

THE WEST COCALICO BEST MANAGEMENT PRACTICE (BMP) ASSESSMENT PROJECT



FINAL REPORT



JANUARY 2017

DRAFT

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I. PROJECT BACKGROUND

This project stems from the growing pressure for municipalities to address water quality issues in their township as part of Executive Order No. 13508 of 2009 to clean up the Chesapeake Bay. With the year 2025 approaching as the end goal for pollutant reductions, townships are looking for approaches and strategies to mitigate nutrient and sediment loads entering the Bay. Water quality regulations, and enforcement of those regulations, have tightened in both developed and rural areas. To address these issues, West Cocalico Township partnered with Lancaster Farmland Trust, a 501(c)(3) organization dedicated to preserving and stewarding Lancaster County's farmland, to develop a public education and involvement strategy to conduct interactive one-on-one meetings with farmers, understand actual conditions on the ground in agricultural areas of the township, collect information on undocumented BMPs (best management practices), and to discuss agricultural compliance to meet MS4/Chesapeake Bay requirements. The personal visits successfully reached township farmers, many plain-sect, a constituency usually adverse to government involvement. The project sought to satisfy federal- and state-mandated Minimum Control Measure (MCM) #1, Public Education and Outreach, and #2, Public Participation/Involvement. This report outlines the data results from the township's BMP Assessment visits and recommendations for a Phase II approach to improve water quality in agricultural areas in the township.

Cocalico Creek Impairment Background

The Cocalico Creek watershed runs through West Cocalico Township and is a subwatershed within the larger Conestoga River watershed in Lancaster County, PA. The Cocalico Creek watershed covers 110 square miles and runs through 12 municipalities in Lancaster County. According to the 2012 Pennsylvania Integrated Water Quality Assessment Report 303(d) list, 52.3 miles of stream within the Cocalico Creek Watershed were noted as impaired. Sources of impairments listed include urban runoff, storm sewers, and agricultural uses. No Total Maximum Daily Load (TMDL) has been established to date. However, municipalities are required to submit Chesapeake Bay Pollutant Reduction Plans (CBRP/PRP) as part of the MS4 process in order to comply with and renew the township's MS4 permit. The goal of the PRP is to identify and implement best management practices to produce tangible improvements to the quality of stormwater in the Chesapeake Bay Watershed. The plan includes the location of the BMP, the reductions in nitrogen, phosphorus, or sediment associated with the BMP, an explanation on why the BMP was selected, and a description of the planned inspection, operation, and maintenance of the BMP. Forty-one percent (41%) of West Cocalico's MS4 area is in agricultural use. Farms could provide the opportunity to implement several cost-effective BMPs.

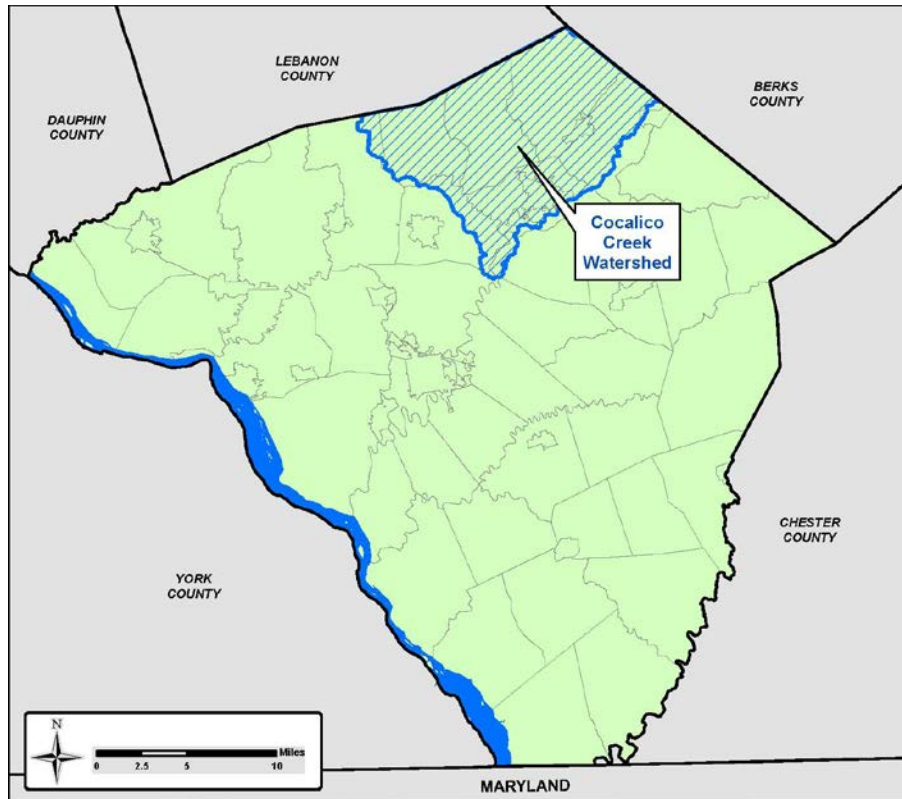


Figure 1: Cocalico Creek Watershed, Lancaster County, PA

Cocalico Creek MapShed Modeling: A Regional Approach to Improving Water Quality

The Cocalico Creek Watershed Association, as well as the municipalities within the Cocalico Creek Watershed, underwent a MapShed modeling process in 2014 by LandStudies. MapShed is a watershed modeling tool developed by Penn State that simulates the transport of pollutant loads throughout the watershed. The baseline model gathered information from both developed and rural areas to determine the highest areas of nitrogen, and phosphorus, and sediment loading. According to LandStudies' MapShed findings, the largest pollutant sources came from agriculture, as listed below:

Nitrogen	<ul style="list-style-type: none"> • Groundwater (stream baseflow) • Livestock • Streambank erosion • Cropland
Phosphorus	<ul style="list-style-type: none"> • Livestock • Streambank erosion • Cropland • Hay/Pasture
Sediment	<ul style="list-style-type: none"> • Streambank erosion • Cropland • Hay/Pasture • Medium Density Residential

Table 1: LandStudies' MapShed Modeling Pollutant Loading Results

Agricultural land presents opportunity areas for BMP implementation to reduce nutrient and sediment loading within the Cocalico Creek watershed. The BMP Assessment project completed by Lancaster Farmland Trust in 2015 and 2016 built upon the MapShed project to compile more detailed information about agricultural areas to fine tune MapShed or other Chesapeake Bay model, document actual compliance and BMP implementation in the township, and recommend a list of Phase II steps to improve water quality in agricultural areas for purposes of the CBRP/PRP.

West Cocalico Township Background

West Cocalico Township, one of the 12 municipalities within the Cocalico Creek Watershed, is located in the northern portion of the county.

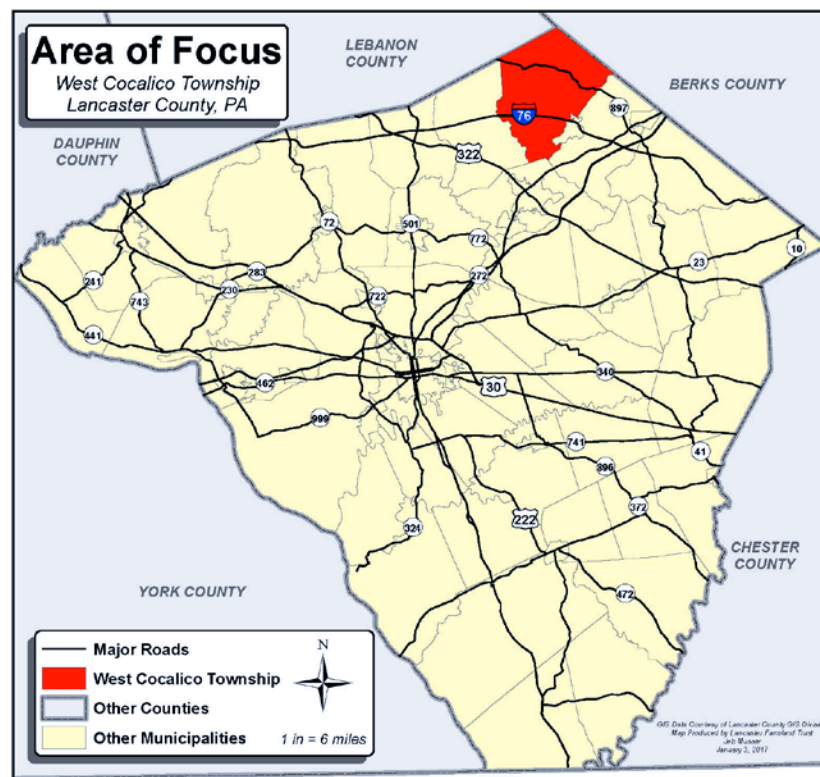


Figure 2: West Cocalico Township Location Map

Encompassing 27.6 square miles, the municipality houses just over 6,967 residents according to the 2000 Census. Over eighty-four percent (specifically 84.68%) is non-developed with agricultural, open space, woodland, or wetland uses.

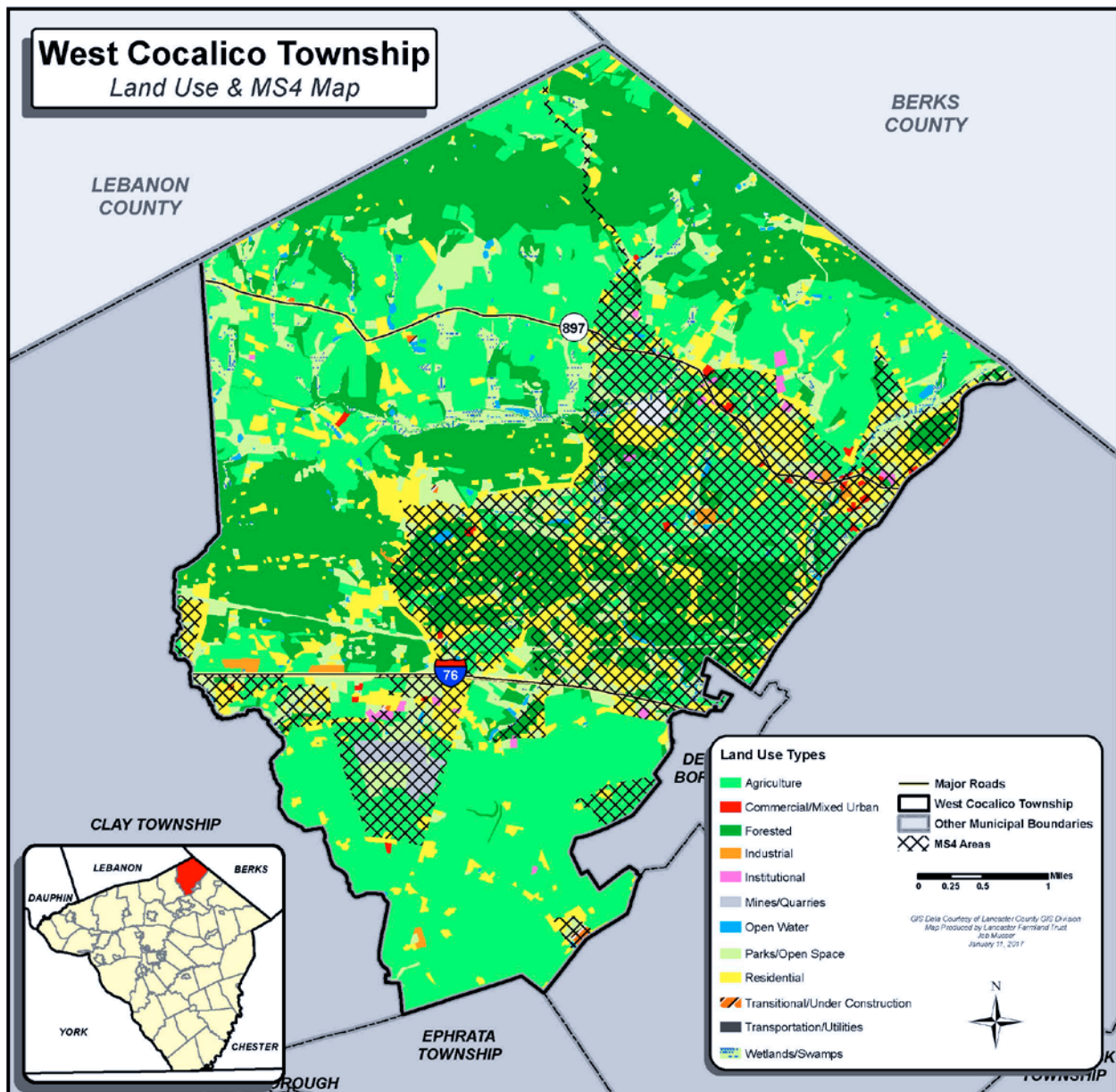


Figure 3: West Cocalico Township's Land Use Map with 2010 Urbanized Area Overlay

As seen in the map above, West Cocalico Township's residential development is mostly bounded by Route 897 to the north and the Pennsylvania Turnpike to the South in the central and eastern sections of the township. West Cocalico Township's 2010 Urbanized Area is also located in this region, reflecting these higher population densities. The township's MS4 permit area comprises 5,631 acres, or 32%, of the township.

LANDUSE	PERCENTAGE
Agricultural	42.25%
Forested	31.08%
Residential/Farmstead	12.78%
Open Space/Rec	9.03%
Open Water/Wetland	2.32%
Mines/Quarries/Under Construction	0.67%
Transportation/Utilities	0.50%
Mixed	0.36%
Industrial	0.36%
Institutional	0.35%
Commercial	0.30%

Table 2: Land Use Breakdown in West Cocalico Township

Above, a land use breakdown shows that agricultural and forested land covers the majority of the township. Agriculture is the municipality's top land use, consistent with the majority of townships in Lancaster County. Lancaster County is one of the leading agricultural producers in the state, ranking in the top five of the Commonwealth's counties in 26 of the 28 products reported in the 2007 Census of Agriculture. Agriculture is the leading industry in the county, and one of the most significant economic drivers locally.

Agriculture: Opportunities for Reductions, but Lacks Baseline Information

Many municipalities faced with increased water quality regulations are finding it difficult to make current reductions without spending several million dollars in upgrades to traditional gray infrastructure systems. In addition, these upgrades may not address all of the pollutant sources in the watershed. Municipalities also need to accommodate for future growth and plan for smarter storm water and runoff management strategies that are also cost-effective for its residents.

The majority of the Cocalico Creek watershed in West Cocalico is in agricultural use, and farmers are required to operate their farms in accordance with state regulations. However, these regulations have not been enforced for several decades. PA Chapter 102 and 91 state all Pennsylvania farms must have an Agricultural Erosion and Sedimentation Plan or Conservation Plan, and a Manure or Nutrient Management Plan. A conservation plan or an agricultural erosion and sedimentation plan is a record of conservation practices that addresses resource concerns and reduces soil loss. The plan outlines a schedule of implementation, addresses manure handling, animal concentration areas (ACAs), field practices, and erosion issues. A manure or nutrient management plan is required for any landowner who has animals on their farm. The plan records the timing and amount of manure applied to the land and regulates ACAs, pastures, and manure storages. To capture agricultural data for the Chesapeake Bay Model, some information from these plans have been funneled to PA DEP and EPA through the

Lancaster County Conservation District (District), however, the District does not have a comprehensive database of plans. Only plans written by the District/NRCS or properties that have participated in federal and state cost-share programs, such as EQIP, would be on file with the District. Many plans written by private consultants, such as TeamAg, Red Barn, and AET, to name a few, are usually not housed at the District unless a landowner voluntarily gives their plan to be placed on file or used a private consultant to develop plans as part of a cost-share program. In addition, there are many farms that do not have plans or have outdated plans, but have implemented many BMPs at their own expense. Penn State University's Survey Research Center underwent a voluntary survey effort via mail to inventory farm conservation practices in early 2016, however, up to this point, there has been no comprehensive effort to capture all compliance and BMP data in the county. In LFT's assessments of eight municipalities in Lancaster County, the percentage of agricultural properties with plans average around fifty-three percent (53%). Of that percentage, only half (25% of total farms) have fully implemented and up-to-date plans with accurate information.

Municipalities do not have access to Conservation Plan information without the consent of the landowner, therefore, even local municipalities do not have a comprehensive understanding of compliance numbers or types of agricultural BMPs implemented in their respective townships. In West Cocalico Township, agricultural land accounts for 2,327 acres, or 41% of the township's MS4 permit area, a significant portion of the township's regulated area.

West Cocalico Township BMP Assessment Project

In October 2014, Lancaster Farmland Trust (LFT) contracted with West Cocalico Township over a two-year period to visit agricultural properties in the township to conduct education, outreach, and assessment regarding PA Chapter 102 and 91 agricultural regulations as part of the township's public engagement strategy to satisfy MS4 permitting requirements and MCM #1 and #2. The project sought to retrieve comprehensive baseline documentation on compliance and capture undocumented BMPs to possibly include in Chesapeake Bay Reduction Plans. It also aimed to identify barriers and provide resources to improve compliance and identify opportunities for successful implementation of runoff measures. These undocumented BMPs may assist in meeting CBPRP (Chesapeake Bay Pollutant Reduction Plan) requirements.

West Cocalico Township BMP Assessment Project

A public education and outreach strategy between West Cocalico Township and Lancaster Farmland Trust to capture previously undocumented agricultural baseline information, assist in meeting MCM #1 and #2 as part MS4 requirements, and cost-effectively improve Chesapeake Bay water quality through one-on-one relationship-building and BMP opportunity identification with township farmers.

A New Model to Improve Water Quality

The information gathered in this project sets the stage for a new, innovative model to improving overall stormwater and runoff issues concerning nutrient and sediment loading to local waterways, and ultimately, the Chesapeake Bay. Lancaster Farmland Trust believes understanding and supporting agricultural compliance and stewardship can assist in reporting requirements and provide opportunities for further reductions. Capturing undocumented BMPs already in place may help townships meet their requirements sooner - and with less money. In addition, the education and outreach component of these visits provide the opportunity to speak with the farmer, understand his/her operational needs, and determine potential partnerships for BMP implementation to meet Chesapeake Bay requirements. BMP Assessments conducted in other municipalities in Lancaster County have resulted in creative partnerships to achieve higher compliance and increased nutrient and sediment reductions. Many landowners, now understanding the need for agricultural compliance, have signed up for plans through the conservation district, paid for their own plans, or worked with Lancaster Farmland Trust to use grant dollars to develop conservation plans. One municipality created a local cost-share program for farmers to develop plans for a lower cost, and public-private partnerships utilizing a mix of funding sources were developed to implement high-impact, cost-effective BMPs on farms. This type of “green” infrastructure, or partnering with a farmer to implement conservation practices, is cheaper than the cost of upgrading and maintaining new gray infrastructure. It also allows the municipality to think about water quality issues on a broad, watershed-level across several land uses. This model will allow municipalities to build relationships with their farmers, reinvest in the township’s most important industry, agriculture, and make cost-effective reductions.

Qualifications of Lancaster Farmland Trust

Lancaster Farmland Trust (LFT), a 501(c)(3) organization, was first established in 1988 with the primary mission to preserve Lancaster County Farmland. To date, LFT has preserved 476 farms and over 29,000 acres. In 2007 and 2008, Lancaster Farmland Trust expanded its scope through its Municipal Outreach and Smart Farms Programs to educate municipalities and farmers how to steward Lancaster County’s preserved and unpreserved farmland. In addition, LFT possesses

significant on-the-farm experience by monitoring over 700 properties annually. LFT has played an important role in current water quality initiatives, assisting farmers in writing and implementing conservation plans, as well as working with municipalities to protect their natural and working land resources. Lancaster Farmland Trust has conducted BMP Assessments in a total of eight municipalities in Lancaster County, visiting 1,063 farms and 47,218 acres.

Lancaster Farmland Trust is uniquely qualified to complete the West Cocalico BMP Assessment due to its:

- Special focus on the plain-sect community
- Trusted entity within the farming community – serves as a liaison between farmer and the municipality
- Specialization in preservation and conservation planning
- Extensive farm knowledge and experience
- 501(c)(3) non-profit status: serves as a resource, not a regulator
- Access to private grant dollars for farmers and municipalities
- Training in “boots-on-the-ground” work

Scope of Work and Methodology

Scope of work for the West Cocalico BMP Assessment project was broken into six sections:

1) identification of parcels to be visited via strategy session with the township, 2) introductory public participation meetings with targeted landowners, 3) site visit assessment which included data collection and one-on-one BMP consultations, 4) data processing, 5) public results meetings to Board of Supervisors and farmers, and 6) final report development.

Identification of Parcels

LFT identified potential parcels through a Geographic Information System (GIS) mapping.

Parcel data was available through Lancaster County’s GIS Department. Criteria included parcels ten acres or more and currently in agricultural use, regardless of zoning designation.

“Agricultural use” was refined through visual inspection of aerial photographs of parcels that possessed either active cropland or pasture. Most parcels were in the township’s agricultural zone, but a few active farms also fell into the Ecologically Sensitive, Woodland, Special Residential, Rural Residential, Village Residential, and Industrial/Commercial districts. With additional input from the township, a total of one hundred ninety-four (194) parcels were selected for education, outreach, and visitation (*see next page and Appendix A*).

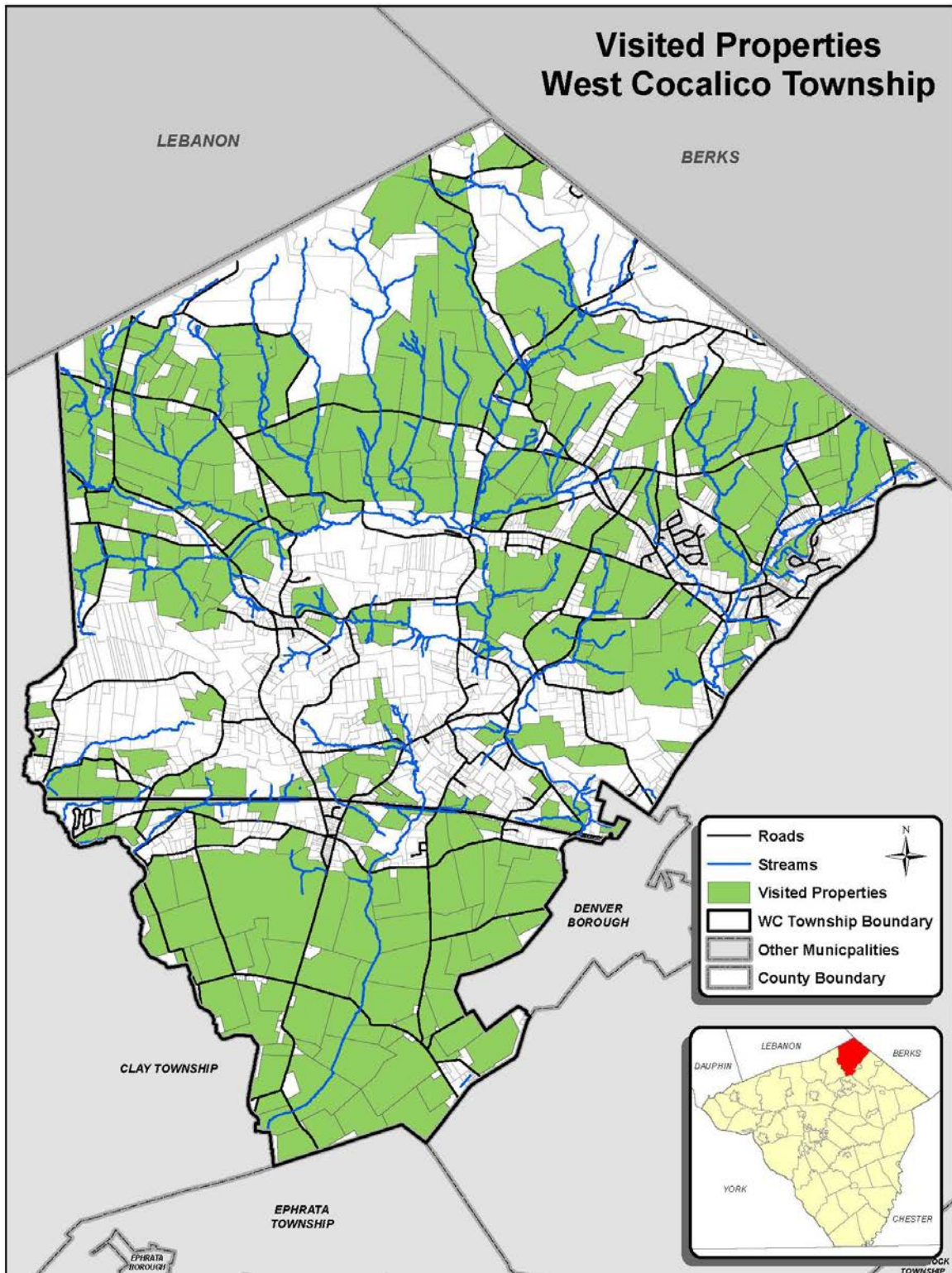


Figure 4: Map of Visited Properties in West Cocalico Township

Public Involvement and Participation (MCM #2)

Lancaster Farmland Trust approached the project with the clear goal of providing education and outreach to its farmers, including holding public meetings to inform landowners and the Board of Supervisors about the project and to solicit input from the community. Lancaster Farmland Trust conducted an introductory presentation to West Cocalico's elected officials at their annual dinner meeting in December 2014. Following up on that presentation, LFT advertised an evening public meeting specifically for farmers in February 2015 to introduce and explain the project. The meeting sought to allay any fear or suspicion regarding the on-farm visits. A letter describing the project and an invitation to the meeting was sent to each landowner of the one hundred ninety-four (194) parcels selected (*see Appendix B*). In both meetings, Lancaster Farmland Trust introduced the mission and programs of the organization, a background on the Chesapeake Bay cleanup, the purpose of the project, regulations affecting farm operations, timeline of project, and specific details regarding the "on-farm" assessment, inventory of BMPs, and resources for improved compliance. At the farmer's meeting, landowners had the opportunity to ask questions about the project, get materials about regulatory compliance, and sign up for site visits or conservation plans.

For those who did not voluntarily sign up for site visits at the farmer's meeting, mailing lists were developed and letters were sent to township landowners scheduling a day and time for the visit (*see Appendix C*).

Site Visit Assessment (Public Education and Outreach, MCM #1)

Two hundred twenty-two (222) site visits were completed April 2015 through November 2016 by the Trust's Stewardship Coordinator, Ken Pacanowski (*please refer page 11-12 under Data and Conclusions for an explanation how final visit numbers were computed*). He conducted personal one-on-one consultations with farmers about their farming practices and informed them about resources to develop and implement conservation plans, manure management plans, and other conservation practices. Each visit included:

- Education and outreach about the project and regulatory compliance
- Physical site inspection
- Determination whether a Conservation Plan, Agricultural Erosion and Sedimentation plan, and Manure/Nutrient Management plan exists
- Verification of compliance with the Plan, if plan was available
- Documentation of types of BMPs being implemented on the farm and whether or not it was reflected in a plan
- Professional assessment of specific opportunities for BMP implementation
- Recommendations to landowners about specific BMPs that could be implemented on the farm to reduce soil erosion and increase productivity

- Understanding farmer concerns and challenges regarding compliance and implementing BMPs

Lancaster Farmland Trust took advantage of the opportunity to visit the farms and talk to the operators in order to gauge understanding of state regulations regarding Conservation/Ag E&S Plans and Nutrient/Manure management plans. Visit length took at a minimum half hour up to an hour or two, depending on the types of questions and needs on the farm, as well as the interest of the farmer. Personal conversations included resources to get plans in place, including governmental and private options, the types of cost-share programs available to farmers, such as EQIP or CREP, as well as private funding options. Discussions and recommendations about types of tillage practices and other BMPs best for that particular operation were offered to the farmer.

LFT's outreach confirmed and reinforced the fact most farmers were already aware of the regulatory requirements to have plans. LFT shared information where to obtain plans if they had not yet had one written for their farm. Plan and BMP information was documented on a BMP Assessment sheet, which was developed by LFT (*see Appendix D*).

Data Processing

When site visits were completed, data was compiled in both a quantitative and qualitative manner. Quantitative data was entered into a Google form and exported into an Excel spreadsheet. Data was analyzed through graphs and charts in an effort to understand trends in compliance and BMP implementation.

Data Results Presentations through Public Involvement/Participation and Final Report Development (MCM #2)

In Winter 2016/2017, when initial data was processed, Lancaster Farmland Trust conducted two data results meetings, one for the Board of Supervisors in December 2016 and one for the farmers in January 2017, to present the findings from the visits. A letter was sent to all 182 landowners who received a visit to invite them to the public meeting. To see the letter that was sent to all visited farmers, please see *Appendix E*. To encourage more public participation a flyer was also developed for the farmer's meeting (*see Appendix F*) and posted at the township office. Final report development occurred December 2016 through January 2017. The full results and recommendations are outline here in this final report.

II. DATA AND CONCLUSIONS

The aggregate data below has been processed to provide a baseline condition of agriculture in the township. One hundred ninety-four (194) properties were initially identified for visitation. Once the project started, staff noted that several farmers were farming other parcels in the township,

and documented those practices as well. Based on that documentation, 222 total properties were assessed for compliance and BMP implementation and opportunities. The data below reflects two hundred twenty-two (222) properties reporting, totaling 9,917 acres.

The process in which the data was collected and the data itself is an invaluable resource in bringing farmers and agricultural areas into the MS4 process for reporting purposes. In Lancaster County, many farms are located within the 2010 urbanized area, yet are viewed as separate from those regulations. Most education and outreach is conducted to residents, and stormwater regulations are geared toward developers of residential, commercial, and industrial parcels. For municipalities with large swatches of agricultural land within their MS4, BMP Assessments conducted by Lancaster Farmland Trust can give a more complete picture of baseline conditions within urbanized areas. In addition, these one-on-one visits provide intensive education, outreach, and public involvement/participation outputs as part of MCM #1 and MCM #2 under MS4 regulations. The one-on-one visits satisfied minimum control measure #1 by conducting outreach activities about the impacts of water runoff and the steps that can be taken to reduce erosion, and well as determine the appropriate BMPs on an individualized basis on farms within the MS4. Using the educational strategy of employing a non-regulatory agency to do work on behalf of the municipality, West Cocalico sought to make the project relevant to a sometimes government-wary farming constituency, who prefer to work with private entities. This approach effectively reached diverse audiences due to the personalization of each visit.

The data was segmented into five sections, providing information about 1) agricultural operations, 2) compliance, 3) best management practices, 4) agricultural streamside properties, and 5) suggested areas for BMP implementation. LFT staff found there were many undocumented BMPs on farms without conservation plans, and there were also more opportunities for BMP implementation than initially perceived. Farmers were quick to tell LFT about improvements they have witnessed or implemented themselves, and what a benefit it has been to their operation and to water quality in general. Best management practices, such as minimum-till, no-till farming and cover cropping, is commonplace and widely adopted in the past ten years. Most farmers are conscious of existing regulations, as well as the need to protect stream side areas. This was exhibited by the volume of BMPs already in place and conversations with landowners. However, opportunities to implement further BMPs exist on a number of farms in the township.

Agricultural Operations in the Cocalico Creek Watershed in West Cocalico Township

An “agricultural operation” was defined as a property farmed as one collective unit, despite its composition of multiple parcels and/or account numbers.

Agricultural Land Use Basics

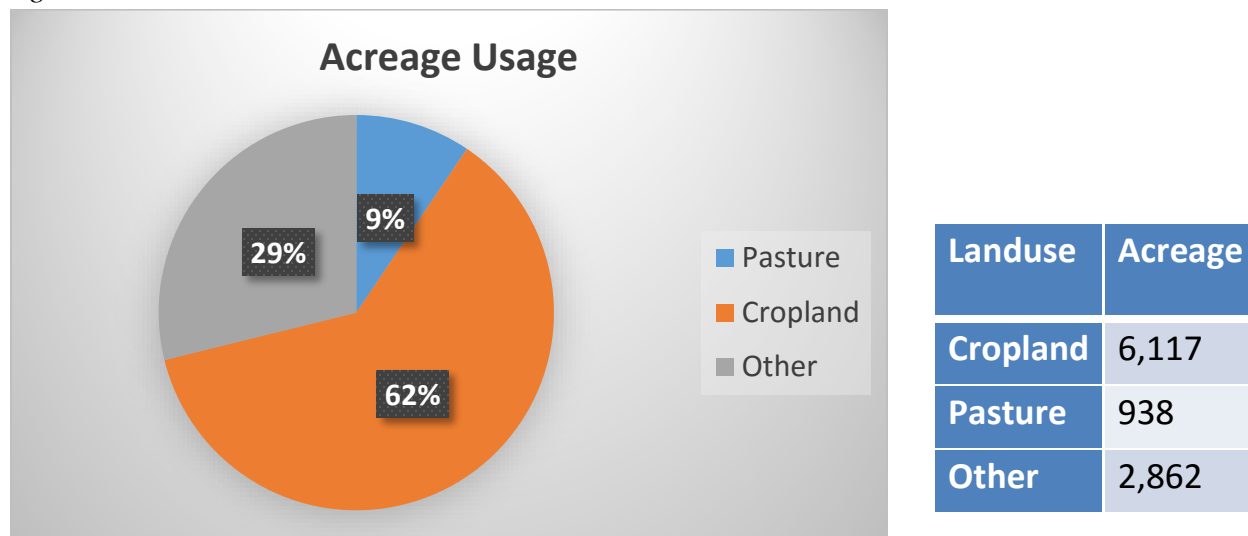


Figure 5: Acreage Usage of Agricultural Land in West Cocalico Township

From the data collected, most of the agricultural land in West Cocalico Township is currently being used to grow crops. To reduce soil loss, best practices in these areas should include cover cropping and no-till. Other improvements such as terraces and grassed waterways usually found in cropland areas also improve water quality.

Crops

The acres of crops grown provide a snapshot of the type of operations in West Cocalico Township. When calculated, acres do not “add up” to the total cropland acreage because of double cropping (two crops grown in the same calendar year).

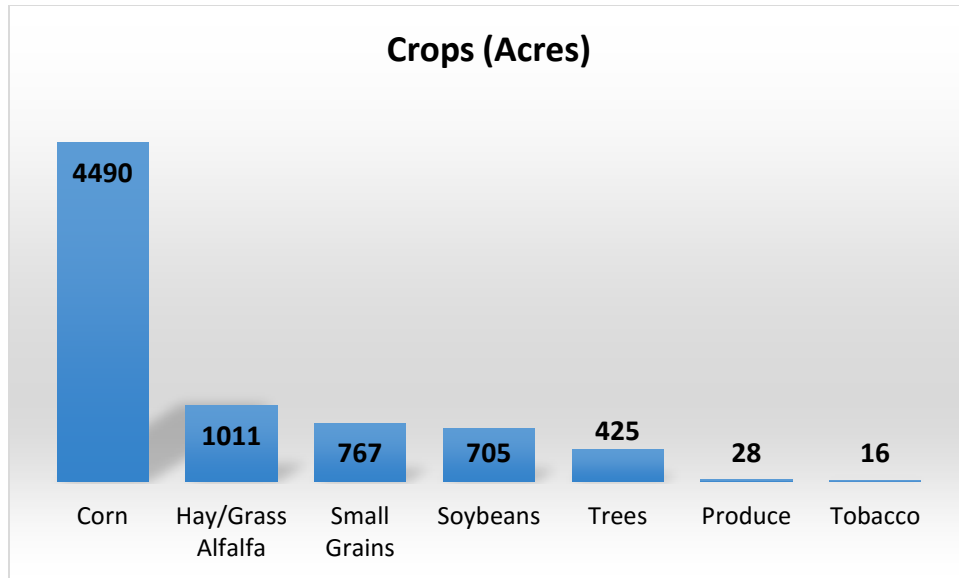


Figure 6: Types of Crops Grown in West Cocalico Township

Corn is the largest crop grown in West Cocalico Township with 4,490 acres, which is similar to other municipalities in Lancaster County. A corn/soybean rotation is commonplace in the county. Both hay/grass alfalfa, small grains, and soybeans come in second, third, and fourth, with 1011 acres, 767 acres, and 705 acres, respectively. Alfalfa and grass/hay in combination with corn is popular with dairy operations in the township. Other small grains, produce, tobacco, and trees/orchards comprise the remaining crops produced in the township.

Agronomic Best Management Practices

The types of crops grown in West Cocalico Township need to be analyzed with their respective tilling practices in order to understand the effect of agriculture on water quality.

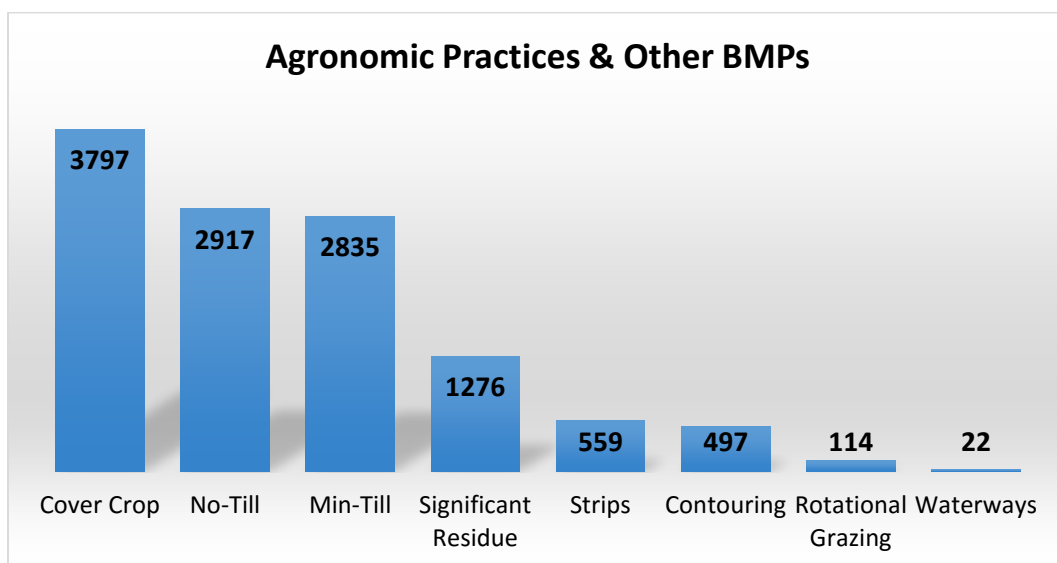


Figure 7: Types of Agronomic Practices in West Cocalico Township

From the data gathered, cover cropping, no-till, and minimum-till are the three largest BMPs employed in West Cocalico Township. Over 5,750 acres of the 9,917 acres visited (about 56%) are being minimum- or no-tilled, which are excellent BMPs to reduce soil erosion while increasing crop productivity. Two major crops that are commonly minimum-tilled or no-tilled are corn and soybeans, two very popular crops in the township. The corn/alfalfa rotation is a good pair for implementing BMPs, as many farmers in the township minimum- or no-till their corn and plant alfalfa as a cover crop. Cover cropping is the largest BMP employed with 3,797 acres. Benefits of using cover crops with no-till include retention of soil nutrients, prevention of soil erosion, building of organic matter, addition of nitrogen, and reduction of soil compaction. Many farmers have already addressed runoff in their cropland with these practices, thus reducing soil loss to the local water course.

Takeaway

Corn is the biggest crop in West Cocalico, and most farmers are minimum- or no-tilling their corn (the second and third highest BMPs in the township, over 56% of acres visited) with a cover crop. No-till and cover cropping is the best BMP pairing to prevent soil erosion and replace nutrients in the soil.

Many farmers are minimum-tilling in West Cocalico Township, and transitioning to full no-till may yield even better results. However, this type of BMP may not be appropriate for every operation, especially in West Cocalico where its soils can hold more moisture, making timing for no-till especially important. A conservation plan will help determine the effectiveness of no-till on soil erosion for a specific farm.

Chapter 102 and 91 Regulations and Compliance

As stated previously, all of Pennsylvania's farms must follow regulations affecting their operations. PA Chapter 102 and 91 states all Pennsylvania farms must have an Agricultural Erosion and Sedimentation Plan or Conservation Plan, and a Manure or Nutrient Management Plan. An Agricultural Erosion and Sedimentation Plan or a Conservation Plan document the types of practices occurring on the farm and ensure the practices being implemented meet a soil loss limit. A Manure or Nutrient Management Plan documents the timing, amount, and location of manure spreading for a particular farm operation. Both documents must be updated and implemented to be in compliance.

Many farmers in Lancaster County and in the Chesapeake Bay Watershed are implementing good agricultural practices, but do not have them documented in an official conservation plan or manure management plan. Lancaster Farmland Trust found that this also holds true for farmers within West Cocalico Township. Even though farmers might be meeting the soil loss limit, their

practices were not getting “credit” to improve water quality. Increasing plan compliance is the first step laying a framework for BMP implementation.

Plan Status

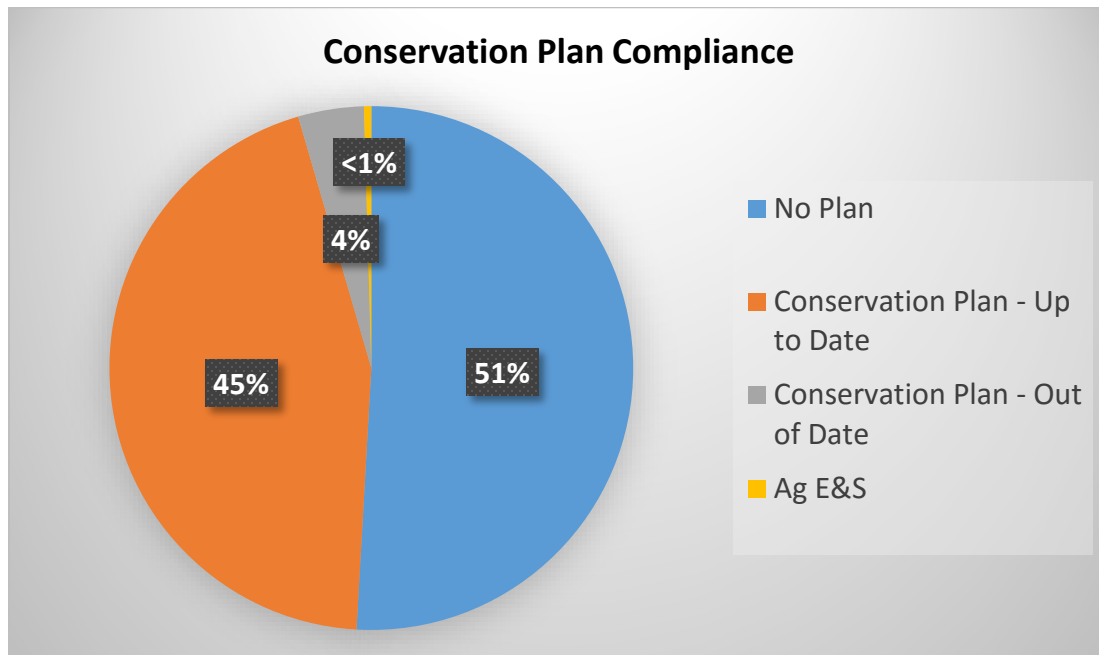


Figure 8: Conservation Plan Status in West Cocalico Township

As seen in the graph above, 45% of farm properties had an implemented Conservation Plan, and less than 1% had an Agricultural Erosion and Sedimentation Plan. Both types of plans, when implemented, equate to regulatory compliance for the landowner. A total of 46% of the farmers in the township are in compliance with state agricultural regulations associated with Conservation Plans. These plans could have been written by the District/NRCS or a private consulting company. However, only a portion of those plans have been captured by the District to be reported back to DEP and EPA in the Chesapeake Bay Model.

Four (4) percent of the plans documented in West Cocalico were out-of-date. An outdated plan may be defined as the following:

- 1) A plan was developed many years ago, but does not reflect the current practices of the operation or current ownership information
- 2) The practices are in place and implemented, but ownership information has changed.
- 3) The practices are in place and implemented with the same owner, but does not address all resource areas (cropland and animal concentration areas).

With assistance from the District, NRCS, Lancaster Farmland Trust, or private consulting firm such as TeamAg, new plans can be developed to additionally count BMPs toward reductions.

Writing plans for farms without a plan or outdated information will help ensure the township can reach 100% regulatory compliance.

Fifty-one (51) percent of the properties visited did not have a Conservation Plan. This percentage is comparable with compliance percentages in other municipalities in Lancaster County (average is 53% over the 8 municipalities visited). Farmers noted reasons why they did not have a Conservation Plan, including their aversion to government imposing regulation and the perceived notion that a plan dictates the way a landowner farms. Staff informed farmers that a plan documents their farm practices and offers ways to limit their overall soil loss. Also, getting a plan in place would avoid the risk of fines or additional regulation.

Undocumented Best Management Practices

Staff noted that 113 properties did not have a plan. However, all of these properties were documenting some type of BMP. Based on the numbers, undocumented BMPs in West Cocalico Township accounted for between 16%-42% (average of 32%) of the practices on the ground. Lancaster Farmland Trust calculated the types and quantities of undocumented BMPs for those properties without a plan. These BMPs have never been documented by the District or any conservation plan-writing entity.

- 1,188 acres of minimum-till (42% of total)
- 1,263 acres of cover crop (33% of total)
- 743 acres of no-till (25% of total)
- 532 acres of significant residue (42% of total)
- 188 acres of strip cropping (34% of total)
- 61 acres of rotational grazing
- 8,037 feet of terraces or diversions (16% of total)
- 2,720 feet of streambank fence
- 31 properties with barnyard improvements (i.e. manure storages, gutters, concreted barnyards)

These numbers should be noted by the township engineer and quantified into a reduction if possible.

Manure/Nutrient Management Plan Compliance

In addition to having an updated and implemented conservation or agricultural erosion and sedimentation plan, farmers must also have a manure or nutrient management plan. The type of plan depends on livestock density on the property. Farmers that exceed an animal density of two animal equivalent units (AEU) per acre are required to have a nutrient management plan. Manure management plans can be written by the farm operator, but nutrient management plans

must be written by a certified nutrient management specialist. On farms visited in West Cocalico Township:

- 102 properties have livestock of some sort on their property to warrant a plan
- 52% in compliance

Manure and nutrient management plans are important because they focus on regulating animal concentration areas, pastures, manure storage and mechanical manure application. The compliance numbers for manure and nutrient management plans in West Cocalico Township are a little lower than average compared to other municipalities in Lancaster County (average is 58% over the 8 municipalities visited). Determination of compliance was difficult in West Cocalico Township because the importation and exportation of manure is more popular due to the larger animal operations. Some landowners were unsure if they were covered by a plan. Many haulers have plans for the farms they service.

Streamside Agricultural Properties

One of the biggest takeaways from the West Cocalico Township BMP Assessment project was the high percentage of farms with stream frontage. Using GIS mapping capabilities, one hundred seventy-seven (177) out of two hundred twenty-two (222) properties, totaling 80% of all properties visited, were identified as being located within 100 feet of a stream. These numbers indicate that the vast majority of township farmers are on the “front line” of water quality in terms of stream proximity. This provides an enormous opportunity for farmers and the township to protect areas directly adjacent to streams. Of the acreage that was within 100 feet of a stream, forty percent (40%) of the properties with stream frontage had some type of informal tree growth or planted a CREP buffer between the operation and the stream. Twenty-eight percent (28%) of it was currently being used as pasture. Many times farmers use streamside areas for pasture because it is usually not suitable for planting. Thirty-two percent (32%) of the properties visited had cropland adjacent to the stream. Staff spoke with farmers during the one-on-one visits encouraging management toward rotational grazing with streamside buffers if those practices were a good fit on the property. The combination of the two can help farmers increase both the environmental and economic performance of their operation. Please see map on next page and *Appendix G* for map of farms with stream frontage.

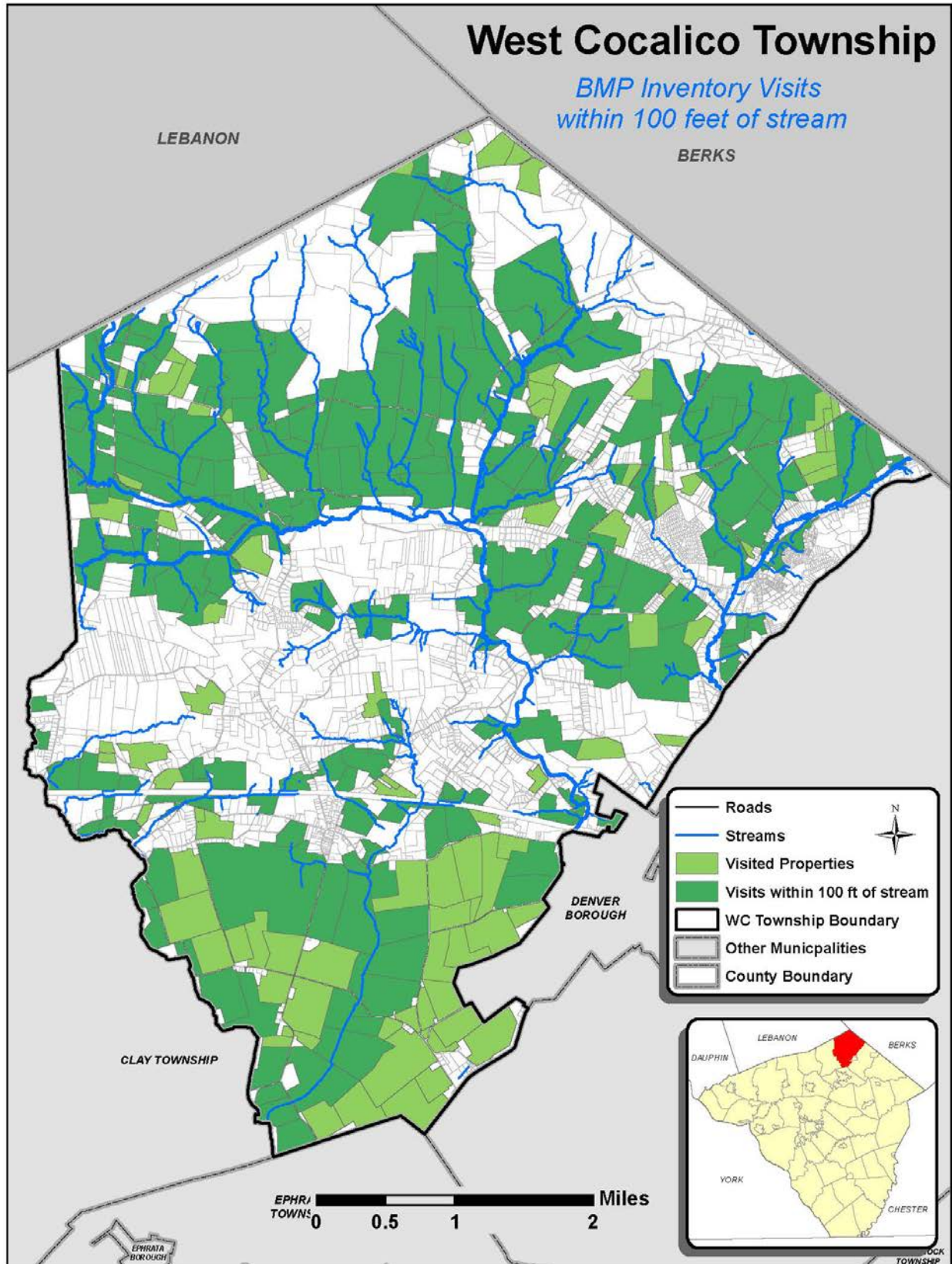


Figure 9: Properties with stream frontage (dark green) in West Cocalico Township

Farm Data within Township MS4 Areas

Data was analyzed within the township's MS4 permit area to give a snapshot of baseline conditions within the urbanized area. Within the MS4 area (see *Figure 10 and Appendix H*), 73 visits were completing, totaling around 2,327 acres. These visits may incorporate multiple parcels or deeds, but are collectively farmed as one unit. Of the 73 visits completed, 29 farms (40%) had a conservation plan and 44 (60%) did not. Of the farms that had livestock on their property, only 42% had a manure management or nutrient management plan. Almost two-thirds (specifically, 64%) of farms possessed some type of stream frontage. From staff observations, the majority of the farms did not have many opportunities for immediate BMP implementation, but plans were lacking. When asked if they were interested in partnering with the township to implement BMPs, only a few farmers seemed willing, either because they did not have current needs or they were hesitant to partner with a government agency. More education and outreach is needed to build interest. Staff noted BMP needs such as streambank fencing or streambank restoration.

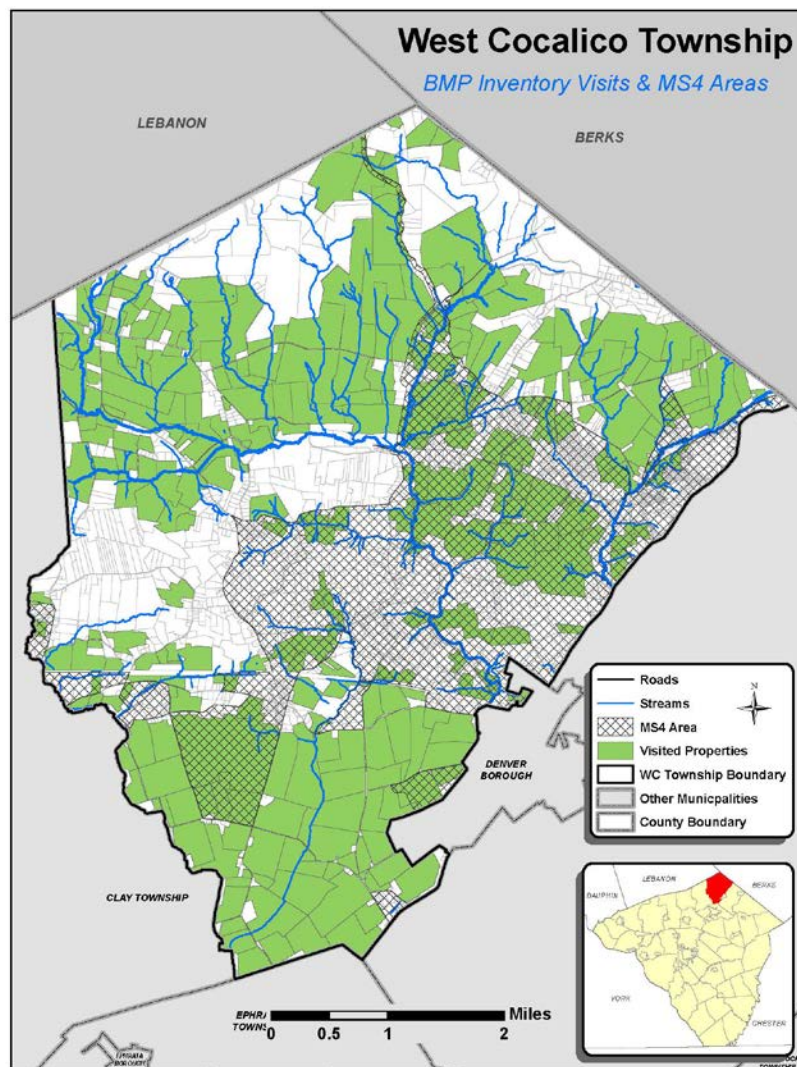


Figure 10: BMP Inventory Visits and MS4 Areas in West Cocalico Township

Field Observations and Data Conclusions

The project progressed from hesitant involvement to willingness to participate to engaging dialogue on the issues. Staff strategically started the process by meeting with the township's toughest or most vocal farmers to introduce the project and dispel any type of fear regarding the project. West Cocalico Township possesses a diverse mix of operations including grain, dairy, poultry, hog, and beef grazing. Most of the properties visited were Mennonite-owned and operated with an average size of 45 acres. The biggest difference in West Cocalico as compared to other townships where BMP Assessments were conducted was the number of large production agriculture facilities for poultry. Most of the farms visited in other townships were Amish-owned and operated dairies, which are usually 40-60 acres in size with 40 milking cows and at least 35 replacement heifers. In Amish dairy operations, manure is usually produced, stored, and spread on the same farm. In West Cocalico, manure from large poultry operations are hauled and more transport is occurring in the township. Therefore, because of larger animal densities and more waste produced, effective manure or nutrient management is essential to improvement of local water quality.

In addition, due to the focus on large-scale production agriculture facilities, the township faces more impervious surface challenges on farms. Creative BMPs that capture and reuse runoff from these facilities may provide additional opportunities for reductions.

For farms which graze livestock, pasture areas present challenges to water quality. Many of the horse and cow pastures did not meet the minimum state requirement of three inches of grass height. Overgrazing pastures leads to less ground cover, compaction, and more water runoff, thus greater soil erosion. For the producer, overgrazing reduces the quality and quantity of forage. Pasture management holds potential for increased water infiltration, decreased soil erosion, and improved forage. Staff also observed a large sector of small horse properties that may not farm as a livelihood. These types of properties may require a different type of education and outreach that resonates with that particular constituency.

In discussions with farmers, there is a heightened sense of awareness regarding stormwater runoff between developed and agricultural areas. Some farmers expressed concerns regarding runoff coming from commercial and residential development, especially chemicals from lawns. LFT staff also noted that all farmers surveyed care about soil conservation and want to keep the soil on their property, but many perceive getting plans as government control on their farm operations and do not want to commit to the process. Staff also noted the wide acceptance of good cropland practices, but also felt some resistance to no-till because of local soil types that drain poorly. Many farmers noted a barrier to no-till is timing during spring planting. Unlike conventional tillage, no-till farmers must wait for just the right conditions to enter the field and plant. Manure handling and management was documented as an issue, especially in timing of spreading over the winter months. Staff noted some manure handling structures had inadequate

storage for the winter months. In those instances, staff recommended larger manure storages or compost bedded pack barns as possible solutions to address nutrient issues. Staff also relayed to farmers ways to finance BMP projects such as using NRCS' cost share programs, such as EQIP, or preserving their farm to fund needed improvements.

About 55% of farms in West Cocalico Township either do not have a plan or had an out-of-date plan. This means over half of the agricultural properties in the watershed have practices that are not accurate or counted. Getting accurate, up-to-date, and implemented plans are necessary to count toward nutrient and sediment reductions. In addition, for farms that currently have livestock, only about half (52%) have an implemented manure or nutrient management plan. Full compliance will help both the farmer and the municipality. Documenting unknown BMPs will be helpful for West Cocalico Township's CBRP/PRP in the short term, but with the adoption of the Commonwealth's Chesapeake Bay reboot, all farmers will soon be held accountable to get conservation and manure management plans, and municipalities can play a key role in ensuring this occurs. West Cocalico Township has already been proactive in requiring conservation plans in order to receive a building permit. This is a very effective method for ensuring agricultural compliance on township farms.

III. RECOMMENDATIONS

Based on the data and interaction with farmers, Lancaster Farmland Trust and the Township now have a possible strategy to increase compliance numbers and effectively implement site-specific BMPs with funding that is acceptable to farmers. The recommendations cited below are also based on feedback from farmers as part of the visits or the public participation meetings to assist in satisfying MCM #2.

Continuation of Verification of Conservation Plans

Current state regulations address all the aforementioned concerns. Development and implementation of Conservation/Ag E&S Plans is imperative. West Cocalico Township is one of several municipalities that has already taken a proactive step to require conservation plans as part of the building permit process. This provides a trigger to ensure that farmers are in agricultural compliance.

The township has already taken proactive steps to ensure farmers are informed and in compliance. Continuing the conservation plan requirement before the township issues a building permit is an excellent method to increase compliance numbers.

Requiring conservation plans when a property is updated or changed prompts the farmer to update his plan to reflect the new operational changes. It also provides a good opportunity for the landowner to implement appropriate water quality measures if needed.

Opportunities for Water Quality Improvement

While agriculture is a significant percentage of land use in West Cocalico Township, residential and commercial development continues to increase. This change in land use, depending on the type of stormwater management plan implemented, may cause flooding downstream.

When agricultural land transitions out of agriculture into residential or commercial use, the Township can proactively take advantage of the land use transition to implement cost-effective green infrastructure projects, such as floodplain restoration or riparian buffers.

When planning a water quality improvement project, or stream restoration project, planners and township staff/engineer can look immediately upstream and downstream and incentivize neighboring parcels to extend conservation value along the stream corridor.

Timing is critical when working with the agricultural community. One way of facilitating this positive collaboration is by offering funding to landowners when they are willing and able to implement conservation measures. Farmers may do additional conservation measures on their own, but they are more likely to implement conservation measures if it is financially beneficial for them with a funding source they can accept, and if they are already thinking about an improvement or change.

It is imperative to maintain a positive working relationship when collaborating with owners and farm operators.

Increase Compliance Numbers: Offer a Cost-Share Program to Write Conservation Plans

In talking with several landowners, many were hesitant to work with government entities to develop a conservation plan. Many farmers have the perception that a conservation plan will dictate the way they farm. Lancaster Farmland Trust has worked with landowners one-on-one to develop plans through TeamAg, a private consulting firm. Many times working with a private firm alleviates the concern of government “telling a farmer what to do”. Lancaster Farmland Trust has found private funding opportunities in the past to provide plans for free or at a discounted rate. West Cocalico Township may want to consider offering match dollars toward plan development for farmers or offer a percentage to a farmer to offset the cost of a plan. Having 100% compliance will assist the township in meeting their water quality regulations,

while at the same time helping farmers develop a timeline for implementation of practices. These plans become roadmaps for organizations such as Lancaster Farmland Trust to find more dollars for implementation.

Increase Compliance Numbers: Offer a Manure Management Workshop for Farmers

One of the most cost-effective ways to increase manure management compliance is to hold a manure management workshop for township farmers. The District regularly conducts manure management workshops in the winter to assist farmers in developing their own manure management plans. LFT has partnered with the District in the past to hold targeted workshops to increase compliance numbers in specific areas of the county. These workshops are free to the public. LFT would be happy to work with the township to organize a half day class for manure management. At the completion of the workshop, farmers walk away with a documented plan on paper.

IV. NEXT STEPS

Update Chesapeake Bay Modeling Software with BMP Assessment Results

Rerunning a Chesapeake Bay Model, such as MapShed, BayFAST, or other approved software, will fine tune the model's results to more accurately identify the areas needed for BMP improvement. With many BMPs such as minimum-till, no-till, and cover cropping unaccounted for the first time around, it would be interesting to see if updated data would reconfigure results based on on-the-ground findings.

Nitrogen	<ul style="list-style-type: none">• Groundwater (stream baseflow)• Livestock• Streambank erosion• Cropland
Phosphorus	<ul style="list-style-type: none">• Livestock• Streambank erosion• Cropland• Hay/Pasture
Sediment	<ul style="list-style-type: none">• Streambank erosion• Cropland• Hay/Pasture• Medium Density Residential

Table 3: MapShed Modeling Results Pre-LFT BMP Assessment

Continue Building Relationships with Farmers

West Cocalico Township may also want to consider financial incentives to farmers to implement BMPs in order to improve water quality. Municipalities demonstrating a proactive, not just a

regulatory approach, will assist in building stronger relationships with their farmers. LFT in the past has acted as an intermediary to other municipalities to do further education and outreach.

Consider a Green Infrastructure Pilot Project

Almost 40% of West Cocalico's MS4 area is in agricultural use, and several farms could provide the opportunity to implement several cost-effective BMPs within MS4 permit boundaries. Based on initial feedback, more education and outreach to farmers would be needed to develop interest in a public-private partnership. However, it can be done and be successful. In Spring 2015, Lancaster Farmland Trust applied for grant dollars to work with six (6) farms within the Pequea Creek Watershed to enroll in the Trust's Continuous Improvement Program (CIP). This program assists landowners in getting plans and implementing them above baseline regulations. By the end of the 5-year time period, all six farms will have a plan and have it fully implemented through grant dollars. This has proven to be an effective private-public partnership to assist farmers to go above baseline compliance to improve water quality for the township and themselves.

Considering the upcoming regulations and reductions associated with the township's MS4 permit, it may be cost-effective to create a similar public-private partnership between LFT, the farmer, and the municipality on a new green infrastructure pilot project. This new model could result in a significant number of green infrastructure implementation projects in West Cocalico Township. It will also reduce nutrient and sediment loads, meet reductions in a timely fashion, reinvest in the township's biggest industry, agriculture, and cut down on long-term stormwater maintenance expenses. LFT could assist in finding and providing private grant dollars to match West Cocalico Township's contributions. Lancaster Farmland Trust would be happy to discuss what type of projects could give the township maximal reductions with the least investment.

Conclusion

Lancaster Farmland Trust and West Cocalico's BMP Assessment process has gained ground with township farmers. Using public-private partnerships between the township and LFT, the project built a successful public education and outreach strategy that developed positive working relationships with farmers in the township. While farmers were initially reluctant to participate, LFT staff built trust within the community and opened the door for further dialogue. In addition, it brought many farmers out to meetings to garner public involvement. When offered several options for compliance and BMP implementation, many farmers were willing to partner for assistance. However, finding private or local funding to implement BMPs is essential to the long term success of the project, due to cultural and religious regions. The biggest challenge to implementing BMPs is the economics of farming – the high cost of land forcing farmers to produce more with less resources. This puts a strain on the financial resources of the farmer and the natural resources of the environment. Developing public-private partnerships that identify

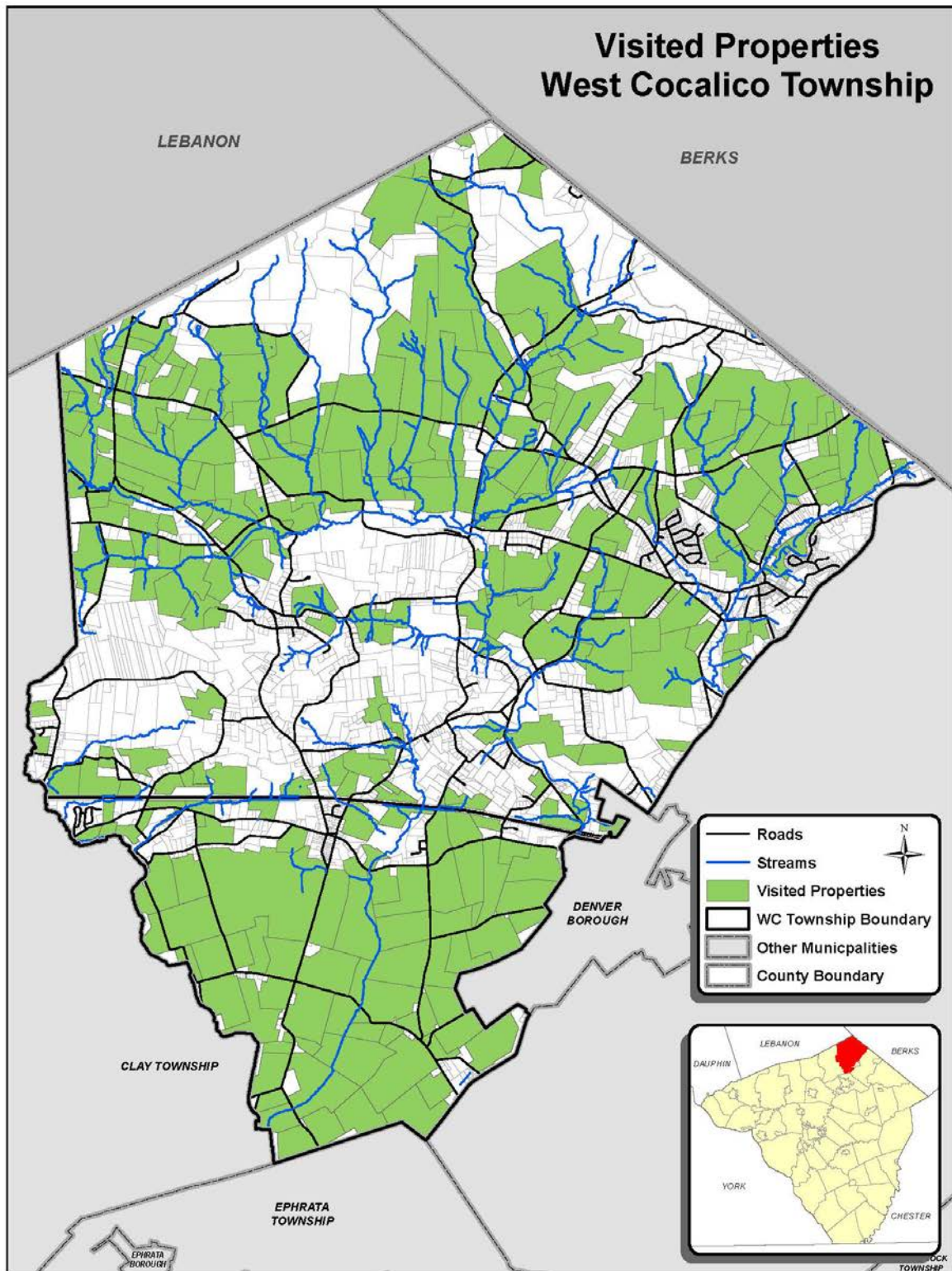
these barriers and offer solutions that work toward the economic and environmental benefit of the farmer and the municipality will help in meeting local and regional water quality goals.

REFERENCES

Cocalico Creek Watershed CBPRP. Baseline Study and Implementation Strategies, Lancaster County, Pennsylvania. Prepared for the Cocalico Creek Watershed Association. LandStudies, Inc. November 2014.

Integrated Water Quality Monitoring and Assessment Report. PA Department of Environmental Protection. 2012.

APPENDICES





February 2, 2015

[REDACTED]

RE: Informational Meeting for West Cocalico Township Farmers, February 17, 2015, 7:00pm, West Cocalico Township Municipal Office

Dear [REDACTED]

Lancaster Farmland Trust is a private, non-profit organization that preserves and stewards Lancaster County's farms. The Trust also helps farmers put conservation practices on their farms, sometimes at a reduced cost. In an effort to clean up local water and the Chesapeake Bay, all land uses, including farming, are being studied for nutrient and sediment pollution of local waterways and finding opportunities for new best management practices implementation (BMPs). Best Management Practices (BMPs) are farming methods that increase plant productivity and minimize impacts on the environment. Lancaster Farmland Trust knows that farmers have installed numerous BMPs to reduce soil loss; however, many of those practices have not been recorded to help local communities meet water quality requirements. The Trust will work with farmers to help them meet agricultural regulations and create a list of BMPs on their farms. The information collected may also help the township meet increasing water quality regulations. Individual farm BMP information will be added to all other farms located in the same watershed and released to the township in a total amount for each specific watershed.

The Trust is holding an informational meeting for landowners on **Tuesday, February 17, 2015 at 7:00pm** at the West Cocalico Township Municipal Office, located at 156B West Main Street, Reinholds. The reason for the meeting is to let farmers know about this project, talk about the details of this two-year process, and discuss the benefits of the project for farmers. All landowners and tenant farmers are encouraged to attend. Issues discussed at the meeting will include:

- Regulations affecting farm operations
- The purpose of the township-wide project, timeline, and role of Lancaster Farmland Trust, West Cocalico Township, and landowners
- Specific details about the "on-farm" visits and inventory of BMPs

If you have any questions regarding the project or the meeting, please call Stephanie Smith at the Trust (717-687-8484). We hope to see you at the meeting on **Tuesday, February 17th, at 7:00 PM.**

Best Regards,

Jeffery E. Swinehart
Deputy Director
Lancaster Farmland Trust



April 8, 2015



Dear [REDACTED],

West Cocalico Township is partnering with Lancaster Farmland Trust to create a list of best management practices (BMPs) on agricultural land in the township. West Cocalico, along with many other municipalities, is facing increasing regulations regarding water quality and this information may help the township in meeting these regulations.

Many farmers within the township are currently using best management practices (BMPs) on their farms, many of which were voluntarily installed by the farmer, but have never been recognized. Keeping track of the BMPs on your farm that reduce soil erosion and minimize nutrients getting into local waterways is a good way to position yourself to meet state requirements for farm operations. Your BMPs may also be a savings for you and other residents of West Cocalico Township by allowing the township to “account” for the reductions of sediment and nutrients these BMPs are providing. Documenting these BMPs may help the township in meeting the water quality regulations and may help to alleviate the need for the township to invest in traditional “brick and mortar” solutions to water quality issues.

In order to account for the BMPs you have implemented, I will be visiting your farm at [REDACTED] during the week of **April 11th, 2015**. During this visit, I would like to talk with you or the farm operator in order to understand the management of the farm. If you have a Conservation Plan, it would be helpful for me to review it, as it lists the BMPs in place. If you do not live at the farm, or someone else operates the farm, please let them know about this visit.

Lancaster Farmland Trust and the township strongly feel this project will show agriculture is the solution, not the cause, of local water quality issues. This will also confirm the importance of agriculture in Lancaster County – not only for its direct agricultural value, but also for the water quality benefits achieved by having farmers working the land.

If you have questions, would like to schedule a time, or need to reschedule this visit, please call me at (717) 288-2831.

Thank you, and I look forward to meeting with you and visiting your farm.

Sincerely,

Ken Pacanowski
Stewardship Coordinator



Visual Assessment

Cropland

☐ N/A

Gully erosion: ☐ none ☐ some ☐ many ☐ ephemeral ☐ persistent

Evidence of sheet or rill erosion: ☐ none ☐ some ☐ significant

Pasture

☐ N/A

☐ Excellent (3" or higher of quality forage)

☐ Good (Ground cover-3" high forage)

☐ Poor (Denuded, overgrazed, significant bare/mud areas, extension of a barnyard)

Barnyard

☐ N/A

☐ All barnyards are concreted/protected and water is collected and treated

☐ Most barnyards are concreted/protected and most water is collected and treated

☐ Barnyards do not protect ground water and water runoff is not collected/treated

☐ Gullies lead from barnyards to an ephemeral or permanent watercourse

Areas within 100 feet of a Stream

☐ Present on Farm

☐ Not Present on Farm

☐ Forested or significant (CREP) vegetated buffer (width) _____

☐ Cropland: ☐ excellent ☐ good ☐ poor

☐ Pasture: ☐ excellent ☐ good ☐ poor

☐ Barnyard: ☐ water doesn't reach stream ☐ water does reach stream

Other Sources of Pollutants

☐ Leachate

☐ Milk House Wash Water

Future Improvements

☐ In Process of Implementation

☐ Future Project w/ Timeline _____

Types of BMPs: _____

Areas of Improvements for Future BMPs (type/location): _____

Comments: (Willingness to partner with agency/org/muni to implement BMPs; what types of funding comfortable with – public/private)



January 4, 2017

[REDACTED]

RE: Follow Up Meeting for West Cocalico Township Farmers, Wednesday, January 25th, 7:00pm, West Cocalico Township Municipal Building

Dear [REDACTED],

Over the past two years, Lancaster Farmland Trust visited 222 agricultural properties in West Cocalico Township to document the types and extent of best management practices (BMPs) implemented on township farms. Thank you for your time and for sharing information with Trust staff during the visit. Understanding the extent of these 'volunteer' or undocumented conservation practices is important to determine the positive effect of agricultural BMPs on water quality in the township.

All landowners and tenant farmers are invited to attend a farmer meeting on **Wednesday, January 25th, 2017 at 7:00pm** at the West Cocalico Municipal Building, located at 156B West Main Street, Reinholds, as a follow up to the farm visits. The purpose of the meeting is to share results of the two-year project, including:

- Report overall acreage of conservation practices implemented on West Cocalico Township farms
- Discuss agricultural compliance percentages in the township
- Identify common conservation challenges
- Highlight opportunities for green infrastructure investment
- Listen to concerns and gain feedback from landowners and tenant farmers

The data shows that farmers have implemented many BMPs that reduce erosion and minimize nutrient loading to local waterways that have not been documented previously.

Lancaster Farmland Trust is committed to building relationships with farmers to support township agricultural operations and improve local water quality. If you have any questions regarding the meeting, please call Stephanie Smith Armpriester, Municipal Outreach Coordinator, at the Trust (687-8484). We hope to see you at the meeting on **January 25th, 2016 at 7:00 PM.**

Best Regards,

Jeffery E. Swinehart
Deputy Director
Lancaster Farmland Trust

WEST COCALICO TOWNSHIP BMP (Best Management Practice) ASSESSMENT FARMER'S RESULTS MEETING

Presented by Lancaster Farmland Trust



**Wednesday, January 25, 2017
West Cocalico Township Building
7:00pm**



Lancaster Farmland Trust, a private, non-profit organization, visited 222 farms over the past two years in West Cocalico Township. The project documented the good practices farmers are implementing on their farm to meet federal and state Chesapeake Bay regulations.

COME TO FIND OUT THE RESULTS!

- Regulations affecting farm operations
- Agricultural compliance percentages
- Overall acreage of BMP practices
- Conservation challenges
- Opportunities for partnerships

Questions?

Call Stephanie Smith Armpriester, Municipal Outreach Coordinator, Lancaster Farmland Trust at (717) 687-8484

