CUMBERLAND COUNTY CLEAN WATER TECHNICAL TOOLBOX

Developing a County-Based Action Plan for Clean Water

January 2020

CUMBERLAND COUNTY TECHNICAL TOOLBOX

Pennsylvania Phase 3 Watershed Implementation Plan (WIP)
The Local Planning Process to Meet Countywide Goals

Introduction

Welcome to your Clean Water Technical Toolbox.

This document has been prepared to help you improve local water quality. This collaborative effort is being made throughout Pennsylvania's portion of the Chesapeake Bay Watershed. Each Pennsylvania county within the watershed will have a Technical Toolbox with similar components tailored to that county's specific conditions.

What is the Technical Toolbox?

This toolbox has been developed as a starting point for each county to use to improve local water quality. It contains useful and specific data and information relevant to your county to assist you with reaching local water quality goals.

No county is required to use every tool in this toolbox! You are encouraged to add other tools as fits your local situation. This toolbox serves as a *guide* to assist with collaborative efforts, *not* as a regulatory tool.

Pennsylvania's State Workgroups have developed a series of recommendations that can apply across the watershed. These are recommendations, and you will find that as a county you might want to adjust the recommendations based on your county's needs. The sector recommendations found in the appendix are to be used as a starting point for your county.

The Local Story: Opportunities to Improve Local Water Quality and Meet Countywide Goals

Information is available that can help inform local planning strategies. This information can help answer questions like:

- What is the water quality like in my area?
- What are important sources of nutrients and sediments in my area?
- What opportunities exist to address these sources?
- Where geographically should we focus our efforts?
- Where do I begin in identifying potential reduction strategies?

This Technical Toolbox provides information to help answer those questions and to tell the story of local water quality in your county. In this Technical Toolbox, you'll find information on local water quality, local sources and drivers of nutrients and sediments, best management practice information, and additional available resources.

The information in this Technical Toolbox and the guidance provided for its use are meant to act as a starting point to help answer some common questions that arise during planning. Local groups can utilize whichever pieces of information they find most useful, supplement with their own local knowledge, and use the additional resources listed to find more information. The technical support team assigned to each county, will help in answering your questions and provide assistance in filling out a Detailed BMP Entry Template.

We hope this Technical Toolbox gives you a foundation to build off in telling Cumberland County's local story and in identifying opportunities for meeting local goals.

Cumberland County's Clean Water Goal

Figure 2. Countywide Goal for Cumberland County

Year	Nitrogen (pounds/year) Delivered to Local Cumberland County Waterways	Phosphorus (pounds/year) Delivered to Local Cumberland County Waterways
1985	6,582,942	388,974
2018	6,299,522	273,851
2025 (Final TMDL Planning Target)	4,094,563	237,038
Remaining Load to be Achieved Through Local Planning Goals	2,204,959	36,813

The monitored nitrogen and phosphorus load for Cumberland County (above) are broken down into nitrogen and phosphorus goals. The top line represents the conditions of Cumberland County in 1985. The second line, 2018, represents the current conditions in Cumberland County. The third line represents the planning goal that Cumberland County is trying to achieve by 2025. The last line represents the total reduction in pounds that Cumberland County needs to reduce by 2025.

Cumberland County needs to reduce its current nutrient pollution by 2.205 M pounds of nitrogen and 37 K pounds of phosphorus. Cumberland County has made great progress since 1985 in reducing the amount of Phosphorus to local waterways, but still needs more reductions to meet the 2025 goal. There is a lot of work that needs to be done with nitrogen. Through the planning process the counties goal is to completely reduce the reductions needed by 2025, for both nitrogen and phosphorus. This may take a combination of state and local efforts.

The Loads Report above can be found on CAST at http://cast.chesapeakebay.net. Log in and click on Reports' tab; Report type: loads report, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress

A Summary of Cumberland County's Water Quality Story

Current Conditions of Cumberland County's Streams

- Monitoring shows that streams in Cumberland County have elevated amounts of nitrogen, phosphorus and sediment.
- Water quality in Cumberland County's streams is changing over time:
  - Of the 786 miles of streams in Cumberland County, approximately 30% are degraded, which means they do not meet water quality standards
  - Approximately 100 ground water samples were taken throughout Cumberland County. Out of the 100 samples, 10 measured groundwater nitrate levels that exceed the EPA's safe drinking water threshold of 10 mg/L.
  - Cumberland County has many waters listed as impaired, but only a few streams within the county have individual TMDLs.

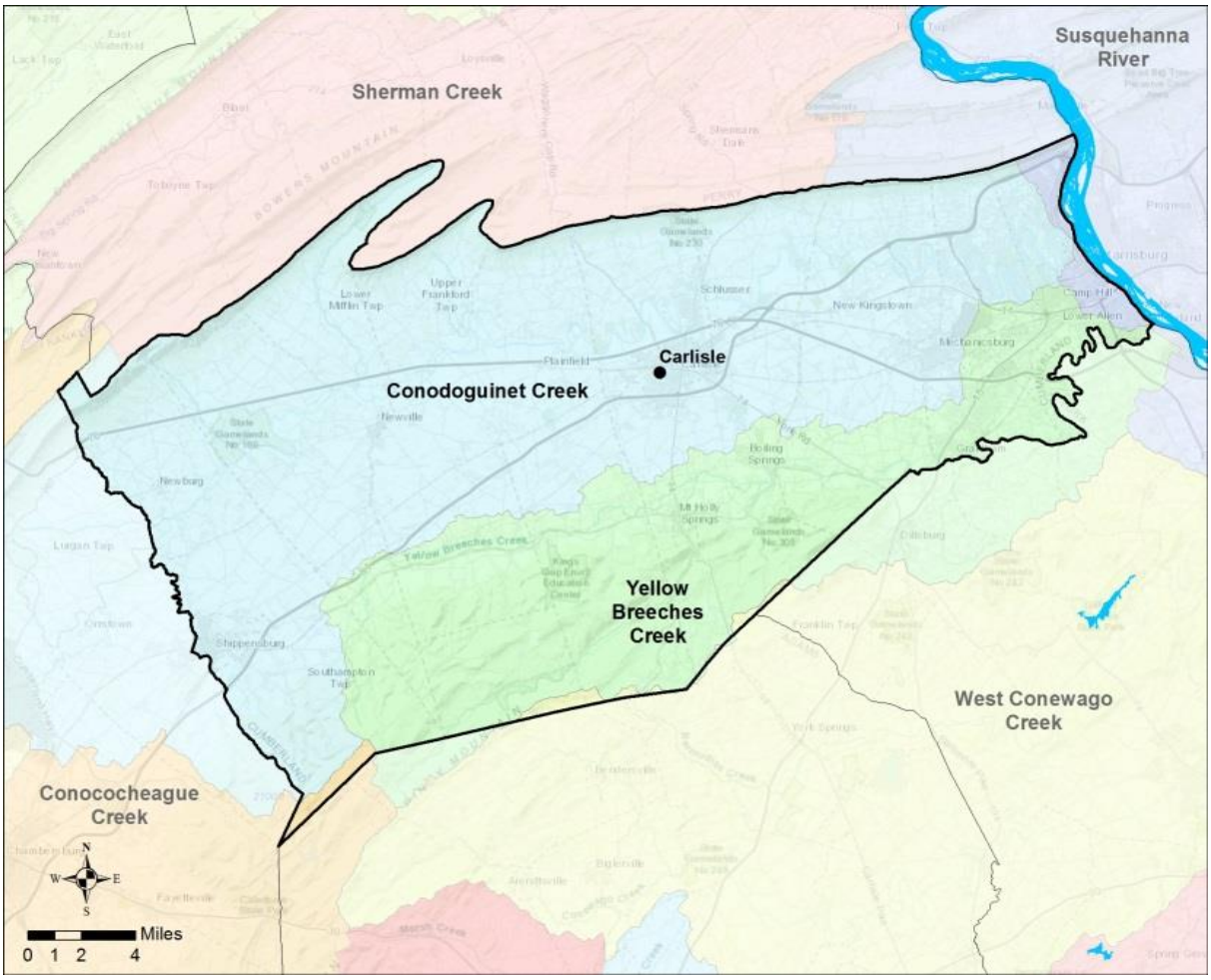
Sources of Nutrients & Sediment in Cumberland County

- It is estimated that most nutrients and sediment in Cumberland County streams comes primarily from agricultural sources (63%). Developed/urban (17%) and wastewater (10%) also make up a significant portion of the total controllable load.
- Effective management will address the specific sources of nutrients and sediment in Cumberland County:
  - On agricultural lands, the majority of nutrients are applied to the land as both fertilizer (65%) and manure (32%). Addressing both sources will be important.
  - On developed/urban lands, more than half of the nutrients entering local streams come from outside of the MS4 areas (53%) (regulated municipal separate stormwater sewer system). Turf grass or grassy areas in Cumberland County are responsible for more than half of the nutrient load (53%) and will be important to manage in both MS4 areas and outside of MS4 areas.
  - Areas outside of MS4s may require outreach, financial programs etc. to address the problems.
  - Wastewater contributes approximately 10% of the nitrogen load in Cumberland County, and has been recently reduced, there could still be slight opportunity for additional reductions.
  - Septic contributes a small portion of nutrients to local streams, but may still impact local water quality.
  - Most of the phosphorus and sediment in local streams comes from overland runoff or streambank erosion during rain events; the most effective management practices reduce application of phosphorus to the land, reduce runoff, and reduce soil erosion.
  - In both agricultural and developed/urban areas, erosion of stream banks are important sources of sediment and nutrients to local streams.

Opportunities for Implementation in Cumberland County

- The Conodoguinet Creek – Susquehanna River and Laurel Run – Susquehanna River HUC-12 are the highest loading watersheds for Nitrogen, Phosphorus and Sediment. These watersheds would be ideal watersheds to prioritize efforts.
- Wertz Run Conodoguinet Creek and Simmons Creek Conodoguinet Creek are also two of the higher loading watersheds within Cumberland County. These watersheds would be a good place to prioritize efforts to reduce nutrients.
- The Conodoguinet Creek Watershed contains a majority of the county's impaired stream miles.
- The significantly large area vulnerable to groundwater contamination (karst geology), will present a unique challenge for Cumberland County. However, focusing efforts on the nutrient application rate will be especially important to effectively managing the problem.
- Some effective practices to address nutrients and sediment are currently being implemented in Cumberland County, such as conservation tillage and barnyard runoff control.
- There are many more opportunities within the county to increase implementation of effective practices such as basic and advanced nutrient management, cover crops, grass and forest buffers in agricultural areas, stormwater controls, and urban nutrient management in developed areas.

Cumberland County's Local Watersheds



The following pages provide in-depth information on local water quality in Cumberland County's monitored watersheds.

Water Quality Monitoring

The overall objective of the WIP is improving Chesapeake Bay health. However, Pennsylvania is much more focused on improving local water quality in our local communities, which in turn will improve the waters of the Chesapeake Bay.

With this focus, it is important to utilize the most appropriate water quality monitoring data for each county or region. Below are some resources that can provide information on the local rivers and streams in your area. While these resources are often robust, they are not the only data available and local partners are encouraged to incorporate other local water quality monitoring efforts in this planning phase as well.

Throughout the county WIP planning stage, these data resources may provide important information stakeholders may need.

Chesapeake Bay Non-tidal Monitoring Network (NTN)

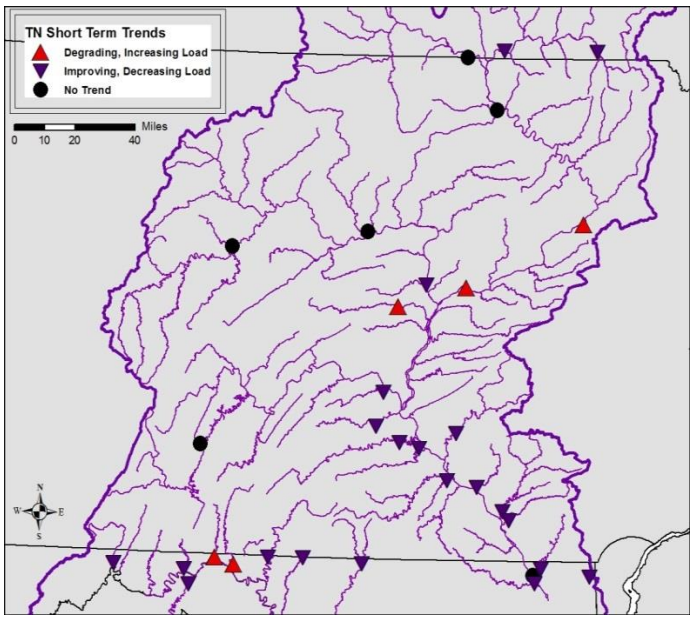
The United States Geological Survey (USGS), Susquehanna River Basin Commission (SRBC), Pennsylvania Department of Environmental Protection (DEP) and other state partners across the Chesapeake Bay watershed, monitor water quality at 115 stations. Changes in nitrogen, phosphorus, and suspended-sediment loads in rivers across the Chesapeake Bay watershed have been calculated using these monitoring data. Nutrient and sediment loads are calculated with at least five years of monitoring data, and trends are reported after at least ten years of data collection.

This data set is very robust. Though all counties may not have a long-term monitoring station within the county boundary, the nearest downstream station gives a regional picture of the current status and historical trends for nutrients and sediment.

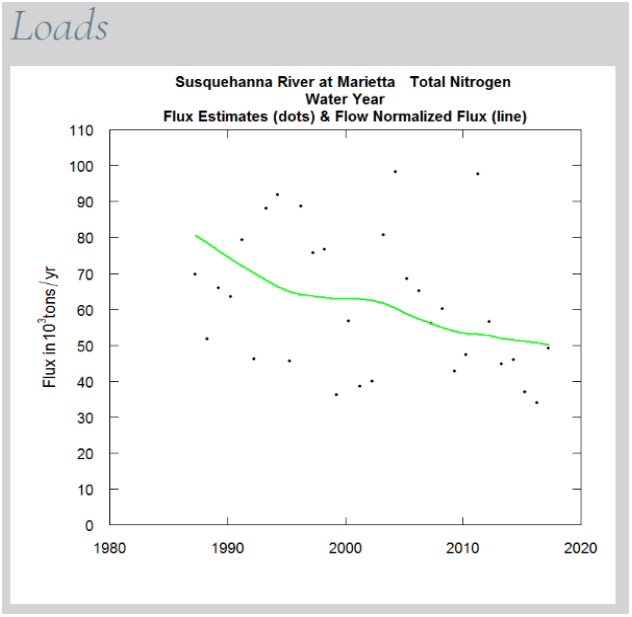
This data set is used to help calibrate the Chesapeake Bay Watershed Model which is the source of much of the information in the remainder of the toolbox.

Additional information for each monitoring station is available at:

- USGS Chesapeake Bay Non-tidal Website: https://cbrim.er.usgs.gov/summary.html
    - Interactive Map- https://cbrim.er.usgs.gov/maps/
- SRBC Sediment and Nutrient Assessment Program: https://www.srbc.net/portals/water-quality-projects/sediment-nutrient-assessment/



Nitrogen trends map from USGS



Historical Nitrogen Load from Susquehanna River at Marietta, Pa.

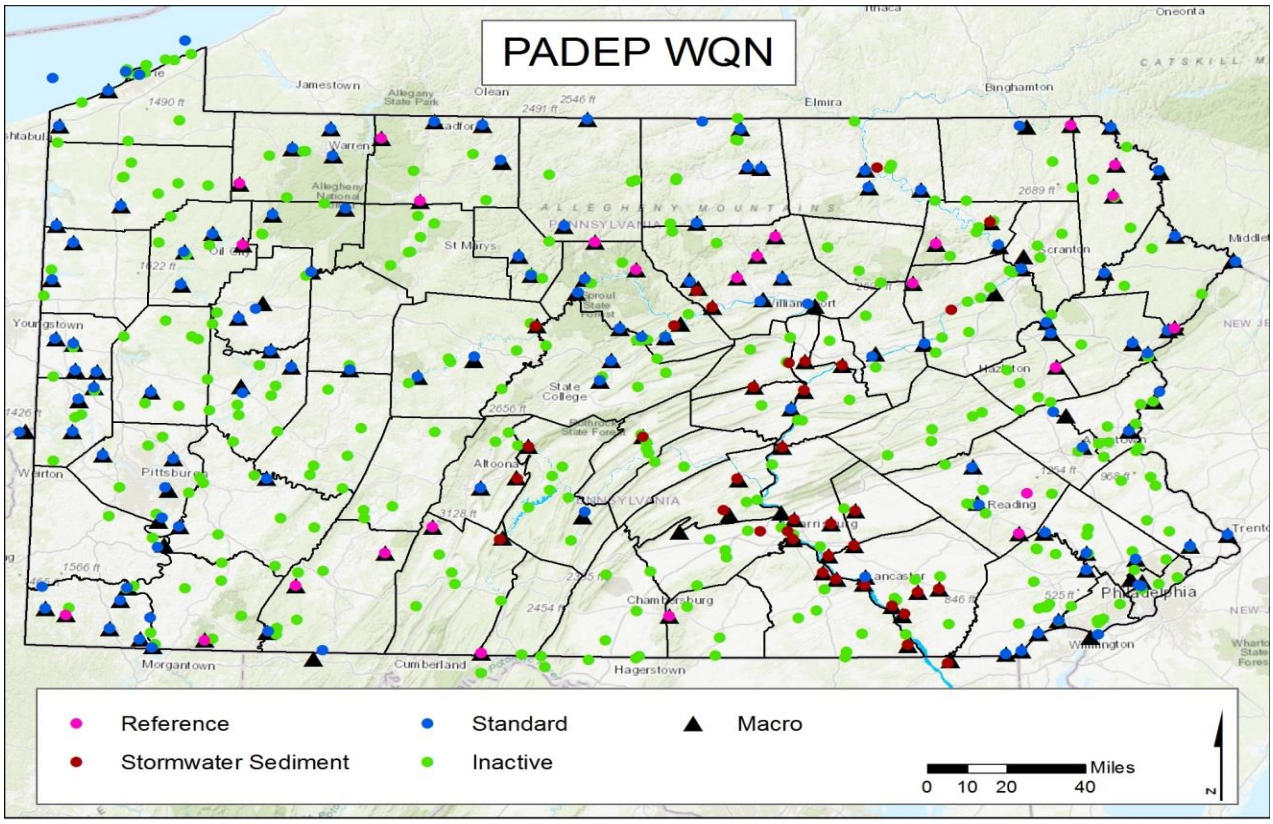
Pennsylvania Water Quality Network (WQN)

The Pennsylvania Water Quality Network (WQN) is a statewide, fixed station water quality sampling system operated by the PA Department of Environmental Protection's (DEP) Bureau of Clean Water. It is designed to assess both the quality of Pennsylvania's surface waters and the effectiveness of the water quality management program by accomplishing four basic objectives:

- Monitor water quality trends in major surface streams throughout the Commonwealth of Pennsylvania
- Monitor water quality trends in select reference waters
- Monitor the trends of nutrient and sediment loads in the major tributaries entering the Chesapeake Bay
- Monitor water quality trends in select Pennsylvania lakes

Some of these stations are also included in the NTN network, however there are many additional monitoring stations that are sampled at a different frequency than the NTN stations.

Additional information and access to the data can be found here:
http://www.depgis.state.pa.us/WQN/

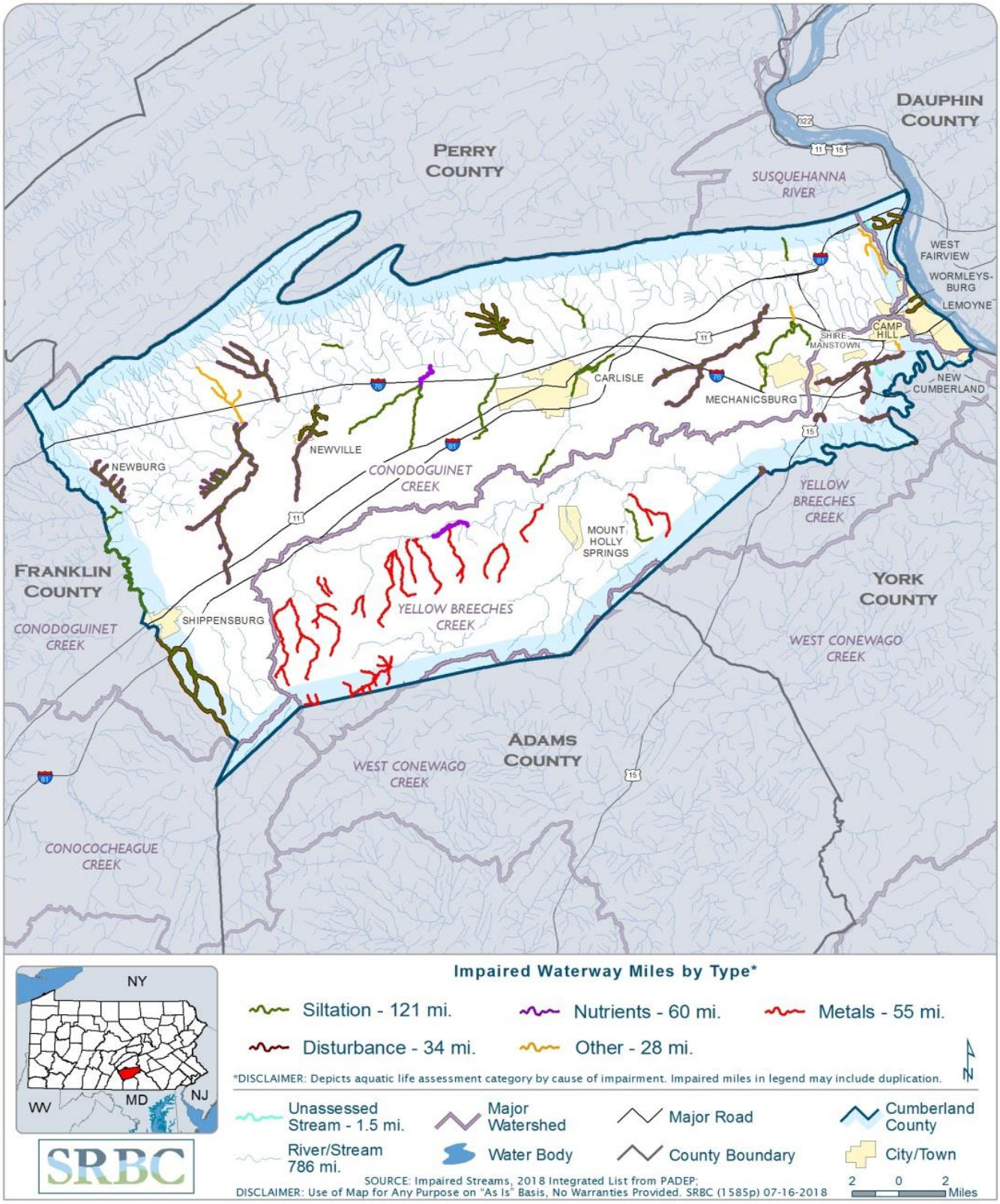


Additional Water Quality Data Sources-

There are additional data resources that may help to target efforts to local streams. Macroinvertebrate data and Continuous In-stream Monitoring (CIM) data are extensively collected across Pennsylvania to both assess and monitor stream health. Below are some additional resources to find this data:

- PADEP Macroinvertebrate Story Map and Data Viewer
  - http://www.depgis.state.pa.us/macroinvertebrate/index.html
  - Contains macroinvertebrate information, and scores as well as a viewer for accessing water quality data.
- National Water Quality Portal (USGS, U.S. EPA, National Water Quality Monitoring Council)
  - https://www.waterqualitydata.us/
  - Contains national water quality data; can be searched by county/region and downloaded.
- Susquehanna River Basin Commission Water Quality Portal
  - https://mdw.srbc.net/waterqualityportal
  - Contains water chemistry, macroinvertebrate, fish and habitat data across the Susquehanna River Basin.
- Susquehanna River Basin Commission Continuous Instream Monitoring (CIM) data
  - https://mdw.srbc.net/remotewaterquality/data_viewer.aspx
  - Contains CIM data including temperature, pH, conductance, dissolved oxygen and turbidity, along with additional parameters collected quarterly.
- Chesapeake Monitoring Cooperative Data Explorer
  - https://cmc.vims.edu/#/home
  - Contains volunteer and non-traditional (i.e. municipal) water quality and macroinvertebrate monitoring data collected throughout the Chesapeake Bay Watershed.

Impaired Waterways in Cumberland County, PA, 2018



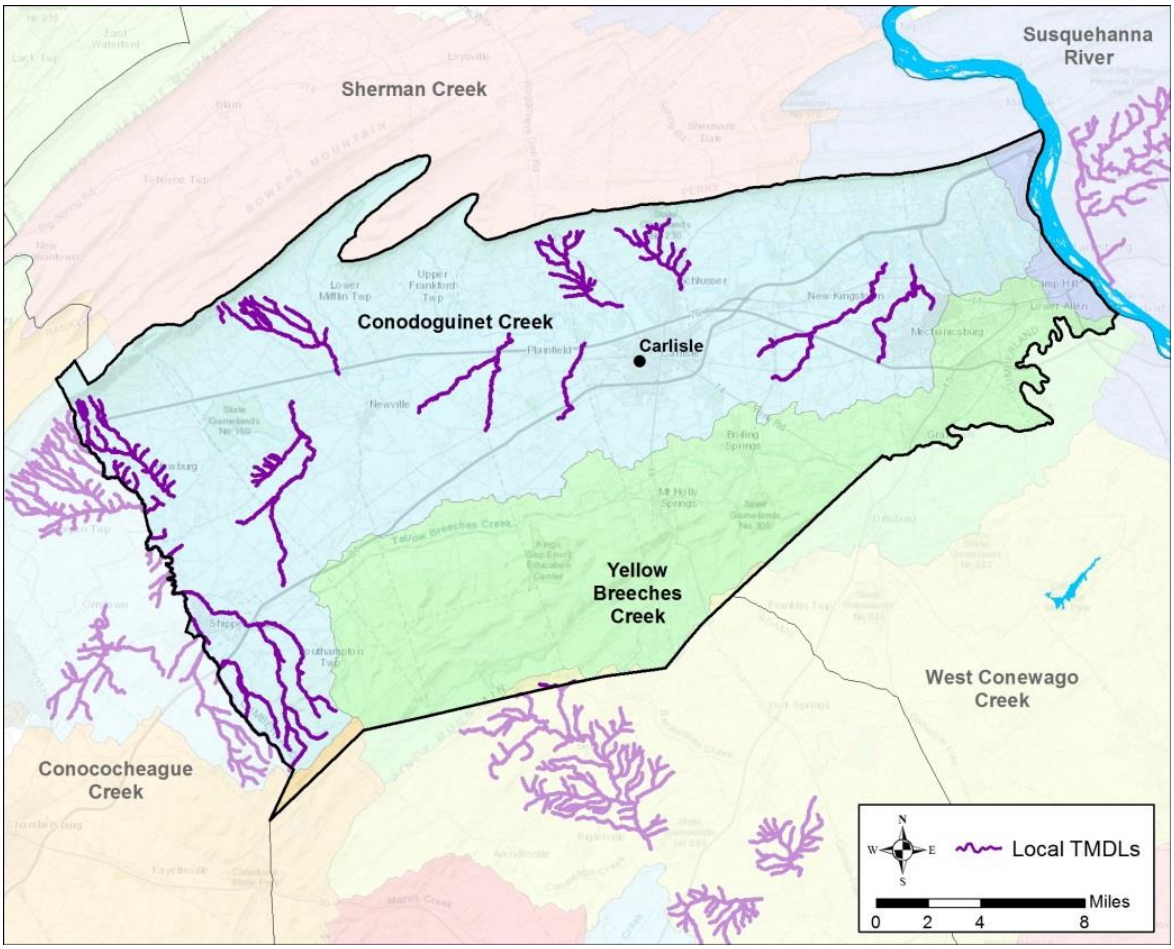
Of Cumberland County's 786 stream miles, approximately 30% have degraded aquatic communities due to causes such as siltation (excessive sediment), nutrient pollution and others.

Knowing the sources of these impairments helps to prioritize or coordinate efforts.

- For example, many agricultural practices that address nutrients can also address siltation impairments from sediment.
- Many urban/developed practices that address nutrients and sediment also address the same causes of pathogen impairments.
- Focusing efforts geographically in areas with impaired streams can help address local issues.

Local impaired waters listed on the 303(d) list can be found at PADEP: http://www.depgis.state.pa.us/integratedreport/index.html.

Local restoration efforts will help Cumberland County's watersheds.



While many waters are listed as impaired, only some of these impairments are being addressed through regulatory Total Maximum Daily Loads (TMDLs).

Local groups may want to coordinate restoration efforts to focus on the watersheds that already have these local TMDLs. Major watersheds with TMDLs in Cumberland County:

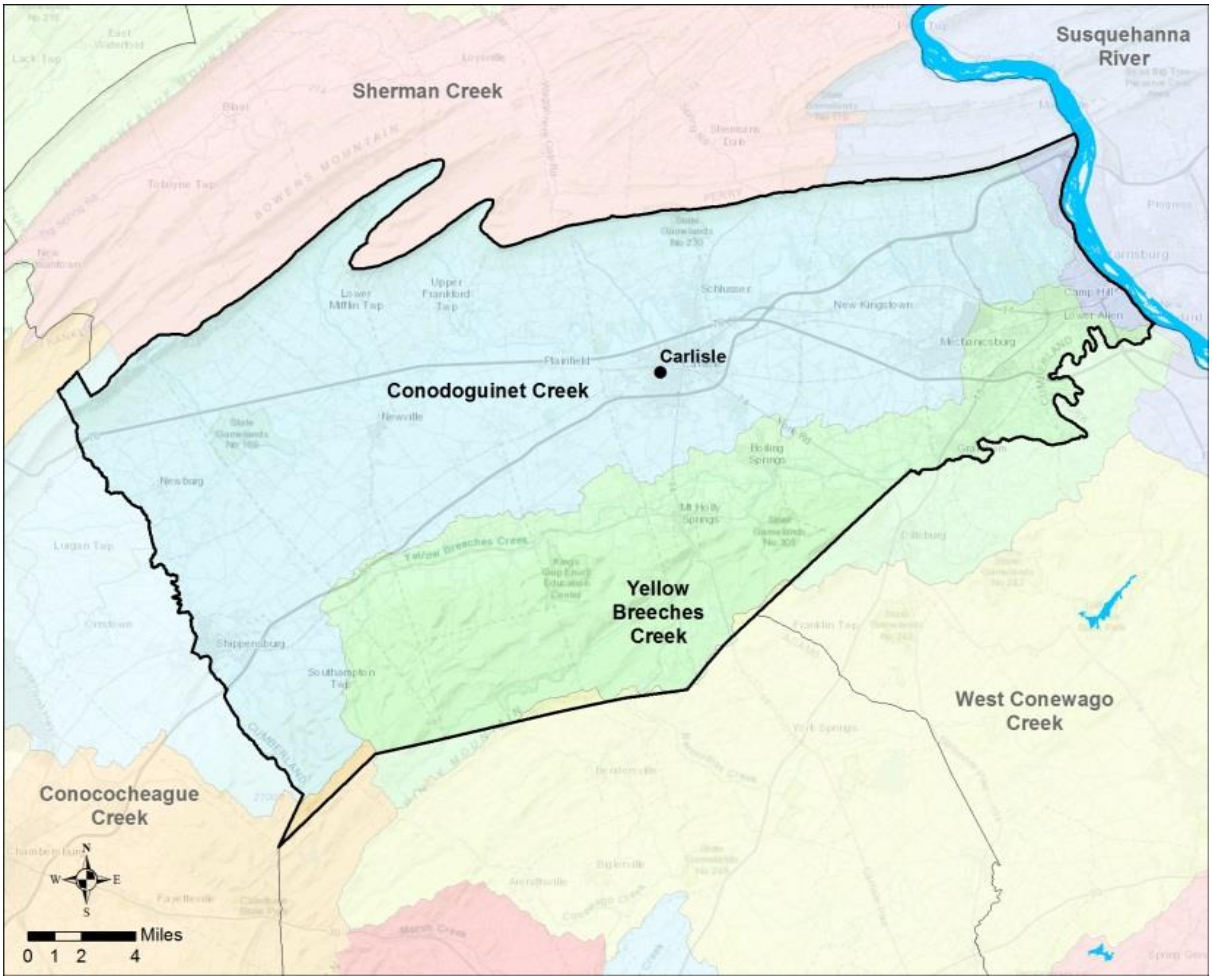
- Conodoguinet Creek
- Opossum Creek

Local impaired waters listed on the 303(d) list that have TMDLs can be found at PADEP: http://www.depgis.state.pa.us/integratedreport/index.html.

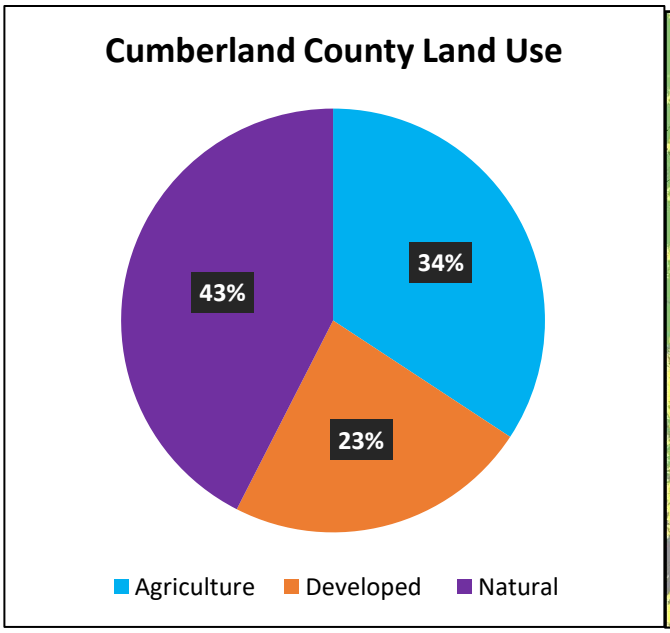
TMDL reports can be found at PADEP: http://www.ahs.dep.pa.gov/TMDL/

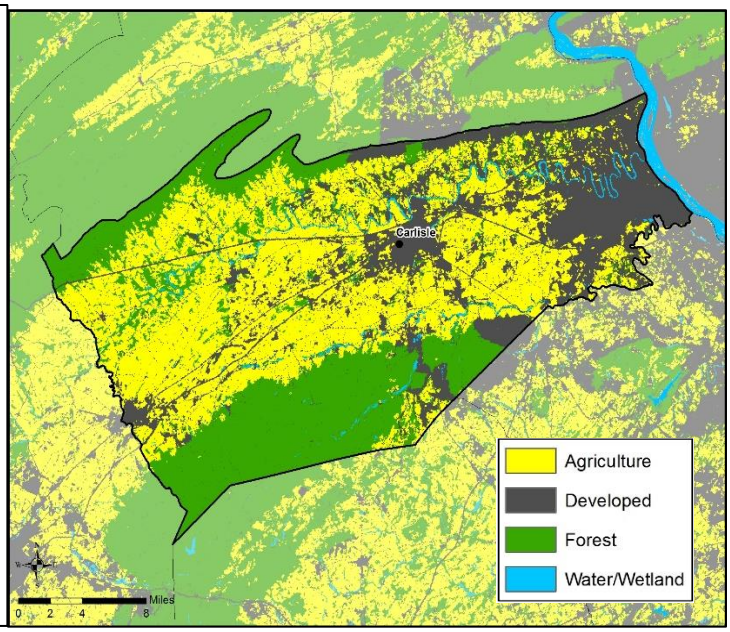
Sources of Nutrients and Sediment in Cumberland County

Cumberland County's Local Watersheds



Water Quality is Strongly Tied to Land Use





Cumberland County has challenges in restoring water quality.

- Agricultural and developed land generates more nutrients and sediment than forested land. Cumberland County has unique local water quality challenges in part due to its high acreage of these land uses.
- The pie chart above shows the breakdown of land uses in Cumberland County. 57 percent of the county is agricultural or developed land, which is higher than most other counties in Pennsylvania.
- The map above shows the geography of land uses, specifically illustrating the relatively small amount of forested land in the county.

High resolution land-use for the Chesapeake Bay watershed is available from USGS and the Chesapeake Bay Program at: https://chesapeake.usgs.gov/phase6/.

The map above is from Falcone, 2015. The breakdown of land use by county can be found on CAST at http://cast.chesapeakebay.net. Log in and click on reports' tab; Report type: loads report , Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress

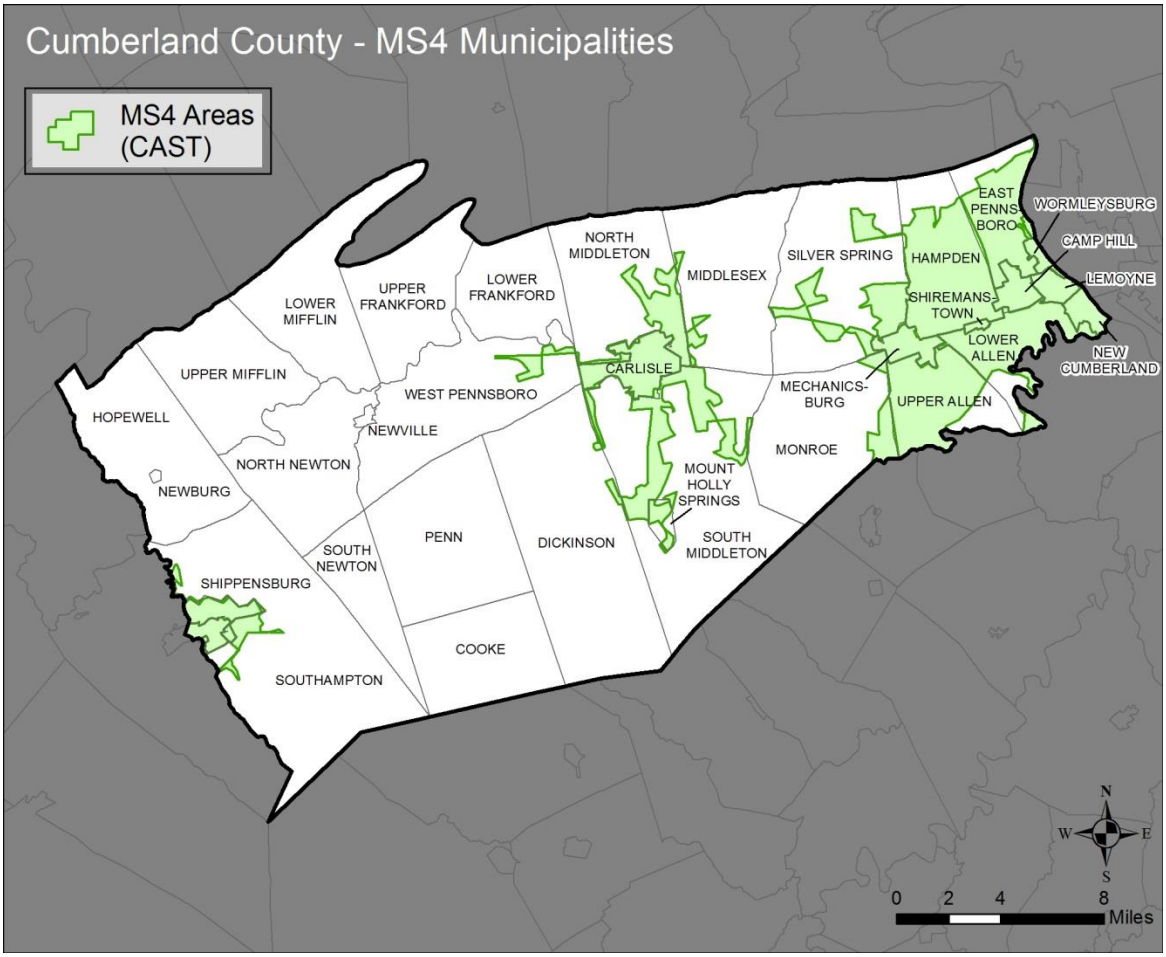
Land Use Breakdown in Cumberland County

Sector	Load Source	2018 Acres Available	2025 Acres Available
Agriculture	Feeding Space	243	260
Agriculture	Hay	33,948	34,201
Agriculture	Pasture	12,140	10,275
Agriculture	Row Crops	72,423	72,414
Agriculture	Other Ag	1,893	2,165
Developed	Construction	497	497
Developed	Pervious Developed	54,393	56,483
Developed	Impervious Developed	27,009	27,616
Natural	Forest	121,268	120,078

The numbers listed above show the projected sector growth within Cumberland County between 2018 and 2025. These numbers are based on data obtained from the U.S. population census, Census of Agriculture, reported construction and land use mapping. Using this data, CAST can project changes to land use acres that can help to inform local planners and assist with accounting for local sector growth.

The available acres in 2025 will influence the quantity of BMPs that can be put into CAST. These numbers are intended to help identify the potential in Cumberland County. Land conservation practices that conserve farmland and forest can help to offset the impact of development but may not be feasible for your county. Forested land generates less nutrients and sediment than developed land.

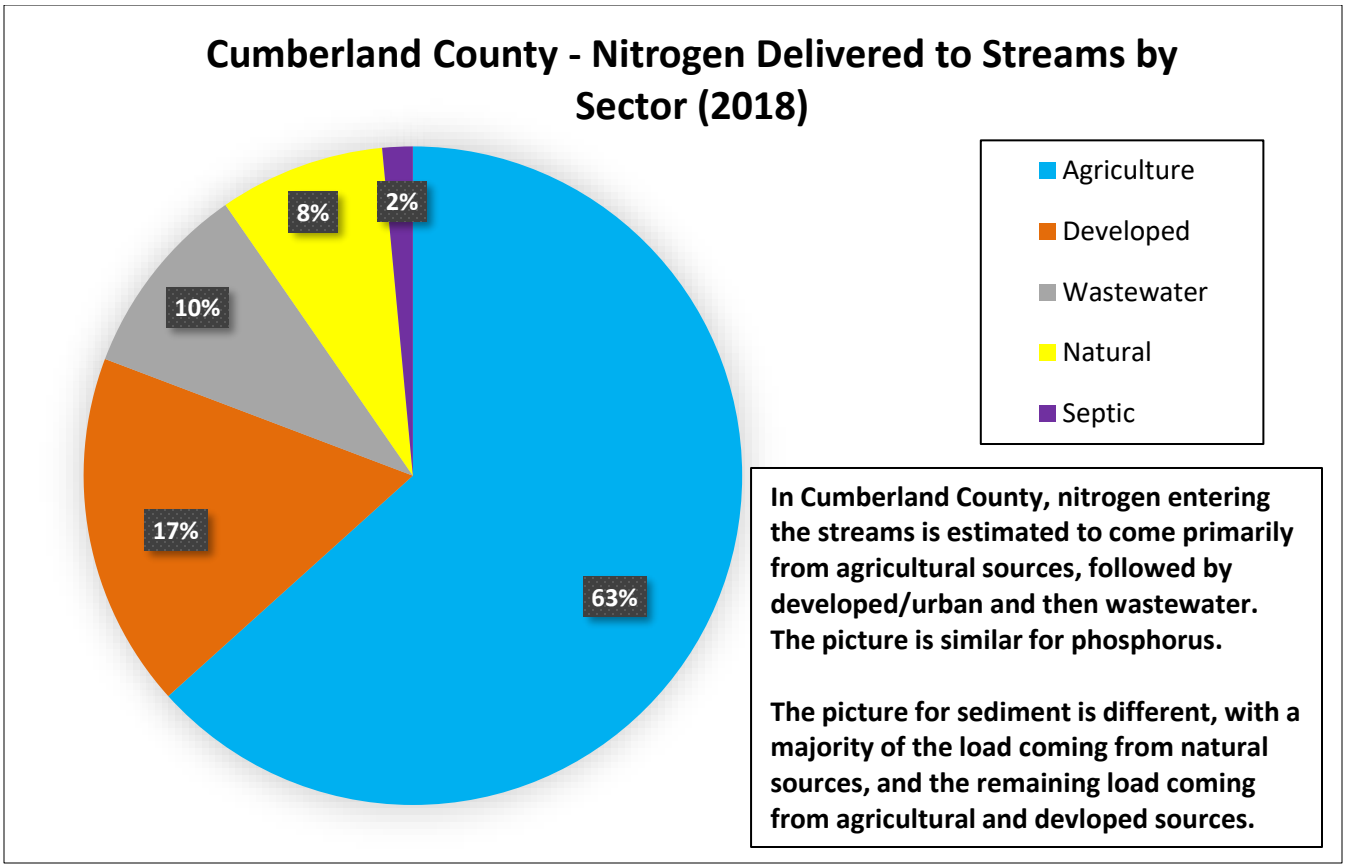
Additional breakdowns for each of the categories can be found at http://cast.chesapeakebay.net/. Log in and click on the reports' tab; Report Type: loads report, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress



Municipal separate storm sewer systems (MS4s) are identified above in Cumberland County.

Municipalities and other entities that meet certain standards must obtain NPDES permit coverage for discharges of stormwater from their municipal separate storm sewer systems (MS4s). MS4s must apply for NPDES permit coverage or a waiver if they are located in an urbanized area as determined by 2010 Census data.

More information can be found here-
http://www.dep.pa.gov/Business/Water/CleanWater/StormwaterMgmt/Stormwater/Pages/default.aspx



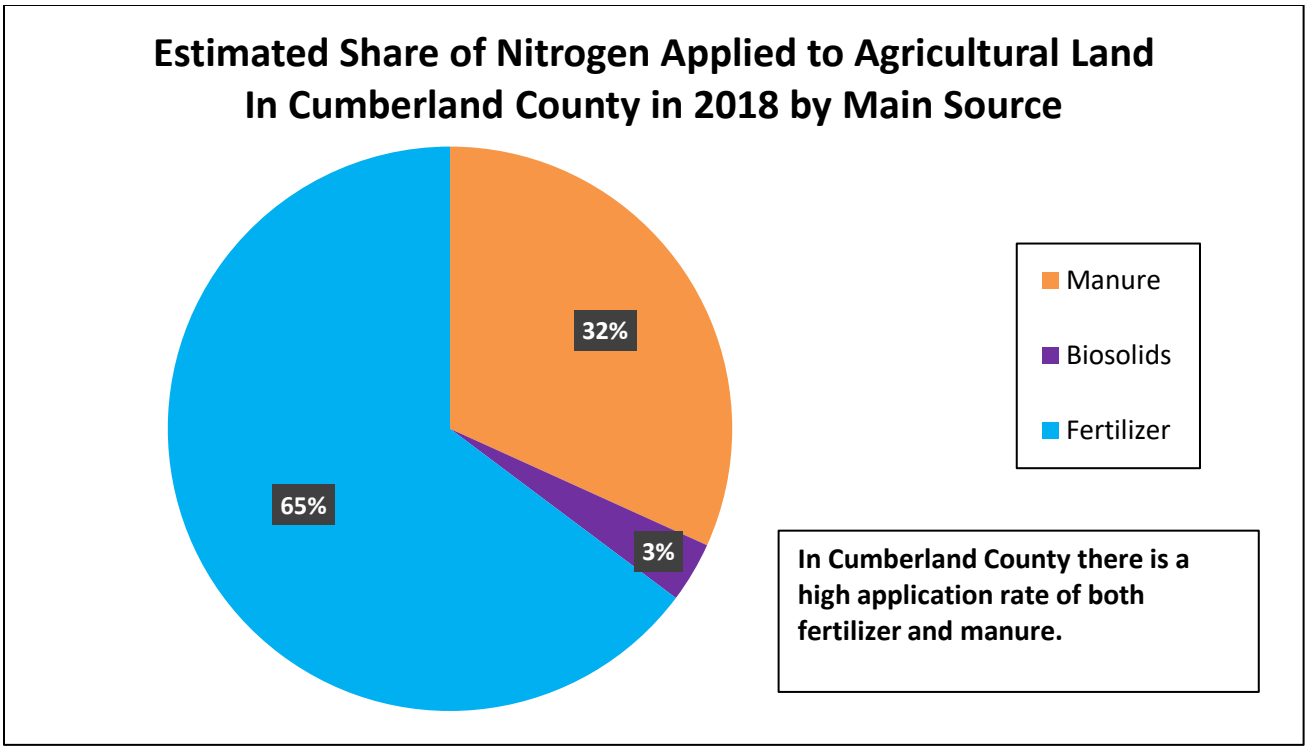
The pie chart above shows the percentage of nitrogen delivered to local streams based on land use or activity. Most nitrogen entering local streams in Cumberland County comes from agricultural sources including cropland, pasture and barnyards.

The developed/urban sector also contributes a fair amount of the load from stormwater.

Because agriculture and developed/urban sources make up the majority of the load in Cumberland County, these sectors will need to consider how they can supply the majority of the reductions to reach local goals. Wastewater and septic sources can also be reduced.

These estimates were generated using the Chesapeake Bay Program's Phase 6 Watershed Model. The model is generated using water quality monitoring data.

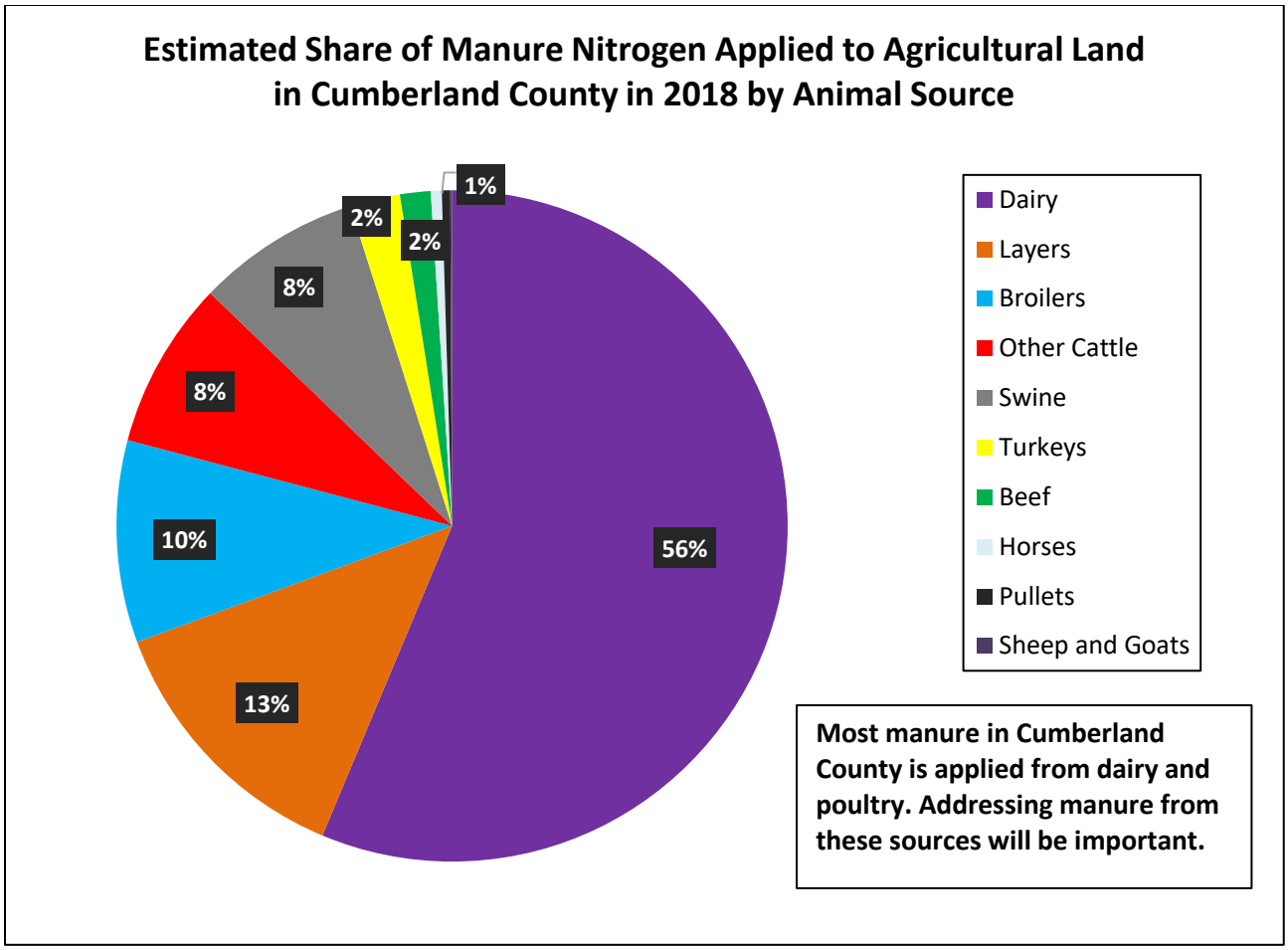
Estimated loads by sector can be found on CAST at: http://cast.chesapeakebay.net/. Log in and click on the reports' tab; Report type: loads report, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress



Understanding how nutrients are being applied to the land can lead to the sources that may need to be managed.

- Most nutrients are applied to agricultural land in Cumberland County as both fertilizer and manure
- Nutrients that are applied to agricultural land and not taken up by crops can negatively impact water quality.
- When identifying strategies to manage nutrient application, focusing on both fertilizer and manure will be important to address the issue. These can require different control and management practices such as advanced or precision nutrient application, manure storage, manure transport, etc.

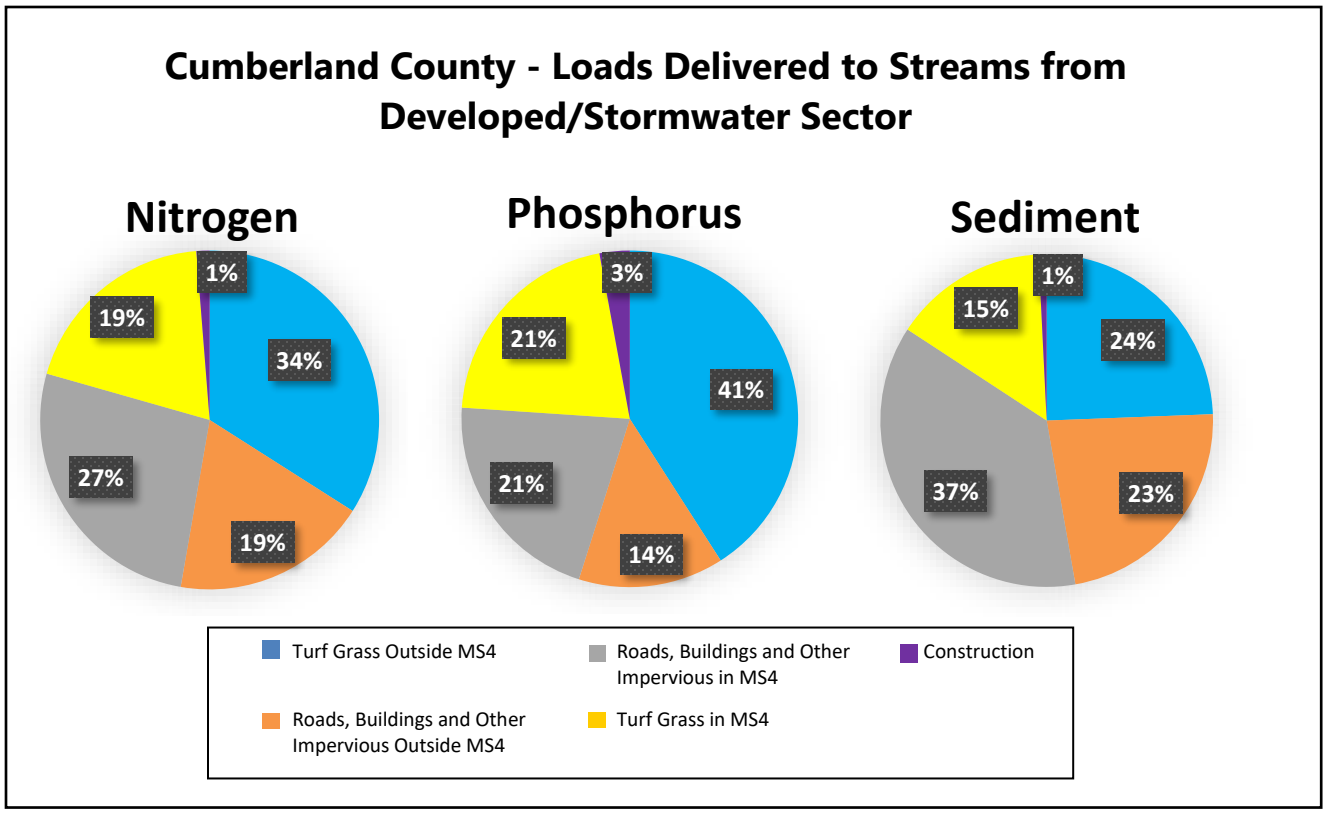
Estimated application of nutrients by source can be found on CAST at: http://cast.chesapeakebay.net/. Log in and click on the reports' tab. Report type: Nutrients Applied, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress



Understanding where manure is coming from within the county will help identify opportunities to manage it.

Most manure in Cumberland County is from dairy and poultry operations. Focusing efforts on implementing practices at these operations can address a large portion of Cumberland County's manure management needs.

Estimated share of manure nutrient animal sources can be found on CAST at http://cast.chesapeakebay.net/. Log in and click on the reports' tab. Report type: Nutrients Applied, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress



The developed / stormwater sector is also an important source of nutrients and sediment in Cumberland County.

The charts above show the estimated breakdown of sources of nutrients and sediment to local streams exclusively from developed/urban lands.

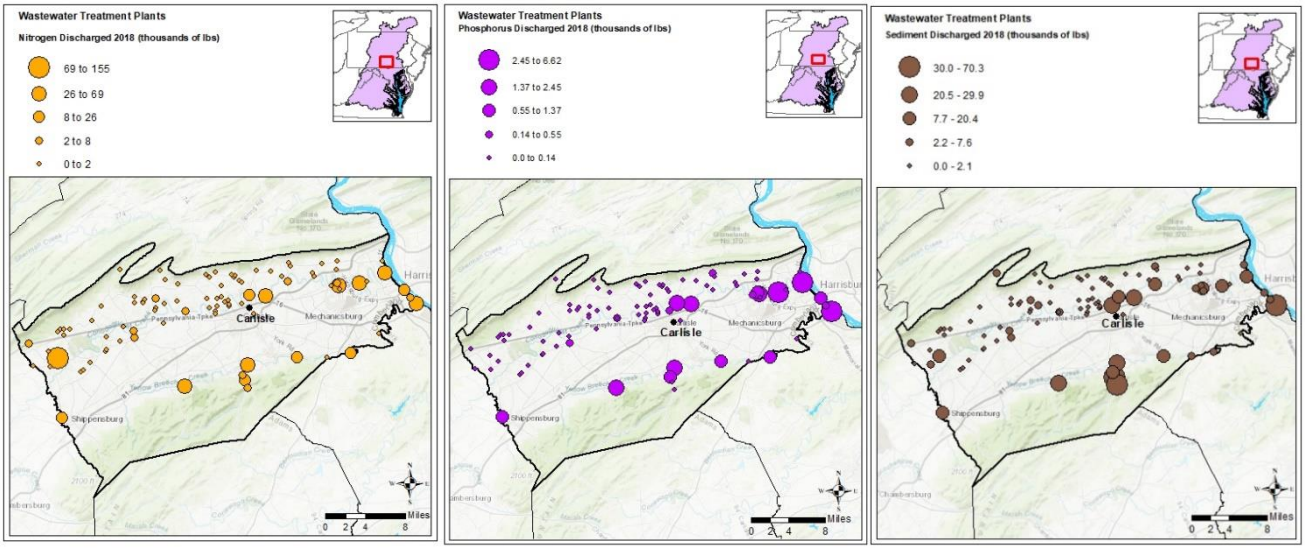
- MS4 (municipal separate storm sewer systems) areas are regulated by DEP, while land outside of MS4 areas is not regulated for stormwater.
- More than half of the developed/urban load comes from outside MS4 areas.
- Managing unregulated stormwater areas may take different outreach, voluntary programs and funding programs to implement practices.
- Turf grass represents grassy and barren lands that have been altered through compaction, removal of organic material, and/or fertilization. These include all lawns and grassy areas in residential, commercial, recreational, cemeteries, shopping centers, etc.

Understanding where stormwater nutrient and sediment comes from is an important first step in addressing it.

- In Cumberland County, a majority of the nutrient load attributes from turf grass, while a majority of the sediment load comes from impervious areas.

Estimated loads by sources can be found on CAST at http://cast.chesapeakebay.net/. Log in and click on the reports' tab. Report type: loads report, Geographic Scale: county-area in CBWS only, Geographic Area: select your county, Scenarios: 2017 Progress V9

Wastewater Treatment Plant Locations and Loads



The maps above show the locations of wastewater treatment plants within Cumberland County and their annual discharges of nitrogen, phosphorus and sediment in 2018.

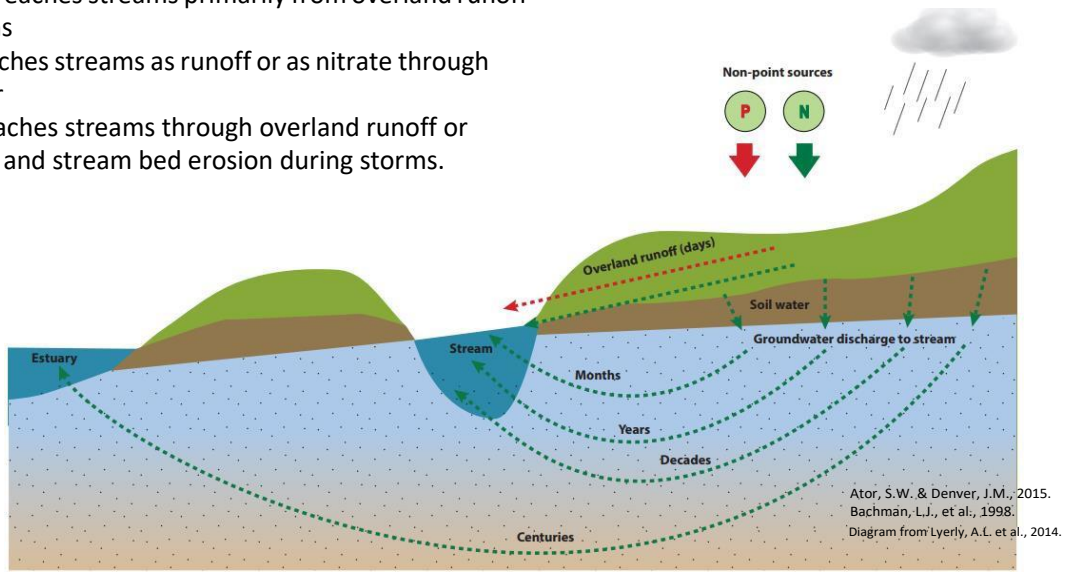
Although wastewater makes up a smaller portion of nutrient loads to streams than agricultural or developed land and has already been significantly reduced in Cumberland County, there is still room for reductions, particularly of nutrients. Wastewater is an important source to control as discharges directly enter the streams.

Understanding where the higher loading plants are located can help identify opportunities for treatment plant upgrades in the future.

Reported wastewater treatment plant discharges and treatment plant locations are available from the Chesapeake Bay Point Source Database:
https://www.chesapeakebay.net/what/downloads/bay_program_nutrient_point_source_database

The transport of nutrients matters for planning implementation

- Phosphorus reaches streams primarily from overland runoff during storms
- Nitrogen reaches streams as runoff or as nitrate through groundwater
- Sediment reaches streams through overland runoff or stream bank and stream bed erosion during storms.



The way in which nutrients and sediment reach our streams impacts which practices will be effective at controlling them.

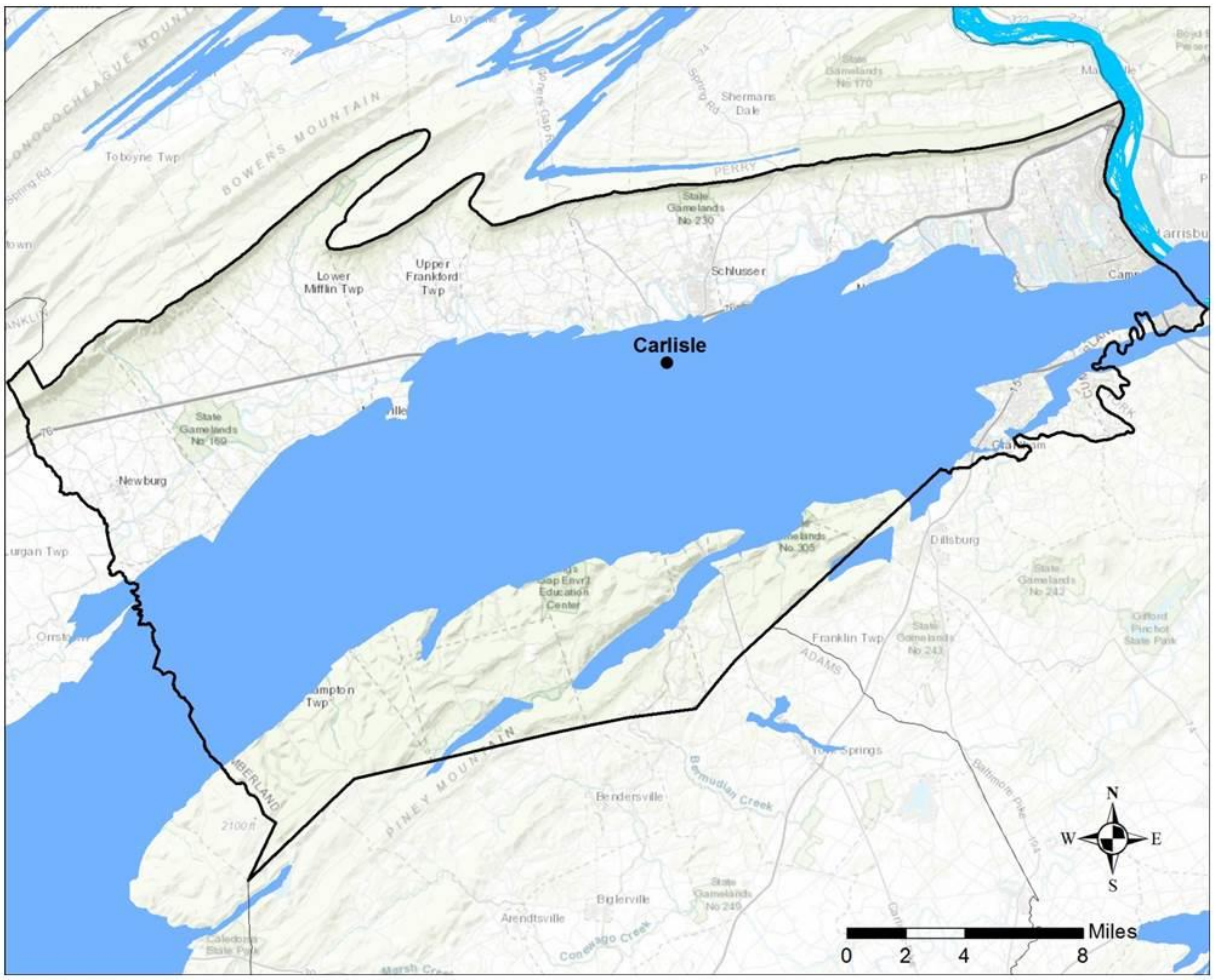
Phosphorus and sediment travel over the top of the land during high runoff events such as storms and rainfall, and also enter streams from stream bank or stream bed erosion.

Nitrogen can travel over land as well, but in many watersheds, including those in Cumberland County, it travels primarily as nitrate underground in groundwater.

- For example, in the Conodoguinet Watershed 61.2%, and in the Yellow Breeches 81.4%, of the nitrogen entering the streams is in the form of nitrate from groundwater.
- If management practices only focus on overland runoff, they could be missing a lot of the nitrogen that is entering streams through groundwater.
- Once nitrogen is in groundwater, it is very difficult to remove. Effective practices include those that stop nitrogen from entering groundwater in the first place, like applying less nitrogen and planting cover crops.
- Riparian buffers can remove nitrate from groundwater if placed in effective locations.

Percent of Nitrogen entering the streams as groundwater nitrate can be found at https://pubs.usgs.gov/wri/wri98-4059/pdf/wri98-4059.pdf

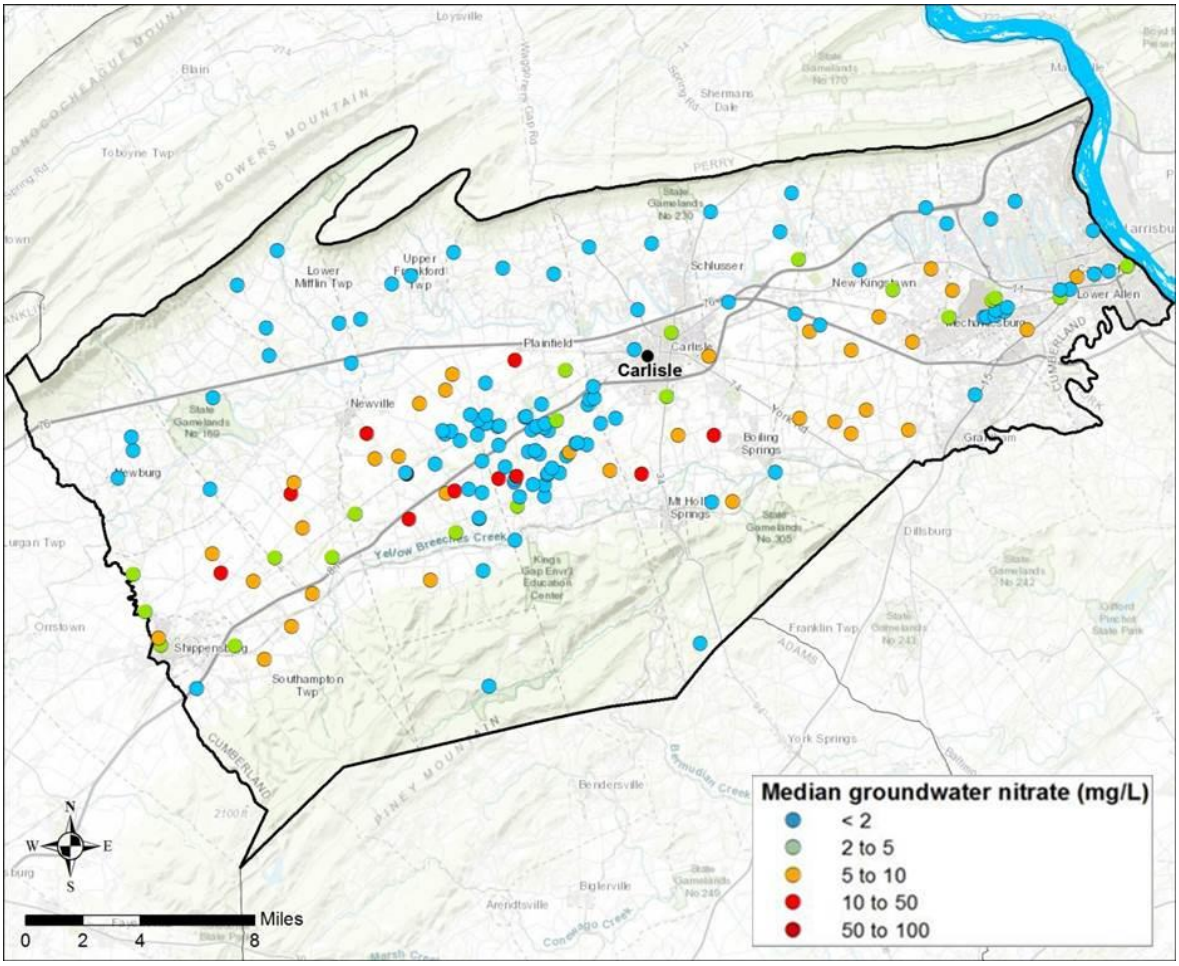
Cumberland County contains a large area vulnerable to groundwater contamination (Karst highlighted in blue)



Certain areas of the watershed are more vulnerable to nitrate contamination of groundwater because the geology under the soil makes it easier for nitrogen to enter groundwater and provides less opportunity for its removal to occur naturally.

- The map above shows these vulnerable areas, which have Karst or carbonate geology.
- Cumberland County has a unique challenge due to the significantly large area vulnerable to groundwater contamination.
- Agricultural land on top of these areas makes the groundwater especially vulnerable due to the high inputs of nitrogen onto the landscape.
- These areas can be very effective for focusing efforts that keep nitrogen from getting into groundwater and are especially important areas to manage application of nitrogen.

Nitrate groundwater concentrations in Cumberland County

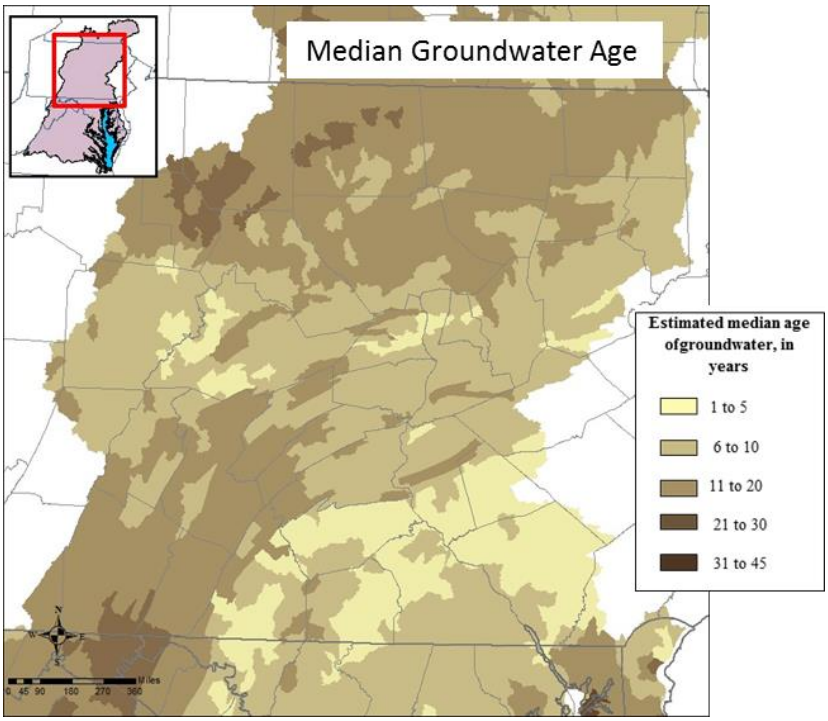


Groundwater in Cumberland County has some elevated nitrate levels.

- This can be due to the vulnerable geology, and also to the over-application of nutrients over time.
- Because groundwater contributes a significant portion of nitrogen to streams in these watersheds, groundwater nitrate levels are good indicators of what will eventually enter streams.
- In a few cases throughout Cumberland County, groundwater nitrate levels exceed the EPA's safe drinking water threshold of 10 mg/L.

Groundwater quality data over multiple years can be found from USGS: https://water.usgs.gov/owq/data.html.

Groundwater takes varying amounts of time to reach streams depending on location



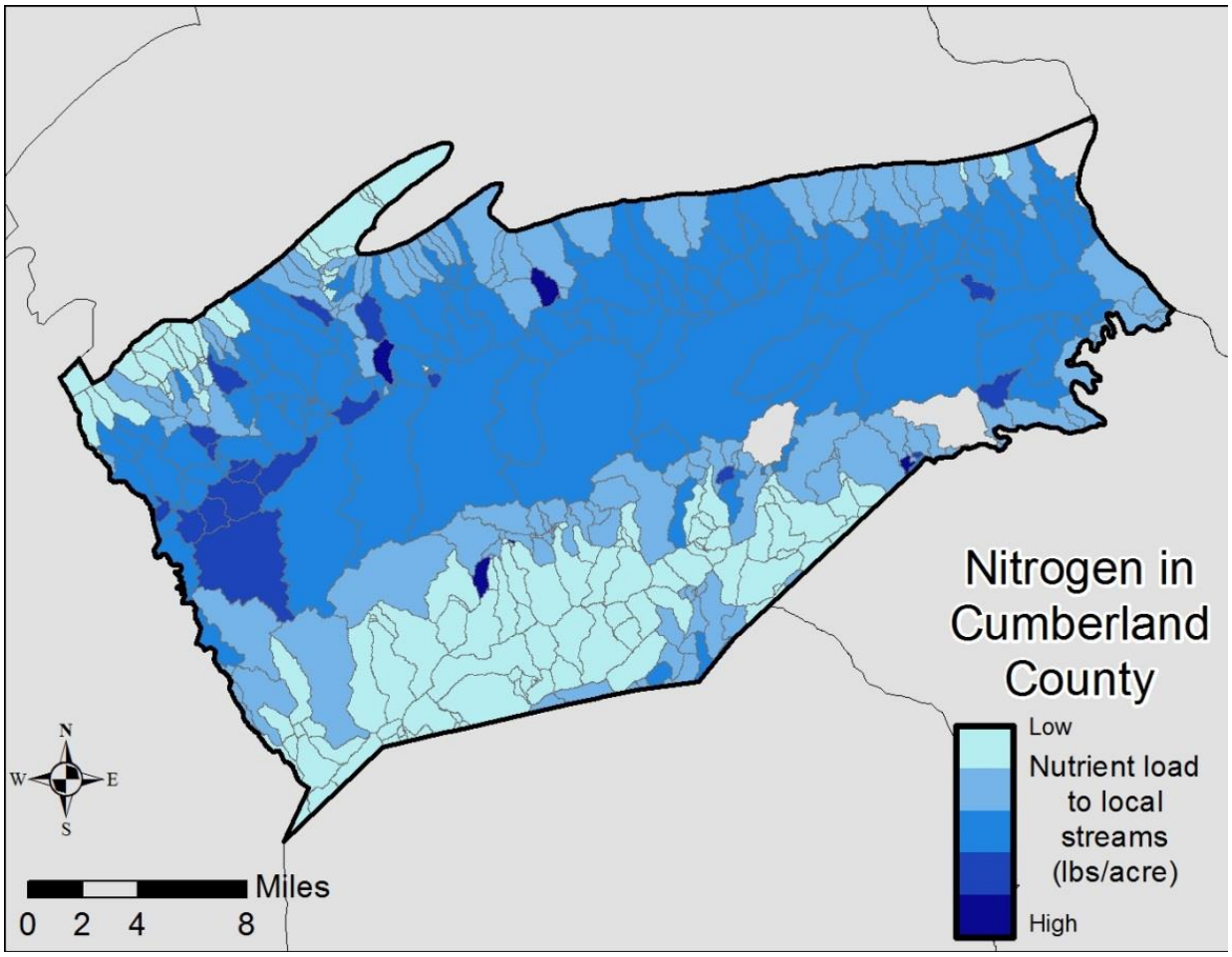
- Nitrate in groundwater represents a range of ages from recent to decades old
- Benefits from management actions will manifest immediately as well as into the future
- Chesapeake Bay Program estimates the median groundwater age across Cumberland County is between 1 and 10 years, with much of the groundwater being less than 5 years old.
- This means we expect very little "lag time" between when a practice is implemented and when that practice's impact can be seen in local streams. That presents a unique opportunity for Cumberland County.

Groundwater takes anywhere from days to years to reach nearby streams.

In Cumberland County, the groundwater is some of the youngest in the Chesapeake Bay watershed, meaning that it doesn't take long to reach streams.

This means we would expect to see benefits from management actions related to groundwater relatively sooner compared to other areas of the watershed.

USGS SPARROW Model Nitrogen



Focusing efforts on the highest loading areas within Cumberland County can result in the greatest water quality benefits

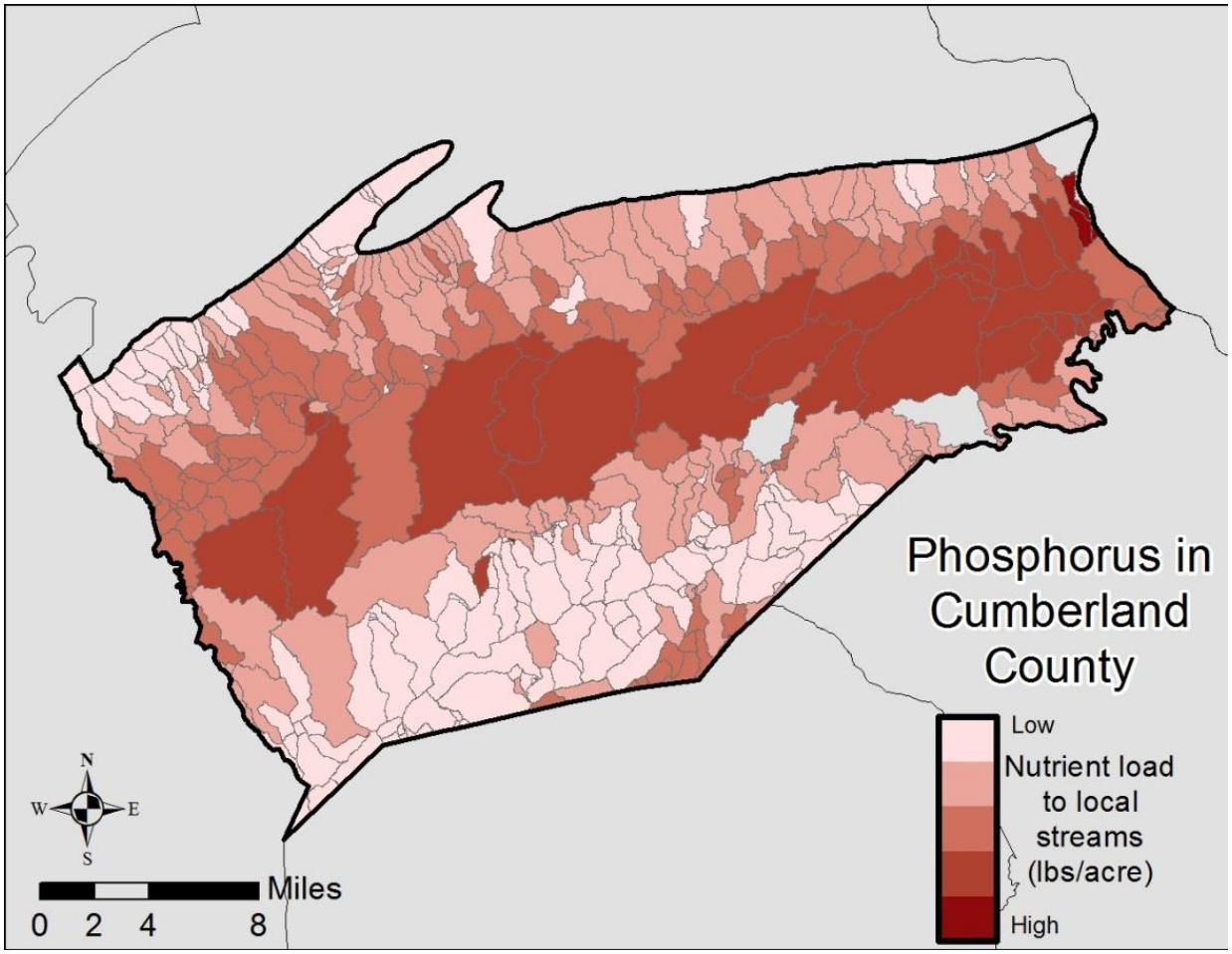
We can estimate where the highest amounts of nitrogen are entering local streams.

The maps above show these higher loading areas within Cumberland County.

Focusing efforts on the highest loading areas can result in the greatest water quality benefits by addressing a larger portion of the nutrients entering streams. In Cumberland County, the highest loading areas for both nitrogen and phosphorus tend to overlap in many areas. Focusing restoration efforts in those areas can be effective for both nitrogen and phosphorus.

The maps above are generated from the USGS SPARROW model for the Chesapeake Bay watershed. More info can be found- https://water.usgs.gov/nawqa/sparrow/#

USGS SPARROW Model- Phosphorus



Focusing efforts on the highest loading areas within Cumberland County can result in the greatest water quality benefits

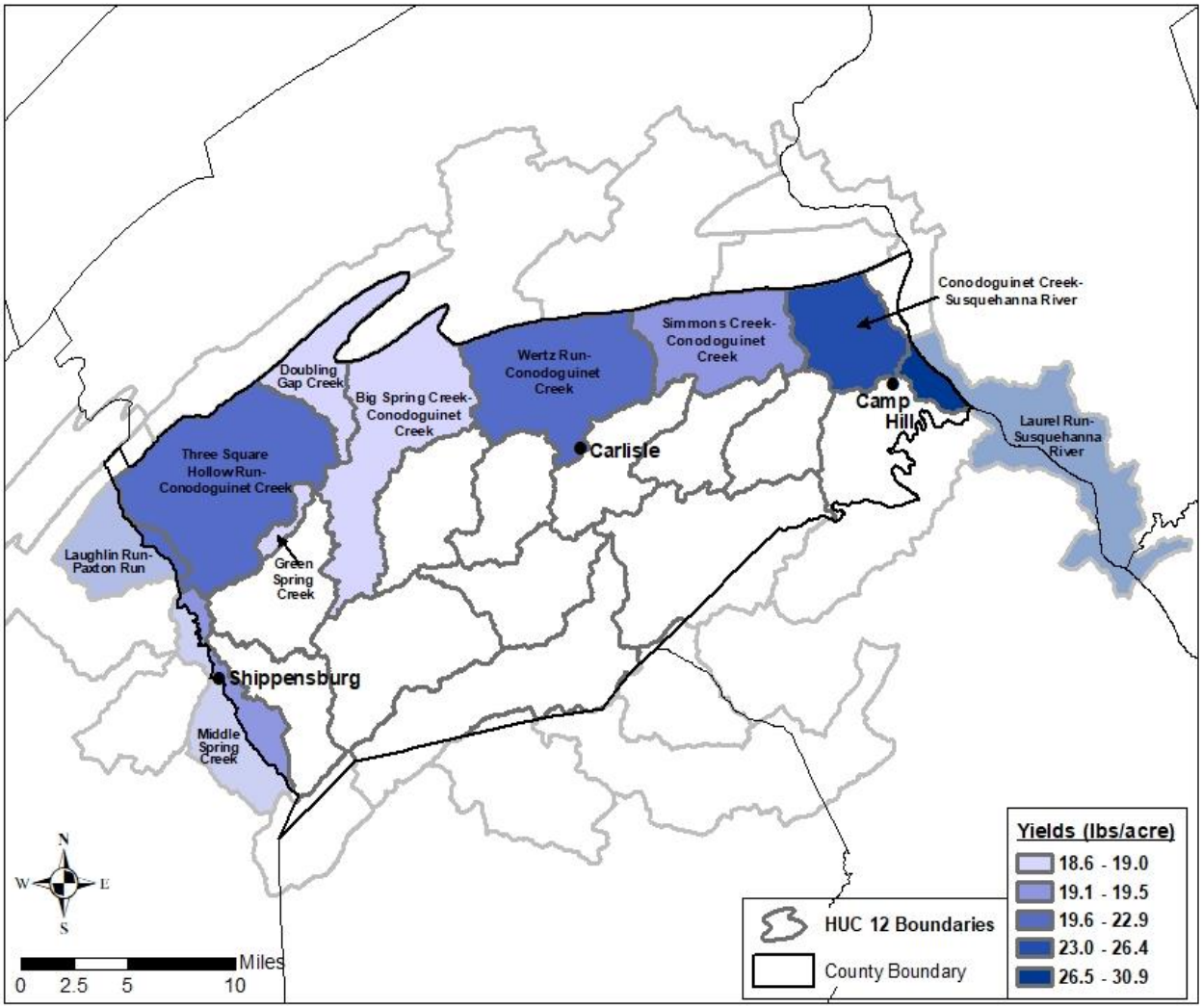
We can estimate where the highest amounts of phosphorus are entering local streams.

The maps above show these higher loading areas within Cumberland County.

Focusing efforts on the highest loading areas can result in the greatest water quality benefits by addressing a larger portion of the nutrients entering streams. In Cumberland County, the highest loading areas for both nitrogen and phosphorus tend to overlap in many areas. Focusing restoration efforts in those areas can be effective for both nitrogen and phosphorus.

The maps above are generated from the USGS SPARROW model for the Chesapeake Bay watershed. More info can be found- https://water.usgs.gov/nawqa/sparrow/#

Top 10 HUC-12 Total Nitrogen Yields



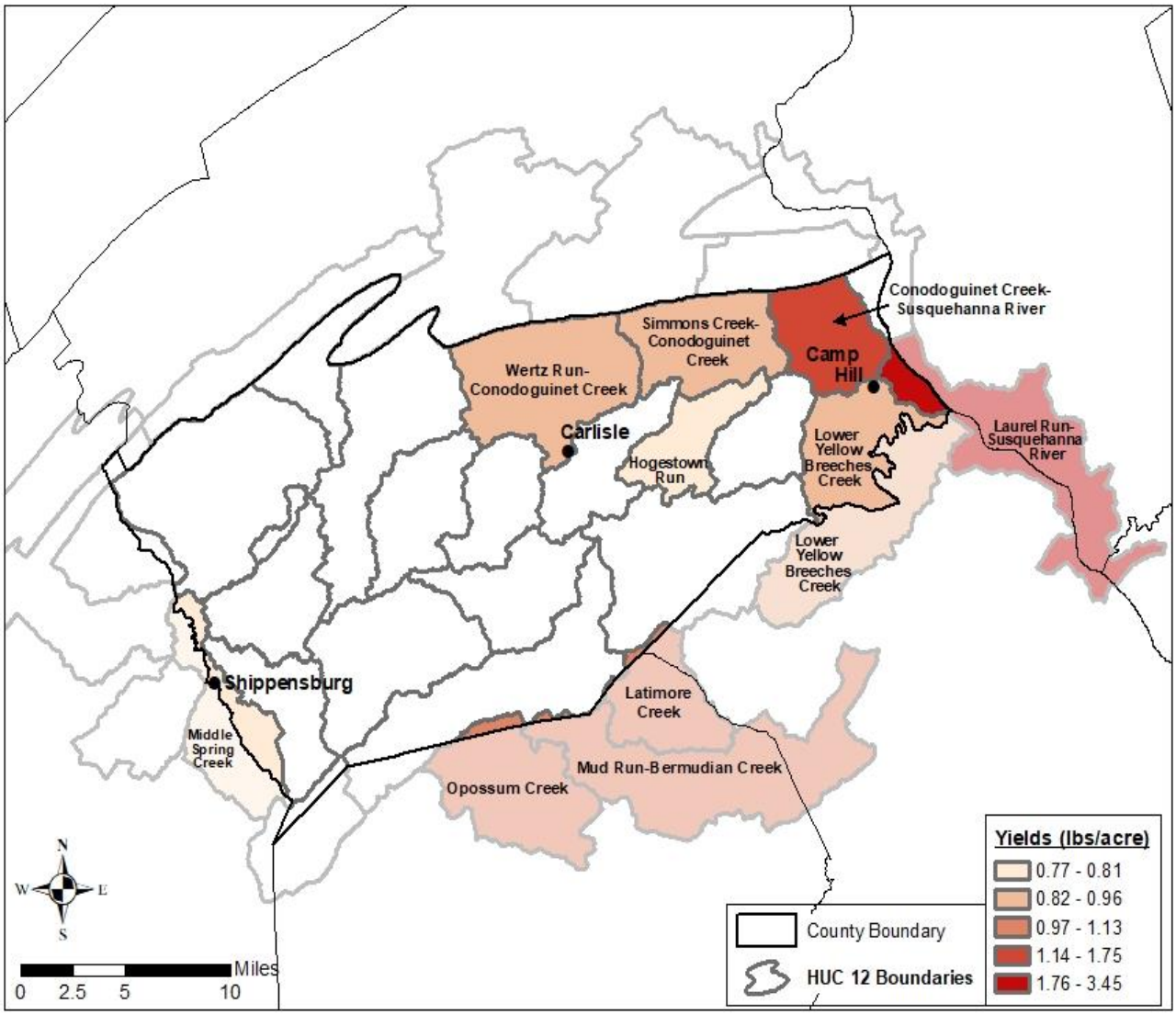
For each Hydrologic Unit Code (HUC) 12 watershed with a portion of the watershed inside of Cumberland County geographic border, we can estimate the total nitrogen yield (in pounds/acre).

HUCs are a way of identifying drainage basins, or watersheds, in an area that catches precipitation that falls within that area, and funnels it to a particular creek, stream, river and so on, until the water drains into an ocean. Drainage basins come in all shapes and sizes, with some only covering an area of a few acres while others are thousands of square miles across, and cross boundaries such as county, state, and international borders. HUC-12 is a more local sub-watershed level that captures tributary systems.

The above map shows the top 10 HUC-12 watersheds for Total Nitrogen yields.

- Although we can never expect these areas to reduce their entire yield, identifying where the highest yields come from can help to geographically focus efforts.
- Laurel Run-Susquehanna River and Conodoguinet Creek-Susquehanna River are the HUC-12 watersheds with the highest estimated total nitrogen yields.
- Where HUC-12 boundaries fall within more than one county, it may be helpful to develop inter-county partnerships.

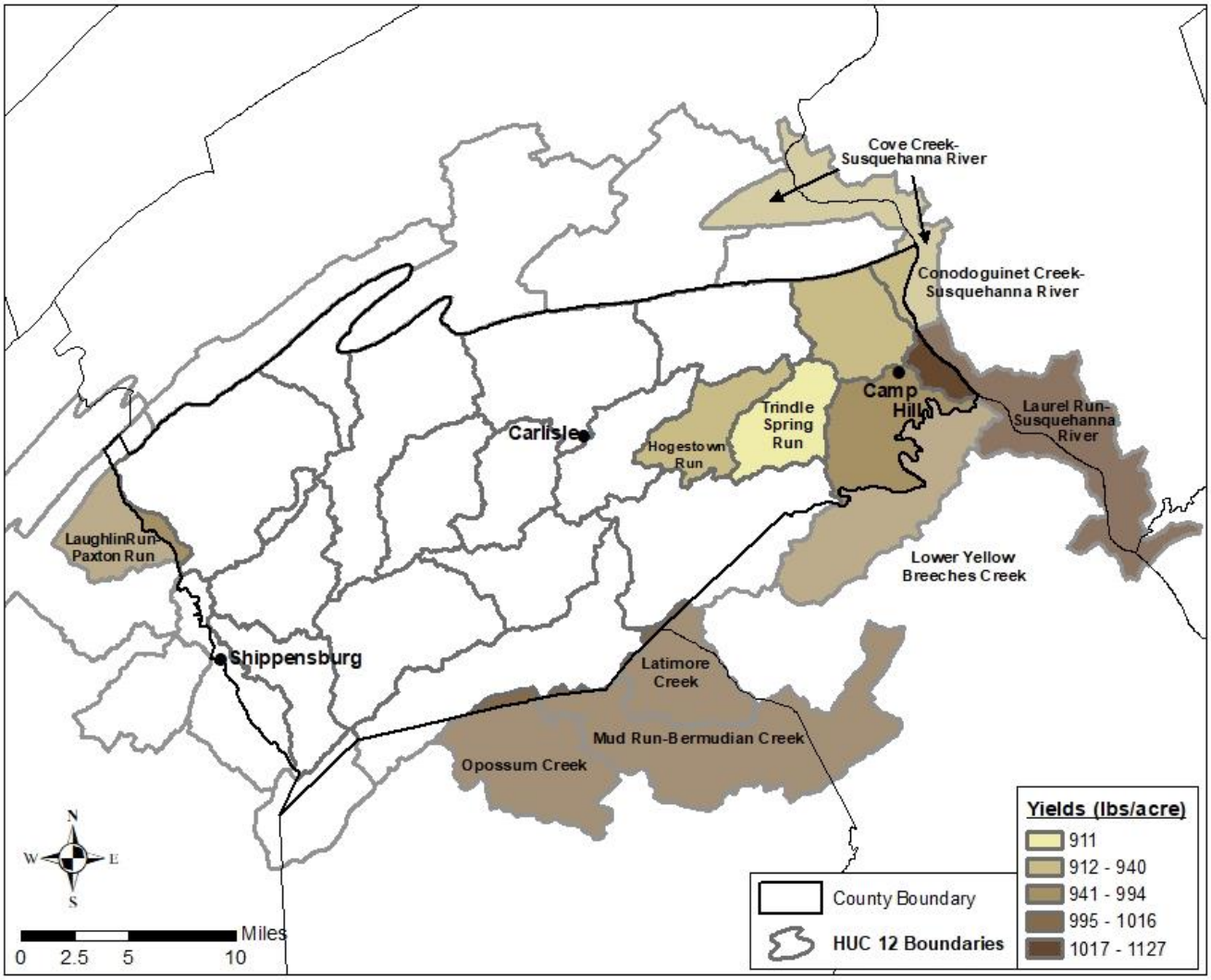
Top 10 HUC-12 Total Phosphorus Yields



For each Hydrologic Unit Code (HUC) 12 watershed with a portion of the watershed inside of Cumberland County geographic border, we can estimate the total phosphorus yield (in pounds/acre).

- The above map shows the top 10 HUC-12 watersheds for Total Phosphorus yields.
- Although we can never expect these areas to reduce their entire yield, identifying where the highest yields come from can help to geographically focus efforts.
- Laurel Run-Susquehanna River and Conodoguinet Creek-Susquehanna River are the HUC-12 watersheds with the highest estimated Total Phosphorus yields.
- Where HUC-12 boundaries fall within more than one county, it may be helpful to develop inter-county partnerships.

Top 10 HUC-12 Total Suspended Sediment Yields



For each Hydrologic Unit Code (HUC) 12 watershed with a portion of the watershed inside of Cumberland County geographic border, we can estimate the total suspended sediment yield (in pounds/acre).

- The above map shows the top 10 HUC-12 watersheds for Total Suspended Sediment yields.
- Although we can never expect these areas to reduce their entire yield, identifying where the highest yields come from can help to geographically focus efforts.
- Laurel Run-Susquehanna River and Mud Run- Bermudian Creek are the HUC-12 watersheds with the highest estimated Total Suspended Sediment yields.
- Where HUC-12 boundaries fall within more than one county, it may be helpful to develop inter-county partnerships.

Most Cost-effective Agricultural Practices for Nitrogen Reduction in Cumberland County

Sector	BMP	Nitrogen $/lb reduced/year
Agriculture	Dairy Precision Feeding and/or Forage Management	-3.38
Agriculture	Alternative Crops	0.72
Agriculture	Grass Buffer	1.38
Agriculture	Grass Buffer-Streamside with Exclusion Fence	1.38
Agriculture	Soil Conservation and Water Quality Plans	1.61
Agriculture	Barnyard Runoff Control	1.94
Agriculture	Wetland Restoration – Floodplain	2.52
Agriculture	Forest Buffer	2.96
Agriculture	Agricultural Stormwater Management	3.10
Agriculture	Water Control Structure	3.10
Agriculture	Grass Buffer – Narrow	3.16
Agriculture	Forest Buffer – Streamside Exclusion Fence	3.36
Agriculture	Loafing Lot Management	5.26
Agriculture	Cropland Irrigation Management	5.84
Agriculture	Tree Planting	6.21

The list above reflects the top 15 most cost-effective agricultural practices for reducing nitrogen in Cumberland County.

This list can serve as a starting point to assess feasibility of practice implementation.

For example, even though Alternative Crops are cost-effective, this practice involves replacing crops with others such as switchgrass, which may not be a feasible practice to implement.

Most Cost Effective BMPs can be found here:
http://cast.chesapeakebay.net/Documentation/DevelopPlans

- Under "Cost Effectiveness of BMPs", Click on the "BMP Pounds Reduced and Costs by County" link.

Detailed information about the BMPs can be downloaded on the CAST website at http://cast.chesapeakebay.net/Home/SourceData by clicking "Download Source Data".

The Official Quick Reference Guide for BMPs can be found here:
https://www.chesapeakebay.net/documents/BMP-Guide_Full.pdf

Most Cost-effective Developed Practices for Nitrogen Reduction in Cumberland County

Sector	BMP	Nitrogen $/lb reduced/year
Developed	Forest Planting	13.42
Developed	Forest Buffer	16.85
Developed	Bioswale	127.09
Developed	Infiltration Practices w/o Sand, Veg. – A/B soils	140.41
Developed	Wet Ponds and Wetlands	169.75
Developed	Dry Extended Detention Ponds	176.01
Developed	Vegetated Open Channels – A/B soils, no underdrain	187.04
Developed	Tree Planting – Canopy	200.12
Developed	Storm Drain Cleaning	341.08
Developed	Bioretention/raingardens – C/D soils, underdrain	435.29

The list above reflects the top 10 developed, most cost-effective practices at reducing nitrogen in Cumberland County.

This list can serve as a starting point to assess feasibility of practice implementation.

For example, even though forest planting is cost effective, it may not be feasible to turn parks and open spaces into forests.

Most Cost Effective BMPs can be found here:
http://cast.chesapeakebay.net/Documentation/DevelopPlans

- Under "Cost Effectiveness of BMPs", Click on the "BMP Pounds Reduced and Costs by County" link.

Detailed information about the BMPs can be downloaded on the CAST website at http://cast.chesapeakebay.net/Home/SourceData by clicking "Download Source Data".

The Official Quick Reference Guide for BMPs can be found here:
https://www.chesapeakebay.net/documents/BMP-Guide_Full.pdf

Remaining Opportunities in Cumberland County for Agricultural Practices

Practice	Current Reported Implementation	Acres Currently Reported	Acres Remaining
Basic Nutrient Management	12%	14,000	105,000
Conservation Tillage	6%	4,700	20,000
High Residue Tillage	58%	42,400	--
Traditional Cover Crop	20%	14,400	55,000
Cover Crop with Fall Nutrients	3%	2,200	--
Prescribed Grazing	7%	900	11,300
Barnyard Runoff Control	56%	135	108
Soil & Water Conservation Plans	15%	17,400	102,800
Forest Buffers	N/A	500	32,000

This chart shows the current **reported** implementation in Cumberland County of some effective agricultural practices, and the remaining acres of land in the county available to implement those practices.

The current reported implementation percent reflects how much of the land that is available for a particular practice already has that practice reported to be implemented on it.

For example, prescribed grazing's current percent implementation reflects that 7 percent of pasture land in Cumberland County is currently reported to have prescribed grazing implemented. 11,300 acres of pasture remain in the county without prescribed grazing, which may represent an opportunity for further implementation of that practice.

Remaining opportunity is determined as the difference between reported implemented acres and all available acres on which the practice can be implemented. Land on which BMPs can be implemented are available in CAST. Reported implementation is available on CAST at http://cast.chesapeakebay.net. Log in and click on the reports' tab. Report type: BMP Summary, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress.

Remaining Opportunities in Cumberland County for Stormwater Practices on Developed/Urban Land

Practice	Acres Currently Reported
Erosion & Sediment Control	100%
Runoff Reduction	1,989
Stormwater Treatment	180
Wetlands and Wet Ponds	183
Bio retention	53
Dry ponds	342
Urban Tree Planting	2

This chart shows the current **reported** implementation in Cumberland County of stormwater practices.

Erosion and sediment control addresses construction areas and time periods. However, sediment from developed land and from erosion of streams on developed land persist as issues long after construction is over. Therefore, stormwater management is incredibly important for managing these issues once construction ends.

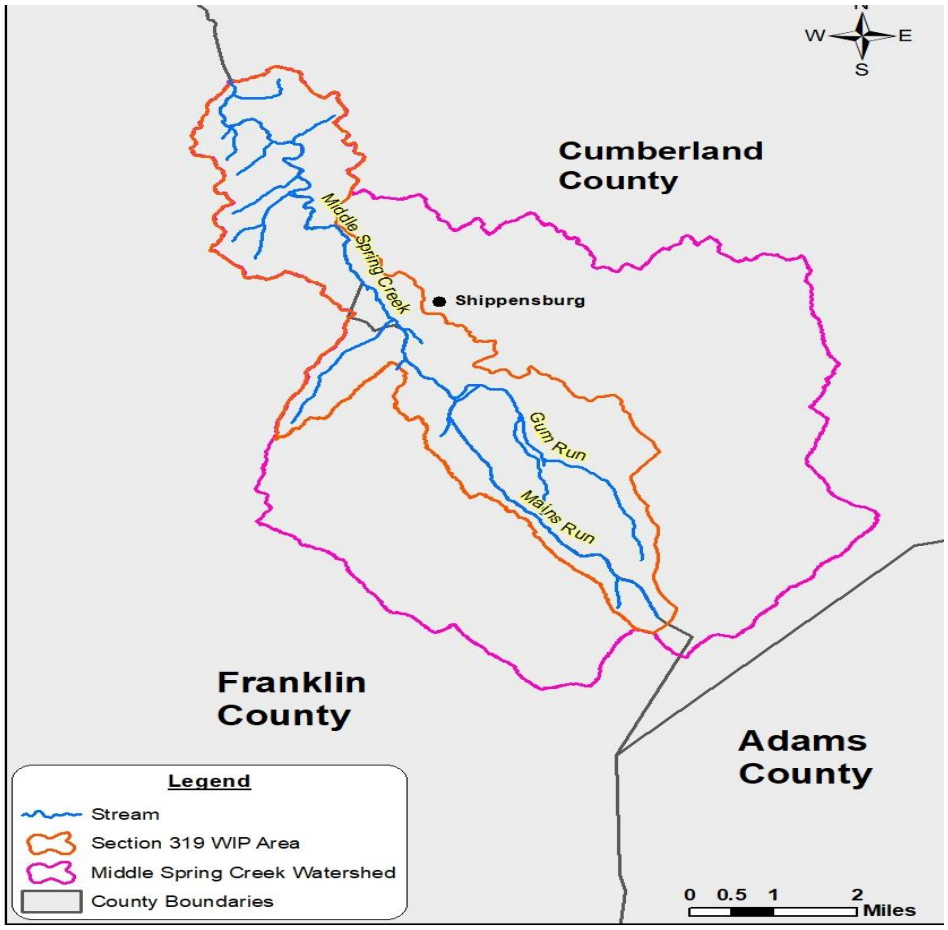
Opportunities exist in Cumberland County to implement stormwater management practices in developed and urban areas.

Remaining opportunity is determined as the difference between reported implemented acres and all available acres on which the practice can be implemented. Land on which BMPs can be implemented are available in CAST. Reported implementation is available on CAST at http://cast.chesapeakebay.net. Log in and click on the reports' tab. Report type: BMP Summary, Geographic Scale: county-area in CBWS only, Geographic Area: select Cumberland County, Scenarios: 2018 Progress.

Cumberland County's U.S. EPA Section 319 Approved WIP's

There are a total of 36 U.S. EPA Section 319 Approved Watershed Implementation Plans (WIPs) in Pennsylvania. Entities receive 319 grant money to support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the success of specific nonpoint source implementation projects. The WIPs cover projects associated with a variety of non-point sources like Agriculture, Urban Stormwater Runoff, and Acid Mine Drainage (AMD). The following watersheds have Section 319 approved WIPs in Cumberland County:

- Middle Spring Creek (located in Cumberland and Franklin Counties)



A map of all Section 319 WIPs in Pennsylvania is located here: http://files.dep.state.pa.us/Water/BWEW/Watershed%20Management/WatershedPortalFiles/NonpointSourceManagement/Section_319_Nonpoint_Source_Management_Grants/PA%20WIP%20map.pdf

Pennsylvanian Section 319 WIPs can be viewed and downloaded here: https://www.dep.pa.gov/Business/Water/PlanningConservation/NonpointSource/Pages/Plans.aspx

Appendix I: The State Recommendations: How to Create A Customized Partnership

The Pennsylvania Watershed Implementation Plan (WIP) workgroup recommendations are available and can help inform local planning strategies. This information can help answer questions like:

- How can we develop a starting point?
- What BMPs can we identify in my county as potential opportunities?
- How do we begin to quantify a goal?
- What are important areas to focus our efforts?
- What resources exist to address these sources?

Appendix I provides information to help answer those questions and to give each county a starting point for developing their county plan. In this Appendix, you will find information on the multiple state workgroup recommendations, a county scenario using the state recommendations, information about meeting your goal, and resources to help identify the next steps.

The information in this Appendix and the guidance provided for its use are meant to act as a starting point to help answer some common questions that arise during planning. Local groups can utilize the state recommendations and tailor the recommendations to better fit their county structure, build upon what is currently listed, and remove recommendations that do not fit within their county's structure.

We hope this Appendix gives you a foundation to work from in telling Centre County's local story and in identifying opportunities for meeting local goals.

Pennsylvania Sector Priority Initiatives

The Pennsylvania WIP workgroups have identified priority initiatives in various sectors that help to reduce nutrient and sediment pollution. These recommendations can be broken down into individual goals for your county. These implementation rates can be found after the explanation of state priority initiatives. For more information on the WIP workgroup state recommendations, please visit www.dep.pa.gov/chesapeakebay/phase3 .

A. Agriculture

The 15-member Agriculture Workgroup produced an action plan that seeks to maintain a vibrant and productive agricultural sector while also meeting local water quality goals that will contribute to cleaning up the Chesapeake Bay and the Pennsylvania Partners and other stakeholders are adopting the action plan as part of the Phase 3 WIP. In addition to compliance with basic regulatory obligations, the plan focuses on three key elements: Soil health; Manure and nutrient management; and Riparian ecosystem improvements and restoration.

1. *Agricultural Compliance*

Action: Ensure farmers are implementing their state required Agricultural Erosion and Sediment Control (Ag E&S) or conservation plan, Manure Management/Nutrient Management Plan, and implementing required barnyard runoff controls, where needed.

- Goal 1: Continue the compliance, inspection and enforcement programs associated with Pennsylvania's Clean Streams Law and federal requirements.

2. *Soil Health*

Action: Use crop and soil management practices that improve long-term soil health and stability.

- Goal 1: Conservation tillage on 20% of croplands.
- Goal 2: High Residue Low Disturbance tillage (No-till) on 47% of croplands.
- Goal 3: Non-harvested cover crops on 33-50% of croplands.
- Goal 4: Prescribed grazing on 50% of pastures, including exclusion fencing, where appropriate.

3. *Expanded Nutrient Management*

Action: Non-manured farmlands use nutrient management plans and precision nutrient management practices.

- Goal 1: 20% of non-manure croplands have and implement Nutrient Management Plans.

- Goal 2: 20% of manured and non-manure croplands use the "4Rs" principles of "Right Source, Right Rate, Right Time and Right Place" for increased nitrogen and phosphorus reductions.

4. *Manure Storage Facilities*

Action: Install and use manure storage systems that meet federal standards.

- Goal 1: 90% of swine and poultry operations have adequate manure storage facilities.
- Goal 2: 75% of other livestock operations have adequate manure storage facilities.

5. *Precision Feeding*

Action: Use precision feed management to reduce nitrogen and phosphorus in manure.

- Goal 1: 70% of cows fed with precision management.

6. *Integrated Systems for Elimination of Excess Manure*

Action: Create integrated (county/regional) programs for removal of or beneficial use of excess manure.

- Goal 1: Develop coordinated regional systems for removing excess manure (through treatment or transportation) from the Chesapeake Bay watershed.

7. *Forested and Grassed Riparian Buffers*

Action: Plant grassy vegetation or forest buffers along streams

- Goal 1: 15% of non-buffered streamside farm lands add 35 ft wide grassed buffer.
- Goal 2: 25% of non-buffered streamside farm lands add 35 ft wide forested buffer.

B. Forestry

Forestry conservation practices such as riparian forest buffers and upland tree plantings are both cost-effective for improving water quality while also providing significant environmental and social benefits in both agricultural and developed areas. Trees along streams improve habitat, reduce flooding impacts, and provide shade to cool waterways. Trees in backyards and communities increase property values and improve human health. These restoration activities help connect citizens to their local watersheds.

The 15-member Forestry Workgroup produced an action plan with forestry practices that seek to reduce nitrogen and phosphorus pollution and meet water quality standards, and

Pennsylvania partners and other stakeholders are adopting the action plan as part of the Phase 3 WIP.

Note that some of these practices are developed specifically to reduce nitrogen and phosphorus, but some are being instituted for other reasons where nitrogen and phosphorus reductions are co-benefits.

1. *Forested Riparian Buffers*

Action: Plant trees and shrubs or grassy vegetation along streams. For accreditation, buffers must be a minimum of 35 feet in width up to 300 feet in width from the edge of the stream.

- Goal 1: 83,000 acres of forested riparian buffer on agricultural lands.
- Goal 2: 2,650 acres of forested riparian buffer in developed areas.

2. *Tree Canopy*

Action: Plant trees in developed areas.

- Goal 1: 50 acres of urban tree canopy planted (15,000 trees).

3. *Woods and Pollinator Habitat*

Action: Convert lawn and turf areas to woods and meadows.

- Goal 1: 5,000 acres of lawns to woods.
- Goal 2: 5,000 acres of lawns to meadows.

4. *Forest, Farm and Natural Area Conservation*

Action: Provide credits for land conservation and revise zoning and ordinances to conserve existing natural areas.

- Goal: 20,000 acres of land conserved annually.

5. *Stream and Wetland Restoration*

Action: Support efforts to restore local streams and wetlands.

- Goal 1: 60,000 linear feet of urban and non-urban streams restored per year utilizing appropriate measures for the site such as stabilization, natural stream channel design, floodplain restoration, etc.
- Goal 2: 400 acres of wetlands restored per year.

C. Stormwater

The 12-member Phase 3 WIP Stormwater Workgroup developed an action plan for BMPs to help localities reduce nitrogen and phosphorus and meet local water quality standards and, Pennsylvania partners and other stakeholders are adopting the action plan as part of the Phase 3 WIP.

1. *Implement Pollutant Reduction Plans (PRPs) for Municipal Separate Storm Sewer System (MS4) Communities*

Action: As one component of the 2018 permit, MS4 Permittees must implement management practices to achieve the reductions identified in their respective PRPs by 2023.

- Goal 1: MS4s in the Chesapeake Bay watershed implement BMPs in current MS4 NPDES permits by 2023.
- Goal 2: Implement the PennDOT and Turnpike Commission MS4 Permits in concert with the other MS4 NPDES permits by 2023

2. *New Riparian Forest Buffers*

Action: Plant trees and shrubs alongside streams.

- Goal 1: Incentivize and facilitate new acres of riparian forest buffers associated with the MS4 Pollutant Reduction Plans

3. *Control Measures for Illicit Discharges*

Action: DEP facilitates municipal ordinance amendments to control illicit discharges to storm sewer systems.

- Goal 1: Municipal ordinance adoption for control of pool drainage.
- Goal 2: Municipal ordinance adoption for control of residential car washing draining.

4. *Industrial Stormwater*

Action: DEP develops technical guidance, intended to supplement existing requirements, to inform industrial stormwater discharge permittees engaged in these activities. This guidance will list appropriate BMP utilization, design standards and implementation to reduce pollution which are acceptable to manage industrial stormwater.

1. Goal 1: Implementation of Chesapeake Bay BMPs by industrial stormwater discharge permittees.

- Goal 2: Identify appropriate industrial stormwater permits suitable for impervious surface retrofit BMPs with the goal of facilitating industrial impervious surface to pervious cover or other volume reduction retrofit BMP.

5. *Fertilizer Legislation*

Action: Pass the legislation described under Programmatic Commitments in the Pennsylvania Phase 3 WIP, Other Legislation to Facilitate Reductions.

6. *Continue to Implement Erosion and Sediment (E&S) Control and Post Construction Stormwater Management (PCSM) Program*

Action: Continue permitting, inspecting, and ensuring compliance with Pennsylvania's erosion and sediment control and post-construction stormwater permit requirements, found in 25 Pa. Code Chapter 102 for all activities including construction, timber harvest, oil and gas exploration, mining, and waste management.

- Goal 1: Increase the number of county conservation districts with post-construction stormwater delegation.
- Goal 2: Increase the inspection outputs as well as DEP staff to ensure compliance with NPDES permit and Chapter 102 delegation.
- Goal 3: Improve the tracking and reporting to include all DEP programs implementing provisions of these regulations.

7. *Dirt and Gravel Roads*

Action: Continue to implement the Dirt and Gravel Roads Program through the Center for Dirt and Gravel Roads

D. Wastewater

The 14 members of the Wastewater Workgroup researched the feasibility of treating to Enhanced Nutrient Removal (ENR) in Pennsylvania. ENR effluent total nitrogen and total phosphorus concentrations are 3.0 mg/l and 0.4 mg/l, respectively. Currently, the 190 significant wastewater treatment systems with Biological Nutrient Removal (BNR) effluent load limits reached their 2025 nitrogen and phosphorus reduction goals in 2018 (seven years ahead of schedule). BNR effluent total nitrogen and total phosphorus concentrations are 6.0 mg/l and 0.8 mg/l, respectively. Although a number of these systems are treating to a level between BNR and ENR, they are currently obligated to meet an annual load limit based on BNR requirements.

1. *Continue Current Treatment Course*

Given the ongoing reduction success, one priority initiative is to continue the treatment course described above. The ongoing tracking of the 190 publicly-owned treatment works and their wasteload allocations is described in the Phase 2 Watershed Implementation Plan Wastewater Supplement that will continue to be updated on a regular basis.

2. *Plant Optimization Program*

DEP's treatment plant optimization program helps troubled facilities get into compliance with permitting requirements. DEP will further investigate the feasibility of how this program could be expanded to help facilities optimize their process for nutrient removal by establishing a facility nutrient removal optimization program. The existing DEP optimization program does not have the capacity to run such a program, and expansion of the program would include a section dedicated to statewide implementation. Varying degrees of implementation could be considered to make the effort slightly less costly; however, the reduction in proposed DEP staffing would shift the burden to the facility to hire operations consultants.

3. *Municipalities Implement Onsite Septic System Inspection and Pumping Programs*

Properly operated and maintained systems provide better protection of local ground water resources as well as a reduction to the total nitrogen loading to the Chesapeake Bay. If all municipalities with on-lot systems would implement sewage management programs that include inspection of the on-lot system and pumping of septic tanks 55,000 pounds of total nitrogen reduction could be realized.

Sewage management programs that incorporate septic system inspection and pumping are recommended. On-lot system oversight is the responsibility of municipalities per the Pennsylvania Sewage Facilities Act.

Pennsylvania's Growth Management

Pennsylvania's Phase 3 WIP relies on the sector growth projections provided by the Chesapeake Bay Program's Chesapeake Assessment Scenario Tool (CAST). CAST has built-in sector growth projections based on a land use model that uses a combination of USDA Census of Agriculture data, land use analysis using one meter by one-meter high resolution land use GIS, county level construction data, and other attributing data to best predict the land use change by sector. The projected changes to land use accounted for in CAST are only projections. These numbers will change when new data, like the 2017 USDA Census of Agriculture, is released to the public. As new information becomes available, it will better inform the current growth projection that is accounted for in the model. It is required for Pennsylvania to address sector growth in the development of the WIP. In order for Pennsylvania to account for sector growth the following strategy was developed.

Pennsylvania's Land Conservation Scenario

Pennsylvania's approach to land conservation consists of four main components:

1. *Forest Conservation:* Forest conservation of working lands, park lands, and other natural areas by agencies and land trusts
2. *Private Forests:* Acknowledging private working forests with forest management plans.
3. *Wetlands:* Jurisdictional wetlands are excluded from development.
4. *Farmlands*: Preserving farmland according to Pennsylvania's nation-leading Farmland Preservation Program.

Cumberland County's Role in Land Conservation

Pennsylvania's Land Conservation Scenario can be broken down to individual goals for each county in Pennsylvania's Bay Watershed. The following represent Cumberland County's portion of the Land Conservation Scenario. These numbers represent a portion of Pennsylvania's goal identified in the WIP. Your county may adjust these goals based on what is reasonable and implementable for your county.

Conservation Practice	Acres Conserved by 2025
Forest Conservation	3,200
Farmland Conservation	2,900
Wetland Conservation	90

Each county can incorporate its own local zoning ordinances and policies to prioritize land conservation. The following are examples of local zoning ordinances that can be incorporated into your Countywide Action Plans.

Land Policy Type	Defining the Policy
Agriculture Conservation Policy	Organizations and governments proactively conserving farmland and productive soils. Example priority areas include agricultural districts, prime farmland, farmland of state importance, floodplains, and other high-priority farmland conservation areas.
Forest Conservation Policy	Organizations and governments proactively conserving forests and wetlands that provide the greatest benefits to wildlife, human safety, and water quality. Example priority areas include riparian zones, shorelines, large contiguous forest tracts, and other high-priority forest conservation areas
Growth Management Policy	Organizations and governments proactively encouraging growth in areas with supporting infrastructure. Example priority areas include undeveloped or under-developed areas with existing roads, wastewater, and water supply infrastructure.

The above Land Policy Types are available in CAST to be implemented as sector growth strategies. Local Governments can set goals for Land Policy Strategies to be incorporated in their Countywide Action Plans. Municipalities are not forced to require zoning ordinances. However, you can receive credit for the zoning ordinances within your county that are currently in place.

Zoning Ordinances

The Pennsylvania Legislature, through the Municipalities Planning Code (MPC, Act 247 of 1968), grants certain zoning powers to municipalities. Within these powers, a municipality could choose to include measures for land conservation in its local zoning ordinance. Such a choice would also have an impact on sector growth management and would be particularly pertinent during efforts to modernize local planning and zoning. Local governments can go above and beyond current state recommendations for land conservation and sector growth management by implementing more stringent policies, so long as they stay within the powers and purposes granted by the MPC.

"Use zoning" is one measure which could be used for land conservation. Through use zoning, a municipality can assign forests, farms, and wetlands to zones that restrict commercial and residential development. Use zoning may be constitutionally sensitive and should be approached judiciously.

Another measure would be using "density zoning" to manage growth by delineating density restrictions. For example, a zoning ordinance may establish a maximum number of units per acre or a minimum lot size in acres. Density zoning could also be implemented on a sliding

scale. For example, a zone could have a permitted and preferred use for agriculture but also allow for limited residential development on a sliding scale – such as up to 2 units allowed on the first 50 acres and then gradually increasing the number of allowed units on additional acres. This variation on density zoning is known as "sliding-scale zoning."

Subdivision Ordinances

A local "subdivision ordinance" manages the development and division of property parcels. Municipalities may use a subdivision ordinance to permit agricultural and residential development on rural land while controlling for density.

Conservation Easements

Pennsylvania has enacted enabling legislation which authorizes municipalities to adopt a local ordinance and thereby establish a program for purchasing "conservation easements." These easements are voluntary agreements which restrict uses or development on a property to protect natural resources and manage growth. Any restrictions assigned to an easement will remain with the title of the land for the duration of the easement term, sometimes guaranteeing conservation in perpetuity. A municipality could also partner with other government entities or land trusts as a strategy for leveraging resources for easement purchases.

Transfer of Development Rights

Pennsylvania has enacted enabling legislation which authorizes local governments to create "Transfer of Development Rights" (TDR) programs. Under a TDR program, a landowner may voluntarily sell development rights to a buyer, such as a municipality, for use on the landowner's property while still retaining ownership. Any existing agricultural or forestry uses may continue but the landowner may not develop the property after selling his or her development rights. By purchasing development rights on private property, a municipality can protect private land and natural resources from the environmental implications of growth and development.

Multi-Municipal Planning

A regional approach to land conservation policies may be optimal for managing growth and designating rural resource areas where there is additional strength of law to promote such conservation. Multi-municipal planning may offer local governments increased agility in zoning and planning efforts as well as mutually beneficial environmental outcomes.

Agriculture Best Management Practice Implementation Amounts for Cumberland County Based on Recommended State Implementation Rate

Best Management Practice	Amount	Units of Measure	Percent of Total Available Acres
Agriculture Compliance			
Conservation Plans	93,000	Total Acres	80%
Nutrient Management (Core N) Manured Acres	79,000	Total Acres	71%
Nutrient Management (Core P) Manured Acres	24,000	Total Acres	21%
Barnyard Runoff Controls	44	New Acres	70%
Soil Health			
High Residue Tillage	35,000 (42,300)	Acres per Year	51%
Conservation Tillage	13,000	Acres per Year	19%
Traditional Cover Crops	7,000 (14,400)	Acres per Year	10%
Cover Crops with Fall Nutrients	25,000	Acres per Year	35%
Prescribed Grazing	5,000	Total Acres	50%
Expanded Nutrient Management			
Nutrient Management (Core N) Fertilizer Acres	9,000	Acres	8%
Nutrient Management (Core P) Fertilizer Acres	3,000	Acres	3%
Nutrient Management Rate (Core N)	14,000	Acres	12%
Nutrient Management Rate (Core P)	14,000	Acres	12%
Nutrient Management Placement (Core N)	17,000	Acres	15%
Nutrient Management Placement (Core P)	14,000	Acres	12%
Nutrient Management Timing (Core N)	19,000	Acres	17%
Nutrient Management Timing (Core P)	14,000	Acres	12%
Manure Storage Facilities			
Manure Storage Facilities	51,000	New AU's	83%
Dairy Precision Feeding			
Dairy Cow Precision Feed Management	18,000	Dairy Cow AU's	70%
Integrated System for Elimination of Excess			
Manure Transport out of Cumberland County	6,000	Dry Tons Per Year	N/A
Agriculture Riparian Zone			
Forested Riparian Buffers	2,750	New Acres	19%
Forested Riparian Buffers with Exclusion Fencing	750	New Acres	5%
Grass Riparian Buffers	1,900	New Acres	13%
Grass Riparian Buffers with Exclusion Fencing	250	New Acres	2%

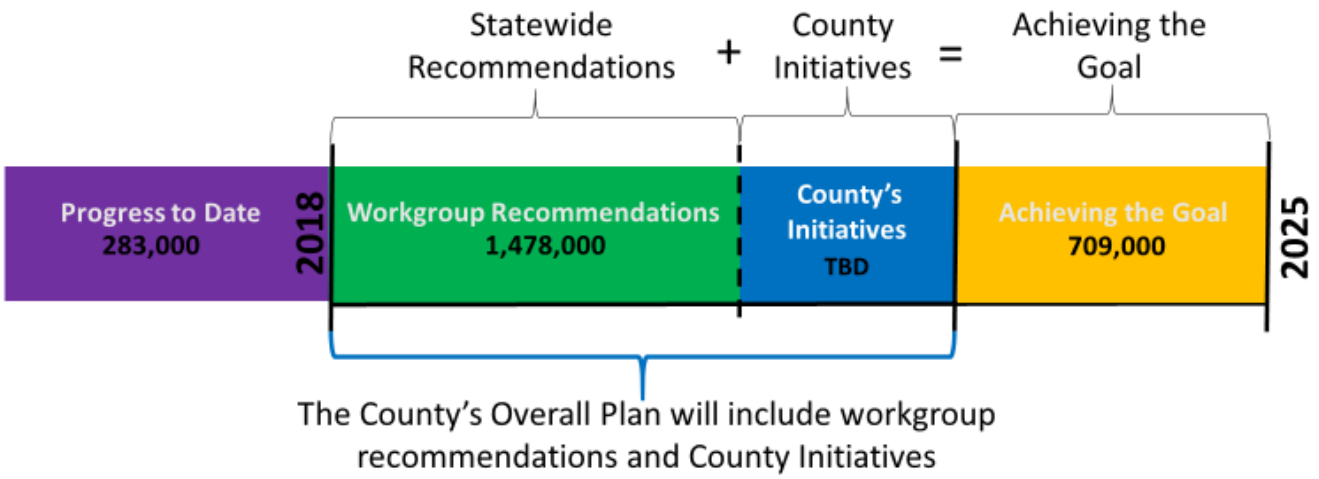
The agriculture BMP implementation rates provided above are based on the state recommendations identified in the Phase 3 Watershed Implementation Plan (WIP). The rates are a suggested starting point for your county. During your Countwide Planning Process, these goals can be changed to meet the priority initiatives identified by your county. Your county is not limited to only the BMPs identified above. These BMPs are to serve as a starting place for your county. The highlighted BMPs, Cumberland County already exceeds the recommended implementation rate. The number in parenthesis is the current reported implementation rate. Cumberland County should consider keeping the current implemenetation rate or setting a higher goal for implementation.

Stormwater Best Management Practice Implementation Amounts for Cumberland County Based on Recommended State Implementation Rate

Urban Riparian Zone			
MS4 Riparian Forest Buffers	55	New Acres	1%
Non-MS4 Forest Buffers	100	New Acres	1%
Woods and Pollinator Habitat			
Conservation Landscaping	250	New Acres	N/A
Urban Forest Planting	250	New Acres	N/A
Urban Tree Canopy			
MS4 Urban Tree Canopy	10	New Acres	N/A
Forest, Farm and Natural Areas Conservation			
Farmland Conservation	2,900	Total Acres	N/A
Forest Conservation	3,200	Total Acres	N/A
Wetland Conservation	90	Total Acres	N/A
Stream and Wetland Restoration			
Urban Stream Restoration	6,000	New Linear Feet	N/A
Non-urban Stream Restoration	4,000	New Linear Feet	N/A
Wetland Restoration	100	Acres	N/A
Control Measure for Illicit Discharge			
Advanced Grey Infrastructure (IDDE) Control	9,000	Acres Treated	16%
Industrial Stormwater			
Impervious Surface Reduction	25	Acres	N/A
Fertilizer Legislation			
Urban Nutrient Management	4,000	Acres	8%

The stormwater BMP implementation rates provided above are based on the state recommendations idenified in the Phase 3 Watershed Implementation Plan (WIP). The rates are a suggested starting point for your county. During your Countwide Planning Process these goals can be changed to meet the priority initiatives identified by your county. Your county is not limited to only the BMPs identified above. These BMPs are to serve as a starting place for your county.

Hypothetical Journey to a County Goal (Nitrogen)



The hypothetical journey is a depiction of the countywide goals and overall Pennsylvania water quality targets. Moreover, the figure above represents Cumberland County's journey to clean water.

The nitrogen and phosphorus planning targets for Pennsylvania counties are broken down into local planning goals for each county. Added together, these goals will help Pennsylvania reach its assigned planning targets.

- The purple section represents the county's nitrogen reduction from 1985 through 2018. These are reductions that have already occurred through restoration efforts. These reductions do not count toward your planning goal for 2025.
- The green section depicts the estimated reductions that can be achieved through the state workgroup recommendations. This does not mean that you have to accept the state workgroup recommendations but serves as a starting point for your county. You may find that your county needs to make a few changes to the state workgroup recommendations to better fit your county's structure. It is important to remember the state recommendations were developed as Pennsylvania's watershed-wide state recommendations. Your county's plan may lower the state's recommendations. Just understand the orange bar will get larger, which means you will be expected to stretch somewhere else.
- The blue section represents the County's initiatives that goes beyond the state workgroup recommendations. These could include practices that the state workgroups did not identify in their recommendations. This could also mean exceeding the state workgroups recommendations for a practice.
- Reductions from County Initiatives and the Statewide Workgroup Recommendations will be added together to form the County's comprehensive plan that will be submitted to DEP. The goal of the County's comprehensive plans is to reduce the orange "achieving the goal."
- The orange section is defined as the "Achieving the Goal." The Goal to be Achieved is a result of the blue and green sections added together, which forms the County's comprehensive plan. As more county initiatives are added, the orange bar will shrink until the county has met its nitrogen and phosphorus goals. Every county is expected to meet the orange bar, but that does not mean it will be achieved for every county.

The Next Steps in Completing Cumberland County's Planning Process

The state workgroup recommendations are to be used as a starting point for development of Cumberland County's Planning Process. How can Cumberland County use the state's recommendations, and what changes can be made to better fit what is needed in your county?

The following is a list of questions that may help you to begin the planning process:

- What technical and financial resources are needed in order to meet the state recommendations?
- What are the programmatic changes needed in order for Cumberland County to meet its goal?
- Are the state recommendations realistic for Cumberland County? If no, how can we adjust the numbers to make the goal realistic?
- Are we able to exceed state recommendations; if so, how?
- Are there additional practices that we would like to focus on that the state did not identify?
- How does our goals as a county align with the state workgroup recommendations? Are there co-benefits that can be achieved with the workgroup recommendations?

The next step in your plan is to begin thinking through how you can accomplish your goals. This will require you to work in coordination with the county support team to begin completing your county's templates. The templates will capture what it is you are trying to achieve and how you will be able to achieve those goals.

Once your county has identified how it can achieve these goals, you will want to take the time to quantify your final goals. The technical support team member will assist you in helping to finalize your county's goals. Along with finalizing your county's goals, you will finalize your county templates that help to identify how the goals will be met. All pieces of the planning process will be submitted to DEP.

Resources and Contact Information

The following list will provide you with expanded resources and contacts to assist you with planning efforts. Your support team contact names and information are also provided as your points of contact throughout your county action planning and implementation process.

Cumberland County Support Team Members	WIP Planning Role	Organization	E-mail	Phone
Kristen Wolf	DEP Chesapeake Bay Office – Overall WIP lead for Cumberland County	PA DEP	kwolf@pa.gov	717-772-1675
Jordan Baker	WIP Technical Support	Susquehanna River Basin Commission (SRBC)	c-jorbaker@pa.gov	717-772-5802