columbia Avenue, Lancaster, PA 17603, 717-431-3706, kara.kalupson@rettew.com

RETTEW is an engineering and environmental consulting firm headquartered in Lancaster. The company provides a wide variety of services supporting implementation of conservation practices.

Resources and Expertise

Outreach

RETTEW's professional staff speak at a variety of workshops and events to educate landowners about the benefits of managing stormwater for water quality, implementing green infrastructure, increasing native plant species in the landscape, and restoring stream corridors.

Technical Assistance

RETTEW's team of landscape architects, engineers, and restoration specialists provide planning, design, engineering, and permitting services necessary to implement stormwater management best management practices, conservation landscaping and riparian buffers, constructed wetlands, and floodplain restoration projects.

RETTEW also serves as the MS4 coordinator for municipalities to support MS4 permit compliance, prepare and implement pollutant reduction plans, and implement pollutant control measures within the watersheds of impaired streams.

Implementation Assistance

RETTEW works with municipalities and landowners to explore grant opportunities and secure funding to implement water quality and conservation projects.

Geographic Focus in Lancaster County

Countywide

TeamAg, Inc.

www.teamaginc.com
Contact: Chris Sigmund, President, 120 Lake Street, Ephrata PA 17522,
(717) 721-6795, chriss@teamaginc.om

TeamAg is a full-service agricultural consulting firm providing engineering and land planning, crop consulting, and agricultural and conservation planning and permitting services for farms.

Resources and Expertise

Outreach

TeamAg has staff capacity to speak at a variety of workshops and events that outreach to farmers and landowners about the benefits of implementing conservation practices. TeamAg also conducts farmer visits to discuss conservation practice implementation and determine a plan of action for farmers willing to implement conservation on their farms.

Technical Assistance

TeamAg provides full scale technical assistance for farmers interested in implementing conservation practice, including conservation and nutrient management plan development, design, engineering and permitting. TeamAg also provides crop consulting and fertility services for crop farmers.

Implementation Assistance

TeamAg can assist farmers in assessing and obtaining funding sources for implementation of conservation practices, and provide construction oversight, inspections, and post-construction certifications for agricultural and stormwater BMPs.

Geographic Focus in Lancaster County

Countywide

Other Private Sector Partners

A variety of other private sector firms provide services relevant to the implementation of conservation practices in Lancaster County. These primarily include design, engineering and permitting services, particularly in the stormwater and municipal sectors. Some, like Rosetree Consulting, provide services for the agricultural sector.

ARRO Consulting, Inc.

Contact: 108 W. Airport Road, Lititz PA 17543, (717) 569-7021
https://www.arroconsulting.com/

Becker Engineering

Contact: 525 Greenfield Rd #201, Lancaster, PA 17601, (717) 295-4975
http://beckereng.net/

Diehm & Sons

Contact: 15 Toll Gate Rd, Lititz, PA 17543, (717) 626-0175, info@diehmandsons.com
https://www.diehmandsons.com/

ELA Group, Inc.

Contact: 743 S Broad St, Lititz, PA 17543, (717) 626-7271
http://www.elagroup.com/

Hanover Engineering

Contact: 20 Snyder Ln # C, Ephrata, PA 17522, (717) 721-7444
https://www.hanovereng.com/

Lancaster Civil Engineering Company

Contact: Ben Craddock, 100 S Marshall St, P.O. Box 8972, Lancaster, PA 17604, (717) 799-8599, bencraddock@lancastercivil.com
http://www.lancastercivil.com/

RGS Associates

Contact: 53 W James St #101, Lancaster, PA 17603, (717) 715-1396,
info@rgsassociates.com
http://www.rgsassociates.com/

Rosetree Consulting

Contact: Eric Rosenbaum, 20 Glenbrook Drive, Shillington, PA 19607, (610) 396-7101,
ericrosenbaum@rosetreeconsulting.com
www.rosetreeconsulting.com

Spotts, Stevens and McCoy

Contact: Randy Heilman, 701 Creekside Lane, Lititz PA 17543, (717) 568 2678,
information@ssmgroup.com
https://www.ssmgroup.com/

Solanco Engineering Associates, LLC

Contact: Mark Deimler, 103 Fite Way, Suite C, Quarryville, PA 17566, (717) 786-0355,
mark@solancoengineering.com,
https://southernlancasterchamber.org/member/solanco-engineering-associates-llc/

Local Partners

Lancaster County Watershed Groups

Lancaster County Municipalities

Lancaster County Watershed Groups

Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2523, mattkofroth@lancasterconservation.org
For more information on Lancaster County's watersheds and its watershed groups, visit www.lancasterwatersheds.org.

Chiques Creek Watershed Alliance
Contact: Penn Township Office, 97 N Penryn Rd, Manheim PA 17545, planner@penntwplanco.org; www.chiquescreewatershed.org

Cocalico Creek Watershed Association
Contact: Jay Snyder, PO Box 121, Reinholds PA 17569, jsnyder@ephrataboro.org
www.facebook.com/CocalicoCreekWatershedAssn/

Donegal Fish and Conservation Association
Contact: www.facebook.com/groups/63211886100/

Friends of Fishing Creek
Contact: friendsoffishingcreek@gmail.com
www.friendsoffishingcreek.com
www.facebook.com/Friends-of-Fishing-Creek-1299118563536584/

Lititz Run Watershed Alliance
Contact: jmartzall@warwicktownship.org
www.warwicktownship.org/LRWA

Little Conestoga Watershed Alliance
Contact: PO Box 6355, Lancaster PA 17607, lcwa@mail.com
www.littleconestoga.org

Millcreek Preservation Association
Contact: PO Box 300, Bird-in-Hand PA 17505

Octoraro Watershed Association
Contact: 517 Pine Grove Rd, Nottingham PA 19362, (717) 529-2132, octorarowa@gmail.com
www.theowa.org

Pequea Creek Watershed Association
Contact: kara.kalupson@rettew.com
www.facebook.com/Pequea-Creek-Watershed-325656381245/

Tri-County Conewago Creek Association
Contact: conewagocreek@yahoo.com
www.conewagocreek.org
www.facebook.com/tricountyconewagocreekassociation/

Lancaster County Municipalities

Adamstown Borough
http://adamstownborough.org/

Akron Borough
http://www.akron-pa.com/

Bart Township
46 Quarry Rd, Quarryville PA 17566
(717) 786-2877

Brecknock Township
http://brecknocktownship.us/

Caernarvon Township
https://caernarvonlancaster.org/

Christiana Borough
http://christianaboro.com/

Clay Township
http://www.claytwp.com/

East Cocalico Township
https://www.eastcocalicotownship.com/

West Cocalico Township
http://westcocalicotownship.com/

Colerain Township
http://www.coleraintwppa.com/

Columbia Borough
https://www.columbiapa.net/

Conestoga Township
https://conestogatwp.com/

Conoy Township
https://conoytownship.org/

Denver Borough
http://denverboro.net/

East Donegal Township
https://eastdonegaltwp.com/

West Donegal Township
http://www.wdtwp.com/

Drumore Township
http://www.drumoretownship.org/

East Drumore Township
Website

Earl Township
http://earltownship.com/

East Earl Township
https://eastearltwp.org/

West Earl Township
http://www.westearltwp.org/

East Petersburg Borough
https://www.eastpetersburgborough.org/

Eden Township
https://www.edentownship.org/

Elizabeth Township
http://elizabethtownship.net/

Elizabethtown Borough
https://www.etownonline.com/

Ephrata Borough
http://ephrataboro.org/

Ephrata Township
http://www.ephratatownship.org/

Fulton Township
http://fultontownship.org/

East Hempfield Township
http://www.easthempfield.org/

West Hempfield Township
http://www.easthempfield.org/

East Lampeter Township
https://eastlampetertownship.org/

West Lampeter Township
http://www.westlampeter.com/

City of Lancaster
https://cityoflancasterpa.com/

Lancaster Township
http://www.twp.lancaster.pa.us/

Leacock Township
https://www.leacocktwp.com/

Upper Leacock Township
https://www.ultwp.com/

Lititz Borough
https://www.lititzborough.org/

Little Britain Township
https://www.littlebritain.org/

Manheim Borough
https://manheimboro.org/

Manheim Township
http://www.manheimtownship.org/

Manor Township
http://www.manortwp.org/

Marietta Borough
https://boroughofmarietta.com/

Lancaster County Municipalities (cont.)

Martic Township
https://www.martictownship.com/

Millersville Borough
https://millersvilleborough.org/

Mount Joy Borough
http://mountjoyborough.com/

Mount Joy Township
http://www.mtjoytwp.org/

Mountville Borough
http://mountvilleborough.com/

New Holland Borough
http://newhollandborough.org/

Paradise Township
https://paradisetownship.org/

Penn Township
https://penntwplanco.org/

Pequea Township
https://www.pequeatwp.org/

Providence Township
http://providencetownship.com/

Quarryville Borough
https://quarryvilleborough.com/

Rapho Township
https://www.raphotownship.com/

Sadsbury Township
http://www.sadsburytownshiplancaster.org

Salisbury Township
https://www.salisburytownship.org/

Strasburg Borough
https://strasburgboro.org/

Strasburg Township
https://www.strasburgtownship.com/

Terre Hill Borough
http://www.terrehillboro.com/

Warwick Township
https://www.warwicktownship.org/

SECTION 3: FUNDING RESOURCES INVENTORY

This section provides an inventory of the funding resources available to implement conservation practices in Lancaster County. A total of 49 funding resources are inventoried.

These resources are organized by funding source or sector as follows: federal funding programs; state funding programs; county funding programs; and specific programmatic grants administered by county clean water partners.

For each funding program or resource, the sponsor organization is listed and a summary description of the funding specifications are given. In addition, the types of services funded are listed, as are the types of conservation practices funded by each funding resource.

Federal Funding Programs

Clean Water Revolving Fund (EPA)

Conservation Innovation Grants (CIG) (USDA NRCS)

Conservation Reserve Enhancement Program (CREP) (USDA FSA)

Conservation Stewardship Program (CSP) (USDA NRCS)

EPA's Chesapeake Bay Program Funding (CBIG, CBRAP) (EPA)

EPA's Innovative Nutrient and Sediment Reductions (INSR) Program (NFWF)

EPA's Most Effective Basins Funding (EPA)

EPA's Small Watersheds Grants (SWG) Program (NFWF)

Environmental Quality Incentives Program (EQIP) (USDA NRCS)

Nonpoint Source Pollution Control Section 319 Program (Section 319) (EPA)

Partners for Fish and Wildlife Program (USFWS)

Watershed Protection and Flood Prevention Program (PL-566) (USDA NRCS)

Wetland Reserve Easement Program (WRE) (USDA NRCS)

Clean Water State Revolving Loan Fund

US Environmental Protection Agency (EPA)
Contact: Magdaline Cunningham, (215) 814-2338, Cunningham.magdalene@epa.gov

Services Funded

Conservation Planning
Design, Engineering
Construction

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

EPA Region 3 provides grants to the Pennsylvania Infrastructure Financing Agency (PENNVEST) which provides loans at below-market interest rates. Any project with a water quality related purpose is eligible. No cost share or match is required. CWSRF loans provide the cost share for other grant programs. Applications are accepted and loans awarded throughout the year. Over $300 million is available annually in PENNVEST's revolving fund.

Geographic Focus in Lancaster County

Countywide

Conservation Innovation Grants (CIG)

USDA Natural Resource Conservation Service (NRCS)
Contact: Ashley Lenig, Conservation Program Manager, 359 East Park Drive, Suite 2, (717) 237-2204, ashley.lenig@usda.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Innovative Agricultural Conservation Practices, Riparian Buffers, or Restoration Projects

Cost Share Amount/Funding Specifications

CIG is a competitive program that supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands. State and national CIG grants are awarded. All non-federal entities and individuals are eligible to apply, and projects must involve EQIP-eligible producers. 1:1 match is required.

Geographic Focus in Lancaster County

Countywide

Conservation Reserve Enhancement Program (CREP)

USDA Farm Service Agency
Contact: Kimberly Merlau, Lancaster County Executive Director, (717) 874-2500, kimberly.merlau@usda.gov

Services Funded

Design & Engineering
Construction & Implementation
Maintenance
Annual Rental Payments

Conservation Practice Types Funded

Forested Riparian Buffers
Associated Ag BMPs (fencing, crossings, etc.)
Other Wildlife-Related Conservation Practices

Cost Share Amount/Funding Specifications

Depending on width, CREP may cover 100% of the cost of planning, designing, and implementing forest riparian buffers and stream bank fencing. Additional funding is also provided with financial caps for other associated BMPs (crossings, off-stream watering, etc.) and for maintenance (4 years of herbicide application). Per acre annual rental payments for total buffer area for the length of the contract (10 or 15 years) are also provided. Minimum buffer width is 35 feet, but full financial benefits require a width of 50 feet. Funding is also available for other wildlife-related conservation practices on farms (wildlife habitat plantings, warm season grasses, etc.)

Geographic Focus in Lancaster County

Countywide

Conservation Stewardship Program (CSP)

USDA Natural Resource Conservation Service (NRCS)
Contact: Heather Grove, District Conservationist, Lancaster Office, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2530, heather.grove@usda.gov

Services Funded

Annual Payments

Conservation Practice Types Funded

Enhanced Conservation Activities and Technologies

Cost Share Amount/Funding Specifications

CSP provides annual payments to farmers for implementing enhanced conservation activities and technologies. To be eligible, the farmer must meet a certain threshold of conservation on their farm and want to do more. Payment amounts are determined each year and are on a per unit basis for the practice. The most recent payment rates for CSP-funded practices in Pennsylvania can be found here.

Geographic Focus in Lancaster County

Countywide

EPA's Chesapeake Bay Program Funding (CBIG & CBRAP)

US Environmental Protection Agency (EPA)
Contact: Rebecca Hindin, Grants Manager, EPA Chesapeake Bay Program Office, (410) 267-5770, hindin.rebecca@epa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Implementation & Maintenance
BMP Tracking & Verification
CCD, State Ag Staff & Programs

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Chesapeake Bay Implementation Grant (CBIG) and Chesapeake Bay Regulatory and Accountability Program (CBRAP) are annual non-competitive grants made to the Bay states to support implementation of priority programs to reduce nutrient and sediment loads to the Bay. Depending on state workplan priorities, funding can potentially be used for all services needed to implement all conservation practice types. 1:1 match required.

Geographic Focus in Lancaster County

Countywide

EPA's Innovative Nutrient and Sediment Reduction (INSR) Grants Program (NFWF)

National Fish and Wildlife Foundation (NFWF)
Contact: Jake Reilly, CBSF Director, 1133 Fifteenth St, N.W., Suite 1000, Washington, DC 20005, (202) 595-2610, jake.reilly@nfwf.org

US Environmental Protection Agency (EPA)
Contact: Rebecca Hindin, Grants Manager, EPA Chesapeake Bay Program Office, (410) 267-5770, hindin.rebecca@epa.gov

Services Funded

Conservation Planning
Design & Engineering
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

EPA's INSR program, currently administered by NFWF, funds projects that accelerate the rate and scale of water quality improvements through coordination and collaboration of sustainable, regional partnerships implementing proven water quality practices more cost-effectively. Awards generally range from $500,000 to $1 million. 1:1 non-federal match is required.

Geographic Focus in Lancaster County

Countywide

EPA's Most Effective Basins Funding

US Environmental Protection Agency (EPA)
Contact: Contact: Rebecca Hindin, Grants Manager, EPA Chesapeake Bay Program Office, (410) 267-5770, hindin.rebecca@epa.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers

Cost Share Amount/Funding Specifications

EPA funding allocated to PA (and other States in the Chesapeake Bay watershed) to implement ag BMPs for agricultural nitrogen reductions in the "most effective basins," which includes several watersheds in Lancaster County.

Geographic Focus in Lancaster County

Chiques Creek, Cocalico Creek, Upper Conestoga River, Lower Conestoga River, Mill Creek, Octoraro Creek, Pequea Creek, River Hills Tributaries North (south of Chiques)

EPA's Small Watershed Grants (SWG) Program (NFWF)

National Fish and Wildlife Foundation (NFWF)
Contact: Jake Reilly, CBSF Director, 1133 Fifteenth St, N.W., Suite 1000, Washington, DC 20005, (202) 595-2610, jake.reilly@nfwf.org

US Environmental Protection Agency (EPA)
Contact: Rebecca Hindin, Grants Manager, EPA Chesapeake Bay Program Office, (410) 267-5770, hindin.rebecca@epa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

EPA's SWG program, currently administered by NFWF, funds projects that promote community-based efforts. Implementation grants fund projects that result in on-the-ground implementation, range from $50,000-$500,000, and require one-third non-federal match. Planning and Technical Assistance grants are awarded up to $50,000 for projects that enhance local capacity to implement in the future through assessment, planning, design, etc..

Geographic Focus in Lancaster County

Countywide

Environmental Quality Incentives Program (EQIP)

USDA Natural Resource Conservation Service (NRCS)
Contact: Heather Grove, District Conservationist, Lancaster Office, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2530, heather.grove@usda.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Agricultural Conservation Practices
Riparian Buffers
Restoration Projects
Forestland Management Practices

Cost Share Amount/Funding Specifications

Each year, NRCS reevaluates the amount of funding for each practice in each state. Funding amounts are on a per unit basis for the practice. They roughly equate to around 75% or more of actual costs. The most recent payment rates for EQIP-funded practices in Pennsylvania can be found here. Eligible applicants must have an NRCS Conservation Plan.

Geographic Focus in Lancaster County

Countywide

Nonpoint Source Pollution Control Section 319 Program (Section 319)

US Environmental Protection Agency (EPA)
Contact: Mike Hoffmann, Biologist, EPA Region 3, (215) 814-2716, hoffmann.michael@epa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

EPA Section 319 funding is administered in Pennsylvania by DEP. Grants are awarded for projects that implement approved Section 319 Watershed Implementation Plans (319 WIPs). Currently 319 WIPs exist for Conewago Creek, Conowingo Creek, and Mill Creek. Section 319 can provide full or partial funding of projects.

Geographic Focus in Lancaster County

Conewago Creek, Conowingo Creek, and Mill Creek Watersheds

Partners for Fish and Wildlife Program

U.S. Fish and Wildlife Service (USFWS)
Contact: Mark Roberts, 110 Radnor Rd, Suite 101, State College PA 16801, (814) 234-4090 ext. 7457, mark_roberts@fws.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Stream, Wetland Restoration Projects
Riparian Buffers

Cost Share Amount/Funding Specifications

External funding must be available for USFWS to implement restoration projects, but the Partners can provide in-kind match toward projects, some of which may be provided by non-federal partners.

Geographic Focus in Lancaster County

Countywide

Watershed Protection and Flood Prevention Program (PL-566)

USDA Natural Resource Conservation Service (NRCS)
Contact: Heather Grove, District Conservationist, Lancaster Office, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2530, heather.grove@usda.gov

Services Funded

Watershed Planning

Conservation Practice Types Funded

Floodplain Restoration Projects

Cost Share Amount/Funding Specifications

NRCS's PL-566 program presently pays 100% of the cost of developing a watershed plan to identify priority floodplain restoration projects in the Chiques Creek Watershed. Potential exists for future funding in support of design and implementation of floodplain restoration projects identified through the planning process.

Geographic Focus in Lancaster County

Chiques Creek Watershed

Wetland Reserve Easement Program (WRE)

USDA Natural Resource Conservation Service (NRCS)
Contact: Heather Grove, District Conservationist, Lancaster Office, 1383 Arcadia Road, Lancaster PA 17601, (717) 874-2530, heather.grove@usda.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation
Easements to Preserve Wetlands

Conservation Practice Types Funded

Wetland Restoration Projects

Cost Share Amount/Funding Specifications

The WRE program pays for the costs of wetland restoration and easements to protect wetland areas on farms. NRCS pays for 50-100% of the easement value and 50-100% of restoration costs of restoration, with exact payment amounts dependent upon what type of easement into which the farmer wants to enter.

Geographic Focus in Lancaster County

Countywide

State Funding Programs

Act 13 Watershed Restoration and Protection and Flood Mitigation Programs (DCED)

Agricultural Plan Reimbursement Program (APRP) (DEP)

Community Development Block Grants (LCRA)

DCNR Riparian Buffer Programs (DCNR)

DCNR Community Conservation Partnerships Program (C2P2) (DCNR)

Exelon Habitat Improvement Project Program (PFBC)

Growing Greener (DEP)

PENNVEST Nonpoint Source Projects (PENNVEST)

Resource Enhancement and Protection Program (REAP) (SCC)

TreeVitalize (DCNR)

Act 13 Watershed Restoration & Protection and Flood Mitigation Programs

PA Department of Community and Economic Development (DCED), Commonwealth Finance Authority
Contact: CFA Programs Division, Commonwealth Keystone Building, 400 North Street, 4th Floor, Harrisburg PA 17120-0225, (717) 787-6245, ra-dcedsitedvpt@pa.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation
Maintenance

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

May not exceed $300,000 for Watershed Restoration & Protection Grants (which may fund a variety of practices) and $500,000 for Flood Mitigation Grants (which may include floodplain restoration as part of a flood mitigation project). For both programs, 15% cash match is required and design/engineering is limited to 10% of overall costs.

Geographic Focus in Lancaster County

Countywide

Agricultural Planning Reimbursement Program (APRP)

PA Department of Environmental Protection (DEP)
Contact: Jedd Moncavage, TeamAg, Inc., 120 Lake Street, Ephrata PA 17522, (717) 721-6795, jeddm@teamaginc.com

Services Funded

Conservation Planning

Conservation Practice Types Funded

Ag E&S Plans, Conservation Plans, Manure Management Plans, Nutrient Management Plans

Cost Share Amount/Funding Specifications

Program reimburses farmers who incur a fee to develop their agricultural plans. Total costs depend upon farm size of the farm and number of plans for which reimbursement is sought. Total reimbursement can range from $250 to $1500 per plan, with a maximum reimbursement amount per landowner/operator of $6,000.

Geographic Focus in Lancaster County

Countywide

Community Development Block Grants (CDBG)

Lancaster County Redevelopment Authority
Contact: Justin Eby, Deputy Executive Director, 28 Penn Square, Suite 200, Lancaster, PA 17603, (717) 394-0793 ext. 225, jeby@lchra.com

Services Funded

Construction & Implementation

Conservation Practice Types Funded

Stormwater BMPs

Cost Share Amount/Funding Specifications

The CDBG program is administered by the Lancaster County Redevelopment Authority. CDBG can fund a variety of improvements in a community's low-to-moderate income areas, including street repairs, improved water and sewer infrastructure to reduce inflow and infiltration (I&I), or stormwater management improvements. Maximum grant amounts are $200,000 per project, and municipalities are limited to 2 projects per funding cycle. CDBG will pay for 95% of construction costs up to $200,000. 20% match of total project cost and 5% match for construction costs is required. Engineering and design are generally contributed as match. Projects need to be "shovel ready," as they must be fully implemented within one year of contracting, and 50% completed within 6 months.

Geographic Focus in Lancaster County

Countywide, except for the City of Lancaster. The City of Lancaster receives its own CDBG funding allocation from HUD and administers its own program. For more information on the City's CDBG program, contact Susannah Bartlett, Community Development Administrator, (717) 291-4743, subartlett@cityoflancasterpa.com.

DCNR Riparian Buffer Grant Program

PA Department of Conservation and Natural Resources (DCNR)
Contact: Kelly Rossiter, 400 Market Street, Harrisburg PA 17105, (717) 772-3319, krossiter@pa.gov

Services Funded

Planning & Design
Implementation & Post-Planting Establishment

Conservation Practice Types Funded

Riparian Buffers

Cost Share Amount/Funding Specifications

Riparian buffer grants are funded through DCNR's Community Conservation Partnerships Program (C2P2). Grants fund outreach, technical assistance, implementation and maintenance of forest riparian buffers within the grant period (3-4 years). The minimum grant request is $50,000 and 1:1 match (cash and/or in-kind) is required.

Geographic Focus in Lancaster County

Countywide

DCNR Community Conservation Partnerships Program (C2P2)

PA Department of Conservation and Natural Resources (DCNR)
Contact: Kelly Rossiter, 400 Market Street, Harrisburg PA 17105, (717) 772-3319, krossiter@pa.gov

Services Funded

Planning, Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Stormwater BMPs
Riparian Buffers

Cost Share Amount/Funding Specifications

DCNR's C2P2 grants can fund not only forest riparian buffer projects, but also other conservation related projects, including stream restoration, floodplain restoration, green infrastructure stormwater BMPs at recreation sites, etc. Watershed conservation planning can also be supported. The program can also help build capacity or support broader initiatives to build watershed partnerships and educate and engage the public around watershed initiatives and conduct strategic landowner outreach. For C2P2 grants, 1:1 match is generally required.

Geographic Focus in Lancaster County

Countywide

Exelon Habitat Improvement Project Program (PFBC)

PA Fish and Boat Commission
Contact: Tyler Neimond, Chief, Division of Habitat Management, 595 East Rolling Ridge Drive, Bellefonte PA 16823, (814) 359-5185, tneimond@pa.gov

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

PFBC receives $100,000 annually for habitat improvement projects in York and Lancaster Counties. These may include ag BMPs, restoration projects, and riparian buffers. Funds are awarded for projects through an RFP process. A maximum of $75,000 per project is awarded. Match is not required but is encouraged.

Geographic Focus in Lancaster County

Countywide

Growing Greener

PA Department of Environment Protection (DEP)
Contact: Scott Williamson, Waterways and Wetlands Program Manager, DEP, Southcentral Regional Office, 909 Elmerton Ave, Harrisburg PA 17110, (717) 705-4802, scwilliams@pa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation
Maintenance

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

DEP's Growing Greener program funds watershed projects across all conservation practice types. Grant rounds typically open annually and specific guidance and priorities may vary year to year. 15% match is generally required.

Geographic Focus in Lancaster County

Countywide

PENNVEST Nonpoint Source Projects

PENNVEST
Contact: Tess Schlupp, 333 Market Street 18th Floor, Harrisburg PA 17101, (717) 713-8618, tschlupp@pa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

PENNVEST can fund agricultural or stormwater BMPs, riparian buffers or restoration projects for eligible applicants. Funding may be in the form of loans, grants or loan/grant combinations.

Geographic Focus in Lancaster County

Countywide

Resource Enhancement and Protection Program (REAP)

PA State Conservation Commission (SCC)
Joel Semke, REAP Coordinator, 2301 N Cameron St, Harrisburg PA 17110, (717) 705-4032, jsemke@pa.gov

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Ag Conservation Equipment (i.e., no till planters)

Cost Share Amount/Funding Specifications

REAP is a tax credit program that funds between 50% and 90% of the costs of implementing ag BMPs (including riparian buffers) on farms. Conservation planning and purchase of equipment necessary to implement ag conservation practices (such as no-till planters) can also be covered. REAP tax credits can be applied to PA tax liability over a 15-year period, or may be sold to another entity with tax liability. 3rd party sponsorship is also permitted.

Geographic Focus in Lancaster County

Countywide

TreeVitalize

PA Department of Conservation and Natural Resources (DCNR)
Contact: Jason Swartz, TreeVitalize Program Manager, (717) 705-2824, c-jlswartz@pa.gov)

Services Funded

Implementation

Conservation Practice Types Funded

Urban Tree Plantings
Urban Riparian Buffers

Cost Share Amount/Funding Specifications

The program administration of TreeVitalize is currently transitioning to DCNR, and thus program specifications are not yet available. The program will continue to focus on funding of urban tree plantings, urban riparian buffers, and potentially other green infrastructure-based practices in developed communities.

Geographic Focus in Lancaster County

Countywide

County Funding Programs

Conservation Excellence Grants (CEG) (LCCD)

Dirt & Gravel/Low Volume Roads Program (LCCD)

Exelon Habitat Improvement Project Program (LCCD)

Lancaster Clean Water Fund (LCCF & Partners)

Lancaster County Clean Water Consortium Stormwater Mini Grants (LCCWC)

Smart Growth Transportation Program (Lancaster MPO)

Susquehanna Riverlands Mini Grants (Lancaster Conservancy)

Conservation Excellence Grant Program (CEG)

Lancaster County Conservation District (LCCD)
Contact: Jeff Hill, 1383 Arcadia Rd, Lancaster PA 17601, (717) 299-5361, jeffhill@lancasterconservation.org

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Stream Restoration

Cost Share Amount/Funding Specifications

Funds are for implementation of ag BMPs and buffer and stream restoration projects on farms. The majority of funding will be allocated for implementation, and the goal of the program is to leverage other funding from a mix of grants, loans, tax credits or other funding sources to ensure full implementation of conservation practices on farms. Maximum award is $250,000 per project. “Small Projects” may be funded at amounts under $25,000.

Geographic Focus in Lancaster County

Countywide

Dirt & Gravel/Low Volume Road Program

Lancaster County Conservation District (LCCD)
Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2523, mattkofroth@lancasterconservation.org

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Stormwater BMPs

Cost Share Amount/Funding Specifications

Funds are administered by the LCCD to implement culvert replacements, stormwater BMPs, and other environmentally sensitive maintenance practices on unpaved and low volume roads to reduce sediment discharges from roadways to streams. Match is not required but will improve ranking. Eligible applicants include municipalities or PENNDOT. Successful applicants must attend free training presented by the Penn State Center for Dirt & Gravel Road Studies.

Geographic Focus in Lancaster County

Countywide

Exelon Habitat Improvement Project Program (LCCD)

Lancaster County Conservation District (LCCD)
Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2523, mattkofroth@lancasterconservation.org

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

$225,000 is provided annually to implement conservation practices in Lancaster County. $150,000 is allocated for stream restoration projects and $75,000 is for ag BMPs. Match is not required but is accepted. All projects must be fully implemented within the grant period (i.e., design/engineering phase only will not be funded).

Geographic Focus in Lancaster County

Countywide

Lancaster Clean Water Fund

Lancaster County Community Foundation and Lancaster Clean Water Partners
Contact: Allyson Gibson, Lancaster Clean Water Partners, 1383 Arcadia Road, Lancaster PA 17601, (717) 368-4831, agibson@lancastercleanwaterpartners.com

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Stream Restoration Projects

Cost Share Amount/Funding Specifications

Started with seed money from a NFWF grant and Lancaster Conservancy's Water Week, the fund is established through LCCF as donor advised fund. New donations can grow the fund. Funds awarded by the Partners annually through grant application process administered by the LCCF. Grants are either Community Grants ($2,500-$5,000) or Water Quality Impact Grants ($10,000-$50,000). Both categories require a 1:1 match of funds or in-kind services. Projects should result in implementation and must be completed within one year.

Geographic Focus in Lancaster County

Countywide

LCCWC Stormwater Mini Grants

Lancaster County Clean Water Consortium
Contact: Joellyn Warren, Chair, 1383 Arcadia Road, Lancaster PA 17601, lancasterccwc@gmail.com

Services Funded

Outreach
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

$10,000 are allocated annually. The minimum request is $3,000. Up to 20% of fund can go toward design; other eligible costs are construction, materials, monitoring and education & outreach. 50% match is required.

Geographic Focus in Lancaster County

Countywide

Smart Growth Transportation Program

Lancaster Metropolitan Planning Organization (MPO)
Contact: Kristiana Barr, Senior Transportation Planner, Lancaster County Planning Department, 150 North Queen Street, Suite 320, Lancaster PA 17603, (717) 299-8333, kbarr@co.lancaster.pa.us

Services Funded

Planning (Studies)
Construction & Implementation

Conservation Practice Types Funded

Stormwater BMPs

Cost Share Amount/Funding Specifications

Funding is provided every two years, with a goal of $3 million available each funding cycle. Eligible applicants include municipalities, transportation service providers, or other county organizations. Funds can pay for transportation/feasibility studies or construction. Construction projects require all pre-construction costs (design, engineering, etc.) to be paid by applicant. Studies require 20% match. Projects fund transportation improvement projects that may include elements of green infrastructure.

Geographic Focus in Lancaster County

Countywide

Susquehanna Riverlands Mini Grants

Lancaster Conservancy
Contact: Christian Przybylek, 117 S West End Ave, Lancaster PA 17603, (717) 392-7891,
cprzybylek@lancasterconservancy.org

Services Funded

Outreach
Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Grants ranging from $2,500 to $25,000 are provided annually for habitat and trail connectivity, ecosystem health, and other conservation priorities along the Susquehanna River. Eligible projects include implementation of conservation projects, particularly those on public lands. Municipalities and nonprofits may apply. A 1:1 match is required, with 50% of the match provided as a cash match.

Geographic Focus in Lancaster County

Municipalities adjacent to Susquehanna River and boroughs within those municipalities (Part of the watersheds of Conewago Creek, Conoy Creek, River Hills Tributaries North, Little Conestoga Creek, Lower Conestoga River, River Tributaries South, Fishing Creek)

Specific Programmatic Grants & Programs

Campbell Foundation Grants

Capital RC&D Grazing Management Program (NFWF, Capital RC&D)

CBF Accelerating Riparian Buffers NFWF Grant (NFWF, CBF)

Chiques-Conoy-Conewago Regional Partnership (NFWF, PSU AEC)

Clay Township Farmer Outreach Initiative (Growing Greener, Clay Township)

Cocalico Creek Watershed Farmer Engagement for Conservation (NFWF, CCWA)

Conewago Creek Watershed 319 Grant (TCCCA)

Conowingo Creek Watershed 319 Grant (DTU)

Farm Stewardship Program (NFWF, Stroud)

Lancaster County 319 Stream Restoration TA (Section 319, LCCD)

Lancaster County Buffer Bonus Program (Growing Greener, Alliance for Chesapeake Bay)

Lancaster County Forest Riparian Buffers Partnership (DCNR, Alliance for Chesapeake Bay)

Lancaster Farmland Trust Farm Conservation Grants (various funding sources, LFT)

Mill Creek Watershed 319 Grant (LCCD)

Multifunctional Riparian Buffers (DCNR, PACD)

Octoraro Farmer Outreach Initiative (Growing Greener, OWA)

PA Soil Health Partnership (NFWF, Growing Greener, Stroud)

Restoring the Octoraro Reservoir (NFWF, Alliance for Chesapeake Bay)

Stroud Forest Riparian Buffer Program (DCNR and other funding sources, Stroud)

Subsurface Application of Manure (Campbell Foundation, LCCD)

Turkey Hill Clean Water Partnership (NFWF, Alliance for Chesapeake Bay)

Campbell Foundation Grants

Campbell Foundation
Contact: Alex Echols, Program Director, Agriculture, 410 Severn Ave, Suite #210, Annapolis MD 21403, (410) 990-0900, aechols@campbellfoundation.org

Services Funded

Outreach and Capacity Building

Conservation Practice Types Funded

Capacity building support to advance broader implementation of all conservation practice types

Cost Share Amount/Funding Specifications

The Keith Campbell Foundation for the Environment provides grants to advance implementation of conservation that results in improvements in water quality, particularly in the Chesapeake Bay. Major support is being provided by the Campbell Foundation currently for the Lancaster Clean Water Partners.

Geographic Focus in Lancaster County

Countywide

Capital RC&D Grazing Management Program

Capital RC&D
Contact: Susan Richards, 401 East Louther Street, Suite 307, Carlisle PA 17013, (717) 241-4361, srichards@capitalrcd.org

Services Funded

Grazing Plans
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs (specifically, rotational grazing management BMPs)

Cost Share Amount/Funding Specifications

Through funding provided by a NFWF grant and other sources, RC&D can provide peer-to-peer grazing mentoring and technical assistance to farmers interested in implementing grazing management for a variety of animal operations. The program also provides cost share for implementation of rotational grazing management systems. Practices are cost-shared at up to 50%. Development of grazing management plans are fully covered.

Geographic Focus in Lancaster County

Countywide

CBF Accelerating Riparian Buffers NFWF Grant

Chesapeake Bay Foundation
Contact: Molly Cheatum, 1426 North 3rd Street, Harrisburg PA 17102, (717) 769-4141, mcheatum@cbf.org

Services Funded

Outreach
Buffer Planning, Design and Implementation
Maintenance

Conservation Practice Types Funded

Forest Riparian Buffers

Cost Share Amount/Funding Specifications

This grant provides outreach, technical assistance, and implementation and maintenance funds for forest riparian buffers in Lancaster and other priority counties. Technicians are available to meet with landowners and provide planning and technical assistance. Funds cover all costs of implementation and post-planting maintenance. The grant also funds a simulated property tax relief incentive of $100/acre/year to the landowner for the ecosystem services provided by buffers implemented through this program. Training and certification in buffer planning, design, planting and maintenance through the Chesapeake Bay Landscape Professionals (CBLP) program is available to landscape professionals to enhance technical assistance capacity.

Geographic Focus in Lancaster County

Countywide

Chiques-Conoy-Conewago Regional Partnership (NFWF INSR)

Penn State Agriculture and Environment Center
Matt Royer, Director, 111 Ferguson Building, University Park, 16802, (814) 863-8756, mroyer@psu.edu

Services Funded

Outreach
Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Grant funds partnerships focused on ag outreach in the target watersheds. Funding for implementation of ag BMPs, riparian BMPs or restoration earned per acre of buffer implemented at $4,000/acre capped at $20,000. Buffers are funded by leveraging other resources (CREP, DCNR, etc.) Farms with no streams may earn up to $10,000 cost share for ag BMPs. Additional grant funds are available for larger-scale stream restoration projects.

Geographic Focus in Lancaster County

Conewago Creek, Chiques Creek, Conoy Creek, River Tributaries North Watersheds

Clay Township Farmer Outreach Initiative (GG Grant)

Clay Township
Contact: Bruce Leisey, Township Manager, 870 Durlach Road, Stevens PA 17578, (717) 733-9675, bruce@claytwp.com

Services Funded

Outreach

Conservation Practice Types Funded

None, but farmer outreach will set the stage for implementation of ag BMPs, riparian buffers and potentially restoration projects.

Cost Share Amount/Funding Specifications

An inventory of all farms in Clay Township to document existing BMPs and outreach to farmers about implementing additional conservation practices will be conducted. The grant will also fund 3 farmer educational workshops and deploy 3 water quality monitoring sondes in the township.

Geographic Focus in Lancaster County

Clay Township (Cocalico Creek Watershed)

Cocalico Creek Watershed Farmer Engagement for Conservation (NFWF SWG)

Cocalico Creek Watershed Association
Contact: Jay R. Snyder, Cocalico Creek Watershed Association, P.O. Box 121, Reinholds, PA 17569-0121, (717) 738-9282, jsnyder@ephrataboro.org

Services Funded

Outreach
Soil Health Mentoring, Testing
Nutrient Management
Design

Conservation Practice Types Funded

Ag BMPs (preliminary design work)

Cost Share Amount/Funding Specifications

Funding available for farmer outreach (winter meetings, farmer visits), soil health testing, mentoring and coaching, advanced N testing, and preliminary design work for ag BMPs.

Geographic Focus in Lancaster County

Cocalico Creek Watershed

Conewago Creek Watershed (319 Grant)

Tri-County Conewago Creek Association
Stewart Williammee, President, 230 South Hertzler Road, Elizabethtown PA 17022, (717) 984-3708, conewagocreek@yahoo.com

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Grant is funding stream restoration, riparian buffers and ag BMPs in Conewago Creek watershed.

Geographic Focus in Lancaster County

Conewago Creek Watershed

Conowingo Creek Watershed (319 Grant)

Donegal Trout Unlimited
Bob Kutz, P.O. Box 8001, Lancaster PA 17604, (717) 940-1541, kutz.bob@gmail.com

Services Funded

Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Grant is funding stream restoration, riparian buffers and ag BMPs in Conowingo Creek watershed.

Geographic Focus in Lancaster County

Conowingo Creek Watershed

Farm Stewardship Program (NFWF SWG)

Stroud Water Research Center
Lamonte Garber, 970 Spencer Road, Avondale PA 19311, (610) 268-2153, lgarber@stroudcenter.org

Services Funded

Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers

Cost Share Amount/Funding Specifications

Two NFWF Small Watershed Grants fund ag BMPs through Farm Stewardship Program offering a "buffer bonus" for implementing forest riparian buffers. One of these is focused on converting marginal cropland. Funding is earned per acre of buffer implemented at $4,000/acre capped at $20,000. Buffers are funded by leveraging other resources (CREP, DCNR, etc.)

Geographic Focus in Lancaster County

Initially Conewago, Cocalico, Chiques, Pequea and Octoraro Watersheds, then opens up countywide.

Lancaster County 319 Watersheds Stream Restoration Technical Assistance (319 Grant)

Lancaster County Conservation District
Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2523, mattkofroth@lancasterconservation.org

Services Funded

Design, Engineering & Permitting
Monitoring

Conservation Practice Types Funded

Stream Restoration

Cost Share Amount/Funding Specifications

Grant funds design and permitting of approximately 8 stream restoration projects in the three approved 319 watersheds in the Lancaster County. Funding also covers installation of four monitoring sondes, two each in Conewago and Conowingo Creek watersheds.

Geographic Focus in Lancaster County

Conewago Creek, Conowingo Creek, Mill Creek Watersheds

Lancaster County Buffer Bonus Program (GG Grant)

Alliance for the Chesapeake Bay
Contact: Jenna Mitchell, PA Director, 37 East Orange St, Suite 302, Lancaster PA 17602, (717) 517-8698, jmitchell@allianceforthebay.org

Services Funded

Outreach
Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Stormwater BMPs
Restoration Projects

Cost Share Amount/Funding Specifications

"Buffer bonus" funds are for landowners willing to implement new forest riparian buffers. Funds are earned at $4,000/acre of new buffer installed, capped at $20,000 and may be used toward implementation of ag BMPs, stormwater BMPs, and stream restoration projects. Funding is also available to support buffer maintenance.

Geographic Focus in Lancaster County

Countywide

Lancaster County Forest Riparian Buffers Partnership (DCNR Grants)

Alliance for the Chesapeake Bay
Contact: Jenna Mitchell, 37 East Orange St, Suite 302, Lancaster PA 17602, (717) 517-8698, jmitchell@allianceforthebay.org

Services Funded

Outreach
Buffer Planning, Design & Implementation
Maintenance

Conservation Practice Types Funded

Riparian Buffers

Cost Share Amount/Funding Specifications

Grant funds outreach, technical assistance, implementation and maintenance of forest riparian buffers, including multifunctional buffers, across Lancaster County. Planning, design and implementation costs are covered at 100% for buffers, fencing and crossings. Maintenance is also covered at 100% for three years over the life of the grant.

Geographic Focus in Lancaster County

Countywide

LFT Farm Conservation Grants

Lancaster Farmland Trust
Contact: Jeff Swinehart, 125 Lancaster Ave, Strasburg PA 17579, (717) 687-8484, jswinehart@lancasterfarmlandtrust.org

Services Funded

Outreach
Conservation Planning
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Ag BMPs
Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

LFT has received a variety of grants over the years from various sources (NFWF, Chesapeake Bay Trust, Campbell Foundation, CFA, DEP) to fund farmer outreach and implementation of BMPs on farms. Outreach staff identifies landowners willing to implement priority projects, and funds are provided for conservation planning where needed and implementation of BMPs. Implementation is generally fully cost shared, although there is some self-funding depending on the project. Different grants are often matched together to fully meet project costs. Presently funding is available for conservation plan development in Paradise Township (Pequea Creek Watershed) and BMP implementation in Mill Creek Watershed.

Geographic Focus in Lancaster County

Countywide with focus on Pequea Creek, Mill Creek and Upper Conestoga Watersheds.

Mill Creek Watershed (319 Grant)

Lancaster County Conservation District
Contact: Matt Kofroth, Watershed Specialist, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2523, mattkofroth@lancasterconservation.org

Services Funded

Watershed Planning
Monitoring
Design, Engineering & Permitting
Construction & Implementation

Conservation Practice Types Funded

Riparian Buffers
Restoration Projects

Cost Share Amount/Funding Specifications

Grant is funding update to 319 Watershed Implementation Plan, monitoring sondes, and implementation of stream restoration projects.

Geographic Focus in Lancaster County

Mill Creek Watershed

Multifunctional Riparian Buffers (DCNR Grant)

PA Association of Conservation Districts
Contact: Amy Brown, 5925 Stevenson Ave, Suite A Harrisburg, PA 17112 (717) 238-7224 ext. 104, abrown@pacd.org

Services Funded

Construction & Implementation
Maintenance

Conservation Practice Types Funded

Multi-Functional Riparian Buffers

Cost Share Amount/Funding Specifications

Subgrants from PACD are available to county conservation districts to fund implementation and maintenance of multifunctional riparian buffers. Funds are available statewide, first come, first serve. Funds can cover planting materials, labor and maintenance through the life of the grant (through June 2022)

Geographic Focus in Lancaster County

Statewide

Octoraro Farmer Outreach Initiative (GG Grant)

Octoraro Watershed Association
Contact: Rupert Rossetti, OWA President, 517 Pine Grove Rd, Nottingham PA 19362, (717) 529-2132, (302) 250-1965 (mobile), rupertrossetti@gmail.com

Services Funded

Outreach
Conservation Planning

Conservation Practice Types Funded

None, but farmer outreach will set the stage for implementation of ag BMPs, riparian buffers and/or restoration projects.

Cost Share Amount/Funding Specifications

This Growing Greener grant funds OWA outreach to mainly plain sect farmers and church elders in the priority Bells Run watershed within the Octoraro. Funds are also available for conservation planning. Farmers interested in implementation are matched with program funding and technical assistance, particularly provided by the Alliance for the Chesapeake Bay, which focuses much of its ag work in the Octoraro.

Geographic Focus in Lancaster County

Bells Run (Octoraro Creek Watershed)

PA Soil Health Partnership (NFWF, Growing Greener)

Stroud Water Research Center
Lisa Blazure, 970 Spencer Road, Avondale PA 19311, (610) 268-2153, lblazure@stroudcenter.org

Services Funded

Outreach
Soil Health and Cover Crop Mentoring & Coaching
Implementation of Soil Health Practices

Conservation Practice Types Funded

Ag BMPs (soil health practices)

Cost Share Amount/Funding Specifications

Various grants fund soil health outreach, mentoring and technical assistance from soil health partners, most notably PA No Till Alliance. No Till Alliance members available to speak at outreach events and visit and mentor farmers interested in transitioning to no-till. Partners PASA offering Soil Health Benchmarking; PSU N modeling. REAP 90% tax credits for soil health practices also being developed through this project.

Geographic Focus in Lancaster County

Countywide

Restoring the Octoraro Reservoir (NFWF SWG)

Alliance for the Chesapeake Bay
Contact: Jenna Mitchell, 37 East Orange St, Suite 302, Lancaster PA 17602, (717) 517-8698, jmitchell@allianceforthebay.org

Services Funded

Conservation Planning
Implementation

Conservation Practice Types Funded

Ag BMPs

Cost Share Amount/Funding Specifications

Grant funds implementation of ag BMPs in the Octoraro Creek watershed. 50% of total cost is covered, capped at $50,000 per landowner. 100% of costs of any necessary conservation planning is also funded.

Geographic Focus in Lancaster County

Octoraro Creek Watershed

Stroud Forest Riparian Buffer Program (DCNR, etc.)

Stroud Water Research Center
Lamonte Garber, 970 Spencer Road, Avondale PA 19311, (610) 268-2153, lgarber@stroudcenter.org

Services Funded

Outreach
Buffer Planning, Design & Implementation
Maintenance

Conservation Practice Types Funded

Riparian Buffers

Cost Share Amount/Funding Specifications

A DCNR riparian buffer grant along with other funding sources (NFWF, K10, etc.) funds forest riparian buffer implementation initially in focus watersheds, but then opens up countywide. Costs of forest riparian buffer establishment and post-planting maintenance are fully covered, with landowners encouraged to take on mowing. Funding can be matched with Stroud's Farm Stewardship Program "buffer bonus" to implement ag BMPs, or stand alone for riparian buffer implementation only.

Geographic Focus in Lancaster County

Initial focus on small watersheds in Chiques, Pequea and Octoraro Watersheds, then opens up countywide.

Subsurface Application of Manure (Campbell Foundation Grant)

Lancaster County Conservation District
Contact: Francesca DePrator, 1383 Arcadia Road, Lancaster PA 17601, (717) 299-5361 ext. 2545, grants@lancasterconservation.org

Services Funded

Implementation

Conservation Practice Types Funded

Manure Injection

Cost Share Amount/Funding Specifications

Grant funds custom operator to inject manure for participating farmers. Grant pays for the cost difference of injection vs. surface application of manure. Grant also will cover or subsidize rental of a horse-drawn manure injection unit for plain sect operators.

Geographic Focus in Lancaster County

Countywide

Turkey Hill Clean Water Partnership (NFWF SWG)

Alliance for the Chesapeake Bay
Contact: Jenna Mitchell, 37 East Orange St, Suite 302, Lancaster PA 17602, (717) 517-8698, jmitchell@allianceforthebay.org

Services Funded

Conservation Planning
Implementation

Conservation Practice Types Funded

Ag BMPs

Cost Share Amount/Funding Specifications

Grant funds implementation of ag BMPs on farms that supply milk to Turkey Hill. 75% of total cost is covered, capped at $60,000 per landowner. 100% of costs of any necessary conservation planning is also funded.

Geographic Focus in Lancaster County

Countywide

SECTION 4: ANALYSIS AND RECOMMENDATIONS

As is clear from the inventories in Sections 2 and 3, Lancaster County has a large number and diversity of partners and resources to foster action toward achieving clean water goals. Given this fact, one challenge is determining the best strategies and approaches for having these partners and resources work in collaboration and avoid duplication of effort. In this section, we organize and analyze the bounty of resources available in Lancaster County to encourage collaboration and leveraging of resources for maximum impact.

It should be noted at the outset of this section that, even with the existing resources inventoried in this report, Lancaster County lacks what it needs to meet the nutrient reduction goals of the Phase 3 WIP. Funding projections in the Phase 3 WIP indicates that Lancaster County requires a staggering $107 million annually to implement actions needed to meet WIP goals. Current resources are clearly far short of that. The analysis and the recommendations that follows will not only allow Lancaster County partners to use existing resources more effectively, but it will put the county in a better position to administer the additional money and conduct the necessary outreach and technical assistance that is needed to accelerate the pace of restoration.

Being in the Bullseye: Challenges and Opportunities

The “hot spot” for nutrient and sediment pollution challenges in Pennsylvania and the Chesapeake Bay is Lancaster County. In heat maps showing nutrient loading sources to the Bay, the entire county glows red. The priority focus on Lancaster County has led to many, many partners becoming involved in clean water efforts, and many funders prioritizing the county. Consequently, there is a lot going on in Lancaster County, a lot of different funding resources available, and a lot of partners working to achieve this success. It becomes a challenge to navigate and coordinate. It is a challenge that was the impetus for the formation of the Partners.

This inventory of partners and funding resources does reveal that there are some partners and some resources that provide similar necessary services, or work in similar fashions to achieve clean water goals. Yet given the magnitude of the challenge, the sheer size of the county, the number of individual farmers, other landowners, and local municipalities, there is plenty of room for all partners and resources to achieve impact without duplication or competition. The bigger challenges are figuring out who is doing what and where, what is the full panoply of funding resources available to partners, what are the specifications and requirements with respect to those funding sources, and how can a mix of partners and funds be used best together to work most efficiently and achieve maximum collective impact.

Below we analyze the resources inventoried in Sections 2 and 3 in ways that may help address these challenges. First, we organize the resources available by critical categories. Second, we analyze the resources based largely on these critical categories and make recommendations for combining funding and partner resources in a “integrated funding delivery” concept that allows resources to be leveraged off of one another for maximum strategic impact.

Organizing Resources by Critical Categories

Different partners and funding resources are available in Lancaster County to support a variety of different services in different geographies necessary to implement different types of conservation projects. Some provide outreach assistance to reach landowners; some engineering and design; and some are financial resources to support implementation. Some are focused on agricultural conservation practices, others stormwater BMPs, others stream restoration, or riparian buffer planting. Some resources are available countywide or even beyond Lancaster County; others are focused on specific watersheds or municipalities.

Here we organize the resources available to partners by several important categories that must be considered in any collaborative and accelerated restoration effort. These categories are:

- **Resources by project type** (do they help support implementation of agricultural conservation practices, stormwater BMPs, riparian buffers, or stream/floodplain/wetland restoration, or some combination thereof?) **and services provided** (following the continuum of services illustrated in Figure 1, are these services in the outreach, technical assistance, or implementation assistance categories?)
- **Resources by source or sector** (are the partners or funding resources available to implement conservation coming from the government, non-profit, or private sectors?)
- **Resources needing matching funds** (this analysis helps to determine how best to match and leverage funding resources to develop successful proposals that may require matching funds, following the integrated funding delivery recommendations discussed in the next section)
- **Available resources by watershed** (we divide the county into 16 watersheds and provide a profile of each watershed and list of the partners and resources available in each)

Resources by Project Type and Services Provided

As discussed in Section 1, we organized the **types of conservation projects** necessary to improve clean water in Lancaster County into four basic categories: agricultural BMPs, stormwater BMPs, riparian buffers, and restoration practices (wetland/stream/floodplain restoration).

Another important metric we considered was the **services needed to implement conservation**, following the continuum of outreach-to-technical assistance-to-implementation assistance illustrated in Figure 1. For each category of conservation practice type and each service necessary for implementation, there are several partners, funding programs, and specific programmatic grants available to achieve conservation goals.

These resources are organized and displayed in separate tables for each conservation project type (Table 1 for Ag BMPs, Table 2 for Stormwater BMPs, Table 3 for Riparian Buffers, and Table 4 for Restoration Practices). A color scheme is used to distinguish between these four project types (see Figure 2). Resources are organized into three categories: Partners (with respect to staff or volunteer capacity to provide certain services); Funding Programs (established programs to pay for certain services); and Funding from Programmatic Grants (i.e., funding to pay for services that comes from a particular grant already awarded to a particular partner). The red/yellow/green columns on the right in each table show the types of services provided, following the outreach/TA/ implementation continuum and color scheme depicted in Figure 1. If a particular service is provided by a particular resource, this is indicated with a dot.

Figure 2. Color scheme for conservation practice types. Ag BMPs are shown in browns, stormwater BMPs in blues, riparian buffers in greens and restoration practices in purples.

Figure 3. Color scheme for sector types. Federal government is in blue, state government in green, county entities in orange, nonprofits and foundations in gold, private sector in pink, and municipalities in purple.

Finally, we also use a color scheme to represent the source or sector of the partner, funding program, or grantee of the programmatic grant listed in these tables (see Figure 3). With respect to funding resources, in Tables 1-4, we use the source/sector color to represent the funding program source (not necessarily the source/sector of the administrator of the funds), and the grantee of any programmatic grants (not necessarily the source/sector of the funding source itself). These distinctions are made and more fully represented in the next section in Table 5, where we organize all partners and resources by source or sector.

Table 1. Resources for Agricultural BMPs by Services Provided

Resources for Agricultural BMPs	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Partners: Staff Capacity						
USDA NRCS	●	●	●	●	●*	
USDA FSA	●					
US EPA	●					
PA DEP	●					
State Conservation Commission	●					
PENNVEST	●					
Lancaster County Conservation District	●	●	●	●		
Lancaster Farmland Trust	●	●				
Alliance for the Chesapeake Bay	●	●				
Chesapeake Bay Foundation	●	●				
Stroud Water Research Center	●	●				
Penn State University	●	●				
TeamAg, Inc.	●	●	●	●		
Red Barn Consulting	●	●	●	●		
Funding Programs						
NRCS Environmental Quality Incentives Program (EQIP)			●	●	●	
NRCS Conservation Innovation Grants (CIG)			●	●	●	
NRCS Conservation Stewardship Program (CSP)					●**	
Section 319 Program	●	●	●	●	●	●
EPA Chesapeake Bay Program Funds (CBIG & CBRAP)	●	●	●	●	●	●
Clean Water State Revolving Loan Fund	●	●	●	●	●	
EPA Most Effective Basin Funding				●	●	
EPA's SWG and INSR grants (currently administered by NFWF)	●	●	●	●	●	
Growing Greener	●	●	●	●	●	●
Ag Planning Reimbursement Program (APRP)			●			
REAP			●	●	●	
PENNVEST			●	●	●	
Act 13 Watershed Restoration and Protection Program	●	●	●	●	●	●
Exelon Habitat Improvement Project Program (PFBC)				●	●	
Exelon Habitat Improvement Project Program (LCCD)				●	●	

Resources for Agricultural BMPs (cont.)	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Funding Programs (cont.)						
Conservation Excellence Grants (CEG)			●	●	●	
Susquehanna Riverlands Mini Grants (Lancaster Conservancy)	●	●	●	●	●	
Lancaster Clean Water Fund				●	●	
Campbell Foundation Grants	●	●	●	●	●	●
Funding from Programmatic Grants						
PA Soil Health Coalition (Stroud NFWF, GG Grants)	●	●	●			
Capital RC&D Grazing Management Program (RC&D NFWF)	●	●	●	●	●	
Lancaster County Buffer Bonus Program (ACB GG Grant)		●	●	●	●	
Farm Stewardship Program (Stroud NFWF Grant)		●	●	●	●	
LFT Farm Conservation Grants (LFT various funding sources)	●	●	●	●	●	
Chiques-Conoy-Conewago Regional Partnership (PSU NFWF Grant)	●	●	●	●	●	
Conewago Creek 319 Grant (TCCCA)			●	●	●	
Subsurface Application of Manure (LCCD Campbell Grant)			●		●	
Octoraro Watershed Outreach (OWA GG Grant)		●	●			
Restore the Octoraro (ACB NFWF Grant)				●	●	
Turkey Hill Clean Water Partnership				●	●	
Clay Township Farmer Outreach Initiative (Clay Twp GG Grant)	●	●				

*Through NRCS-administered funding programs like EQIP, CSP, etc.

**Does not pay for construction/implementation per se, but rather provides annual payments for implementing conservation enhancements

Table 2. Resources for Stormwater BMPs by Services Provided

Resources for Stormwater BMPs	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Partners: Staff Capacity						
US EPA	●					
PA DEP	●					
PA DCNR	●	●	●	●	●	
PENNVEST	●					
PA DCED	●					
Lancaster County Conservation District	●	●				
Lancaster County Planning Department	●					
Lancaster County Clean Water Consortium	●					
Lancaster Conservancy	●	●				
Alliance for the Chesapeake Bay	●	●			●	●
Chesapeake Bay Foundation	●	●				
Penn State University	●	●			●	●
LandStudies, Inc.	●	●	●	●	●	●
RETTEW	●	●	●	●	●	●
C.S. Davidson	●	●	●	●		
David Miller/Associates	●	●	●	●		
Earthbound Artisan			●	●	●	●
Funding Programs						
Section 319 Program	●	●	●	●	●	●
EPA Chesapeake Bay Program Funds (CBIG & CBRAP)	●	●	●	●	●	●
EPA's SWG and INSR grants (currently administered by NFWF)	●	●	●	●	●	
Clean Water State Revolving Loan Fund	●	●	●	●	●	
Community Development Block Grants					●	
Growing Greener	●	●	●	●	●	●
TreeVitalize						
DCNR C2P2	●	●	●	●	●	
PENNVEST			●	●	●	
Act 13 Watershed Restoration and Protection Program	●	●	●	●	●	●
Dirt & Gravel/Low Volume Road Program				●	●	
Smart Growth Transportation Program			●		●	

Resources for Stormwater BMPs (cont.)	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Funding Programs (cont.)						
LCCWC Stormwater Mini Grants	●	●		●	●	
Susquehanna Riverlands Mini Grants (Lancaster Conservancy)	●	●	●	●	●	
Lancaster Clean Water Fund				●	●	
Funding from Programmatic Grants						
Lancaster County Buffer Bonus Program (ACB GG Grant)		●	●	●	●	

Table 3: Resources for Riparian Buffers by Services Provided

Resources for Riparian Buffers	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Partners: Staff Capacity						
USDA NRCS	●		●			
USDA FSA	●		●			
PA DEP	●					
PA DCNR	●	●	●	●	●	●
Lancaster County Conservation District	●	●	●			
Lancaster Conservancy	●	●				
Donegal Trout Unlimited	●	●			●	●
Alliance for the Chesapeake Bay	●	●	●	●	●	●
Chesapeake Bay Foundation	●	●	●	●	●	
Stroud Water Research Center	●	●	●	●	●	●
Penn State University	●	●	●	●	●	●
LandStudies, Inc.	●	●	●	●	●	●
Crow & Berry Land Management	●	●	●	●	●	●
Earthbound Artisan	●	●	●	●	●	●
RETTEW	●	●	●	●	●	●
Funding Programs						
CREP				●	●	●
Partners for Fish and Wildlife Program				●	●	
Section 319 Program	●	●	●	●	●	●
EPA Chesapeake Bay Program Funds (CBIG & CBRAP)	●	●	●	●	●	●
Clean Water State Revolving Loan Fund	●	●	●	●	●	
EPA Most Effective Basin Funding				●	●	
Growing Greener	●	●	●	●	●	●
DCNR Riparian Buffer Grant Program	●	●	●	●	●	●
DCNR C2P2	●	●	●	●	●	●
TreeVitalize					●	
REAP			●	●	●	●
PENNVEST			●	●	●	
Act 13 Watershed Restoration and Protection Program	●	●	●	●	●	●
Exelon Habitat Improvement Project Program (PFBC)				●	●	

Resources for Riparian Buffers (cont.)	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Funding Programs (cont.)						
Conservation Excellence Grants (CEG)			●	●	●	
Exelon Habitat Improvement Project Program (LCCD)				●	●	
LCCWC Stormwater Mini Grants	●	●		●	●	
Susquehanna Riverlands Mini Grants (Lancaster Conservancy)	●	●	●	●	●	
EPA's SWG and INSR grants (currently administered by NFWF)	●	●	●	●	●	
Lancaster Clean Water Fund				●	●	
CBF K10 Partnership					●	●
Funding from Programmatic Grants						
Mill Creek 319 Grant (LCCD)				●	●	
Lancaster County Buffers Partnership (ACB DCNR Grants)	●	●	●	●	●	●
Multifunctional Riparian Buffers (PACD DCNR Grant)					●	●
CBF Accelerating Riparian Buffers NFWF Grant	●	●	●	●	●	●
Stroud Forest Riparian Buffer Program (DCNR, others)	●	●	●	●	●	●
Chiques-Conoy-Conewago Regional Partnership (PSU NFWF Grant)	●	●	●	●	●	●
Conewago Creek 319 Grant (TCCCA)				●	●	●
PSU AEC CCC Regional Partnership NFWF Grant	●	●	●	●	●	●
LFT Farm Conservation Grants (LFT various funding sources)	●	●	●	●	●	

Table 4: Resources for Restoration Practices by Services Provided

Resources for Restoration Practices	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Partners: Staff Capacity						
USDA NRCS	●	●	●	●		
US Fish and Wildlife Service	●	●	●	●	●	●
US EPA	●					
PA DEP	●					
PA Fish & Boat Commission	●	●	●	●		
Lancaster County Conservation District	●	●	●	●		
Donegal Trout Unlimited	●	●			●	●
Penn State University	●	●				
Water Science Institute	●	●	●			
LandStudies, Inc.	●	●	●	●	●	●
RETTEW	●	●	●	●	●	●
Funding Programs						
NRCS Environmental Quality Incentives Program (EQIP)			●	●	●	
NRCS Conservation Innovation Grants (CIG)			●	●	●	
NRCS Wetland Reserve Easement Program (WRE)			●	●	●	●*
NRCS Watershed Protection & Flood Prevention Program (PL-566)			●			
Partners for Fish and Wildlife Program				●	●	
Section 319 Program	●	●	●	●	●	
EPA's SWG and INSR grants (currently administered by NFWF)	●	●	●	●	●	
EPA Chesapeake Bay Program Funds (CBIG & CBRAP)	●	●	●	●	●	
Clean Water State Revolving Loan Fund	●	●	●	●	●	
Growing Greener	●	●	●	●	●	
DCNR C2P2	●	●	●	●	●	
PENNVEST			●	●	●	
Exelon Habitat Improvement Project Program (PFBC)				●	●	
Exelon Habitat Improvement Project Program (LCCD)				●	●	
Conservation Excellence Grants (CEG)			●	●	●	
LCCWC Stormwater Mini Grants	●	●		●	●	
Susquehanna Riverlands Mini Grants (Lancaster Conservancy)	●	●	●	●	●	

Resources for Restoration Practices	Services Provided					
	Outreach		Technical Assistance		Implementation Assistance	
	Workshops/ Events	Landowner Visits	Planning	Design/ Engineering	Construction/ Implementation	Maintenance
Funding Programs (cont.)						
Lancaster Clean Water Fund				●	●	
Funding from Programmatic Grants						
Lancaster County 319 Stream Restoration TA (LCCD 319 Grant)	●	●	●	●		
Mill Creek 319 Grant (LCCD)				●	●	
Conewago Creek 319 Grant (TCCCA)				●	●	
Conowingo Creek 319 Grant (Donegal TU)				●	●	
Chiques-Conoy-Conewago Regional Partnership (PSU NFWF Grant)	●	●	●	●	●	
LFT Farm Conservation Grants (LFT various funding sources)	●	●	●	●	●	
Lancaster County Buffer Bonus Program (ACB GG Grant)		●	●	●	●	

*Program does not provide maintenance per se, but preservation of wetlands through an easement program.

Resources by Source or Sector

As made clear in this report, partners and funding sources represent a range of sectors: government (federal, state, and local), non-profit, foundations, and private sector. For some landowners and local decision makers, the source of the funding by sector may be an important consideration in deciding whether to utilize such resources to implement conservation. Also important may be the sector of lead partners in managing projects and administering funds. For example, a landowner may not be interested in working with a federal government entity to fund conservation, but if a nonprofit organization or private sector consultant was the lead partner in working with the landowner to manage the project and administer government funds, this may be more palatable.

Table 5 organizes the funding resources available in Lancaster County by the type of source or sector of funding (federal government, state government, county, nonprofits and foundations, and private sector). It also indicates the lead partner.

The color scheme used in the previous section to identify each source or sector type (see Figure 3) is also used in Table 5. This allows for easy distinguishing by sector type. In particular, where a partner of a different sector is the lead partner for a funding source (the nonprofit Alliance for the Chesapeake Bay for the DCNR-funded Lancaster County Riparian Buffer Partnership, for example) this can be easily distinguished using the color scheme.

For each funding source in these categories, the table further indicates what types of conservation practices are funded (ag BMPs, stormwater BMPs, buffers, or restoration) and what services it funds (outreach/TA/implementation). These are also color coded for ease of reference between practice types and services provided, following the same color schemes demonstrated in Figures 1 and 2.

Table 5: Funding Resources by Source or Sector

Funding Resource	Lead Partner	Practice Types Funded				Services Funded		
		Ag BMPs	SW BMPs	Buffers	Restoration	Outreach	TA	Implementation
Federal Government								
Envtl Quality Incentives Program (EQIP)	USDA NRCS	●		●	●		●	●
Conservation Stewardship Program (CSP)	USDA NRCS	●		●	●			●*
Wetland Reserve Easement Program (WRE)	USDA NRCS				●		●	●
PL-566	USDA NRCS				●		●	
CREP	USDA FSA	●		●	●		●	●
Partners for Fish and Wildlife Program	USFWS			●	●		●	●
319 Program	PA DEP	●	●	●	●	●	●	●
Lancaster County 319 Stream Restoration TA	LCCD				●		●	
Mill Creek Watershed 319 Grant	LCCD			●	●		●	●
Conewago Creek Watershed 319 Grant	TCCCA	●		●	●		●	●
Conowingo Creek Watershed 319 Grant	Donegal TU			●	●		●	●
EPA Chesapeake Bay Program Funds (CBIG & CBRAP)	PA DEP	●	●	●	●	●	●	●
Clean Water Revolving Fund	PENNVEST	●	●	●	●		●	●
EPA Most Effective Basin Funding	TBD**	●		●			●	●
Community Development Block Grants	LCRA		●					●
EPA's SWG and INSR Grants	NFWF	●	●	●	●	●	●	●
CBF Accelerating Riparian Buffers (NFWF Grant)	CBF			●		●	●	●
Capital RC&D Grazing Program (NFWF Grant)	Capital RC&D	●				●	●	●
Cocalico Farmer Engagement (NFWF Grant)	CCWA	●				●	●	
Chiques-Conoy-Conewago Regional Partnership	PSU	●		●	●	●	●	●
Farm Stewardship Program (NFWF Grant)	Stroud	●					●	●
PA Soil Health Coalition (NFWF Grant)	Stroud	●				●	●	
Restoring the Octoraro (NFWF Grant)	Alliance for Bay	●					●	●
Turkey Hill Clean Water Partnership (NFWF Grant)	Alliance for Bay	●					●	●
State Government								
Growing Greener	PA DEP	●	●	●	●	●	●	●
Lancaster County Buffer Bonus Program (GG Grant)	Alliance for Bay	●	●		●		●	●
PA Soil Health Coalition (GG Grant)	Stroud	●				●	●	
LFT Farm Conservation Program (various grants)	LFT	●	●	●	●	●	●	●
Ag Planning Reimbursement Program	PA DEP	●					●	
DCNR Riparian Buffer Grant Program	PA DCNR			●		●	●	●
DCNR C2P2 Grant Program	PA DCNR		●	●	●	●	●	●
Multifunctional Riparian Buffers (DCNR Grant)	PACD & LCCD			●			●	●

Funding Resource (cont.)	Lead Partner	Practice Types Funded				Services Funded		
		Ag BMPs	SW BMPs	Buffers	Restoration	Outreach	TA	Implementation
State Government (cont.)								
Lancaster County Buffers Partnership (DCNR Grant)	Alliance for Bay			●		●	●	●
Stroud Riparian Buffer Program (DCNR, others)	Stroud			●		●	●	●
TreeVitalize	PA DCNR		●	●			●	●
REAP	SCC	●		●			●	●
PENNVEST	PENNVEST	●	●	●	●		●	●
Act 13 Watershed and Flood Mitigation Programs	CFA	●	●	●	●		●	●
Clay Township Farmer Outreach Initiative (GG Grant)	Clay Township	●				●		
Octoraro Watershed Farmer Outreach (GG Grant)	OWA	●		●		●		
County								
Dirt & Gravel/Low Volume Road Program	LCCD		●				●	●
Conservation Excellence Grants	LCCD	●		●	●		●	●
Smart Growth Transportation Program	Lanc. MPO		●				●***	●
LCCWC Stormwater Mini Grants	LCCWC		●	●	●	●	●	●
Susquehanna Riverlands Mini Grants	Lanc. Conservancy	●	●	●	●	●	●	●
Lancaster Clean Water Fund	LCCF & Partners	●	●	●	●	●	●	●
Nonprofits and Foundations								
LFT Farm Conservation Program (various grants)	LFT	●		●	●	●	●	●
Subsurface Application of Manure (Campbell Grant)	LCCD	●						●
Private								
Exelon Habitat Improvement Project Program (LCCD)	LCCD	●		●	●		●	●
Exelon Habitat Improvement Project Program (PFBC)	PFBC	●		●	●		●	●

*Does not pay for construction/implementation per se, but rather provides annual payments for implementing conservation enhancements.

**Administrator to be selected by EPA through a request for assistance (RFA) process.

***Pays for planning costs only, not design & engineering.

Resources Needing Matching Funds

Many funding programs require matching funds or only fund a portion of a project. This often requires partners to think strategically about how to match and leverage programs off of one another to fully implement conservation projects.

Table 6 provides a list of those funding programs that require match and are available in Lancaster County. Again, each funding is color coded by sector following the scheme illustrated in Figure 3.

The match required is illustrated by the remaining gray portion of each bar. Sometimes specifications exist with respect to the sector or type of match required, or what services the funding resource or match can fund. Where these specifications exist, they are indicated on the graphic.

What is not well depicted in this graphic is the size of the funding source (and consequently the size of the match required), since relative match percentages are depicted instead. For example, both NFWF INSR grants and Lancaster Clean Water Fund Grants required 50% match, yet INSR grants are usually maximum awards of $1 million while Clean Water Fund grants are maximum of $50,000. Maximum size of award is something to be cognizant of when developing a matching funds strategy.

Table 6. Funding Resources in Need of Matching Funds

Funding Resource (with % of funds provided and specifications, if any)	Match Required (with specifications, if any)
Federal Government	
EQIP (approx. 75%)	approx. 25%
Community Development Block Grants (80% total costs; can only fund construction)	20% (5% construction)
EPA's INSR Grants (currently administered by NFWF) (50%)	50% (non-federal)
EPA's Small Watershed Grants (currently administered by NFWF) (67%)	33% (non-federal)
State Government	
Growing Greener (85%)	15%
DCNR Riparian Buffer Grants (50%)	50%
DCNR C2P2	50%
TreeVitalize (50%)	50%
REAP (equipment, many ag BMPs, stream/floodplain rest.) (50%)	50%
REAP (conservation & nutrient management plans, barnyards & ACA treatment, buffers ≥50 ft) (75%)	25%
REAP (buffers ≥50 ft, fencing, crossings, etc., soil health tests in TMDL watersheds) (90%)	10%
Act 13 Watershed & Flood Mitigation Programs (85%; D&E limited to 10%)	15%
County	
Smart Growth Transportation Program (80% for studies; construction projects require D&E costs as match)	20% (or all D&E costs)
LCCWC Stormwater Mini Grants (50%; D&E limited to 20%)	50%
Susquehanna Riverlands Mini Grants (50%)	50% (half of which must be cash)
Lancaster Clean Water Fund (50%)	50%

Available Resources by Watershed

The watershed-based approach to management and restoration is critical to achieving success in clean water improvement efforts. While there are many different ways of organizing and classifying the watersheds of Lancaster County, for ease of organization and following commonly recognized watershed names and units, we have divided the county in into the following 16 watersheds:

1. Conewago Creek
2. Conoy Creek
3. Chiques Creek
4. River Hills Tributaries North
5. Little Conestoga Creek
6. Lititz Run
7. Cocalico Creek
8. Upper Conestoga River
9. Lower Conestoga River
10. Mill Creek
11. Pequea Creek
12. Octoraro Creek
13. Conowingo Creek
14. Fishing Creek
15. River Hills Tributaries South
16. Brandywine Creek

For each of these watersheds, a watershed profile is provided that contains basic information about the watershed, including total size, municipalities located in the watershed, basic land uses (agriculture, urban, forested), and impaired stream segments within the watershed.

In addition, the profile lists all core partners and funding resources available in the watershed, following the sector-based color scheme illustrated in Figure 3. For each of the partners and resources listed, the services provided within the outreach/TA/implementation continuum is indicated using red/yellow/green bars as applicable (following the color scheme illustrated in Figure 1 and used throughout this document).

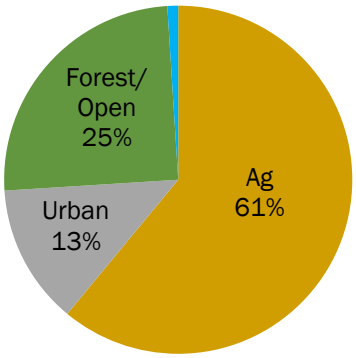
Pequea Creek Watershed

Size
154.9 mi²

Municipalities

Bart Twp	Pequea Twp
Conestoga Twp	Providence Twp
Earl Twp	Quarryville Boro
East Drumore Twp	Sadsbury Twp
East Earl Twp	Salisbury Twp
East Lampeter Twp	Strasburg Boro
Eden Twp	West Lampeter Twp
Leacock Twp	Honey Brook Twp
Martic Twp	West Caln Twp
Paradise Twp	West Sadsbury Twp

Land Use



Impaired Segments

Stream Name	Miles
Pequea Creek	47.01
Goods Run	5.79
Big Beaver Creek	31.31
Little Beaver Creek	22.69
Walnut Run	3.19
Watson Run	3.33
Eshleman Run	14.49
Houston Run	4.49
Umbles Run	14.93
White Horse Run	5.18
Indian Spring Run	4.77
Other Tributaries to Pequea Creek	41.64
TOTAL	**198.82**

Core Partners

- Lancaster Farmland Trust
- Chesapeake Bay Foundation
- Salisbury Township
- Pequea Creek Watershed Assoc.
- Lancaster CCD
- TeamAg
- Red Barn
- Stroud Water Research Center
- Other Pequea municipalities
- Lancaster Conservancy
- Donegal TU
- US Fish & Wildlife Service

Funding Resources

- NRCS Programs (EQIP, CSP, WRE)
- CREP
- DCNR Lanc. Co. Buffers Partnership
- Lanc. Co. Buffer Bonus (GG Grant)
- Multifunctional Buffers (PACD)
- CBF K10 Partnership
- Ag Planning Reimbursement
- PENNVEST
- REAP
- Dirt & Gravel Road Program
- Conservation Excellence Grants
- PA Soil Health Coalition NFWF
- Subsurface Application of Manure
- LFT Farm Conservation Grants
- FSP, Buffer Programs (Stroud)
- EPA Most Effective Basin Funding
- Capital RC&D Grazing Program
- CBF Accelerating Buffers NFWF Grant

Analysis and Recommendations for Integrated Funding Delivery

The previous sections make clear that there are many and diverse funding resources available and partners who have skills relevant to conservation implementation in Lancaster County. The different critical categories reveal some areas where sufficient capacity exists and others where there are gaps. In addition, trends and strategies can be observed whereby partners and resources can best work collaboratively to support implementation. This section identifies and discusses capacity strengths, gaps, and observable trends and strategies with respect to Lancaster County's partners and resources.

Almost all partners are able to contribute to broader public outreach, like presenting at a workshop, field day, or outreach event. Several partners—particularly in the nonprofit sector, the conservation district, and to some extent the private sector—have the ability and bandwidth to conduct landowner visits and explore conservation opportunities at the individual property and landowner level. This becomes a critical service, since all conservation implementation must happen at the individual landowner level, and landowners must be committed to long term land management changes to ensure sustained land and water quality improvements.

Technical assistance becomes another critical skillset that is provided by only some of the partners inventoried. In the agriculture sector, TA is provided by a mix of agencies (NRCS, conservation district) and private sector ag consultants. Few if any nonprofits have the capacity, experience, and training to develop conservation and nutrient management plans and provide design and engineering services. For restoration practices, private sector environmental consultants have the capacity to provide technical assistance, as does NRCS, the conservation district, and most notably the US Fish and Wildlife Service through its Partners for Fish and Wildlife Program, which has a successful track record of stream and wetland restoration in Lancaster County. With respect to stormwater BMPs, technical assistance services are almost exclusively provided by the private sector. Design of these practices requires specialized technical expertise in landscape design and engineering.

In Lancaster County, capacity for technical assistance in support of forest riparian buffers is uniquely significant, as a large group of entities across sectors (government agencies, nonprofits, and private sector businesses) can provide planning and design (as well as planting and, in more limited capacity, maintenance) assistance for forest riparian buffer projects. These partners work together on the Partners Buffer Action Team.

Funding programs and grants fund the range of services needed to implement conservation along the outreach/technical assistance/implementation assistance continuum. Only a limited number of funding resources are available to fund outreach work, a noticeable gap in resources. Most notably these funding sources include NFWF, Campbell Foundation, Growing Greener, DCNR's Riparian Buffer Grants, and potentially some of EPA's Chesapeake Bay funding programs (CBIG and CBRAP).

Other funding sources more strictly fund TA and implementation, such as NRCS program funding like EQIP, Pennsylvania's REAP tax credit program, and the funding programs administered by the county conservation district (Dirt & Gravel/Low Volume Roads Program for stormwater BMPs and the new Conservation Excellence Grants for agricultural conservation practices). Some have very specific requirements that only construction can be funded (Community Development Block Grants, for example).

These differences in funding resources support strategic leveraging or "knitting together" partners' skillsets with specific mixes of funding sources to best accomplish all services within the outreach/TA/implementation continuum. Being smart about how match can be provided when pursuing funding programs that require match is also part of this strategic leveraging.

With respect to the type of conservation practice funded, there are a significant number of sustained, core funding resources for agricultural conservation practices. Most of this funding is federal (USDA and to a lesser extent EPA) but state funding (primarily through REAP) and state funding administered at the county level (Conservation Excellence Grants) are also provided, although the latter is not a sustained source of funding at this time. Funding for riparian buffers is also robust and includes a variety of funding sources. Stream and wetland restoration and stormwater BMPs can take advantage of several potential funding resources, even if they lack the kinds of core programmatic funding that are available for agricultural conservation practices (such as EQIP, REAP, and CREP). Lack of core funding for restoration and stormwater BMPs is a clear gap in resources. But even the sustained funding sources for ag BMPs and riparian buffers are not sufficient to achieve the type of accelerated conservation implementation that is needed in Lancaster County to achieve clean water goals. Across the board, more funding is needed to fund conservation practices across all sectors.

Consideration of resources available within the specific watersheds of Lancaster County reveals a range of different local capacities for accelerating implementation. One model that is deployed successfully in several watersheds relies upon local capacity (generally a combination of nonprofits, conservation district, private sector and municipalities) to conduct outreach, and professionals at agencies and private firms to provide technical assistance, tapping into existing funding programs for implementation dollars. In many cases, specific programmatic grants provide enhanced/matching funding for implementation and also help to fund the critical outreach elements in those watersheds.

Watersheds where this model is being deployed and dedicated partners and funding resources are in place include Conewago Creek, Chiques Creek, Mill Creek, Pequea Creek and Octoraro Creek. Emerging capacity for this model is developing in Cocalico Creek, Conoy Creek, and the River Hills Tributaries North (the latter two through the Chiques-Conoy-Conewago Regional Partnership), where partners with programmatic grants support various levels of outreach, partnership facilitation and implementation of conservation.

Lititz Run is a unique example of a long-term, well supported local effort to infuse watershed stewardship into many aspects of life within the community, in support of the economic well-being of its residents, businesses and agricultural industry. Local leadership at the municipal level is key to this success.

Little Conestoga Creek and Fishing Creek are watersheds where grant funded partnership-based efforts were implemented in the recent past, but where an infusion of new funding resources and supporting partners may be needed. A core of local support exists in both watersheds, through local watershed organizations and Donegal TU's continued stream restoration efforts in Fishing Creek. Conowingo Creek and Peters Creek (the latter within River Hills Tributaries South) are other watersheds in the southern portion of the county where Donegal TU has led stream restoration efforts. The ongoing stream restoration efforts in these watersheds could be enhanced by partners and funding to support accelerated implementation of agricultural conservation practices in these agriculturally impaired watersheds, and the cultivation of additional local leadership.

Portions of the Upper Conestoga River have been the beneficiaries of focused outreach and implementation work by some partners, most notably by Stroud Water Research Center and Lancaster Farmland Trust (the latter through the ELANCO Source Water Collaborative). This watershed does however lack a local watershed organization, a deliberate effort to build locally led watershed partnerships, and focused priority funding from programmatic funding resources (though we note that the new EPA "Most Effective Basin" funding will be available throughout the Conestoga). The same can be said for the Lower Conestoga River, although that watershed includes municipalities that have established successful stormwater green infrastructure programs, of greatest note the City of Lancaster.

Across all watersheds, given the plethora of partners and resources available in Lancaster County, it is critical to develop and deploy a strategy that integrates partners and funding to take full advantage of specific and collective strengths and weaknesses, thus enhancing the delivery of conservation on the ground. We make the following eight specific recommendations to achieve ***integrated funding delivery*** for maximum collective impact:

Recommendation One: Strategically match and leverage different funding sources to stretch limited dollars for maximum impact.

The funding resources inventory in Section 3 reveals a wide variety of funding sources. Yet each of these are limited in amount, and collectively fall far short of the total amount of funding needed to meet the county's water quality goals. Moreover, many have caps or matching requirements that prevent use of a particular funding source to fully implement a practice. Accordingly, it becomes important to consider at every juncture how funding resources can be leveraged to stretch limited dollars for maximum impact.

As an example, consider funding for the Heller Restoration Project on the Heller farm on Dellinger Run in the Chiques Creek watershed. The Hellers were interested in addressing stream bank erosion along a reach of the stream that was historically pastured and lacked riparian vegetation. The Penn State Agriculture & Environment Center and Lancaster County Conservation District conducted outreach and worked with the farmer to develop a concept plan that included stream restoration, exclusion fencing and crossings, and the planting of three acres of forest riparian buffer. The buffer was paid for by the DCNR-funded Lancaster County Riparian Buffer Partnership, administered by the Alliance for the Chesapeake Bay, at an estimated cost of $12,000. Installation of 3 acres of forest buffer made the Hellers eligible for another $12,000 of "buffer bonus" funding from a Chiques NFWF grant administered by the AEC, which was used toward the costs of the stream restoration project. Stream restoration design and permitting was undertaken by the US Fish & Wildlife Service, which provided in-kind cost share of $18,000 toward the project through its Partners for Fish and Wildlife Program. An additional $20,000 of Exelon Habitat Improvement Project funding was provided by the conservation district. Finally, funding for buffer maintenance for the first two years of maintenance (a $3,000 cost) was provided by the inaugural "Lancaster BEST" (Buffer Establishment Support Team) program, funded by another NFWF grant administered by the Partners.

Accordingly, a high impact conservation project at a total cost of $65,000 was implemented by six partners working together using six leveraged funding sources (a mix of state, federal, foundation and private sector funding) to provide the outreach, technical assistance and implementation services (including maintenance) necessary to get the project in the ground and be an impactful, long term project to improve clean water. None of the funding sources provided more than $20,000,

allowing all of them to put dollars saved through strategic leveraging toward other conservation projects.

Recommendation Two: Recognize the importance of maintaining and growing a diversity of funding sources.

As reflected in Table 5, nearly 50 distinct funding programs or programmatic grants are currently available in Lancaster County, representing a diversity of funding sources from five different source or sector categories. While this may seem like an almost overwhelming amount of funding opportunities and choices, it is important that the diversity of funding sources is maintained and provided. As previously discussed, some funding sources inherently have limitations. Some are unable to fund critical outreach components necessary to accelerate implementation. Others fund construction only and would require partners to bring other resources to the table for design and engineering components of a project. Still others provide only partial funding for projects (see Table 6: Funding Sources in Need of Matching Funds). In addition, the nature of certain funding sources (such as government funding) may not be palatable for any number of reasons to certain landowners, and thus a robust diversity of funding sources from public to private is necessary.

In addition to maintaining the diversity of funding sources, the funding amounts must grow. Current funding levels are not nearly enough to implement the number of conservation practices necessary to meet Lancaster County's water quality goals. By establishing an integrated funding delivery system and demonstrating its ability to efficiently transform dollars to on-the-ground conservation, Lancaster County's clean water partners can make a case for further investment in the county's conservation infrastructure.

Recommendation Three: Determine and utilize core funding sources for specific conservation practice types.

To establish some level of certainty with respect to funding resources, we recommend determining and utilizing certain core funding sources for specific conservation practice types. These core funding sources can already be identified for all of the practice type categories discussed in this report.

For agricultural conservation practices, a trifecta of federal (USDA NRCS programs, primarily EQIP), state (REAP and PENNVEST) and county (Conservation Excellence Grants) sources are now established that can provide funding for a full suite of agricultural conservation practices. An established, well-funded program like EQIP, which brings with it high levels of technical assistance competence and technical standards for conservation planning and practice design can be an excellent choice for funding highly engineered and technical structural practices like manure storages, barnyard runoff controls, and stabilized animal concentration areas. These are often more expensive but necessary practices for which larger government sources of funding are often needed. Pursuit of a Regional Conservation Partnership Program (RCPP) for Lancaster County, another NRCS program that can bring specific, targeted NRCS dollars to implement BMPs, would provide significant additional federal funding for agricultural conservation practices. PENNVEST, while newer to the nonpoint source funding arena, can also provide similar levels of financial assistance, including grants or loans as meets a farmer's financial situation and needs. REAP, as a state tax credit program, provides a different financial wrinkle to traditional government grants and therefore may

also be an intriguing option for some producers. The Conservation Excellence Grants program, established under the 2019 Pennsylvania Farm Bill, is a new program offered through the State Conservation Commission and administered locally by county conservation districts. This program provides more of a flexible, local, and simpler approach to cost share funding that is not burdened by the higher levels of paperwork and administrative steps that EQIP, PENNVEST, and even REAP entail.

Forest riparian buffer restoration also has a mix of core funding provided by multiple sectors. USDA's CREP program provides sustained core funding for forest buffers and other wildlife-related conservation practices, but in recent years DCNR's riparian buffer grants program has been a viable option for many landowners, particularly those interested in more program flexibility, including the ability to plan and utilize multifunctional buffers. While the nature of the DCNR program requires eligible applicants to apply for individual grants, in Lancaster County the Alliance for the Chesapeake Bay has led a coalition effort to apply for larger amounts of funding shared by a group of partners who conduct outreach to landowners related to riparian buffers. This allows the funds to be more programmatic in nature and, if this approach continues, establish a state-based companion core funding source alongside CREP available in Lancaster County.

Restoration practices can rely on a few core funding sources, even if the dollar amounts are more limited than what is available for agricultural conservation practices and buffers. Exelon funding administered by both the Lancaster County Conservation District and the PA Fish & Boat Commission are options in Lancaster County, but these can only fund a handful of projects per year, at most. Section 319 funding in Lancaster County has provided another source of funding for stream restoration in the three watersheds with approved Section 319 Plans (Conewago Creek, Mill Creek, and Conowingo Creek) NRCS programs can also be utilized for stream, wetland and floodplain restoration. We recommend that active 319 grants be maintained by project sponsors in each of the 319 watersheds to establish this as a core funding stream for restoration. EQIP can fund .stream restoration practices, though that program has been minimally used to date. NRCS' Wetland Reserve Easement Program (WRE) can fund wetland restoration and preservation and should be a funding source considered seriously for landowners interested in wetland restoration. NRCS' Watershed Protection and Flood Mitigation Program (PL-566) funding is currently funding watershed planning in Chiques Creek which may lead to funding opportunities for design and implementation of floodplain restoration practices in the future for that watershed.

Of the four types of conservation practices, stormwater BMPs probably have the greatest dearth of what could be considered core funding. PENNVEST funding provides another state core funding source, but these urban practices lack the sustained core federal funding source that is provided from USDA's conservation programs for agricultural conservation practices, riparian buffers, and restoration on farms. The county-administered Dirt & Gravel/Low Volume Road program has recently begun to fund stormwater BMPs associated with eligible low volume road networks, even in highly urban communities. Federal and state grants can provide opportunities to fund stormwater BMPs but would require individual grant applications and would not be considered the kind of consistent, dedicated funding source necessary for core funding. Municipalities can provide funding to support stormwater BMP implementation but given the plethora of local services that must be provided by municipal government and limited revenue generation sources, funding for stormwater BMPs is scarce at the local level. Some municipalities such as the City of Lancaster have enacted stormwater fees which can establish core and sustainable funding sources, but these have limited applicability and scope in Lancaster County at this point in time.

Recommendation Four: Use flexible funding sources to gap-fill and match.

Reliance on core funding is often not sufficient to ensure that a conservation practice is implemented. Several core funding sources, namely EQIP and REAP, generally provide a cost share and not full funding necessary to implement a project. Depending on the project scope, 10-50% of the project costs may be left unfunded. While in many instances the landowner can provide private funding, this may not always be a realistic option.

Accordingly, we recommend tapping into some of the more flexible funding sources available to fill gaps in funding and provide necessary match to make a project happen. Programmatic NFWF grants are often used in this respect by several partners. Other, smaller flexible pots can be used as well to "top off" funding and make a project happen, including the Lancaster Clean Water Fund, Lancaster County Clean Water Consortium's Stormwater Mini Grants, and, for those communities along the county's western River boundary, the Susquehanna Riverlands Mini Grants program administered by the Lancaster Conservancy.

Recommendation Five: Use a strategic mix of partner skills and funding resources to maximize outreach and TA capacity and deliver the dollars for implementation.

Almost all of the funding programs available for implementation cover construction and implementation costs, and often technical assistance as well. Fewer will fund the outreach (or even planning) aspects of a project. NFWF grants and Growing Greener are examples of funding sources that will fund outreach. DEP's Agricultural Planning Reimbursement Program is available to cover conservation and nutrient/manure management planning costs.

The inventory of partners working in Lancaster County indicates capacity to conduct landowner outreach among nonprofits, for-profits, the conservation district, some local municipalities and watershed organizations, and other agencies. In addition, the county is blessed with an abundance of farmers who are leaders in conservation and epitomes of the culture of stewardship that is a backbone of Pennsylvania agriculture. Many of these farmers are leaders in their communities, and even serve local government leadership roles as planning commission members, other local government boards and committees, or as elected supervisors. There is tremendous potential to tap into this local leadership in the farming community to conduct outreach to other farmers in a peer-to-peer or advisor approach. The successful farmer outreach approach in Salisbury Township is something being modeled in several other municipalities in the county. In addition, the Pennsylvania No Till Alliance, with support from Stroud Water Research Center, has developed and successfully deployed these kinds of farmer-based approaches to outreach, education and technical assistance related to soil health, representing models that can be replicated across the county.

Technical assistance is provided by a similar but more limited network of partners who have the skills, training, and experience to provide the technical services necessary to plan, design, and oversee construction of conservation practices. For agricultural conservation practices, entities providing TA include USDA NRCS, the conservation district, and private sector ag consultants. Stream, wetland and floodplain restoration technical assistance is provided by a different set of specialized technicians, chiefly at the US Fish & Wildlife Service, conservation district, NRCS, PA Fish & Boat Commission, Water Science Institute, and private sector firms with experience in such

restoration practices. Urban stormwater BMP design and engineering is largely provided by the private sector. Technical assistance for forest riparian buffers is provided by a larger partner network of agencies, nonprofits, and for-profits, many of which also can provide landowner outreach assistance.

Given the largely partner-driven capacity for outreach in Lancaster County, and the funding-driven opportunities for implementation dollars, we recommend a strategic approach that takes advantage of existing skills and resources of the county's partnership network. This approach involves nonprofit organizations, municipalities, farmer leaders, or similar entities with local connections and trust taking the lead on farmer and landowner outreach, funneling interested landowners to TA providers at agencies and within the private sector to provide the technical services and leverage the funding pots necessary for implementation of conservation practices. There are many examples of this strategic method in practice in Lancaster County, including the work with the agricultural community in Salisbury Township, the Fishing Creek conservation project, the partnerships working in Octoraro Creek and Chiques Creek watersheds, and Stroud Water Research Center's Farm Stewardship Program.

Recommendation Six: Develop and deploy customized strategies that work best for specific watersheds and communities.

Given the size and diversity of Lancaster County, it is clear that there is not a singular countywide strategy for accelerating conservation practice implementation. While there is certain guidance and methods that are worth sharing and replicating, the exact nature of how these methods are implemented, and the exact mix of partners and programs that are utilized, will depend upon the unique makeup of individual communities and watersheds.

The presence of local leadership—particularly within municipalities or within the agricultural community—is often a lynchpin for successful acceleration of conservation efforts. Some funding strategies may be harder to implement within certain communities—government funding in some plain communities, for example. One approach that has been successful is having non-government entities—such as nonprofits, or private consultants—as lead partners in reaching out to plain sect farmers and serving as project managers for projects that seek to leverage agency funds. The conservation district's plain sect coordinator also provides extensive relationships within the community, can help provide technical assistance, and work with plain sect farmers to navigate conservation program opportunities. Penn State Extension Educators can play similar roles.

Similarly, different watersheds have different mixes of local leadership, community membership, population density, geographic and geologic features, land uses, and partners and funding resources available. Accordingly, customized approaches in these watersheds are necessary to successfully accelerate conservation practice implementation. The Lancaster Clean Water Partners Watershed Action Team can play a key role in working with local watershed communities to help develop these customized approaches. The watershed profiles above help to summarize the partners and resources currently available in each watershed to support these approaches.

Recommendation Seven: Seek to develop common standards and approaches to funding conservation across all partners and, to the extent possible, programs.

Lancaster County is home to many clean water partners, each with innovative ideas on how to fund conservation on the ground. The competitive nature of seeking grants and other sources of funding necessarily requires innovative thinking and creativity to be successful with proposals. Consequently, there are many different and innovative funding opportunities provided by individual organizations. There have been some informal efforts to create some consistency in how these opportunities are managed and what level of funds are offered. For example, several organizations, including the Chesapeake Bay Foundation, Stroud Water Research Center, Alliance for the Chesapeake Bay, and Penn State AEC, provide funding following the "buffer bonus" concept, where landowners willing to implement forest riparian buffers can earn $4,000/acre capped at $20,000 that can be used toward implementation of other conservation practices on the property. Yet there may be variations on program details regarding eligibility or how program dollars are administered. We recommend that for these and other funding opportunities, partners providing such programmatic resources meet and discuss the potential development of common standards and approaches to funding conversation. This will ensure consistency, simplify the process for landowners, and avoid situations where landowners shop for the best deal among programs and partners.

Recommendation Eight: Centralize administration and coordination of funding to streamline integrated funding delivery processes for all.

Among the significant barriers to accelerating conservation in Lancaster County is the time and resources that must be spent on seeking and applying for grants and other funding resources, administering grants and programs, and coordinating efforts among partners. To overcome this barrier we recommend a single entity provide centralized assistance in administering and coordinating funding and developing and implementing processes to simplify and streamline the ability of partners to quickly turn dollars into conservation on the ground. This kind of resource would be of tremendous assistance to the conservation community in Lancaster County.

The Conservation Foundation of Lancaster County has the organizational mission and structure to provide these kinds of services, and we recommend that it explore obtaining the resources necessary to provide this role through the Partners. The capacity to provide this would require at a minimum a full-time position with grant management and financial management experience.

With respect to funding conservation practice implementation, the Lancaster Clean Water Fund, established as a donor-advised fund at the Lancaster County Community Foundation, could serve as the foundation on which this kind of nimble and streamlined funding structure could work. From a fundraising perspective, it has the potential to tap into a diversity of funding sources, including private, that could grow the pot of funds available for conservation practice implementation. Currently this fund requires annual applications by eligible partners for grants, and partnership review and selection of successful awards. The manner in which this fund operates could be streamlined to operate less like a re-grant or mini grant program that requires partners to apply annually for funds, but rather administered by the Conservation Foundation as a rolling fund into which all partners across all sectors could tap to deliver dollars to fund conservation practices quickly, avoiding some of the existing administrative and bureaucratic hurdles that sometimes slow

the process and thwart efficiencies. Where the flexibility exists, larger funding resources could be "thrown into the pot" and administered in the same nimble way. A sustainable, long term buffer maintenance fund (for example, the Buffer Action Team's BEST program) could also be provided through this funding mechanism. For funding programs that lack flexibility to support the Clean Water Fund, the Conservation Foundation, with its enhanced funding administrative capacity, could help partners match Clean Water Fund resources with existing core programs (EQIP, REAP, CREP, PENNVEST, Conservation Excellence Grants, etc.) to accelerate conservation implementation and maximize impact.

APPENDIX D

Model Riparian Buffer Protection Overlay District
Proposed Regulations for Use in a Municipal Zoning Ordinance, Second Edition

Brandywine Conservancy, Pennsylvania Land Trust Association

March 2016

Model Riparian Buffer Protection Overlay District

Proposed Regulations for Use in a Municipal Zoning Ordinance

Second Edition

Prepared by the

Brandywine Conservancy and
Pennsylvania Land Trust Association

in consultation with the
Stroud Water Research Center, Natural Lands Trust, and Fronefield Crawford, Jr., Esq.

and financially supported by the
William Penn Foundation, Colcom Foundation, and Community Conservation Partnerships Program, Environmental Stewardship Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation

Find the most recent edition at
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Preface

Numerous scientific studies document the fundamental role of forested riparian buffers in protecting water quality, reducing flooding, and delivering other public benefits.[1] In Pennsylvania, municipalities may ensure the protection and restoration of these buffers through local regulation.

The *Model Riparian Buffer Protection Overlay District, 2nd Edition*, which was reviewed and approved by legal counsel[2] experienced in land use planning and development, provides government officials with a tool they can adapt and adopt to achieve water quality and other health and safety goals in their locales. Several townships in the Commonwealth have already incorporated into their land use ordinances all or part of the original model (published in 2014).

[1] See "Streamside Forest Buffer Width Needed to Protect Stream Water Quality, Habitat, and Organisms: A Literature Review," Bernard W. Sweeney and J. Denis Newbold, June 2014, *Journal of the American Water Resources Association.*

[2] See the letter by Fronefield Crawford, Jr., Esq., dated May 5, 2016, which is included with some editions of this model and available at http://conservationtools.org/library_items/1261. In the five-page letter, Mr. Crawford concludes that: "the Model Ordinance has been carefully drafted (i) to conform in its scope and specifications to the underlying scientific basis, (ii) to provide procedures for administrative relief in the event that, as applied to a specific fact situation, the property owner would suffer unnecessary hardship, and (iii) to avoid conflict with state agency regulations. As such, it is a valid exercise of municipal zoning authority, to protect environmental resources both in the municipality itself and in areas of the Commonwealth downstream therefrom."

The guide *Riparian Buffer Protection Via Local Regulation*, available at ConservationTools.org, provides additional information that may be of use to those seeking to protect and restore riparian buffers.

Key Design Decisions

Placement in Zoning Ordinance

This model riparian buffer protection overlay district is proposed in the context of the municipal zoning ordinance rather than the subdivision and land development ordinance (SALDO) for the following reasons:

1. Pennsylvania's Municipalities Planning Code (MPC) provides authority to municipalities to protect riparian buffers both through zoning and subdivision and land development regulations but sets forth the zoning authority more firmly. Several provisions within the MPC's Article VI are of particular relevance:

- Subsection 603(b)(5) authorizes municipal zoning ordinances to "protect and preserve the natural and historic resources….";
- Section 603(c)(7) authorizes zoning ordinances to contain "provisions to promote and preserve … environmentally sensitive areas";
- Subsection 603(d) authorizes zoning ordinances to "assure the availability of reliable, safe and adequate water supplies …";
- Section 604 requires that zoning ordinances be designed to promote and facilitate "public health, safety, morals, and the general welfare… safe, reliable and adequate water supply for domestic, commercial, agricultural or industrial use, as well as preservation of the natural, scenic and historic values in the environment and preservation of forests, wetlands, aquifers and floodplains."
- Section 605 authorizes separate zoning classifications for the "regulation, restriction or

prohibition of uses and structures, at, along or near… natural or artificial bodies of water…."

2. The Pennsylvania appellate courts have provided stronger and more articulate decisions sustaining the validity of zoning ordinance requirements in the context of preservation of natural resources.[3]

3. The applicability or scope of regulations set forth in the zoning ordinance is broader than the in the SALDO, which apply only to *land development* activities. Many occurrences that could adversely affect a riparian buffer area that would potentially be covered under the zoning ordinance would not be covered under the MPC's definition of *land development*. Examples:

- A change in land use where no construction is involved (or the construction is exempt from SALDO requirements)
- Issuance of a land disturbance permit or grading permit, again under circumstances that would not constitute a land development.

4. Utilization of riparian buffer regulations within the context of a zoning ordinance creates a stronger and more specific defense in the event of a challenge based upon allegations of preemption.[4] ACRE,[5] for example, authorizes the Attorney General's Office to challenge the validity of an unauthorized local ordinance. The definition of an *unauthorized local ordinance* (i.e., one that is subject to validity challenge by the Attorney General's Office) creates a specific exception (i.e., that an ordinance is not invalid) to the general prohibition of *normal agricultural operations*, where the local ordinance "has expressed or implied authority under state law to adopt the ordinance; and is not prohibited or preempted under state law from adopting the ordinance." Given the explicit authority contained in Article VI of the MPC (as referenced above), any challenge under ACRE to reasonable riparian buffer requirements in the zoning ordinance should fail, unless specifically preempted by a PA Department of Environmental Protection requirement applicable to a property devoted to agricultural use.

Buffer Width

Sweeney and Newbold advocate, based upon their studies, minimum 30-meter (100-foot) forested riparian buffers as effective to substantially reduce pollutants from reaching a watercourse.[6] This model ordinance establishes a minimum buffer width of one hundred (100) feet consistent with these findings.

Municipalities may wish to impose a greater width than 100 feet, for example, requiring a 150-foot buffer for headwater or first-order streams, which are more sensitive to land disturbance and stormwater runoff. Conversely, municipalities may wish to impose a lesser width than 100 feet for political reasons, but all should understand that the science is clear that the effectiveness of the smaller buffers in reducing stream pollution will be substantially reduced.

Non-Dependence on Unevenly Applicable State Regulation

State regulations do not provide for riparian buffer protection except in the case of state-designated Exceptional Value and High Quality Waters and,

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[3] See Jones v. Zoning Hearing Board of the Town of McCandless, 578 A.2d 1369 (Pa. Cmwlth. 1990); Chrin Brothers v. Williams Township ZHB, 815 A.2d 1179 (Pa. Cmwlth. 2003); and Hoffman Mining Company, Inc. v. Zoning Hearing Board of Adams Township, 32 A.3d 587 (Pa. Sup. 2011).

[4] See Robinson Township v. Commonwealth of Pennsylvania Public Utility Commission, 83A. 3d 901 (Pa. Sup. 2013).

[5] 3 Pa.C.S. §311-318

[6] "Streamside Forest Buffer Width Needed to Protect Stream Water Quality, Habitat, and Organisms: A Literature Review," Bernard W. Sweeney and J. Denis Newbold, June 2014, *Journal of the American Water Resources Association.*

even then, the regulations contain a variety of exceptions and limitations.[7] The state General Assembly does not appear prepared to remedy this inadequate regulatory situation anytime in the foreseeable future. As such, local governments can only rely on themselves to ensure adequate protections.

The model does not exempt the subset of waters subject to state buffer requirements from local government buffer requirements because:

1. A two-tiered treatment does not conform to the science of riparian buffers. Different streams in the same municipality could be treated differently even though the effectiveness of buffers does not vary with the state regulatory status of the water body.
2. The state regulatory environment is complex, shifting, and uncertain. As such, local government cannot rely on the state to consistently protect the riparian buffers of even Exceptional Value and High Quality Waters.

Protection and Restoration

This model ordinance uses two strategies for establishing and maintaining riparian buffers. First, it limits intrusion of impervious coverage and land disturbance within riparian areas. Second, it requires the restoration of impacted riparian buffer areas to a *forested* condition, utilizing the specifications set forth in Section 600.C. of the model. This second strategy is essential to the model's goals in that the science is abundantly clear that forested riparian buffers deliver far superior resource protection results than non-forested buffers

Avoiding Unnecessary Hardship and Takings

Under most factual settings, the scope of regulation provided by the model should allow a landowner to make reasonable use of his property, without suffering undue hardship or a "taking" of land. It is clear that regulations to protect sensitive natural resources, including stream quality, may lawfully impair the value of the land upon which they are imposed. For example, Commonwealth Court sustained the validity of a DEP refusal to issue a wetlands fill permit to enable development of a 5.2-acre tract of land, of which 3.94 acres were wetlands.[8] In this case, regulations prevented development of 76% of the tract, leaving a quarter of it available for development.

However, regulations can go too far. If, for example, a tract of land were completely sterilized against development as a result of riparian buffer regulations, it would constitute a regulatory taking.[9] The modification provisions of Section 700 of this model ordinance seek to address this issue and, in addition, any property owner who believes that the riparian buffer regulations as applied to his property would create unnecessary hardship, will have the right to apply to the Zoning Hearing Board for a variance.

Regarding the restoration of impacted riparian buffer, the model's requirements are felt to be generally reasonable in cost and as such should not create unnecessary hardship to a property owner. However, in specific circumstances, it's possible that the cost of restoration per the model's requirements could be viewed as unreasonable, causing unnecessary hardship. As such, the model provides the landowner the right to apply for a modification through the provisions of Section 700, and/or seek the normal variance relief available by application to the zoning hearing board.

[7] See Chapter 102 "Erosion and Sediment Control" of the Pennsylvania Code, §102.14.

[8] Mock v. Pennsylvania DER, 623 A.2d 940 (Pa. Cmwlth. 1993).

[9] See Lucas v. South Caroline Coastal Council, 112 S.Ct. 2886 (U.S. Supreme Ct. 1992).

Grandfathering of Existing Uses Including Agriculture

As the model is written, existing, legally conforming or non-conforming uses of land may continue without having to comply with the riparian buffer requirements. See Section 300.B. This includes existing agricultural uses.

Chesapeake Bay Foundation studies find that agriculture represents "the largest single source of the pollution degrading water quality in the region, responsible for more than half the pollution entering the Chesapeake Bay and its rivers and streams."[10]

To address this problem, a municipality could seek to extend riparian buffer requirements to existing agricultural uses, but this is beyond the scope of the model. It is also a significant challenge. First, farming activities within the Commonwealth are a protected industry; second, agricultural runoff to watercourses involves no triggers (such as permit requirements) against which new riparian buffer regulations could be implemented under a zoning ordinance or subdivision and land development ordinance.

Conservation by Design

In municipalities that have adopted Conservation by Design principles into their SALDOs, developers can easily accommodate forested riparian buffers in subdivisions with little or no loss of development density. For more information, see the ConservationTools.org guide *Growing Greener: Conservation by Design*.

PENNSYLVANIA LAND TRUST ASSOCIATION

BRANDYWINE CONSERVANCY

[10] The Spring 2015 issue of *Save the Bay*, Volume 41, No. 1, published by the Chesapeake Bay Foundation, contains this quote and extensive analysis of the agricultural-related pollutants that impair the water quality in the Chesapeake Bay.

Disclaimer
Nothing contained in the model ordinance or this preface is intended to be relied upon as legal advice. The model should be adapted to reflect the specific facts and circumstances under the guidance of legal counsel. The authors disclaim any attorney-client relationship with anyone to whom this document is furnished.

Acknowledgements

In preparing this second edition of the model, the Pennsylvania Land Trust Association and the Brandywine Conservancy are grateful for the time and expertise offered by Bernard W. Sweeney, Ph.D., of the Stroud Water Research Center; Ann Hutchinson, AICP, of the Natural Lands Trust; and Fronefield Crawford, Jr., attorney at law.

STROUD WATER RESEARCH CENTER

Natural Lands Trust

For financially supporting the development of the model, the Pennsylvania Land Trust Association and the Brandywine Conservancy thank the William Penn Foundation and its Delaware River Watershed Initiative; the Colcom Foundation; and the Community Conservation Partnerships Program, Environmental Stewardship Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation. The organizations also acknowledge the Department of Environmental Protection's support for the first edition.

WILLIAM PENN FOUNDATION

DCNR

Colcom Foundation

DEP

Model Riparian Buffer Protection Overlay District

Second Edition
(*with annotations)*

BOARD OF SUPERVISORS
_____ TOWNSHIP
_____ COUNTY, PENNSYLVANIA
ORDINANCE NO. ____-__

AN ORDINANCE TO AMEND THE _____ TOWNSHIP ZONING ORDINANCE IN ORDER TO PROVIDE FOR PROTECTIONS TO STREAMS AND OTHER WATERCOURSES BY ESTABLISHING RIPARIAN BUFFER AREAS ADJACENT THERETO; STATING THE PURPOSES AND INTENTS OF SUCH PROTECTIVE PROVISIONS; DEFINING CERTAIN TERMS IN CONNECTION WITH SUCH REGULATIONS; PROVIDING FOR THE SCOPE OF APPLICABILITY OF THE REGULATIONS; DELINEATING THE SCOPE OF RIPARIAN BUFFERS; ESTABLISHING PERMITTED USES WITHIN RIPARIAN BUFFER AREAS; PROVIDING FOR THE RESTORATION OF BUFFER AREAS AND PLANTING REQUIREMENTS, IN ORDER TO CREATE EFFECTIVE FORESTED RIPARIAN BUFFER AREAS; PROVIDING FOR MODIFICATIONS TO RIPARIAN BUFFER STANDARDS AND PROCEDURES FOR SAME.

UNDER AND BY VIRTUE OF THE AUTHORITY SET FORTH IN ARTICLE I, SECTION 27 OF THE CONSTITUTION OF THE COMMONWEALTH OF PENNSYLVANIA, THE PENNSYLVANIA CLEAN STREAMS LAW (35 P.S. §691.1, ET. SEQ.) AND ARTICLE VI OF THE PENNSYLVANIA MUNICIPALITIES PLANNING CODE (53 P.S. §10601 ET. SEQ.), THE BOARD OF SUPERVISORS OF _____ TOWNSHIP DOES HEREBY ENACT AND ORDAIN THE FOLLOWING AMENDMENTS TO THE _____ TOWNSHIP ZONING ORDINANCE.

Section 100. Purpose and Intent. The specific purposes and intent of this article are to:

A. Conserve, protect, and restore natural riparian resources through scientifically supported processes.

Note: See "Streamside Forest Buffer Width Needed to Protect Stream Water Quality, Habitat, and Organisms: A Literature Review," Bernard W. Sweeney and J. Denis Newbold, June 2014, Journal of the American Water Resources Association.

B. Maintain and improve surface water quality by reducing the entry of detrimental substances, including nutrients, sediment, organic matter, pesticides, and other harmful substances that reach watercourses, wetlands, and surface and subsurface water bodies.

C. Reduce the entry of detrimental substances by restricting development and uses in riparian areas that intercept surface water runoff, wastewater, subsurface flow and deep groundwater flows from upland sources and where the processes of filtration, deposition, absorption, adsorption, plant uptake, sediment and phosphorus attenuation, denitrification and infiltration may occur; encouraging sheet flow and minimizing, mitigating and preventing concentrated flows of storm water runoff across riparian areas, and securing increased channel and bank stabilization that avoids stream bank erosion and associated water quality, quantity and flow harms.

D. Attenuate flooding and reduce soil loss.

E. Reduce adverse aquatic health impacts due to changes in the temperature of receiving waters (both temperature increases and temperature decreases) as a result of storm water runoff, loss of vegetative shading and direct discharges to water bodies.

F. Enhance in-stream processing of nutrients and pollutants such as pesticides and reduce the downstream movement of pollutants.

G. Improve and maintain the safety, reliability and adequacy of the water supply for domestic, agricultural, commercial, industrial and recreational uses along with sustaining diverse populations of aquatic flora and fauna.

H. Provide wildlife habitat, protect native plant species, and provide opportunities for passive recreation.

I. Conserve headwater areas, groundwater recharge zones, floodway, floodplain, springs, seeps, streams, wetlands, woodlands, prime wildlife habitats and other features that provide recreational value or contain natural amenities, whether on developed or undeveloped land.

J. Integrate with floodplain, steep slope, woodland protection and other ordinance requirements contained herein that regulate environmentally sensitive areas to minimize hazards to life, property and riparian features.

K. Conserve scenic and recreation areas within and adjacent to riparian areas.

L. Regulate the use, siting, engineering and maintenance of all development to be consistent with the purposes and intent of this article and accepted conservation practices and to work with the carrying capacity of existing natural resources.

M. *[When applicable]* Further the Chesapeake Bay Tributary Strategy goals and objectives by implementing best management practices (BMPs) to address point and non-point pollution sources.

N. *[When applicable]* Implement the recommendations for water quality protection in the Township's adopted comprehensive plan (*or rivers conservation plan, open space plan, etc.)*, as amended.

Section 200. Definitions. *[In addition to other definitions typically found within the zoning ordinance]*

APPLICANT – a landowner or developer who has filed an application for subdivision or land development or for any zoning or building permit that will result in land disturbance, including his heirs, successors and assigns or the equitable owner of property with the owner's permission. Applicants must either be the legal or beneficial owner or owners of land subject to the application, including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if he is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in land.

BANKFULL FLOW OR LEVEL – The discharge that just fills the water channel to the top of its banks and at a point where the water beings to overflow onto a floodplain.

BEST MANAGEMENT PRACTICE (BMP) – A structural or non-structural device designed to temporarily store or treat stormwater runoff in order to mitigate flooding and pollution, and reduce soil loss and water quality degradation caused by runoff containing nutrients, animal wastes, toxins, and sediments.

EDGE OF WATER– The top of bank of a watercourse, or the limit of water within a wetland, pond, lake, or other surface water feature that does not have a discernible bank.

FORESTED RIPARIAN BUFFER – A riparian buffer that consists predominantly of native trees, shrubs and/or herbaceous plants that provide a minimum of sixty (60) percent uniform canopy coverage.

IMPACTED RIPARIAN BUFFER – A riparian buffer that does not consist predominantly of native trees, shrubs and/or herbaceous plants, and where its existing use, or activity conducted thereon, is not otherwise exempted or expressly permitted by the provisions of this Ordinance.

IMPERVIOUS COVER – Those surfaces that do not readily absorb precipitation and surface water. The term includes but is not limited to buildings, parking areas, driveways, roads, sidewalks, swimming pools, and any areas in concrete, asphalt, packed stone, or other equivalent surfaces, including those with a coefficient of runoff of 0.7 or higher. Impervious surfaces also include disturbed soils with a bulk density of ninety-five (95) percent of the value at which plant growth limitation is expected for average plant material.

LAND DISTURBANCE – Any activity that exposes soils, alters topography, and/or alters vegetation.

NORMAL POOL ELEVATION –

A. For water bodies which have no structural measures to regulate the height of water, the height of water at ordinary stages of low water unaffected by drought.

B. For structurally regulated water bodies, the elevation of the spillway, outlet control, or dam crest which maintains the water body at a specified height.

C. The term does not apply to wetlands.

RIPARIAN – Belonging or related to the bank of a water body, river, stream, wetland, lake, pond, or impoundment.

RIPARIAN BUFFER – A vegetated area, including trees, shrubs, and herbaceous vegetation, adjacent to a water body.

TOP OF BANK – The elevation at which rising waters begin to inundate the floodplain. In case of ambiguous, indefinite, or non-existent floodplain or question regarding the location, the Top of Bank shall be the bankfull water elevation as delineated by a person trained in fluvial geomorphology. "Top of Bank" shall be synonymous with "edge of water", where applicable.

WATER BODY – Any natural or manmade pond, lake, wetland, impoundment, or watercourse. This shall not include any pond or facility designed and constructed solely to contain stormwater, or a swimming pool.

WATERCOURSE – Any channel of conveyance of surface water having a defined bed and banks, such as a stream, river, brook, or creek, whether natural or artificial, with perennial, intermittent or seasonal flow. This shall not include any channel or ditch designed and constructed solely to carry stormwater.

WETLAND OR WETLANDS – Those areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, ponds, lakes, and similar areas. Wetlands shall include any area so delineated by the National Wetlands Inventory of the U.S. Fish and Wildlife Service and all lands regulated as wetlands by the Pennsylvania Department of Environmental Protection (PADEP) or the U.S. Army Corps of Engineers (ACE). In the event there is a conflict between the definitions of these agencies, the more restrictive definition that defines the wetlands most expansively shall apply.

Section 300. Applicability.

A. The provisions of this article shall apply to any water body as defined herein, where any of the following Township submissions, reviews and approvals are required; or, when a violation of this article requires an enforcement action:

1. Zoning or building permits;
2. Subdivision or land development plans;
3. Conditional use approvals;
4. Zoning variances or special exceptions; and
5. Any land disturbance for which a grading permit is required.

Note: Municipalities may wish to establish a minimum threshold for land disturbance below which no riparian buffer protection or restoration requirements would apply. For example, Chester County's model Act 167 Ordinance proposed a threshold of 1,000 sq. ft. of impervious cover or 5,000 sq. ft. of land disturbance for stormwater management purposes.

B. The provisions of this article shall not apply to the footprints of existing primary and accessory uses, including but not limited to all agricultural uses and research related thereto, buildings, fences, lawns, gardens, utility lines, roads, driveways, sidewalks, bikeways, decks, piers, water, septic and sewage supply facilities and their related appurtenances (well houses, utility pump and lift stations, manholes, etc.).

Section 400. Riparian Buffer Delineation.

A. The riparian buffer area is designated as:

1. An area that begins at each edge of a water body and shall extend landward a minimum width of one hundred (100) feet, measured horizontally on a line perpendicular to the nearest edge of the water body, as reviewed and approved by the municipal engineer.
2. Where the floodplain extends greater than one hundred (100) feet from the water body, the riparian buffer area shall extend to the outer edge of the defined 100-year floodplain.

B. Reduced buffer width for isolated wetlands and other water bodies. Wetlands and other water bodies not located along a watercourse, where the wetland or other water body is greater than 5,000 square feet in area, shall have a minimum buffer width of fifty (50) feet, measured from the edge of the wetland or other water body around the entire perimeter.

C. Applicant to initially delineate. The applicant shall delineate, for the property as a whole, any riparian buffer areas as specified in subsections 400.A and 400.B above on any plan that is submitted for any review or approval listed in Section 300.A.

Section 500. Uses Permitted.

A. The following uses or activities are permitted by right in riparian buffer areas:
   1. Wildlife sanctuaries, nature preserves, forest preserves, fishing areas, passive areas of public and private parklands.
   2. Temporary stream restoration projects, stream bank restoration projects and vegetation restoration projects to restore the stream or riparian zone to an ecologically healthy stage utilizing natural channel design practices to the

greatest degree possible. The project duration and timing shall be subject to Zoning Officer approval.

3. Stream crossings for farm vehicles or livestock if part of a federal, state, or county conservation district or local nonprofit riparian buffer improvement project.
4. Provision for stone-dust or natural trail and related trail access when determined by the Zoning Officer to result in minimum disturbance to existing trees and shrubs.
5. Research and monitoring devices, such as staff gages, water recording, water quality testing, cross vanes, weirs and related demonstration facilities.
6. Within the outer fifty (50) feet of a riparian buffer area, provided that the area does not contain slopes over 25% or floodplain, timber harvesting operations, when conducted in compliance with a timber harvesting plan prepared, submitted, and approved in accordance with Section ____ of the Zoning Ordinance.

Note: Some municipal ordinances may permit forestry or timber harvesting uses without appropriate standards or without requiring a timber harvesting plan to be submitted for municipal approval. In such cases, the following text could be added to the riparian buffer protection provisions: "Clear-cutting of timber, or high-grading of forests, as defined therein, shall not be permitted within the regulated riparian buffer." And, while water quality goals generally can be best achieved by avoiding any disturbance of the forested riparian buffer, some municipalities may prefer not to prohibit clear cutting of forested buffer areas. In such cases, the restoration requirements of Section 600 become doubly important.

B. The following uses or activities are permitted by Special Exception *[or Conditional Use, if so desired]* approval in riparian buffer areas:
    1. Structures that, by their nature, cannot be located anywhere except within the riparian buffer. These structures shall include docks, boat launches, public water supply intake structures, facilities for natural water quality treatment and purification and public wastewater treatment plant sewer lines and outfalls. The structures shall provide for the minimum practicable disturbance of the riparian buffer by minimizing size and location and by taking advantage of collocation, if possible.
    2. Road crossings (when perpendicular to the stream or buffer), bridges, culverts, utilities, and impoundments.
    3. Provision for paved trail and related trail access when determined by the Zoning Hearing Board to result in minimum disturbance to existing trees and shrubs.
    4. Stormwater conveyance structures and outfalls.

C. The following uses or activities are permitted by Special Exception *[or Conditional Use, if so desired]* approval only within the outer fifty (50) feet of a riparian buffer area:

1. The grazing of livestock or growing of agricultural crops provided existing forested riparian buffers are not removed or otherwise impacted, and subject to an approved conservation and/or nutrient management plan, as applicable.
2. Any other use or activity permitted in the underlying (base) district, provided there is no re-grading, filling, or alteration within the inner fifty (50) feet of the riparian buffer area, and no more than twenty (20) percent of the outer fifty (50) feet may be re-graded, filled, or otherwise altered or subject to land disturbance. Uses and activities permitted by this provision shall not include the establishment of any impervious surfaces.

Note: Regarding C.1., this language is intended to conditionally permit new agricultural activities within the outer half of an impacted riparian buffer and not require restoration of this portion (see Section 600). To accommodate this new activity, fencing at the outer edge of the inner half of a riparian buffer may be necessary to avoid impacts to existing or restored forest vegetation or adjoining water bodies from livestock. Regarding C.2., some municipalities may prefer greater or lesser disturbance provisions; the 20% maximum in the outer half of the buffer is here used as an illustration.

D. The following activities or practices are expressly prohibited in riparian buffer areas:

1. Removal or disturbance of vegetation in a manner that is inconsistent with erosion and sedimentation control and riparian buffer protection.
2. Storage or discharge of any hazardous or noxious materials, except those used during emergencies for the treatment and/or maintenance of any public sewer and public water treatment facilities (i.e., generator sets or alternative drive units).
3. Use of fertilizers, pesticides, herbicides, and/or other chemicals, except:
    a. where permitted by a valid conservation plan, forest management plan, or approved planting and maintenance plan (see Section 600.E. below);
    b. for selective herbicide application by a qualified professional to control noxious weeds and invasive species of plants in riparian buffers.
4. Motor or wheeled vehicle traffic in any area not designed to accommodate adequately the type and volume of vehicular movement.

Section 600. Buffer Restoration and Planting Requirements.

A. All riparian buffer areas shall be continually maintained with a diverse mix of locally adapted native species of canopy trees, understory trees, shrubs, and herbaceous plants so as to constitute a forested riparian buffer where not otherwise occupied by any

existing use excepted in accordance with Section 300.B, or any authorized use permitted in Section 500.

B. The applicant shall restore the full one hundred (100) feet of impacted riparian buffer area, or the first one hundred (100) feet of a 100-year floodplain, to a forested riparian buffer, as a condition of any approval listed in Section 300 A., except as provided in subsection F. below, through invasive plant removal and planting of a diverse mix of native tree species.

C. Restoration of the impacted riparian buffer shall occur as follows:

1. Restoration plantings shall be planted at a density sufficient to provide a minimum of two-hundred (200) trees per acre at canopy closure. The following tree planting and spacing standards shall apply at installation:

   a. Seedlings – 10-foot spacing (approx. 435 seedlings/acre) protected by 5-foot tree shelters.
   b. Bare root trees or container trees (at least 6 feet in height for either) – 12-foot spacing (approx. 300 trees/acre). Tree shelters, wraps, or other proven methods shall be required to prevent damage from antler rubbing.

   To reduce competition from grasses and invasives, vegetation around tree shelters shall be sprayed or otherwise effectively controlled annually for a minimum of four (4) years. Tree shelters shall be maintained at all times and removed when the tree reaches 1½ - 2" caliper.

2. Landowners who are enrolled in, and fully in compliance with, the Conservation Reserve Enhancement Program (CREP) administered through their local Farm Service Agency are permitted to utilize their stream-side buffer restoration to satisfy the forested riparian buffer restoration requirements of this section for as long as they are enrolled in, and fully in compliance with, that voluntary program.

Additional planting guidance may be obtained from PADEP's Bureau of Watershed Management Document Number 394-5600-001, entitled "Riparian Forest Buffer Guidance, November 27, 2010, and the "Chesapeake Bay Riparian Handbook, A Guide for Establishing and Maintaining Riparian Forest Buffers," USDA Forest Service, NA-TP-02-97, Radnor, PA.

D. Applicants shall submit, and as a condition of approval for any application listed in Section 300 A., a planting and maintenance plan for the impacted riparian buffer. The plan shall be prepared by a registered landscape architect or professional plant ecologist. The plan shall identify the number, density and species of locally adapted native trees appropriate to the site conditions that will achieve a minimum of sixty (60) percent uniform canopy coverage within ten (10) years. The plan shall describe the maintenance program to be conducted by the buffer owner for a minimum of five (5) years, including measures to remove, and subsequently control, invasive plant species, limit deer and

rodent damage, and replace deceased trees for the first four (4) years. Applicants with riparian buffer areas associated with a pending Township application, and which are also enrolled in CREP, shall submit a plan showing the existing or proposed stream-side buffer planting that has been approved by the Farm Service Agency.

E. Any riparian buffer that is included within a lot created after the effective date of this ordinance shall include as a condition of approval of the subdivision creating the lot, a restrictive covenant approved by the municipal solicitor, and recorded with the final subdivision or land development plan and the deed for the lot. The restrictive covenant shall define the riparian buffer area, shall include binding provisions for the adequate long-term functioning and integrity of the riparian buffer, and shall include a requirement for notification of all subsequent lot owners of its restrictive nature.

Note: Municipalities wishing to include the restrictive covenant requirements—and we advocate that they be required—must be willing to accept the responsibility to enforce the provisions of a restrictive covenant agreement. This concept is not new. For example, municipalities customarily accept the responsibility to enforce the operations and maintenance provisions of post-construction stormwater management plans in regard to stormwater management facilities. As would here be the case, the municipality would seek compliance from the property owner, in the event of a breach of the restrictive covenant agreement. (It is unlikely that a land trust or conservancy would be willing to accept the responsibility.)

F. Restoration to a forested riparian buffer shall not be required for issuance of a building permit for a single-family residence, addition thereto, or for the construction of an accessory structure disturbing less than ____ of land on an existing lot**.**

Note: Municipalities may or may not, at their discretion, wish to exempt from these regulations construction of single family residences, additions thereto, or even the construction of accessory structures to a residence, on existing lots. A municipality may also wish to reduce or limit impacted riparian buffer restoration requirements for the construction of certain agricultural buildings. For example, a municipality may reduce the buffer restoration requirement by half where a landowner submits a valid conservation plan, or the municipality may limit the buffer restoration area to that drainage area (sub-basin) containing the agricultural building for which a building or zoning permit is being sought.

Section 700. Modifications to Riparian Buffer Standards.

A. For any use or activity subject to Subdivision or Land Development review, as part of applicable Plan submission, modification(s) may be requested to the provisions of Sections 400 or 600 of this Article. Requested modification(s) may be granted at the

discretion of the Board of Supervisors pursuant to the provisions of the Subdivision and Land Development Ordinance.

B. For any use or activity not subject to Subdivision or Land Development review, but subject to application for approval of a Conditional Use, Special Exception, or Zoning Variance under the provisions of this Ordinance, the applicant may request modification(s) to the provisions of Sections 400 or 600 of this Article.

C. For any use or activity not falling within the scope of subsections A or B, the applicant may request modification(s) to the provisions of Sections 400 or 600 of this Article in the form of an application for grant of a Special Exception by the Zoning Hearing Board. *[Optional: Such applications shall be submitted to the Planning Commission for review and comment prior to formal Special Exception application to the Zoning Hearing Board.]*

D. Applicants shall provide appropriate documentation in support of their modification request, and the Board of Supervisors or Zoning Hearing Board (as applicable) may request additional documentation of an applicant, or of its municipal consultants, to help reach its decision.

E. In consideration of approval of any applicant request for modification(s) under this Article, the following standards shall serve as the basis for a decision:

    1. That there are unique physical circumstances or conditions, including but not limited to irregularity, narrowness, or shallowness of lot size or shape, excessive frontage along a water body, presence of existing buildings or structures, or exceptional topographical or other physical conditions peculiar to the particular property. That because of such physical circumstances or conditions, it is impracticable for the property to be developed in strict conformity with the buffer requirements of this Article and that the approval of the modification is therefore necessary to enable the reasonable use of the property under base zoning provisions.

    2. That the modification, if approved, will result in the minimum reduction in performance of the riparian buffer, pursuant to the purposes set forth in Section 100, as needed to provide for the lawful intended use

F. No alteration of the Use Regulations set forth in Section 500 shall be authorized as modification pursuant to this Section 700. Any such requested alteration shall constitute an application for a variance, meeting all applicable requirements for same, to be submitted to the Zoning Hearing Board.

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