

ENVIRONMENTAL RESOURCE ANALYSIS

Introduction

The inventory and identification of Hereford and Washington Townships' natural resources is an important part of the planning process. Delineation of these resources serves as a guide for future planning and preservation decisions. The following will identify and describe the planning area's environmental features and natural resources. Environmental features mapping will be utilized to spatially demonstrate the various resources described in this chapter.



Climate

Washington and Hereford Townships are located in the eastern corner of Berks County, in the southeastern part of Pennsylvania. They share the border with Lehigh and Montgomery Counties. The Townships have a fairly moderate, humid continental climate. As they are located on the leeward side of the Appalachian Mountains, winters are comparatively short and mild (with an average January temperature of 30 degrees) while summers are long and frequently humid (with an average July temperature of 77 degrees). The immediate climate is quite variable, changing with greater frequency during the winter and spring months, than in the summer months. This is due to the influence of prevailing westerly winds that carry many of the major weather systems eastward across the continent. Air masses tend to linger longer in the summertime. Climate is not a major factor affecting land use patterns in the area; however, it is a prime determinant of the natural vegetation pattern. The area usually encounters freezing temperatures between mid-October to mid-April, and receives approximately 45 inches of precipitation annually.

Physiography

A physiographic region combines the aspects of geology and topography, creating broad classifications based on terrain texture, rock type, and geologic structure and history. There are three physiographic sections in Hereford and Washington Townships, as shown on the Physiographic Provinces maps. The Reading Prong section (New England Physiographic Province) encompasses the higher ground in the western portion of the Townships. The Great Valley section (Ridge and Valley Province) runs narrowly between the hills and the valley. The valley section is classified as the Gettysburg-Newark Lowland section (Piedmont Province).

A majority of Hereford and Washington Townships falls in the New England Physiographic Province (specifically the Reading Prong section), which is characterized by circular to linear, rounded low hills or ridges that project upward in significant contrast to the surrounding lowlands. These hills and ridges are generally composed of granitic gneiss, granodiorite, and quartzite – all very resistant to erosion. Therefore, the hills and ridges stand higher than the softer sedimentary rocks that surround them. The slopes of these hills and ridges are often steep, lie in a northeast to southwest pattern, and have a very well defined change in slope where the bases of the hills and ridges meet the lower and gentler slopes of adjacent sections. The streams eroding into the hills and ridges are short and steep. Local relief is 300 to 600 feet and elevations range from 140 to 1,240 feet. The Reading Prong is a narrow belt of folded and faulted Precambrian crystalline rocks and metamorphosed Paleozoic igneous and sedimentary rock, similar to that which comprises many New England mountains. These are some of the oldest rocks in the Piedmont/Appalachian region. They are a deposition of sediments on the ancient North American coastline more than one billion years ago.

Rocks of the Great Valley Section of the Ridge and Valley Province serve as a thin barrier weaving between the Reading Prong and Gettysburg-Newark section. This section of rocks are typically found in the very broad lowland that sweeps across the southeast portion of the state from Maryland to New Jersey that is bordered

Chapter 6 - Environmental Resource Analysis

by the Blue Mountain to the north and the South Mountain and Reading Prong to the south. The thin band of Great Valley sequence rocks found in Hereford and Washington Townships are about five miles south and well outside of the actual Great Valley as a result of faulting and rock displacement during the Alleghanian orogeny. While the actual Great Valley has gently undulating hills eroded into shales and siltstones on the north side of the valley and a lower elevation flatter landscape developed on limestones and dolomites on the south side, the Great Valley rocks found in Hereford and Washington Townships are solely comprised of carbonate rocks and sandstones. Local relief in this thin section of Great Valley rocks is less than 100 feet. Surface water in the thin band of Great Valley rocks consists of a number of small streams that originate in the hills and ridges of the New England province in the western portion of the townships, cut across the band of carbonate and sandstone rocks of the Great Valley section and continue on through the lowlands in the eastern portion of the Townships. A number of contact springs are present along the boundary of the Reading Prong metamorphic rocks and the Great Valley carbonate rocks. The best known of these springs is the Barto Spring located near the intersection of Forgedale Road and Old Route 100 in Washington Township.

The eastern edge of Washington Township and the lower edge of Hereford Township are part of the Gettysburg-Newark Lowland Piedmont Physiographic Province. The Gettysburg-Newark Lowland Section consists mainly of rolling low hills and valleys developed on red sedimentary rock. There are also isolated higher hills developed on diabase, baked sedimentary rock (hornfels), and conglomerates. Almost all of the underlying sedimentary rock dips to the north or northwest and many of the smaller drainage ways are oriented normal to the direction of dip so that some of the topography has a northeast-southwest linearity. However, the basic drain-age pattern is dendritic. Soils are usually red and often have a visually striking contrast to the green of vegetation. Relief is generally in the area of 100 to 200 feet, but locally is up to 600 feet on some of the isolated hills. Elevation in the Section ranges from 40 to 1,335 feet. The Section is made up of sedimentary rocks that were deposited in a long, narrow, inland basin that formed when the continents of North America and Africa separated more than 200 million years ago.

Geology

The Townships are underlain by a number of geologic formations of the Precambrian and Lower Mesozoic eras. Each of the nine formations has unique characteristics that determine its construction suitability, such as cut-slope stability, ease of excavation, and foundation stability. In addition, geologic formations reveal groundwater characteristics and yields.

The table on the next page highlights the major geologic formations within Hereford and Washington Townships along with a description of each formation's engineering characteristics. The Surface Geology maps show the locations of these various formations within the Townships. The ridge that runs along the center of the Townships is generally composed of Granitic Gneiss (gn), while the lowland area under the State Route 100 (SR 100) corridor is generally composed of the Brunswick Formation (Trb) and Limestone Fanoglomerate (Trfl).

Nine geologic formations have been identified in the planning area. Porosity and permeability, the ability to absorb and transfer water to the aquifer, is a key characteristic to determining where structures are built. The formations in Hereford and Washington Townships are generally low to moderate with the exception of the Leithsville Formation, which abuts the middle ridge of the Townships on both sides, and the Limestone Fanoglomerate, which is located on the eastern lowland corridor. Excavation is typically difficult, though foundation stability is good.

Engineering Characteristics of Hereford and Washington Townships' Geologic Formations						
Formation	Description	Porosity	Permeability	Ease of Excavation	Foundation Stability	Median Ground-water Yield (GPM)
Brunswick Formation (Trb)	Reddish-brown shale, mudstone, and siltstone; beds of green shale and brown shale occur; very fine grained; near base, rock is tough, red argillite interbedded in some places with dark-gray argillite.	Moderate	Moderate	Moderately difficult to moderately easy	Good	60
Diabase (Trd)	Dark gray to black, dense, and very fine grained, and consists of mainly labradorite and augite; occurs as dikes and sheets.	Low	Low	Difficult	Good	5
Granitic Gneiss (gn)	Light buff to light pink; fine to medium grained; primary minerals are quartz, microcline, hornblende, and biotite.	Low	Low	Difficult	Good	20
Granodiorite & Granodiorite Gneiss (ggd)	Medium grained; light pink to green; largely quartz, feldspar, and mica; commonly gneissic.	Low	Low	Difficult	Good	10
Hardystone Formation (Cha)	Light-gray quartzite; weathers yellow brown; porous and limonitic in many places; quartz-pebble conglomerate occurs at base.	Low	Low	Difficult	Good	20
Hornblende Gneiss (hg)	Dark -gray to black; composed of hornblende and labradorite (feldspar).	Low	Low	Moderately difficult	Good	10
Leithsville Formation (Clv)	Dark-gray to medium-gray dolomite; some calcareous shale and sandy dolomite.	High	Moderate to high	Difficult	Good	100
Limestone Fanoglomerate (Trfl)	Yellow-gray to light medium gray; Composed mainly of limestone and dolomite pebbles and fragments; some shale fanoglomerate interbeds; very fine grained, red quartz matrix.	Moderate	Moderate to high	Difficult	Good	200
Metadiabase (md)	Dark-greenish-gray to almost black diabase; consists of augite, feldspar (andesine to labradorite), and manetite; extensively altered-feldspar is altered to sericite and augite has been replaced by epidote and chlorite; occurs as mostly thin dikes.	Low	Low	Moderately easy	Excellent	5

Sources: *Pennsylvania State University, Earth Resources Research Institute, 1994.*

Alan R. Geyer and J. Peter Wilshusen, Engineering Characteristics of the Rocks of Pennsylvania. 1992. (Pennsylvania Geological Survey, Harrisburg, PA).

Chapter 6 - Environmental Resource Analysis

Soils

The Soil Survey Geographic Data Base (SSURGO) combines soils into Soil Associations, which emphasize how soil depth, slope, and drainage affect potential land use. The associations are helpful in attaining a general idea of soil quality, in comparing different sections of the study area and locating large areas suited for certain uses. The soil associations found in Hereford and Washington Township are shown on the Soils maps.

Prime Agricultural Soils

Prime farmland, as defined by the U.S. Department of Agriculture (USDA), is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has soil quality, growing season, and water supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods, as shown on the Sensitive Natural Features map. Such fertile soils are commonly found close to streams in Hereford and Washington Townships. They generally lie along the SR 100 corridor, in the eastern portion of the Townships and along the western edge of Hereford Township. The ridge that runs down the middle of the Townships has less prime agricultural soils, tending to do best in non-hilly areas. Farmland soils of statewide importance are soils that are predominantly used for agricultural purposes within a given state, but have some limitations that reduce their productivity or increase the amount of energy and economic resources necessary to obtain productivity levels similar to prime farmland soils. These soils are usually classified as capability Class II or III.

Hydric Soils

Hydric soils are soils that retain water during a portion of the year. As a natural resource, hydric soils provide water storage and infiltration that naturally regulates water sources and flows. These soils are susceptible to compaction and uneven settling when developed. These factors impact land use decisions. Hydric soils in Hereford and Washington Townships are generally located in the flood plains, near riverbeds. See the Sensitive Natural Features or Soils maps for specific locations.



On-Lot Septic Suitability

The suitability for septic tank installation is of great importance to future development and is completely dependent on local soil properties, including depth to seasonal high water table, depth to bedrock, slope, and susceptibility to flooding. Without proper soil conditions, septic tanks will not operate properly and health hazards may result. The Public Utility Service Areas maps illustrate the locations of proposed sanitary sewer service areas. These proposed areas are locations where due to soil properties, sanitary sewer service would be most appropriate to reduce on-lot septic system failures. The Public Utility Service Areas maps also identify existing sanitary sewer service areas, sanitary sewer plants, and sanitary sewer pumping stations.

Soil Suitability for Construction

Areas set aside for development within Hereford and Washington Townships are based on a number of factors, most importantly the engineering characteristics of soils determine where the growth of such communities will occur. Construction suitability is based on the local water table and the depth to bedrock. These areas correlate with on-lot septic suitability, but account for a wider range of uses. Again, most of the Townships have severe limitations for development. Areas that pose moderate and slight limitations are in the lower lying areas of the Townships, on either side of the middle ridge that runs throughout the Townships.

Sinkholes are a common name given to a depression in a limestone soil's surface. These develop when underground cavities that are formed when water percolates through soluble limestone bedrock, collapse. Sinkholes are found in areas that are underlain by carbonate bedrock. Carbonate bedrock is generally found in the Allegheny Mountains in central Pennsylvania and in southeast Pennsylvania. In Berks County, sinkhole prone areas overlie limestone beds. Although most sinkholes in Berks County lay in the limestone belt north of Reading, Hereford and Washington Townships have pockets of such areas along the eastern lowlands. DCNR's Sinkhole Interactive map identifies surface depression locations and sinkholes throughout the state. A sinkhole located in close proximity to a septic system may allow untreated wastes into an underground water supply.

Limited mining operations in the Townships have also left dormant mine shafts in the area. This may present some difficulties in the available land to be developed or constructed upon. Iron Ore quarrying near the intersection of Barto Road and Old Route 100 has presented such problems.

Floodplains

Floodplain areas absorb and store large amounts of water, resulting in aquifer recharge. Natural vegetation supported by floodplains helps to trap sediment from upland surface runoff, stabilize stream banks, and reduce soil erosion. Floodplains also provide shelter for wildlife and proper stream conditions for aquatic life. Regulations of floodplains help to reduce the threat to human life and property caused by periodic flooding. For regulatory purposes, a floodplain is defined by the 100-year or base flood, which has a one percent chance of being equaled or exceeded in a given year. The Sensitive Natural Features maps show the 100-year floodplain for the major creeks and streams located in Hereford and Washington Townships.

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires municipalities identified as being flood-prone, to enact floodplain regulations that (at a minimum) meet the requirements of the National Flood Insurance Program (NFIP). The NFIP is a federal program that allows property owners in participating communities to purchase insurance protection against losses from flooding. Currently, both Hereford and Washington Townships are participating in this program and have enacted floodplain ordinances.

The NFIP Community Rating System (CRS) was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the CRS in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce

Chapter 6 - Environmental Resource Analysis

flood losses, (2) facilitate accurate insurance rating, and (3) promote the awareness of flood insurance. Neither Hereford nor Washington Township participates in the CRS program.

Participation in the CRS is voluntary. No fee is charged for a community to apply for participation in the CRS. The only costs the community incurs are those of implementing creditable floodplain management activities and the staff time needed to prepare the CRS Application. The benefits to participating in the CRS program, beyond insurance premium reduction, include the following:

- The CRS floodplain management activities provide enhanced public safety, a reduction in damage to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, and protection of the environment.
- A community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.
- Technical assistance in designing and implementing some activities is available at no charge.
- A CRS community's flood program benefits from having an added incentive to maintain its flood programs over the years. The fact that the elimination of a flood-related activity or a weakening of the regulatory requirements for new development could affect the community's CRS status should be taken into account by the governing board when considering such actions.
- Implementing some CRS activities, such as floodplain management planning, can help projects covered under this plan qualify for certain other federal assistance programs such as the Flood Mitigation Assistance Program (FMA), the Hazard Mitigation Grant Program (HMGP), and the U.S. Army Corps of Engineers.

Wetlands

Wetlands are unique environments that perform a variety of important functions. They moderate storm water runoff and downstream flood crests because they are natural water storage areas. Wetlands help to maintain a stream flow and groundwater recharge. Wetlands also provide important habitats for many species of plant and animal life. There are problems associated with developing on wetland soils. Wetlands located in floodplains are often flooded. Draining or filling in of upland wetlands removes natural water storage, which can add to storm water runoff problems downstream. Wetland soils are easily compacted, which results in uneven settling of structures. Wetland soils with low permeability and high groundwater tables are not suitable for the installation of on-lot septic systems. Laws, such as the Federal Clean Water Act and similar state and local laws, have led to the enforcement of wetland protection. In Pennsylvania, the U.S. Army Corp of Engineers and the Pennsylvania Department of Environmental Protection strictly regulate development in wetland areas. Therefore, any development of these areas is subject to both federal and state permitting processes.

As shown on the Sensitive Natural Features maps, wetlands are located throughout Hereford and Washington Townships, based on The National Wetlands Inventory by the U.S. Department of Agriculture, Fish and Wildlife Service. They are commonly found along the major creeks and/or tributaries; namely Swamp Creek in the lower portion of Washington Township, West Branch Perkiomen Creek in both Townships, and the Perkiomen Creek in eastern Hereford Township. There are also several smaller 'pockets' of wetlands spread throughout the Townships.

Steep Slopes

The slope of the landscape affects land use patterns and development in a variety of ways. Steep slopes constrict development potential and cost, e.g. the placement of sewage systems and septic tanks, as well as

buildings. Slope can also be an economic incentive, offering unique scenic quality to the placement of structures. Slopes with grades of 15% or greater are considered steep. If disturbed, these areas can yield heavy sediment loads on streams. Very steep slopes, with over 25% grade, produce heavy soil erosion and sediment loading.

Steep slopes generally fall within the middle ridge of the Townships, which roughly correlates with the placement of Granitic Gneiss bedrock. Both Hereford and Washington Townships have identified slope as a restrictive factor of land development in their subdivision ordinances. Hereford Township restricts the development of buildings on slopes of 25% or more. Structures proposed on land that has a slope of 15 – 25% are permitted, with limitations.

Land Cover

Open Fields

Open fields are very abundant throughout Berks County, including the Oley Valley east of the City of Reading. Hereford and Washington Townships are no exception. The Berks County Comprehensive Plan defines open field as, “farmland, both active and inactive, pastureland, meadows, and yards.”

Open fields are a key asset in Hereford and Washington Townships. They provide an important source of groundwater recharge and high quality soils. Open fields also serve as a prime area for plant and animal habitat and activity, as well as providing scenic vistas for visitors and residents of the region. Although the use of open fields depends largely on soils and underlying geology, agriculture is a common use for such land in the Townships.

The importance of open fields are addressed in earlier comprehensive plans and zoning for both Hereford and Washington Townships. As most of the development within the Townships are focused on the SR 100 corridor in Washington Township, the hillier areas west of this area is generally open fields and forested areas that are not developed. Cluster development, transfer of development rights (TDR), conservation easements, and agricultural preservation strategies (Ag Security Act, Clean and Green, etc.) are the most commonly used tools to preserve open fields. The cultural resources analysis highlights these resources in further depth.

Forested Areas

As Washington and Hereford Township are in relatively rural areas, a large majority of the land remains forested. Such coverage provides aesthetic qualities of scenery, climate control, and better air quality. Woodlands also provide erosion control on steep slopes, which inhibits stream pollution. Areas that have year-round foliage covering determine wooded areas in Hereford and Washington Townships. Although both Townships have the preservation of significant woodlands as an objective in their earlier comprehensive plans and zoning ordinances, both allow conditional development on areas deemed for woodland conservation.

Surface Water Features

Surface waters include rivers, streams, and ponds. They provide aquatic habitat, carry or hold runoff from storms, and provide recreation and scenic opportunities. Surface water resources are a dynamic and important component of the natural environment, but ever-present threats such as pollution, construction, clear-cutting, mining, and overuse have required the protection of these valuable resources. Hereford and Washington Townships include several creeks, streams, and pools, all within the Delaware River Basin. The Perkiomen Creek, the west branch of the Perkiomen Creek, and Swamp Creek are the larger tributaries in Hereford and Washington Townships. A slight portion of the Little Lehigh watershed falls in the extreme northwest corner of Hereford Township, while the Manatawny Creek watershed runs along the southern border of Washington Township. See the Natural Resources maps for surface water features and watersheds.

Hereford Township and the upper half of Washington Township lie in the Perkiomen Creek watershed,

Chapter 6 - Environmental Resource Analysis

encompassing approximately 30 square miles of the Upper Perkiomen Creek watershed. These are the headwaters of this watershed. The lower half of Washington Township lies in the Swamp Creek watershed. These watersheds serve as a vital resource for the Philadelphia Suburban Water Company.

The Pennsylvania Chapter 93 Water Quality Standards classify surface waters according to their water quality criteria and protected water uses. Selected bodies of water that exhibit exceptional water quality and other environmental features are referred to as “Special Protection Waters.” Certain activities in those watersheds that could adversely affect surface water are more stringently regulated to prevent degradation. Land development, sewage treatment and disposal, industrial and municipal waste, mining and quarrying, timber harvesting, stormwater management, and confined feeding operations must follow guidelines found in PADEP’s Special Protection Waters Implementation Handbook, or other regulations relative to Special Protection Waters. The waterways that are deemed high quality or exceptional, or another special status of Chapter 93 are listed in the table on the following page.

Chapter 93: Water Quality Standards for Hereford & Washington Townships		
Stream	Location	Protected Use
Delaware Estuary		
Schuylkill River		
Perkiomen Creek	Basin, Source to SR 1010 Bridge at Hereford	HQ-CWF, MF
West Branch Perkiomen Creek	Basin, Source to SR 1022 Bridge (Huffs Church Road (RM 12.9)	CWF, MF
West Branch Perkiomen Creek	Basin, SR 1022 Bridge to SR 2069 Bridge (Old Route 100) (RM 8.0)	EV, MF
West Branch Perkiomen Creek	Basin, SR 2069 Bridge to Mouth	CWF, MF
Swamp Creek	Basin, Source to Dam in Bechtelsville (RM 15.5)	HQ-CWF, MF
Swamp Creek	Basin, Dam in Bechtelsville to SR 100 Bridge	CWF, MF
<i>Cold Water Fishes (CWF):</i> Maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna that are indigenous to a cold water habitat.		
<i>Migratory Fishes (MF):</i> Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes that ascend to flowing waters to complete their life cycle.		
<i>High Quality Waters (HQ)</i>		

Source: Pennsylvania Department of Environmental Protection, 2013

The Pennsylvania Environmental Quality Board recently designated the west branch of the Perkiomen Creek, and the Perkiomen Creek itself, as high-quality habitats for cold-water fish. The Townships’ area of the watershed is classified as cold water fishery. According to the Pennsylvania Department of Environmental Protection (PADEP), this is defined as the, “maintenance of propagation, or both, of fish species including the family Salmonidae and additional flora and fauna that are indigenous to a cold water habitat.” (Chapter 93) As well as being a cold-water fish haven, the Perkiomen Creek has been designated as having exceptional value. Swamp Creek in Washington Township has been designated a stream with high water quality. Such designations are based on scientific conditions and require a public comment period.

Watershed Conservation Groups

Perkiomen Watershed Conservancy

The Perkiomen Watershed Conservancy is a non-profit organization founded in 1964 by local citizens to combat pollution in the Perkiomen Creek and its tributaries. The Conservancy’s mission has since been broadened to protection of the watershed’s ecosystems in the midst of regional growth. The Conservancy provides an integrated approach to issues through Environmental Education, Land Conservation and Protection, and Watchdog Activities. Although a majority of their efforts are concentrated in Montgomery County (because

geographically, a majority of the watershed is in that County), they hold high water quality of the Perkiomen Watershed (in Berks County) as one of their goals.

Upper Perkiomen Watershed Coalition

The Upper Perkiomen Watershed Coalition is a non-profit organization that strives to protect the water quality and environmental integrity of the Upper Perkiomen Watershed. The Coalition educates the public in watershed management, coordinates various municipalities for cooperation, represents interests for local government support, and identifies and evaluates water resources and the threats to them. A main activity of the Coalition has been to produce the Upper Perkiomen Creek Watershed Conservation Plan. The Plan serves as a guide for stakeholders, providing an overview of key natural and cultural elements, water quality and quantity concerns, and examines potential major land use changes. The plan was recently completed in 2002 as part of the PA DCNR's River Conservation Program. Since completion, the Upper Perkiomen Creek has been added to the Pennsylvania Rivers Conservation Registry, making participating municipalities eligible for DCNR matching grants. The Rivers Registry program is used to promote river conservation and serve as an avenue to endorse local initiatives by binding them together in a statewide recognition program.

Schuylkill River Greenway Association

The Schuylkill River Greenway Association (SRGA) strives to conserve, interpret, and develop the historical, cultural, natural, and recreational resources related to the industrial and cultural heritage of the Schuylkill River Valley. As part of this overall mission, protecting the water quality and resources of the Schuylkill River is a key objective of the organization. The larger Schuylkill River Watershed encompasses all of the subwatersheds (Perkiomen Creek, West Branch Perkiomen Creek, Swamp Creek, Little Lehigh, and Manatawny Creek) in Hereford and Washington Townships, stretching from Schuylkill County to the headwaters in Philadelphia. In the year 2000, the SRGA was a main facilitator in the production of the Schuylkill Watershed Conservation Plan. This plan was completed in 2001. As a DCNR River Conservation Plan (RCP), the Schuylkill River Watershed has been added to the Pennsylvania Rivers Conservation Registry. This allows river support groups and municipalities within this watershed to apply for future grant funding from other state agencies to conduct implementation and development projects based on the recommendations of the RCP. The Rivers Registry program is used to promote river conservation and serve as an avenue to endorse local initiatives by binding them together in a statewide recognition program.

Berks Nature

Berks Nature, previously known as Berks County Conservancy, was established as a non-profit membership organization in 1974. Their mission is to preserve Berks County's cultural and environmental heritage. Berks Nature has focused its efforts on preserving agricultural land and open space; protecting the quality of our streams and ground water; preserving historic landmarks and scenic landscapes; and by promoting those values which contribute to a sustainable future in the region. Watershed protection is one of the main areas of focus for Berks Nature. The Manatawny Creek Watershed was a key project of the watershed protection division of Berks Nature. This watershed contains several streams of exceptional value. Using state grants, Berks Nature took the role of coordinating partnerships within the watershed. The Ironstone Creek branch of the Manatawny Creek watershed falls along the southern border of Washington Township.

Groundwater Quality and Supply

The supply of groundwater to Hereford and Washington Townships is of key importance. Groundwater is the ultimate source of drinking water for Township residents. This underground water that flows through aquifers, springs, and caverns is extracted by private wells or by public water companies using wells or springs. Therefore, the location and amount of groundwater is of key importance to the capacity of development for the Townships.

Chapter 6 - Environmental Resource Analysis

Groundwater quality and supply is ultimately controlled by bedrock geology. Geologic factors such as rock type, intergranular porosity, rock strata inclination, faults, joints, folds, bedding planes, and solution channels affect groundwater movement and availability. Groundwater quality is dependent on interaction between the groundwater and the bedrock. The more soluble bedrock, such as limestone, allows more compounds to be dissolved in the groundwater, thus resulting in increased hardness values. The table on page 59 and the Surface Geology map provide the details about the bedrock geology of the two Townships.

Porosity and permeability of bedrock is the most important factor that affects groundwater. Median groundwater yield is the most variable of the parameters; median yields vary from 5 gallons per minute (gpm) in the Diabase (located in the extreme southeast corner of Washington Township) and Metadiabase (located in the northwest corner of Hereford Township) formations. Higher yields of up to 100 and 200 gpm, respectively in the Leithsville and Limestone Fanoglomerate Formations, can also be found in the Townships. These formations are generally found along the SR 100 corridor in the Townships.

Sources of Public Water

As noted earlier, groundwater is the final source of all drinking water in Pennsylvania. Public water systems and private wells are both used in Hereford and Washington Townships. A public water system generally consists of supply sources (wells, pumping and distribution system, storage facilities, filtering system, etc.). Sources for a public water system may come from a variety of sources, and usually a combination of two or more, such as reservoirs, springs, streams, or wells. Ensuring there is large enough supply for the dependent population and protecting the water from pollution (creating a high quality water level) are two key issues that are important for a public water system. As these systems are constructed, they naturally facilitate housing and commercial development. Therefore, the infrastructure of such systems needs to be carefully placed.

There are three main public water systems that are operating in Hereford and Washington Townships. The Bally Municipal Water System serves peripheral lots that are located in Washington Township. The Bally Borough Municipal Authority is supplied water by two surface springs and two groundwater wells. Washington Township has a surface water reservoir providing water to Bally Borough's water treatment facility. Once treated, the water is redistributed back to Washington and Hereford Townships. See the Public Utility Service Areas map for location of Public Water Supply Areas.

The Upper Hanover Water Authority has two wells located in Hereford Township that serves a limited amount of residents along SR 29. Green Lane Reservoir is an 814-acre impoundment located in northwestern Montgomery County, PA, in Marlborough, Upper Frederick and Upper Hanover Townships owned and operated by the Philadelphia Suburban Water Company (PSWC). The reservoir discharges an average of 16.5 million gallons per day into the Perkiomen Creek and supplies drinking water to 140,000 customers in Chester and Montgomery Counties. The modular home community in central Hereford Township also has a community water system.

Groundwater Threat - Superfund Site (Crossley Farms)

A major concern regarding the quality of the groundwater supply focuses on the Crossley Farm Superfund Site. The Crossley Farm Site encompasses 24 acres at the intersection of Huff's Church Rd. and Blackhead Hill in Hereford Township. Between 1960 and 1980, the nearby company of Bally Case and Cooler used Crossley Farms as a disposal site for its liquid waste. The Pennsylvania Department of Environmental Resources (PA DER) performed an investigation in 1983. They found contamination of volatile organic compounds (VOCs) in residential wells downhill from the site. A regional study of the area in 1987 found a large area of trichloroethylene (TCE) contaminated groundwater. Public and private wells within four miles of the site supply drinking water to approximately 4,800 residents. Currently, the U. S. Environmental Protection Agency (EPA) has spent over \$9 Million to complete a Remedial Investigation and Feasibility Study. The study outlines the plans for cleanup. This involves an interim measure of extracting the most contaminated groundwater from a limited area located

at the top of Blackhead Hill and treating the groundwater until it meets drinking water standards. After which, random extraction wells in the area will be tested to evaluate the effectiveness of decreasing concentration of contaminants in the groundwater. As of the date of this publication, the remediation of this site has been completed but the site is still currently being monitored by the EPA.

Air Quality

Some residents of the planning area have reported to municipal officials of experiencing respiratory issues. These respiratory problems seem to be attributed to the application of a certain type of fertilizer on farmlands throughout the region. Although no scientific evidence has been collected to determine the exact cause of these issues, officials, at both the state and local level, should continue to monitor this problem and take appropriate action as necessary.

Areas of Concern (Pennsylvania Natural Heritage Program)

The Pennsylvania Natural Heritage Program (PNHP) identifies rare and significant ecological features across the Commonwealth. These features include plant and animal species of special concern (those classified as Endangered, Threatened, or Rare as listed by various environmental divisions of the State of Pennsylvania), rare and exemplary natural communities, and outstanding geologic features. The Pennsylvania Natural Heritage Inventory information system is continually refined and updated.

Five PNHP sites lie within the study area, as shown on the Sensitive Natural Features maps. One site is located in the southwest corner of Hereford Township. It marks the nesting location of a bird species imperiled at the state level. Such a ranking means that the species is imperiled in Pennsylvania because of its rarity (6 – 20 occurrences or few remaining individuals or acres) or vulnerability to extirpation from the state. It was observed nesting among boulders and rock outcrops in a tulip poplar, ash, and maple woodlot. This rare bird and a more common species will continue to use the site if the surrounding area remains undisturbed.

Another site is located in the southeast corner of Washington Township. It is designated as a Pennsylvania-vulnerable plant species because of widespread collecting in the past. It grows on private property owned by a famous local botanist who is dedicated to the preservation of the native flora. The site should be secure for the foreseeable future.

Pennsylvania Natural Heritage Program policy requires that the name and exact location of species remain undisclosed; however the general location of the species habitat can be identified in public documents, such as the comprehensive plan. By documenting the habitat area, local officials and planning commission members can determine whether or not a development proposal may impact the rare and significant ecological features of the community during the plan review process. If a development proposal is located within a Pennsylvania Natural Heritage Inventory-designated area, officials should contact the Pennsylvania Natural Heritage Program (PNHP) for further information on the specific species and compatible development and conservation techniques.

Pennsylvania Natural Heritage Program (PNHP)
Department of Conservation and Natural Resources
Bureau of Forestry
PO Box 8552
Harrisburg, PA 17105-8552
(717) 787-3444

Chapter 6 - Environmental Resource Analysis

Public Lands for Conservation and Recreation

State Game Lands

The Pennsylvania State Game Commission was formed in 1920 with the goal to ensure that wild animals always have shelter and food. To obtain this goal, the Commission has purchased approximately 300 separate tracts, comprising roughly 1.5 million acres, to create the Pennsylvania State Game Lands. Each State Game Lands tract has an individual management plan designed to improve wildlife habitat and provide recreational opportunities. The Agency's Food and Cover Corps carry out plans. The State Game Lands serve hunters, anglers, hikers, and birdwatchers, and other wildlife enthusiasts.

State Game Land #315 is comprised of two areas, located in southern Washington Township and on the shared Hereford-Washington border. Combined, they contribute approximately 152 acres of public recreation land to the Townships open space and recreation system. See the Community Facilities map for specific locations.

Public and Private Lands

Public lands include open space and recreational facilities available to the general public, regardless of ownership. These include parks, playgrounds, and nature study centers. Facilities and areas that are owned by the State, County, and Municipality are considered public facilities. There are five public parks in Hereford Township and twelve in Washington Township.

Open space and recreation facilities that are privately owned are available to individuals or organizations by membership only. Examples of such private open space include country clubs, golf courses, gyms, gun clubs, and swimming pools. The Community Facilities maps identify the location of recreation areas in Hereford and Washington Townships.

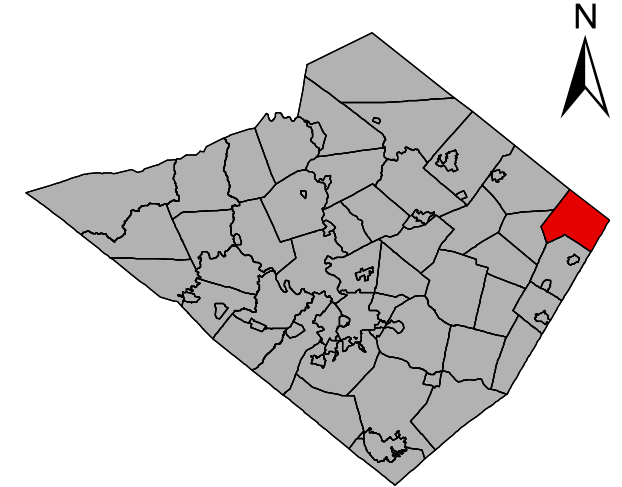
Key Trends and Issues

- **The geologic formations that underlie the planning area influence development and open space opportunities.** Geologic constraints to development include excavation difficulty throughout most of the planning area.
- **Wellhead development potential is highest along the eastern edge of the planning area,** following SR 100. Groundwater appears most available in the Leithsville and Limestone Fanogglomerate Formations located along the eastern edge of the Townships. Wellheads in any location will need designated protection areas to prevent groundwater contamination.
- **Groundwater contamination has occurred in the western portion of the planning area.** Mitigation efforts are complete; however this area is currently unsuitable for additional development that would rely on groundwater for water supply. The U.S. Environmental Protection Agency is still monitoring the site.
- **Air quality is a concern throughout the planning area.** There is a growing concern, especially in Washington Township regarding residents experiencing respiratory illness that could be contributed to the application of certain stabilized residual solids fertilizer on farms throughout the planning region.
- **Prime farmland soils in the planning area have supported agriculture as the predominant local industry since its settlement; increasing regional growth threatens the agricultural landscape with development pressure.** The planning area contains prime farmland soils; the majority of these are in active agricultural production. Many of these areas have Agricultural Conservation Easements and Agricultural Security Areas.
- **The planning area includes areas sensitive to disturbance and therefore unsuitable to**

development. The planning area contains floodplains, wetlands, and steep slopes; these areas are not suitable for development and are key to the preservation of rural character in the planning area.

- **A high percentage of open fields and forest cover define the planning area as a scenic, rural landscape.** The planning area contains open fields and forest; defining its rural character. Changes to the distribution of the land cover will have significant impacts to this character.
- **The planning area contains environmentally sensitive features: high (surface) water quality and five species of state concern.** The headwaters of the Perkiomen Creek, which lie in the planning area, have been classified as high quality and exceptional value watersheds and high quality cold-water fisheries. Because of their high quality, Swamp and Middle Creeks serve as a vital water supply sources. If development in these areas is planned, careful assessments of its impacts will need to be addressed in order to preserve these designations. Failing septic systems in the Huff's church area are of immediate concern.
- **Although many areas of the Townships are undeveloped, public and private recreation is scattered throughout.** The planning area contains state game land, public parkland, and private parkland.

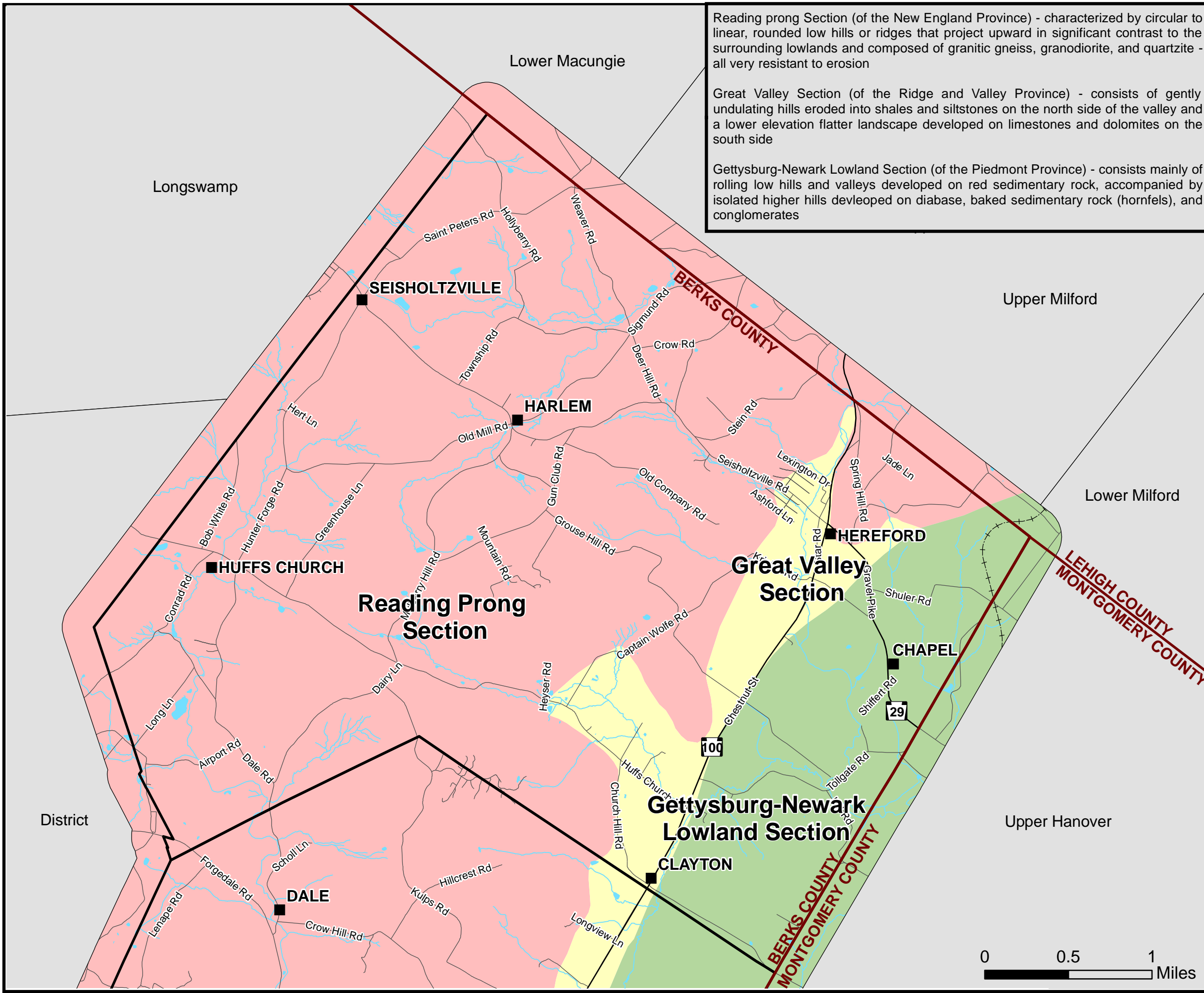
Physiographic Provinces Hereford Township



Reading prong Section (of the New England Province) - characterized by circular to linear, rounded low hills or ridges that project upward in significant contrast to the surrounding lowlands and composed of granitic gneiss, granodiorite, and quartzite - all very resistant to erosion

Great Valley Section (of the Ridge and Valley Province) - consists of gently undulating hills eroded into shales and siltstones on the north side of the valley and a lower elevation flatter landscape developed on limestones and dolomites on the south side

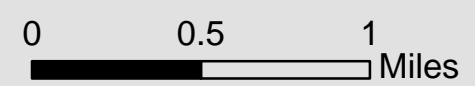
Gettysburg-Newark Lowland Section (of the Piedmont Province) - consists mainly of rolling low hills and valleys developed on red sedimentary rock, accompanied by isolated higher hills developed on diabase, baked sedimentary rock (hornfels), and conglomerates



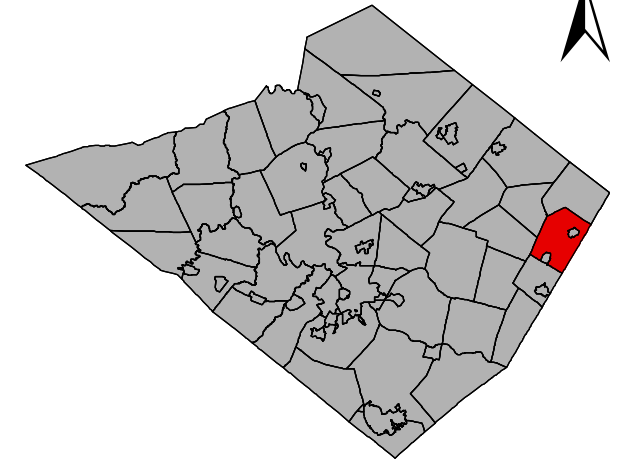
Legend

- Physiographic Provinces
- New England
 - Piedmont
 - Ridge and Valley
 - Villages
 - Roads
 - Railroads- Active
 - Streams and Water Bodies
 - Municipal Boundaries
 - County Boundaries

Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA Natural Resources Conservation Service
Published by the Berks County Planning Commission



Physiographic Provinces Washington Township



Legend

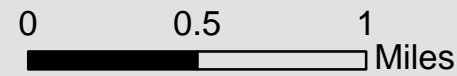
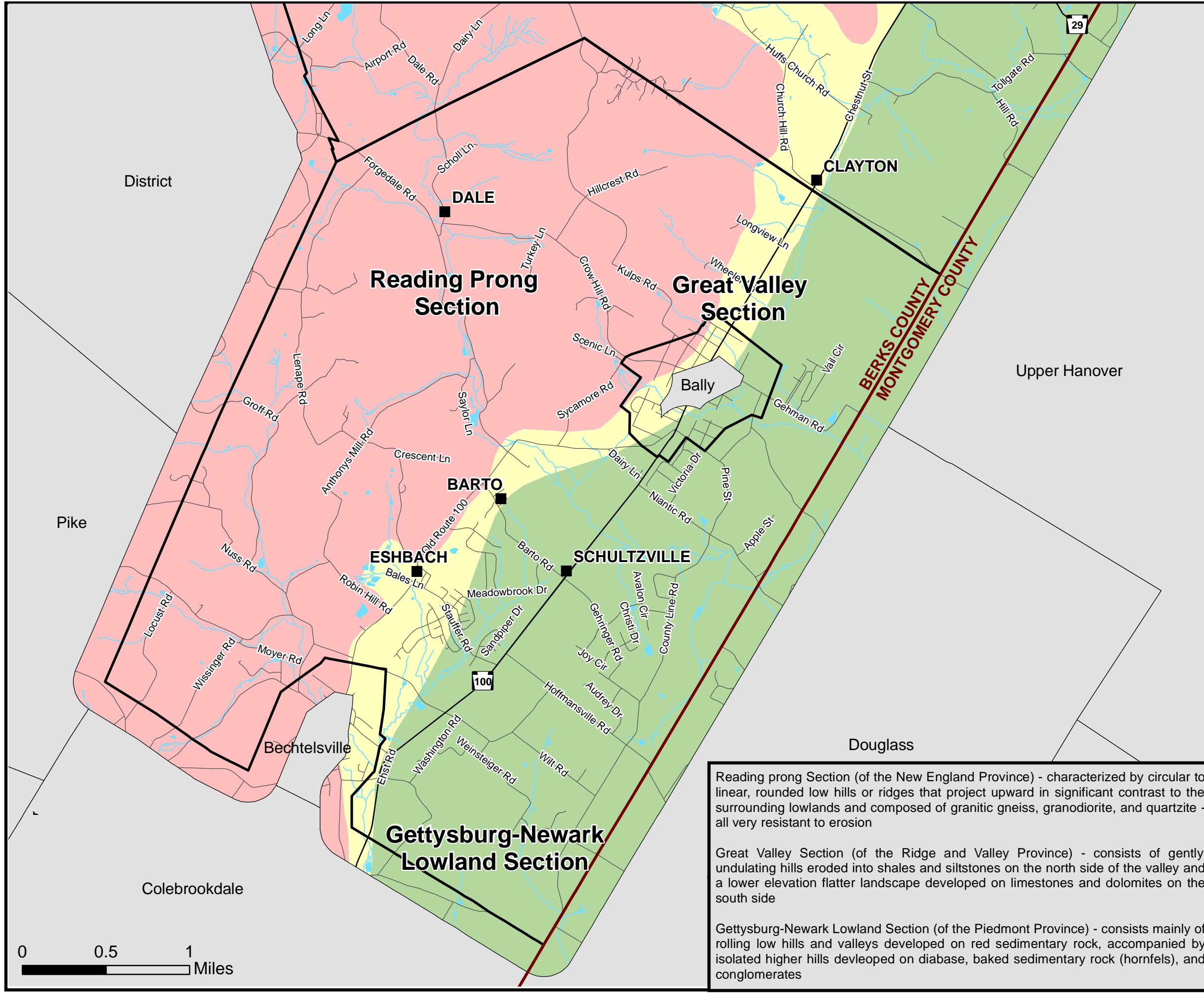
Physiographic Provinces

- New England
- Piedmont
- Ridge and Valley
- Villages
- Roads
- Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA Natural Resources Conservation Service

Published by the Berks County Planning Commission

LFM 8/18

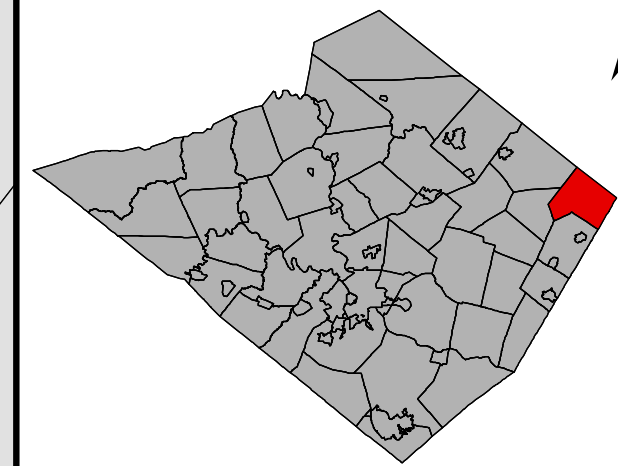


Reading prong Section (of the New England Province) - characterized by circular to linear, rounded low hills or ridges that project upward in significant contrast to the surrounding lowlands and composed of granitic gneiss, granodiorite, and quartzite - all very resistant to erosion

Great Valley Section (of the Ridge and Valley Province) - consists of gently undulating hills eroded into shales and siltstones on the north side of the valley and a lower elevation flatter landscape developed on limestones and dolomites on the south side

Gettysburg-Newark Lowland Section (of the Piedmont Province) - consists mainly of rolling low hills and valleys developed on red sedimentary rock, accompanied by isolated higher hills developed on diabase, baked sedimentary rock (hornfels), and conglomerates

Surface Geology Hereford Township



Surface Geology

Cha	Hardstone Formation	Trb	Brunswick Formation	gn	Granitic Gneiss
Clv	Leithsville Formation	Trfl	Limestone Fanogglomerate	hg	Hornblende Gneiss
Jd	Diabase	ggd	Granodiorite/Granodiorite Gneiss	md	Metadiabase

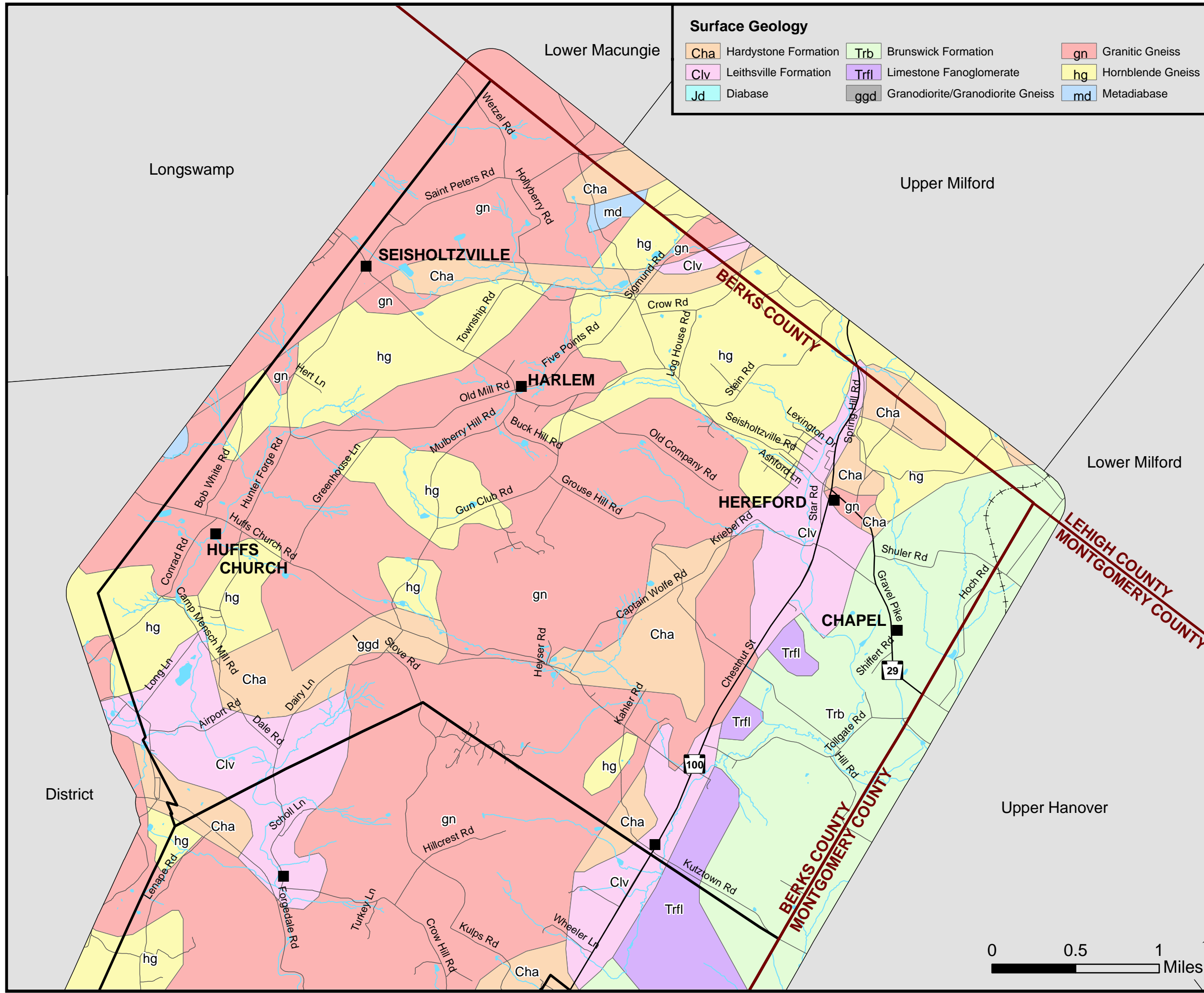
Legend

- Villages
- Roads
- - - - Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

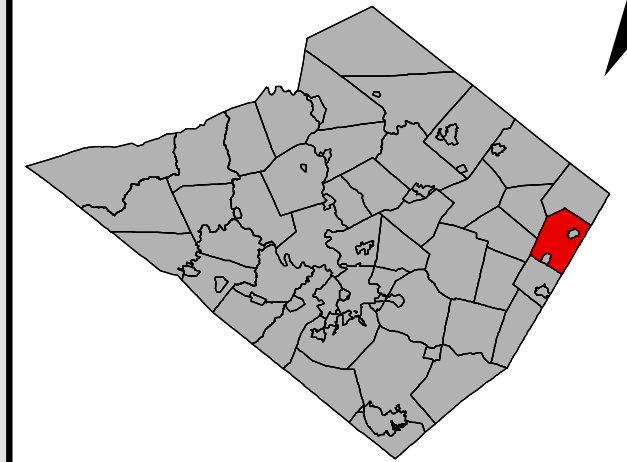
Note: See Table #-#, Engineering Characteristics of Hereford and Washington Townships' Geologic Formations, for descriptions of geologic formations

Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA Natural Resources Conservation Service
Published by the Berks County Planning Commission

LFM 8/18



Surface Geology Washington Township



Legend

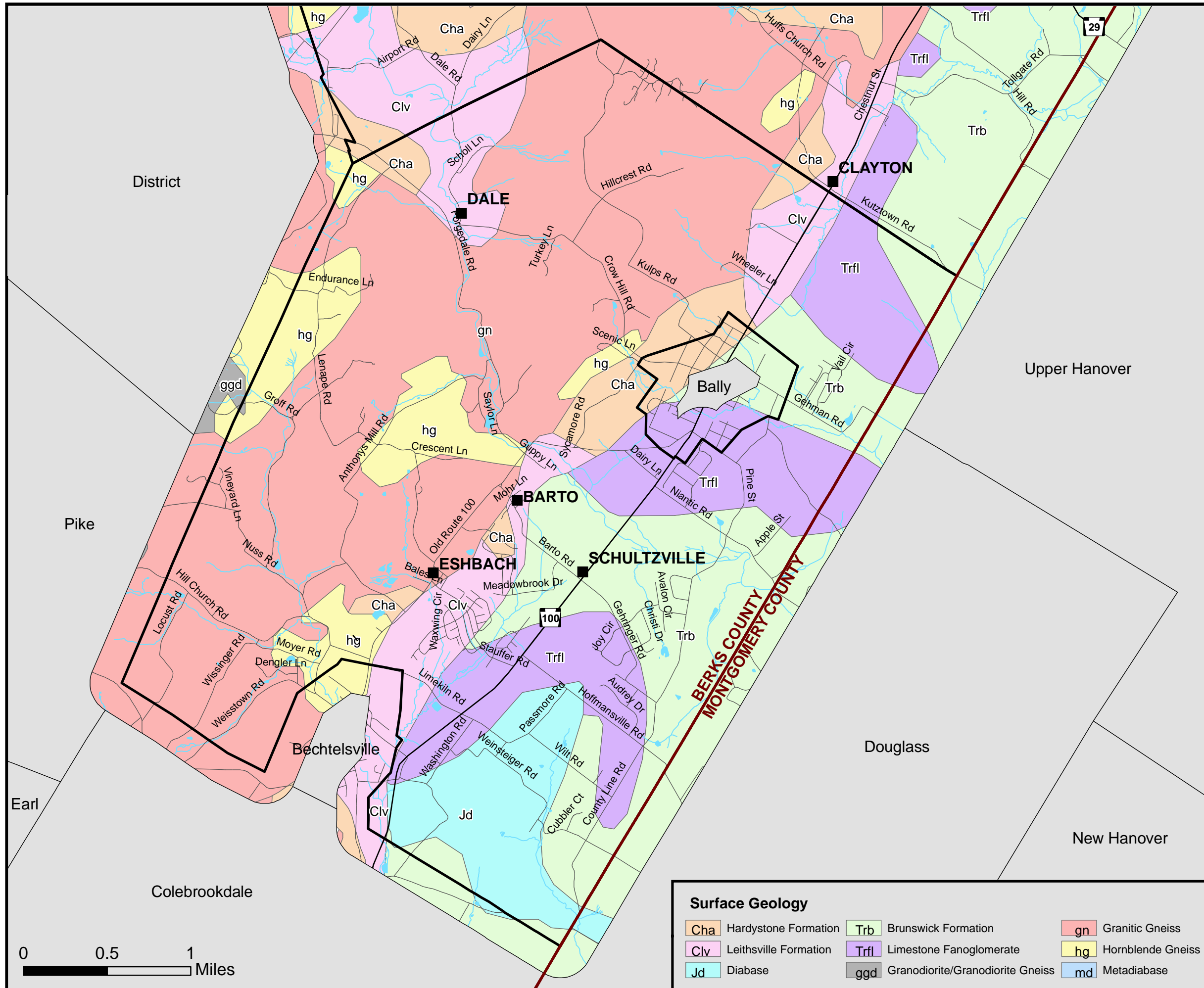
- Villages
- Roads
- ++++ Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

Note: See Table #-#, Engineering Characteristics of Hereford and Washington Townships' Geologic Formations, for descriptions of geologic formations

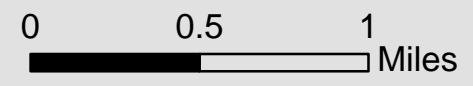
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA Natural Resources Conservation Service

Published by the Berks County Planning Commission

LFM 8/18



Surface Geology					
Cha	Hardstone Formation	Trb	Brunswick Formation	gn	Granitic Gneiss
Clv	Leithsville Formation	Trfl	Limestone Fanoglomerate	hg	Hornblende Gneiss
Jd	Diabase	ggd	Granodiorite/Granodiorite Gneiss	md	Metadiabase



District

Pike

Earl

Colebrookdale

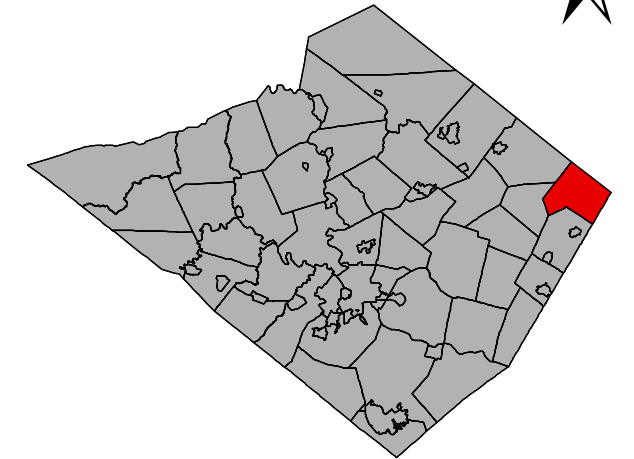
Douglass

New Hanover

Upper Hanover

BERKS COUNTY
MONTGOMERY COUNTY

Soils Hereford Township



Soil Type

AsB	LaC
AsC	LbB
AuD	LbD
Bo	Me
CaC	MuB
CaD	MuC
CmA	NaB
CmB	NaC
CwA	NaD
CwB	NhD
DbA	NhF
DbB	PaA
DfC	PeB
DfD	PeC
EdB	PeD
EdD	PkD
EhB	Qu
EhC	ReA
EhD	ReB
GeB	RhA
GeC	RhB
GeD	ThA
GfB	ToA
GfD	ToB
GfF	TwB
GnA	Ua
GnB	UgB
HeD	UmB
HeF	UmD
Ho	UnB
JnB	UnD
JpB	UsB
JpD	UsD
LaB	W

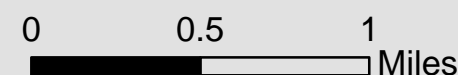
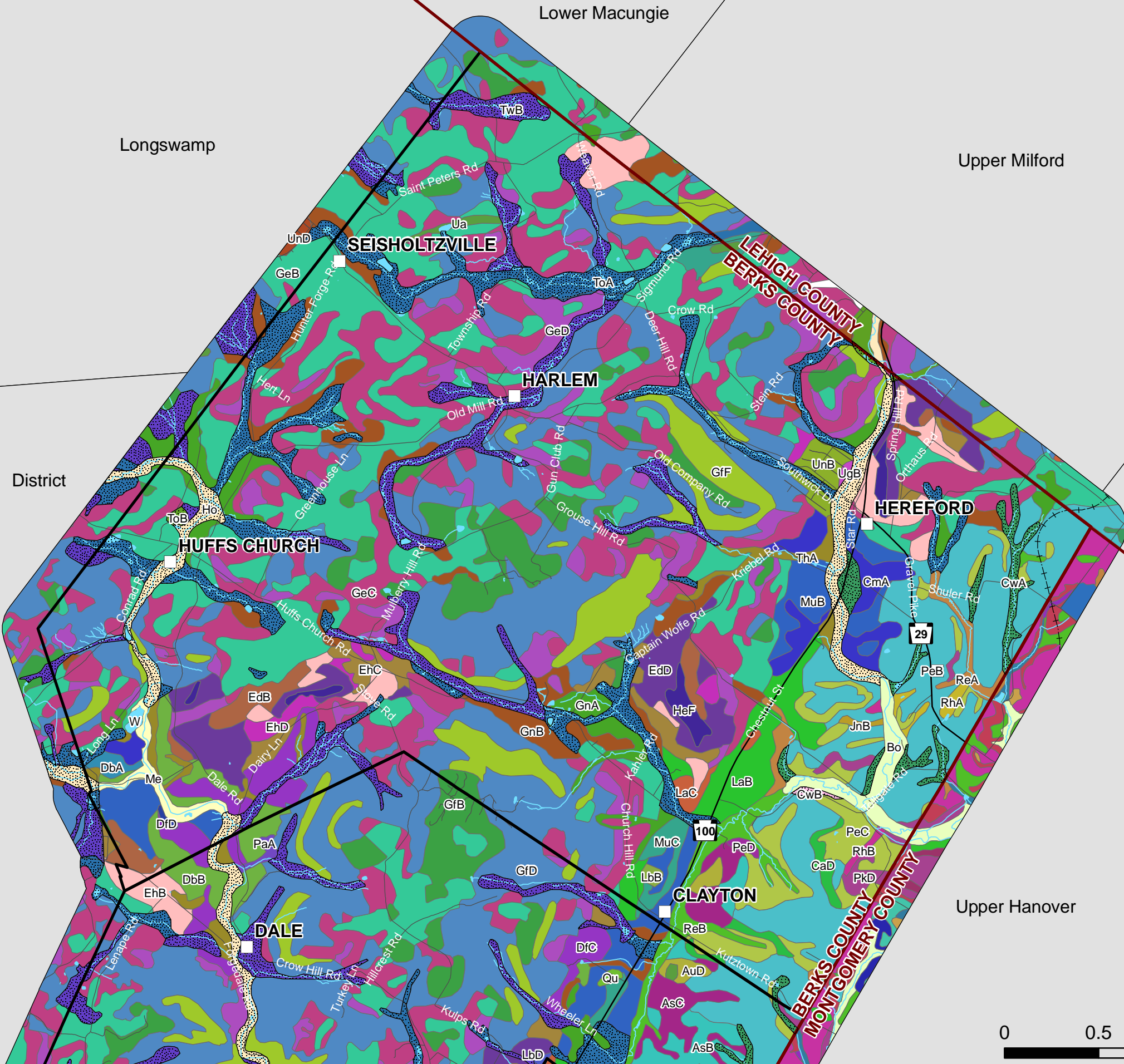
Legend

- Hydric Soil
- Villages
- Roads
- Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

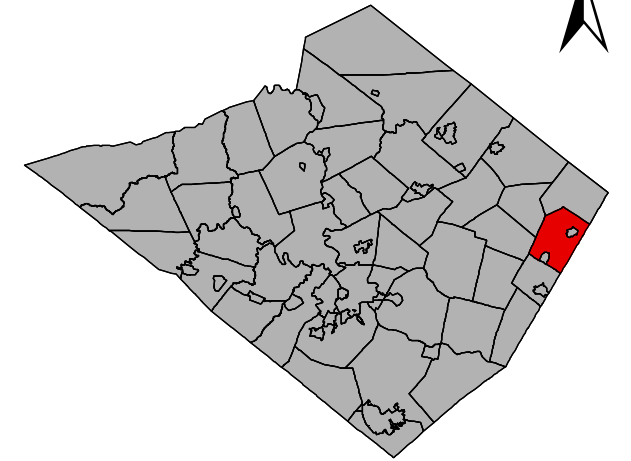
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA

Published by the Berks County Planning Commission

LFM 8/18



Soils Washington Township



Soil Type

AsB	LaC
AsC	LbB
AuD	LbD
Bo	Me
CaC	MuB
CaD	MuC
CmA	NaB
CmB	NaC
CwA	NaD
CwB	NhD
DbA	NhF
DbB	PaA
DfC	PeB
DfD	PeC
EdB	PeD
EdD	PkD
EhB	Qu
EhC	ReA
EhD	ReB
GeB	RhA
GeC	RhB
GeD	ThA
GfB	ToA
GfD	ToB
GfF	TwB
GnA	Ua
GnB	UgB
HeD	UmB
HeF	UmD
Ho	UnB
JnB	UnD
JpB	UsB
JpD	UsD
LaB	W

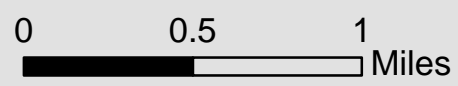
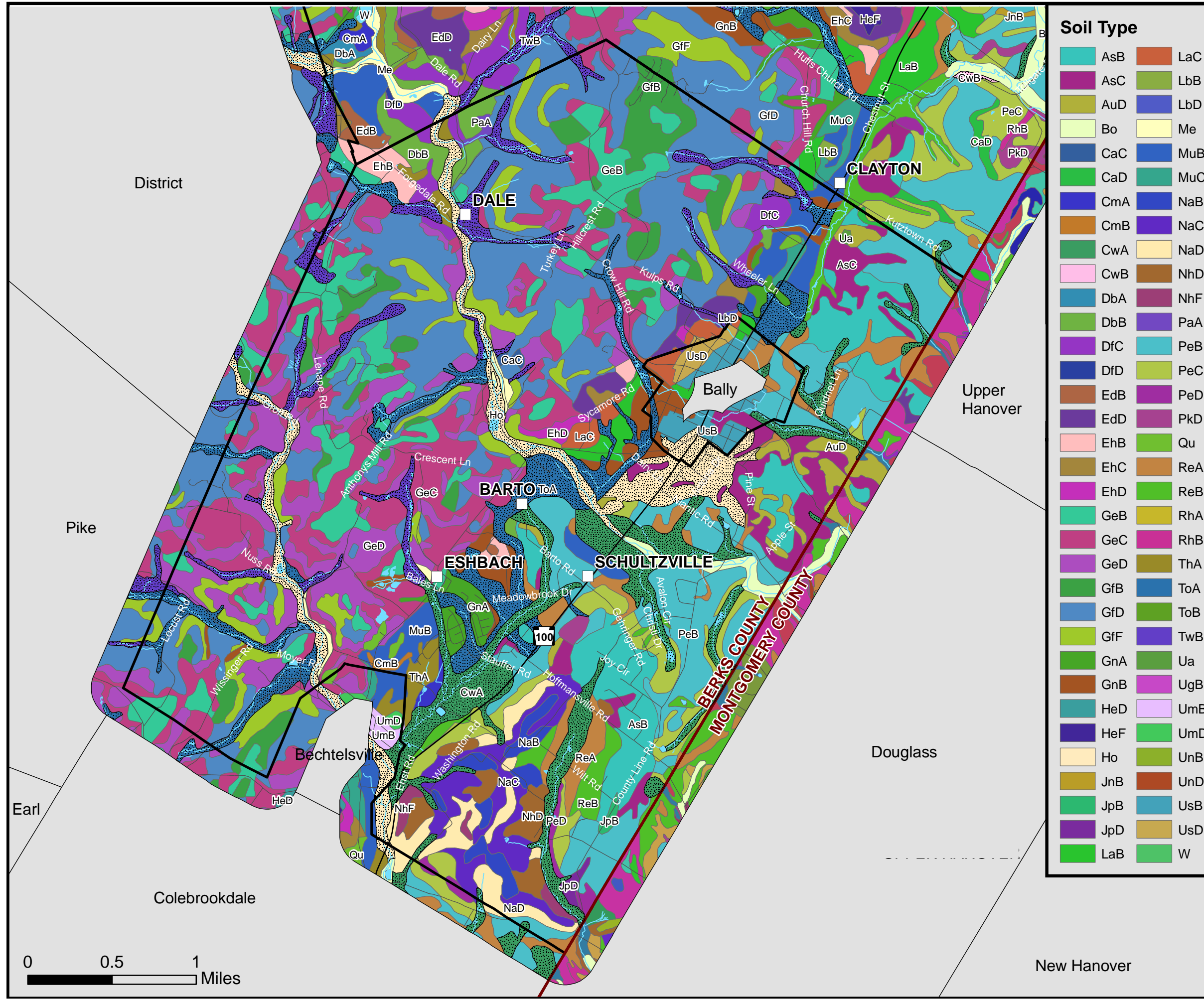
Legend

- Hydric Soil
- Villages
- Roads
- Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

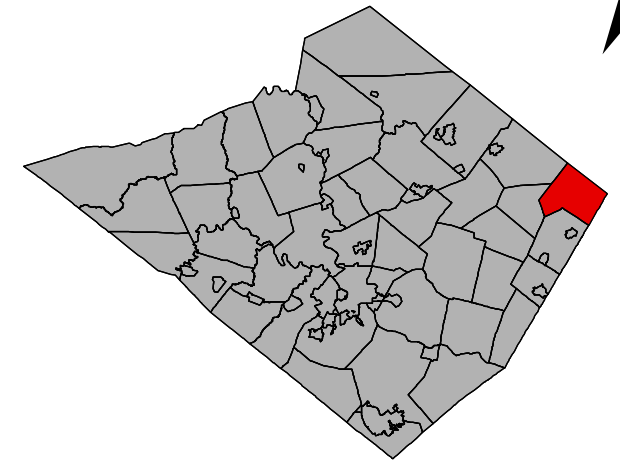
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA

Published by the Berks County Planning Commission

LFM 8/18



Natural Resources Hereford Township



WATER QUALITY FOR MAJOR WATERWAYS:

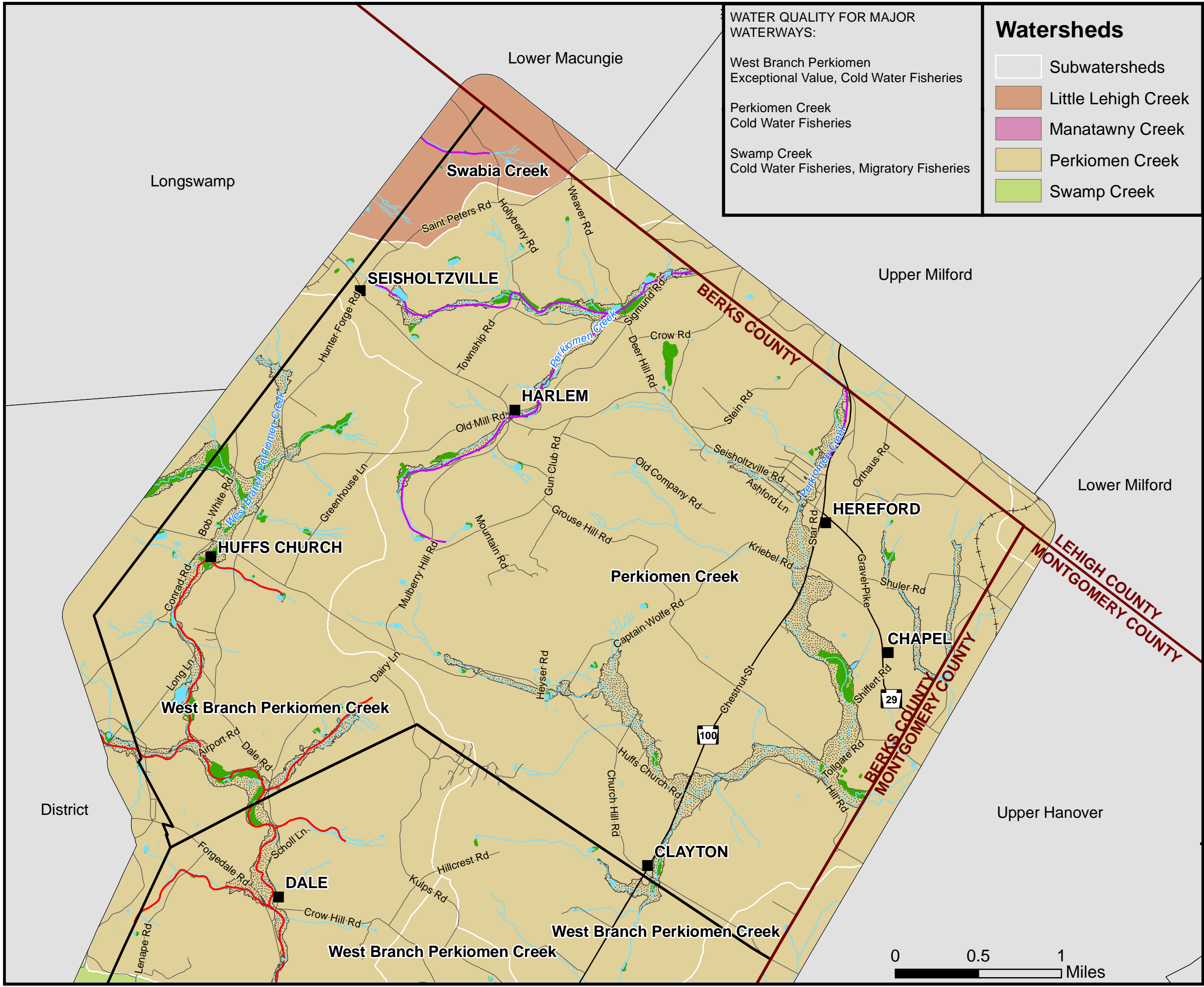
West Branch Perkiomen
Exceptional Value, Cold Water Fisheries

Perkiomen Creek
Cold Water Fisheries

Swamp Creek
Cold Water Fisheries, Migratory Fisheries

Watersheds

- Subwatersheds
- Little Lehigh Creek
- Manatawny Creek
- Perkiomen Creek
- Swamp Creek

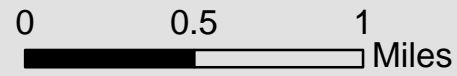


Legend

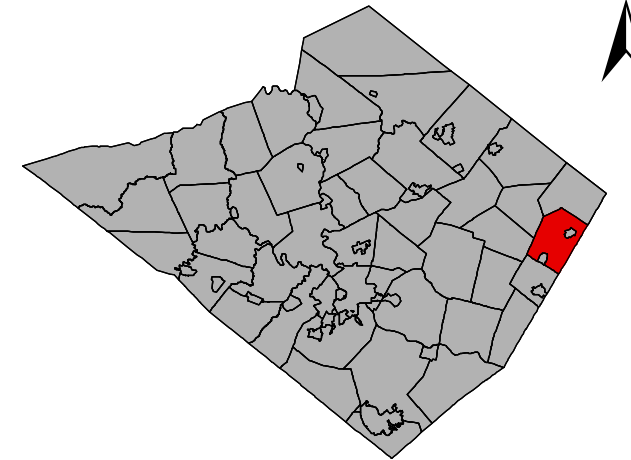
- ~ Exception Value Streams
- ~ High Quality Streams
- Floodplain 100 Year
- Wetlands
- Villages
- Roads
- Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, FEMA, National Wetlands Inventory, Penn State Institutes of the Environment

Published by the Berks County Planning Commission LFM 8/18



Natural Resources Washington Township



Legend

- Exception Value Streams
- High Quality Streams
- Floodplain 100 Year
- Wetlands
- Villages
- Roads
- Railroads- Active
- Streams and Water Bodies
- Municipal Boundaries
- County Boundaries

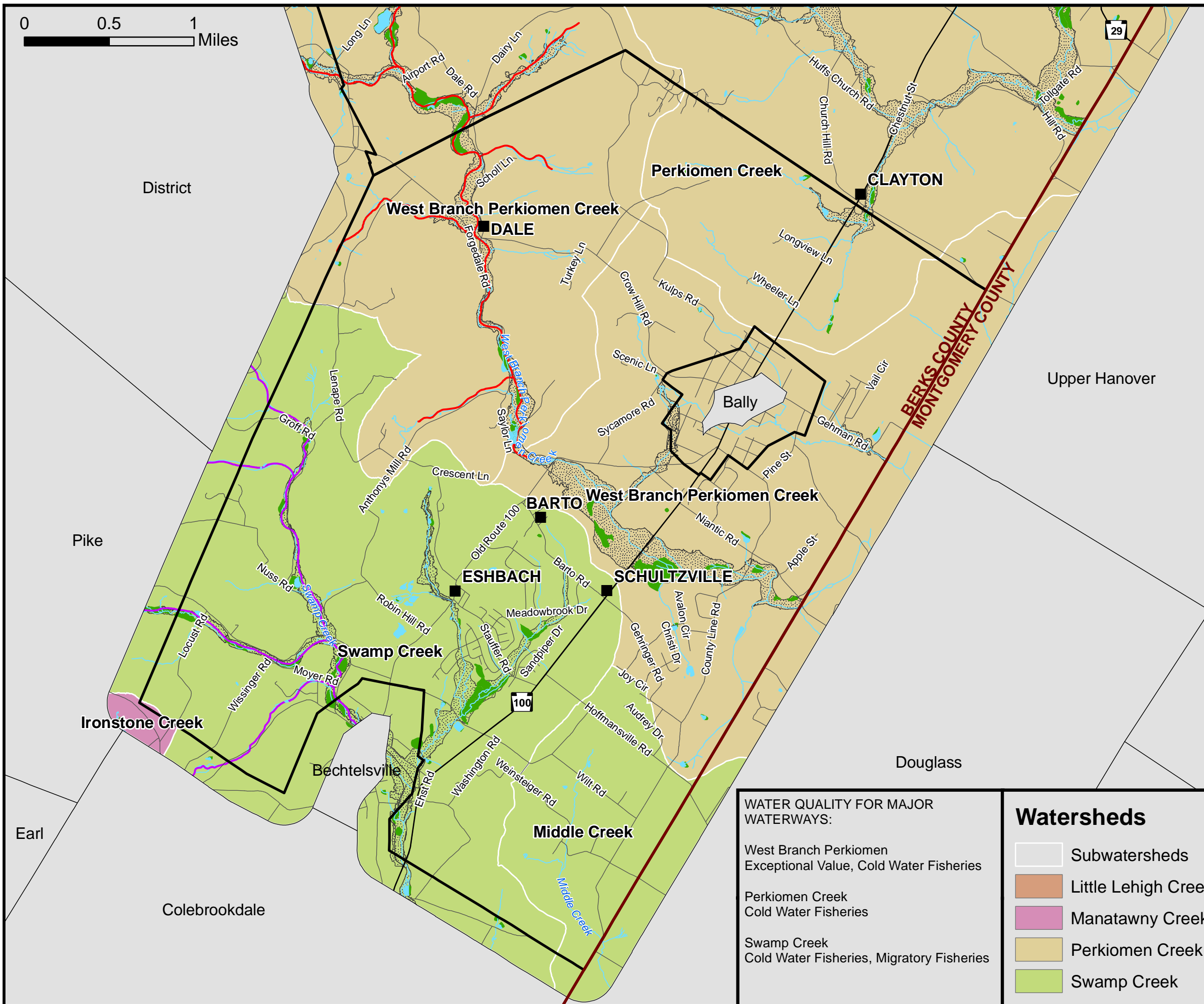
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, FEMA, National Wetlands Inventory, Penn State Institutes of the Environment

Published by the Berks County Planning Commission

LFM 8/18



0 0.5 1 Miles



WATER QUALITY FOR MAJOR WATERWAYS:	
West Branch Perkiomen	Exceptional Value, Cold Water Fisheries
Perkiomen Creek	Cold Water Fisheries
Swamp Creek	Cold Water Fisheries, Migratory Fisheries

Watersheds	
	Subwatersheds
	Little Lehigh Creek
	Manatawny Creek
	Perkiomen Creek
	Swamp Creek

District

Pike

Earl

Colebrookdale

Perkiomen Creek

CLAYTON

West Branch Perkiomen Creek

DALE

Bally

BARTO

West Branch Perkiomen Creek

ESHBACH

SCHULTZVILLE

Swamp Creek

Ironstone Creek

Bechtelsville

Middle Creek

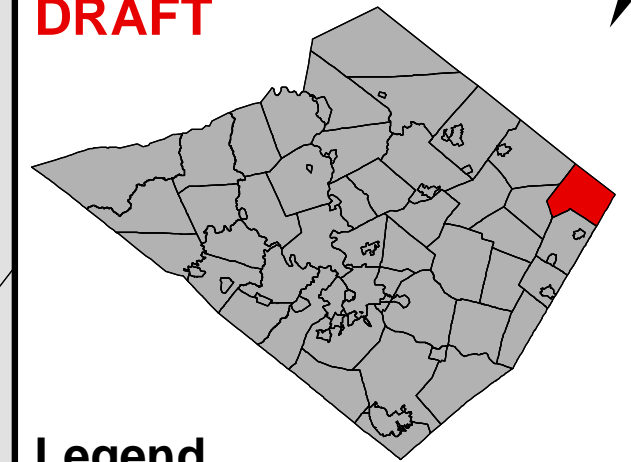
Douglass

Upper Hanover

BERKS COUNTY
MONTGOMERY COUNTY

Sensitive Natural Features Hereford Township

DRAFT



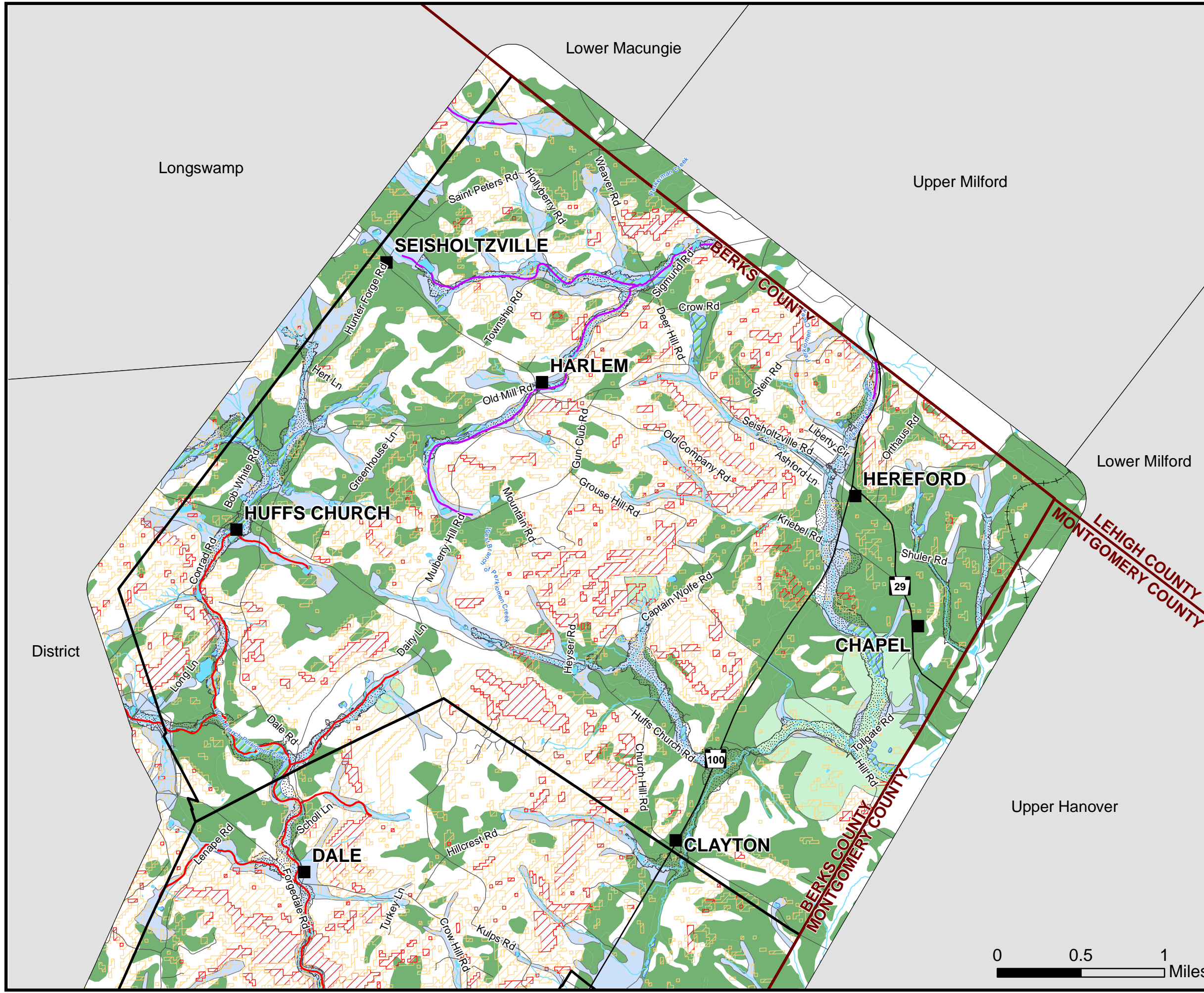
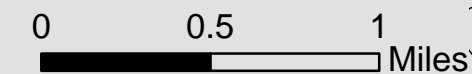
Legend

- | | | | |
|--|---------------------------|--|--------------------------|
| | Exceptional Value Streams | | Slopes 15-25% |
| | High Quality Streams | | Slopes over 25% |
| | Villages | | Roads |
| | Railroads-Active | | Streams and Water Bodies |
| | Floodplain 100 Year | | Municipal Boundaries |
| | Wetlands | | County Boundaries |
| | Hydic Soil | | |
| | Prime Farmland | | |
| | NHA Core Habitat | | |

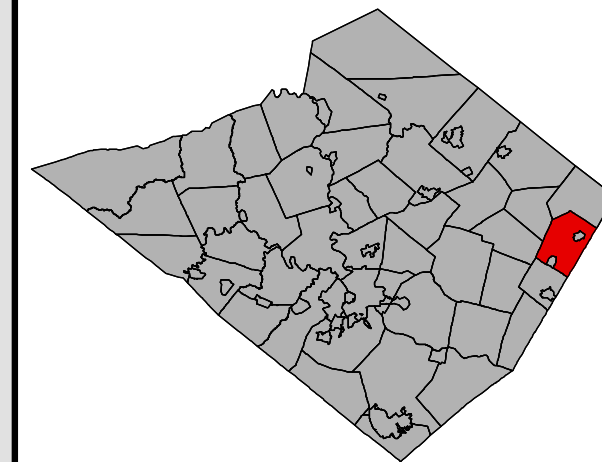
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA, FEMA, Penn State Institutes of the Environment

Published by the Berks County Planning Commission





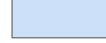

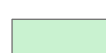

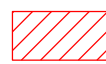






LFM 8/18



Sensitive Natural Features Washington Township



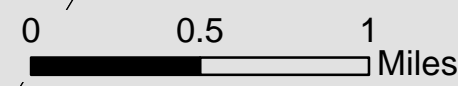
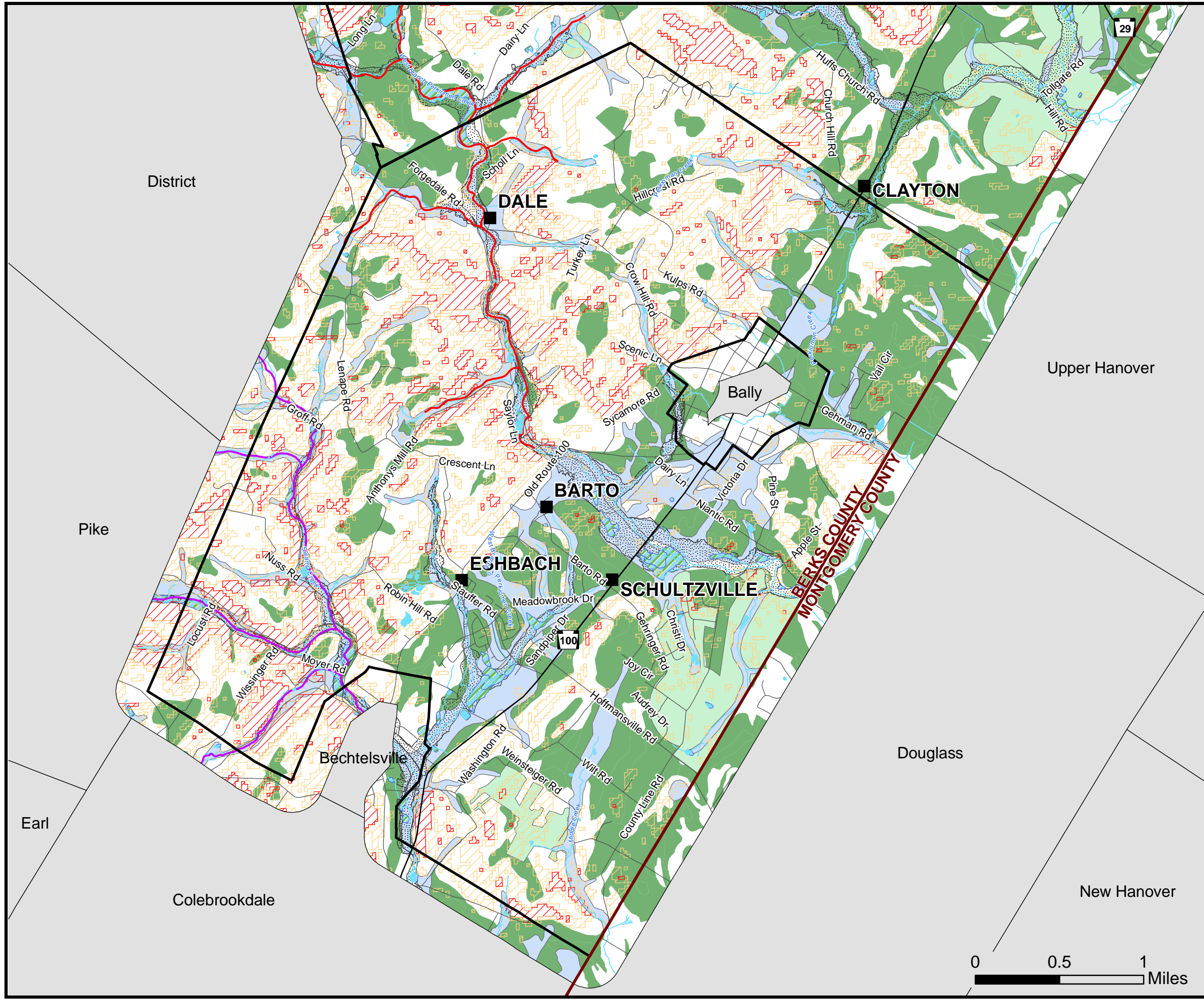
Legend

-  Exceptional Value Streams
-  High Quality Streams
-  Floodplain 100 Year
-  Wetlands
-  Hydric Soil
-  Prime Farmland
-  NHA Core Habitat
-  Slopes 15-25%
-  Slopes over 25%
-  Streams and Water Bodies
-  Villages
-  Roads
-  Railroads-Active
-  Municipal Boundaries
-  County Boundaries

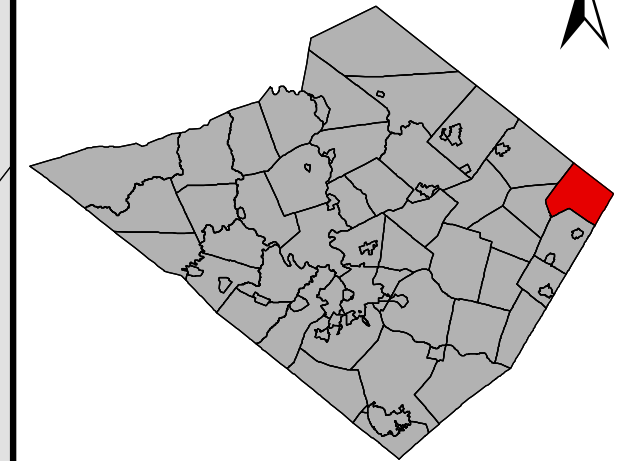
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES, USDA, FEMA, Penn State Institutes of the Environment

Published by the Berks County Planning Commission

LFM 8/18



Protected Lands Hereford Township



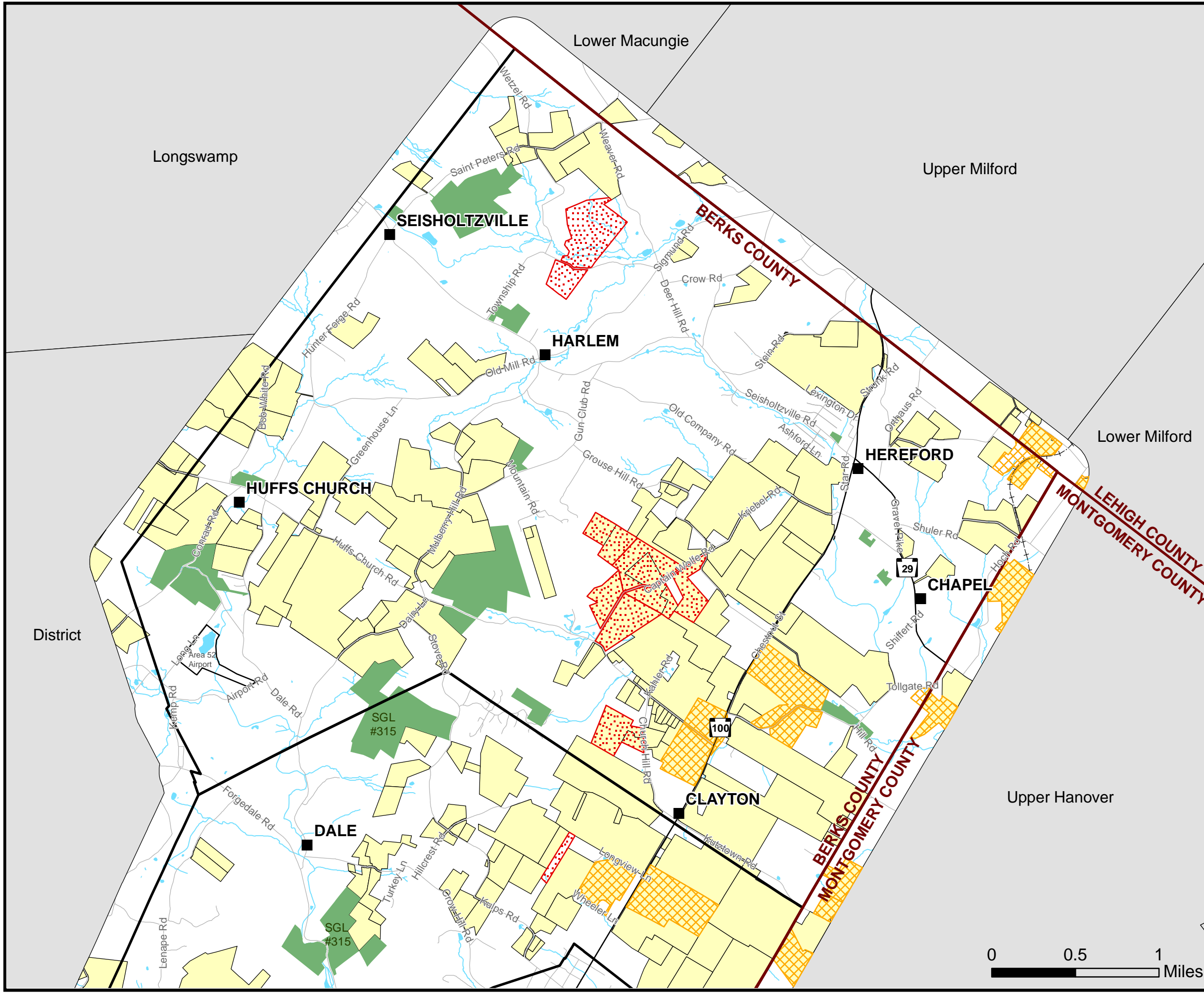
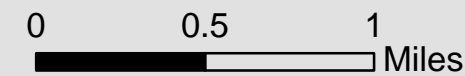
Legend

-  Agricultural Conservation Easements
-  Easements
-  Agricultural Security Areas
-  Public/Private Recreation Area
-  Villages
-  Roads
-  Railroads
-  Streams and Water Bodies
-  Municipal Boundaries
-  County Boundaries

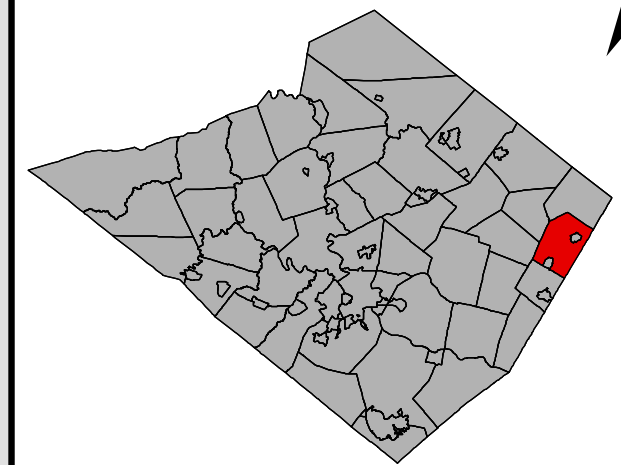
Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES

Published by the Berks County Planning Commission

LFM 8/18



Protected Lands Washington Township



Legend

-  Agricultural Conservation Easements
-  Easements
-  Agricultural Security Areas
-  Public/Private Recreation Area
-  Villages
-  Roads
-  Railroads
-  Streams and Water Bodies
-  Municipal Boundaries
-  County Boundaries

Source data: Berks County Planning Commission GIS, Berks County GIS/IS, Berks County Mapping, Berks DES

Published by the Berks County Planning Commission

LFM 8/18

