NATURAL ENVIRONMENT AND RESOURCES

INTRODUCTION

For Perry County to grow in an orderly, intelligent, and efficient manner, it is essential that certain specific features of the natural environment are first recognized; and secondly this information is integrated with all the other planning tools and procedures. The purpose of this section is to provide a practical compilation of all the available environmental data as an aid to environmentally sound planning efforts in the County. It is important for government decision makers, residents, and those doing business in the County to be keenly aware of the County’s natural resources, and the limitations each may pose upon future development of the County.

CLIMATE (REGIONAL)

Perry County is dominated by atmospheric flow patterns common to Humid Continental type climate. The complex weather systems that influence the area originate in the Central Plains of the United States. As they travel eastward, they are gradually modified by the characteristics of the underlying topography. Moisture in the form of precipitation is lost due to topographic uplift, as the weather systems moving eastward are lifted over the Appalachian Mountain chain. A secondary flow pattern and primary source of heavy precipitation associated with cyclonic circulation forms from the Gulf of Mexico northward through the County. The moist airflow from the Atlantic Ocean, to the east, is a modifying rather than a controlling climatic factor. A considerable amount of moisture is periodically picked up by storms developing and moving up along the southeastern coastline of the United States. Disturbances of this type usually bring moderate to heavy precipitation to the Lower Susquehanna River area due to the general up slope motion of moist air over the area’s rugged terrain. In the colder months when temperatures are near or below freezing, these storms often deposit heavy amounts of wet snow throughout the area. The Great Lakes, a source of moisture, have little or no influence on the climate of the study area since the weather systems formed over the Great Lakes typically migrate northward.

The normal succession of high and low pressure systems moving eastward across the United States produce weather changes in the area every few days in the winter and spring of the year. In the summer and fall, the weather changes are less frequent due to a slowing down of the general atmospheric circulation during the warmer months. Low-pressure cycloic systems usually dominate the area with southerly winds, rising temperatures, and some form of precipitation. The high-pressure anticyclonic systems normally bring west to northwest winds, lowering temperatures, and clearing skies to the area.

Hurricanes or tropical disturbances as they move northward follow a northeasterly path in the middle latitudes and produce heavy rainfalls and strong surface winds in the study.
area. Frequently affecting water supplies and causing floods, these tropical storms are observed during the hurricane season, June through November.

Weather elements or activities of the atmosphere, such as precipitation, temperature, wind direction and speed, relative humidity, and sunshine have measurable qualities; which affect the study area.

The study area normally receives about 46 inches of precipitation annually. Normal monthly precipitation totals average from a minimum of 2.6 inches in February to a maximum of 4.3 inches in August. Snowfall is light to moderate averaging about 30 inches annually, while the mean annual number of days with snow cover one inch or more is about 50 days.

Air temperatures are important to the management of water resources and water quality. The average annual temperature for the study area is about 50 degrees F. The mean freeze-free period is about 175 days. Because of the rugged terrain, the freeze-free season varies between 170 days in the mountains to 180 days in the lowlands. In the study area, the summer mean temperature is about 76 degrees F, and the winter mean is about 32 degrees F.

Winds are important hydrological factors because of their evaporate effects and their association with major storm systems. The prevailing wind directions in the area are from the northwest in winter and from the west in spring. The average wind speed is 10 mph, with an extreme wind speed of 68 mph from the west-northwest reported in the Lower Susquehanna area during severe storm activity in March of 1955.

Relative humidity also affects evaporation processes. The mean monthly relative humidity for the months of January, April, July, and October are about 68 percent, 62 percent, 70 percent and 75 percent, respectively.

Sunshine, which varies with latitude and time of the year, is a factor to be considered in the various aspects of water resources. The mean annual sunshine in hours per year for the study area is about 2,500 hours.

The evaporation process is controlled by temperature, wind, sunshine, and humidity. The rate of evaporation during the warmer months has an important impact on water storage in reservoirs and on irrigation. The mean May to October evaporation accounts for about 72 percent of the total annual evaporation.

Development in the County should take some of the climatic conditions into consideration. Tree lines and high ground should be on the northwest side of buildings to take advantage of microclimates of a tract of land. By breaking the velocity of the northwest winds, energy conservation can be realized by reducing the temperature slightly. To take advantage of the sun for passive or active solar systems, building should have south facing walls. Although the climate will not have a major effect on land uses, it should be considered in the layout of buildings.
CLIMATE (LOCAL)

Located at the Harrisburg International Airport, in Harrisburg/Middletown, at 40.2 ° north latitude by 76.7 ° west longitude at an elevation of 308’ is a U.S. Weather Service recognized weather station. The following weather statistics were recorded at the weather station.

TABLE 3-1
PERRY COUNTY WEATHER STATISTICS
(Harrisburg/Middletown Station)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coldest Temperature</td>
<td>-9 ° Fahrenheit</td>
</tr>
<tr>
<td>Hottest Temperature</td>
<td>107 ° Fahrenheit</td>
</tr>
<tr>
<td>Average Mean Temperature</td>
<td>52.9 ° Fahrenheit</td>
</tr>
<tr>
<td>Average Annual Rainfall</td>
<td>37 – 42.9 inches</td>
</tr>
<tr>
<td>Maximum Annual Rain</td>
<td>81.74 inches (1996)</td>
</tr>
<tr>
<td>Average Annual Precipitation</td>
<td>40.50 inches</td>
</tr>
<tr>
<td>Average Annual Snowfall</td>
<td>34.8 inches</td>
</tr>
<tr>
<td>Maximum Annual Snowfall</td>
<td>92.2 inches (1996)</td>
</tr>
<tr>
<td>Maximum Seasonal Snowfall</td>
<td>117.7 inches (1995-1996)</td>
</tr>
<tr>
<td>Wind (Average Speed)</td>
<td>7.5 MPH</td>
</tr>
<tr>
<td>Wind (Maximum Speed)</td>
<td>7.7 MPH</td>
</tr>
</tbody>
</table>

SOURCE: National Oceanic and Atmospheric Administration (NOAA)

HYDROLOGY

In order to provide safe usable drinking water at continuous levels for the residents of the County, as well as guide future development in areas of potentially damaging high water levels in streams and rivers, decision makers must understand the importance of watershed management. Studies of water usage pertaining to water consumption and quality are generally concerned with low water flow conditions. Where floodplain management is concerned, high water levels and its flow patterns are of considerable importance. Only through understanding and awareness of watersheds by decision makers and residents in combination with responsible management can positive results be attained within Perry County’s watersheds.

A watershed is the entire land area drained by a particular watercourse. Land use activities and wastewater discharges within the watershed determine the quality of the water; which eventually flows out of the drainage area. The concept of watershed management has practical planning application, due to the fact that it is the primary geographic region in which to collect water resources.
Almost all of Perry County lies in the Susquehanna River watershed. The Juniata River is a major tributary that enters the Susquehanna River at the eastern county line. The Juniata River portion of the Susquehanna River watershed drains 37 percent of the County while nearly 63 percent drains into the Susquehanna River from sources other than the Juniata River. The largest drainage area into the Susquehanna River from those other sources is Sherman Creek; which drains 42 percent of Perry County. Only a very small area of 520 acres along the western boundary drains into the Conococheaque Creek, a contributing tributary to the Potomac River Basin.

The first factor affecting water flow conditions is runoff; which is primarily influenced by precipitation distribution. However, other factors such as land cover and land use, geology and physiography influence the variability of flows from individual watersheds.

Runoff has a distinct seasonal variation, with the period of highest runoff occurring in late winter or early spring, and the period of lowest runoff occurring in late summer and early fall. The seasonality of evapotranspiration accounts for most of this variation.

Low flow deficiencies develop after prolonged periods of little or no precipitation and persist until sufficient rainfall relieves the situation. Flow deficiencies of significant duration may cause new water supply problems and may magnify existing water quality problems.

Although floods occur in all seasons, studies of the relationships among storm intensity, duration, affected area, and seasonality suggest a tendency for flooding on principal streams to occur in winter and for floods on small streams to occur mostly in summer. Large flood areas are caused by storms of low rainfall intensity and long duration covering the entire area of principal watersheds. Small area floods, on the other hand, are caused by storms of high rainfall intensity and relatively short duration. An exception to this is tropical storms which normally occur during the summer months and cause extensive flooding over large areas. The result of such flooding over long periods of time is the creation of flood plains.

Flood plains are defined as low lying, flat areas adjacent to streams, which are subject to frequent, periodic flooding. For the purpose of land use planning in Perry County, those areas delineated by the Federal Emergency Management Agency as within the 100-year flood boundary and those areas delineated as floodplain soils in the latest FEMA maps for Perry County.

Flood plains are intrinsic and beneficial aspects of the natural landscape. They allow for an increase in drainage during rainy periods and buffer the stream from any detrimental effects of surrounding land uses. Map 3-1 shows the 100-year flood plains in Perry County.
GROUNDWATER

The topography, or physical land features, of the study area determines the drainage patterns and surface flow characteristics. Steeper slopes facilitate increased runoff and erosion and discourage infiltration into the water table. Groundwater flow directions are controlled in part by the topography.

Bedrock geology has ultimate control on the storage, transmission, and utilization of groundwater. Geologic factors such as rock type, intergranular spacing, rock strata inclination, faults, joints, folds, bedding planes, and solution channels affect groundwater movement and availability. Natural groundwater quality is a result of interaction between the groundwater and the bedrock with which it is in contact. The more soluble bedrock types will allow more compounds to become dissolved in the groundwater. For example, groundwater in highly soluble limestone aquifers will commonly have high hardness values. Groundwater quality will eventually affect surface water quality as it percolates into surface streams as base flow.

The County is located within the physiographic province called the Ridge and Valley Province. The mountains running east and west through the County are the ridge portions of the province. Rock types in the ridge section are quartzite, sandstones, and conglomerates. Most of the sandstones, conglomerates, and quartzite are tightly cemented, and in general, their primary porosity is quite low. Although these rocks are tightly cemented and have a low primary porosity, they are hard and brittle so that numerous joints have developed. These joint openings produce a secondary porosity, which increases the permeability of the rock. In general, the number and size of joint openings decrease with depth. With quartzite, jointing is the most important factor in groundwater production.

A major portion of the Valley Province is composed of shales. The shale provides about half of the wells of the Valleys with an adequate amount of groundwater for domestic needs. The pore spaces in these shales are very small. Fortunately, however, joints break the shale and it is these joints, as well as spaces between bedding planes, that allow for some water movement. In hard, brittle shale, joints are more open and tend to have somewhat greater yields.

The remaining portion of the County is composed of limestone and dolomites. Almost anywhere in these areas where limestone or dolomite occur at the surface or in the subsurface, serious problems may be expected from solution opening cave-ins. Such depressions are known as sinkholes. Surface drainage passes directly into the groundwater system, which means a high potential for groundwater pollution.

SLOPES-TOPOGRAPHY

The topographic features of the landscape are derived from the structure and weathering characteristics of the underlying bedrock. The more weather-resistant rock is responsible
for areas of higher elevation, while less resistant rock, such as limestone has eroded to form low lying valleys of moderate relief.

The features of Perry County showing the most prominent relief are Blue Mountain, which forms the southern boundary of the County, Tuscarora Mountain, which forms the northern boundary, a series of mountains in the eastern half of the County including Cove Mountain, Mahoney Ridge and Buffalo Mountain, and several mountains in the western portion of the County including Sherman Mountain, Bowers Mountain, Amberson Ridge, Rising Mountain and Conococheague Mountain. These mountains along with numerous ridges with local names run in a general east-west direction divided by several valleys. The valleys are generally rolling and border the local streams, which created them. The major break in this pattern is the narrow valley carved by the Juniata River while the eastern boundary is also a valley created by the Susquehanna River.

Topography has been a determining factor in the distribution of population within Perry County. Because of the relative ease of development of the flatter areas, the more desirable lands are those occurring in the valleys located on these mostly level lands. The steeper the slopes of the mountain and hill areas of the County have presented physical barriers to the development of these lands, which are, therefore, the least populated areas of the County. The combination of the valleys meeting the rivers created an ideal area for development of such Boroughs as Marysville, Duncannon, Millerstown, Newport and Liverpool.

Agricultural uses also occur in the valleys, as these lands allow for efficient farming operations. In Perry County, this factor is enhanced by the occurrence of the best agricultural soils within the lower, flatter lands. Additional competition for the flatter lands is intensified because commerce and industry, along with residential and agricultural uses, seek flatter, more easily developed areas.

In the development and planning of any area, the slope of the land is a major factor. Map 3-2 shows those areas of 15 percent slope and over. Development in these areas should be considered with caution.

When discussing the slope of the land, it is important to keep in mind that the natural gradients are created by erosion forces trying to establish a stable condition. Sometimes when altering these slopes in road building or other construction, it upsets the balance, which results in landslides, rock falls, mudslides, and soil creep as nature tries to restore the equilibrium.

Within Perry County, soil creep is prevalent and may at times be severe in areas where shale occurs. In locations where soil creep should be curtailed, adequate drainage leading water away from the face of a steep slope and keeping it from entering the top of the slope is advisable.
GEOLOGY

Geologists recount that at one time the eastern part of the United States sank below sea level and formed a great inland body of water known as the Appalachian Gulf. Sediments and dissolved material from surrounding areas settled or precipitated out in uniform layers resulting in the formation of stratified layers of shale, siltstone and sandstone. Continued deposition of sediments exerted extreme pressure on the deeper layers forming flat hard sheets referred to as sedimentary rocks. These events were followed by a period of upward movement caused by great horizontal compression, folding, and faulting of the flat sheets of rock. This last sequence of geologic activity was responsible for forming the series of ridges and valleys comprising the Appalachian Mountains in a northeast to southwest pattern.

In a later period, molten material originating from within the earth heated these sedimentary rocks. The expansion of these heated rocks and gases forced this molten material into cracks and cavities in the surface. Upon solidification, this became igneous rock. Igneous rocks are formed from cooled magma. Metamorphic rocks are the result of intense heat and pressure, which has changed the texture and/or component minerals of sedimentary or igneous rocks.

The oldest rocks exposed in Perry County are the Ordovician limestone and shale. Progressively younger rocks were formed during the Silurian and Devonian Periods. Mississippian rocks are the youngest in the County. The following is a more detailed description of the significant rock formations found at the earth’s surface in the county beginning with the oldest and continuing to the youngest.

Ordovician (O) Period

Name: *Martinsburg Formation*
Geologic Description: Dark-gray, slaty to phyllitic shale, calcareous at the base. Probably only the lower part of Martinsburg Formation is present; overlain by Hamburg sequence rocks.

Name: *Juniata Formation*
Geologic Description: Grayish-red, very fine to medium-grained, cross-bedded sandstone, and grayish-red siltstone and shale; merges with underlying Bald Eagle Formation to the south; not present east of Susquehanna River, except Spitzenberg Hill area (Berks County).

Name: *Bald Eagle Formation*
Geologic Description: Gray to olive-gray and grayish-red, fine- to coarse-grained, cross bedded sandstone, siltstone, and shale; some conglomerate (Lost Run Member); not present east of Susquehanna River, except at Spitzenberg Hill area (Berks County).
Silurian (S) Period

Name: **Bloomsburg Formation**
Geologic Formation: Grayish-red and greenish-gray shale, siltstone, and very fine to coarse-grained sandstone; some calcareous mudstone in central Pennsylvania; thins to west and is replaced by Mifflintown beds; thickens eastward, replacing overlying Wills Creek and Tonoloway Formations and underlying Mifflintown Formation.

Name: **Tuscarora Formation**
Geologic Formation: Light to medium gray quartzite and quartzitic sandstone and minor inter-bedded shale and siltstone, locally conglomeratic in lower part; includes (to the northwest) interbedded red and non-red sandstone (Castanea Member) at top; east of Harrisburg equivalent to Minsi and Weiders Members of Shawagunk Formation.

Name: **Clinton Group**
Geologic Formation: Predominantly Rose Hill Formation-light-olive-gray to brownish-gray, fossiliferous shale; locally, limestone occurs near top; includes dark-reddish-gray, very fine to coarse-grained, ferruginous sandstone; east of Harrisburg, equivalent to Lizard Creek Member of Shawangunk Formation. Above Rose Hill is Keefer Formation-light-to dark-gray, fossiliferous sandstone, hematitic, oolitic sandstone, and shale; not recognized east of Harrisburg.

Name: **Bloomsburg Formation: Bloomsburg and Mifflintown Formations, undivided**
Geologic Formation: Includes, in descending order, the Bloomsburg Formation which is described above, and the Mifflintown Formation-inter-bedded dark-gray shale and medium-gray fossiliferous limestone; equivalent to “McKenzie” and “Rochester” of earlier workers; not present east of Harrisburg.

Names: **Wills Creek Formation**
Geologic Formation: Variegated gray, grayish-red, yellowish-gray and greenish-gray, inter-bedded calcareous shale, siltstone, shaly limestone, and dolomite; passes into Bloomsburg Formation in the southeast; not present east of Harrisburg.

Devonian (D) and Silurian (S) Periods

Name: **Keyser and Tonoloway Formations**
Geologic Formation: In descending order: Keyser Formation-medium-gray, crystalline to nodular, fossiliferous limestone; upper part laminated and mud cracked; not present east of Harrisburg; passes into lower Coeymans, Rondout, and Decker Formations in the east. Tonoloway Formation-medium-gray, laminated, mud-cracked limestone containing some medium-dark or olive-gray shale interbeds; lower part passes into Wills Creek Formation east and south; passes into Bossardville and Poxono Island beds in the east.
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Devonian (D) Period

Name: *Onondaga and Old Port Formations*
Geologic Formation: Includes, in descending order, the Onondaga Formation, Ridgeley Member of Old Port Formation, and Shriver, Mandata, Corriganville, and New Creek Members of Old Port Formation, undivided.

Name: *Trimmers Rock Formation*
Geologic Formation: Olive-gray siltstone and shale, characterized by graded bedding; marine fossils; some very fine grained sandstone in northeast; black shale of Harrell Formation at base in Susquehanna Valley.

Name: *Clarks Ferry Member of Catskill Formation*
Geologic Formation: Gray to yellowish-gray sandstone, siltstone, and conglomerate.

Name: *Duncannon Member of Catskill Formation*
Geologic Formation: Grayish-red sandstone, siltstone, and mudstone in fining-upward cycles; conglomerate occurs at the base of some cycles.

Name: *Hamilton Group / Mahantango Formation*
Geologic Formation: A dark gray, gray, brown and olive laminated shale, siltstone, and very fine-grained sandstone or claystone containing marine fossils. In Pennsylvania runs approximately 970 feet deep.

Name: *Irish Valley Member of Catskill Formation*
Geologic Formation: Averaging 350 feet in thickness and containing calcareous materials, the McKenzie formation is composed of thin greenish-gray shale inter-bedded with thin fossiliferous limestone.

Name: *Sherman Creek Member of Catskill Formation*
Geologic Formation: Also calcareous, the Bloomsburg formation rests above the McKenzie formation and is red thin and thick-bedded shale, siltstone, and sandstone with thin impure limestone.

Mississippian (M) and Devonian (D) Periods

Name: *Spechty Kopf Formation*
Geologic Formation: Light-to olive-gray, fine-to medium grained crossbedded sandstone, siltstone, and local polymictic diamicritite, pebbly mudstone, and laiminite; arranged in crude fining-upward cycles in some places; locally has grayish-red shale near top conglomerate at base and in middle.
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Mississippian (M) Period

Name: Pocono Formation
Geologic Formation: Light-gray to buff or light-olive-gray, medium-grained, cross-bedded sandstone and minor siltstone; commonly conglomeratic at base and in middle; medial conglomerate, where present, is used to divide into Mount Carbon and Beckville Members; equivalent to Burgoon Sandstone of Allegheny Plateau.

Name: Mauch Chunk Formation
Geologic Formation: Grayish-red shale, siltstone, sandstone, and some conglomerate; some local non-red zones. Includes Loyalhanna Member (cross-bedded, sandy limestone) at base in south-central and southwestern Pennsylvania; also includes Greenbrier Limestone Member, and Wymps Gap and Deer Valley Limestones, which are tongues of the Greenbrier. Along Allegheny Front from Blair County to Sullivan County, Loyalhanna Member is greenish-gray, calcareous, cross-bedded sandstone.

The mineral resources at the surface of Perry County are not of a high yielding benefit to mining operations. During the past century, iron was produced locally to supply several small furnaces. The ore was obtained from the Onondaga formation, which is a part of the Marcellus and Mahantango.

The limestone for the flux was obtained close by from the Keyser, upper part of the Tonoloway and to a limited extent, the Onondaga. Agriculture lime and later crushed stone for road construction have been obtained from the above three formations. Large developments in the limestone formations are not likely with the massive limestone in great quantities in the nearby Cumberland Valley.

The geology of an area is an ever-present factor in land use planning. The ultimate or best use of land has historically been determined by the characteristics and quality of an area's geologic composition. The resulting soil layer was produced from the weathering of the geology. On-lot sewage disposal, agricultural productivity, drainage, well water and construction cost are some of the factors affected by bedrock geology. For the most part, the rock types found in Perry County do not present specific inherent limitations. However, there are a few notable formations with limestone which could contribute to the rapid spread of groundwater contaminants. In some cases, on-site evaluation of geologic factors may be necessary to determine the feasibility and impacts of a proposed project.

The engineering aspects of the bedrock geology are also important. These characteristics give an indication of such things as ease of excavation, cut-slope stability, and foundation stability. Generally, the rock formations provide strength and support for heavy structures such as dams, highways, bridges, and large buildings. Those areas, which are underlain by limestone and dolomites, however, may pose some problems to foundation engineering. Cavernous areas and areas known to be susceptible to sinkholes should be investigated thoroughly before construction of heavy structures. It is important to
recognize that most of these problems would be site specific and require an on-site evaluation to determine the appropriateness of a project. The geology of Perry County is shown on Map 3-3.

Only recently has subsurface geology raised the levels of interest in the field with the exploration of natural gas in the Marcellus Shale. While the prospect of natural gas discovery in this shale layer may not be as lucrative as elsewhere in the state, natural gas can be found in the Utica layer which is further in the substrate. When feasible the petroleum and natural gas industry will be active in Perry County and municipal officials will need to take the necessary steps to balance industry and environment on a human and physical scale.

SOILS

Soil is the earth’s skin. Its composition consists of weathered geologic material which covers the surface of the earth. It is a product of the geology, topography, climate, and vegetation. Alterations in any of these variables cause major changes in soil type. Soil formation and soil erosion are continuing actions, the latter of which has been greatly accelerated by the misuse of the land.

Soils have many properties by which they are identified. Knowledge of these properties is essential in determining land use policy. Some soils are deep and well drained making them suitable to most, if not all, types of urban or agricultural uses. However, shallow and poorly drained soils have definite use limitations. Although these soils may be altered by applying various engineering practices to the land, this is always a costly and frequently unwarranted expenditure. In an effort to avoid such expenditures, engineers, planners and developers are using soil maps more frequently as a basis for land use decisions and planning.

A detailed soil survey was developed for Perry County which classifies the soils according to depth, texture (coarseness or fineness), natural drainage, thickness, and arrangement of the various layers, kind of parent material, slope, erosion, flooding and other characteristics. Because each soil has its own characteristic place depending on the slope or its composition, and soils ordinarily occur together in the landscape, a small scale map can be produced to present this information. A map representing the Perry County soil associations is shown on Map 3-4.

The following list describes the various soil associations in the County. These principle soils are named in order of their importance in the association. After the soil name, there is a brief description explaining the general characteristics of the soil in the association. It is important to note that minor soils occurring within the association are estimated and that one solid series can occur in more than one association, depending on its relative extent, the slope, or stoniness phases which are typical within the areas of the different associations.
Name: **Berks-Weikert-Bedington Association**  
Soil Description: Shallow to deep, gently sloping to very steep, well drained soils that formed in material weathered from gray and brown shale, siltstone, and sandstone; on uplands.

Name: **Hagerstown-Duffield Association**  
Soil Description: Deep, nearly level to moderately steep, well drained soils that formed in material weathered from limestone; on uplands.

Name: **Hazleton-Laidig-Buchanan Association**  
Soil Description: Deep, nearly level to very steep, well drained to somewhat poorly drained soils that formed in material weathered from gray and brown quartzite, sandstone, siltstone, and shale; on uplands.

Name: **Monongahela-Atkins-Middlebury Association**  
Soil Description: Deep, nearly level and gently sloping, moderately well drained to poorly drained soils that formed in alluvium; on terraces and flood plains.

Name: **Murrill-Laidig-Buchanan Association**  
Soil Description: Deep, nearly level to moderately steep, well drained to somewhat poorly drained soils that formed in colluviums from gray sandstone, conglomerate, quartzite, and limestone, on uplands.

Name: **Elliber-Freamer Association**  
Soil Description: Deep, gently sloping to very steep, well drained and moderately well drained soils that formed in material weathered from cherty limestone; on uplands.

Name: **Weikert-Calvin-Berks Association**  
Soil Description: Shallow and moderately deep, gently sloping to very steep, well drained soils that formed in material weathered from red, gray, and brown shale, siltstone and sandstone; on uplands.

The **Soil Survey of Cumberland and Perry Counties, Pennsylvania**, published in April 1986, is the primary source for information regarding soils in the County. The overall capabilities i.e. traits of soils are often expressed by grouping the soils into classes. Soils of a single class have similar abilities and limitations. Approximately 42,000 acres or 12 percent of the County is defined by the Soil Conservation Service as prime farmland. These include Soil Classes I, II, III, and IV, the most productive soils for crop production because they are well drained, not highly erodible, and resist flooding during the growing season.

The Pennsylvania Municipalities Planning Code (Act 247, as reenacted and amended) defines “Prime Agricultural Land” as:
“Land used for agricultural purposes that contains soils of the first, second or third class as defined by the United States Department of Agriculture natural resource and conservation services county soil survey.”

There are seven capability classes of soils in Perry County. Classes I, II, and III have few limitations for crop production. Most of the land in these categories is currently in crop production. However, because these desirable agricultural soils coincide with flat, level topographic features, development pressure could affect these prime farmland areas. Map 3-5.

Historically, agriculture has been very important to the culture and economy of Perry County. Agriculture is extremely dependent upon the quality of soils. It is important to realize, once these prime agricultural soils are taken out of production by development, they will in all likelihood never be returned to that purpose.

Another concern for the loss of farmland that has vital links to soil conditions is the development of on-lot sewage systems. These systems often accompany the rural development of the county. A few of the soil types are known to pose severe limitations on development and major construction projects. These limitations result from such factors as slow percolation rates for on-lot sewage disposal, shallow depth to bedrock, and erodibility. Individual soil tests are recommended prior to construction on sites where the soil type indicates that such limitations may exist.

A rather significant extent of the County can expect unsatisfactory performance of septic tank absorption fields including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, all of which can affect public health. In situations where (1) soils are composed of highly permeable sand and gravel, or (2) fractured bedrock is less than 4 feet below the absorption field or, (3) excessive slopes exist, or (4) the water table is near the surface, the potential for groundwater pollution is increased. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively to prevent the groundwater pollution.

FORESTS AND WOODLAND AREAS

Prior to clearing by European settlers, most of Perry County was covered by forests. Today, most of the forested areas are concentrated on the slopes and ridges throughout the County.

The main forest cover type is mixed oak-hickory stands consisting mainly of white oak, red oak, hickory, black oak, and chestnut oak. Other species to be found include yellow poplar, shagbark hickory, white ash, red maple, beech, elm, birch, sycamore, hemlock, white pine, and Virginia pine.
Forests have a relationship with water resources in both a protective and a depletive manner. These timberlands offer protection from floods and erosion, while at the same time gradually deplete the stream flows. Covered with litter (leaves and twigs), the forest floor acts as a protective layer to the soil and reduces the possibility of sheet erosion caused by raindrop splash and impact on soil. In addition, litter decays and becomes humus, which helps to form a highly permeable layer of soil, in which infiltration rates usually exceed rainfall intensities. This impedes runoff from heavy rainfall, thus reducing downstream flood peaks.

When the forest floor becomes disturbed, particularly construction activities associated with roads and buildings, the potential for erosion increases. With erosion inevitably soil loss becomes the resulting consequence. It is a proven fact that wooded areas on steep slopes reduce stormwater runoff rates. By similar account such vegetation (riparian) cover along stream banks helps prevent erosion and reduces bed load; all of which reduce the severity of flooding.

WILDLIFE

Perry County has an abundance of wildlife. There are a variety of non-game species of birds, amphibians, reptiles, and small mammals. Game species include white-tailed deer, gray squirrel, cottontail rabbit, turkey, grouse, ring-neck pheasant, woodcock, morning dove, bald eagles, and various waterfowl. There are also red and gray fox, mink, muskrat, raccoon, weasel, opossum, and beaver.

WETLANDS

Wetlands are low lying, swampy areas usually associated with larger bodies of water such as lakes and streams. Wetlands have unique environmental characteristics, which include various plants and animal species peculiar to these areas. Significant wetland areas in Perry County are associated with the confluence of the Susquehanna and Juniata Rivers with their tributary streams.

The National Wetlands Inventory, the only official statewide mapping of wetlands, can be found in the offices of the Perry County Conservation District, Tri-County Regional Planning Commission and the Pennsylvania Department of Environmental Protection, Division of Rivers and Wetlands. These maps highlight documented wetlands throughout the County and region. Their publication date, however, inhibits documentation of recently proven wet areas. Therefore these maps should be used only as a guideline and initial reference when examining for wetland potential.
Though they are often overlooked and ignored, wetlands provide a wide variety of important functions in the environment for man and animals. Their existence helps to ensure food and natural habitat for an assortment of wildlife. They create safe areas for migrating and nesting birds, as well as wintering areas for waterfowl. Wetlands naturally form breeding, spawning and feeding areas, and provide natural cover for nursery areas for fish. During flooding and high water periods, wetlands form natural water storage areas by retaining the high waters and then releasing them gradually after subsidence. This action helps to cushion the effects of flooding and ultimately reduce flood damages. Wetlands also act as groundwater recharge areas, and through their filtering processes they assist in naturally purifying water by removing pollutants.

To preserve the advantages that healthy wetlands provide for the natural environment, the United States Army Corps of Engineers has the regulatory authority at the federal level (and the Department of Environmental Protection at the state level) over the discharge of dredged and fill materials within these wetland areas (Section 404 of the Clean Water Act of 1977). Map 3-6 graphically identifies the location of NWI Identified wetlands in Perry County.

NATURAL AREAS INVENTORY

In October 1999, the Natural Areas Inventory (NAI) for the Tri-County Region was completed after more than three years of field investigations and public involvement. The final report was compiled and written by the Pennsylvania Science Office of the Nature Conservancy. Based on public input and field investigations, the final report and map products contain information on the locations of threatened and endangered species and the highest quality natural areas in the three counties. However, it is not an inventory of open space. The NAI was updated in 2005 and some additional natural area sites were added.

The same pieces of the landscape which provide scenic and recreational opportunities also function as habitat for a great diversity of plants and animals, including some which are rare, threatened, or endangered species. Perry County contains intact examples of natural communities and sites for species rare in the state or even globally rare. Protecting the integrity of these natural systems provides benefits to humans and provides for the survival of wildlife and habitat.

A balance between growth and the conservation of scenic and natural resources can be achieved by guiding development away from the most environmentally sensitive areas. In order to achieve such a balance and ensure protection of critical natural areas, County and municipal governments, the public and developers must know the location and importance of these sites. This knowledge can help prevent conflicts over land uses as well as help to direct protection efforts and limited conservation dollars to the most vulnerable areas.
The inventory describes locations of areas significant on a countywide scale but not deemed exemplary natural communities because past disturbances to the areas surrounding them have rendered them somewhat isolated. These “locally significant” sites represent good examples of habitats that are relatively rare in the County, support an uncommon diversity of plant species, and/or provide valuable wildlife habitat on a local level.

The inventory is one tool which will aid the implementation of this plan and municipal comprehensive plans. The inventory can be used by a number of organizations to identify potential protection projects that may be eligible for funding through state or community grant programs. Landowners will also find this inventory useful in managing and planning for the use of their land. It gives them the opportunity to explore alternatives that will provide for their needs while protecting the species and habitat on their land. In addition, land managers may wish to consult this report in an effort to avoid potential conflicts in areas with species of special concern and/or identify ways of enhancing or protecting this resource.

The 2007 Plan included the most recent update to the NAI. As such, there are no additions to this natural resources element.

Natural Areas in Perry County with State Significance for the Protection of Biological Diversity

Within the NAI, sites received a rank where the highest priority ranking were rankings listed as 1 while the least significant received a rank of 5. The initial reported sites are as follows:

1. **BOX HUCKLEBERRY STATE FOREST NATURAL AREA – CENTRE TOWNSHIP**: This site is an approximately 10-acre oak-heath forest occupying a dry, northwest facing slope. Box huckleberry is a dominant species in the groundcover on about eight acres of the site. This is the largest population of species in PA, and it is thought to have persisted at the site for over 1200 years. (Newport USGS quadrangle) (Rank = 1)

2. **LAMBS GAP/TROUT RUN HEADWATERS – RYE TOWNSHIP**: This site supports a fair quality example of a Circumneutral Broadleaf Swamp Natural Community. The site supports a good quality population of a globally rare plant species. Limiting disturbances in this watershed in the future will help to maintain the quality of this site and help the globally rare plant species to persist here. (Wertzville USGS quadrangle) (Rank = 1)
3. **SECOND NARROWS SLOPES – TOBOYNE TOWNSHIP:** This site contains a fair to good quality Ephemeral/Fluctuating Natural Pool Community in State Game Lands 76. The site contains two plants and one animal species of concern. (Doylesburg and Newburg USGS quadrangles) (Rank = 2)

4. **WATTS MOUNTAIN – WATTS TOWNSHIP:** This site is a series of parallel ridges on the eastern side of the Juniata River and U.S. Routes 22/322. Various portions of the wooded north facing upper slopes support a good ranked population of a PA-endangered plant species. (Duncannon USGS quadrangle) (Rank = 2)

5. **ADUEDUCT BLUFFS/JUNIATA RIVER SCOUR – WHEATFIELD TOWNSHIP:** This site along the Juniata River has four listed species occupying several distinct habitats. There are two additional plant species of concern occurring along the riverbank. Finally, an aquatic animal species of concern was collected from the Juniata River at this site in 1994. (Duncannon USGS quadrangle) (Rank = 3)

Others initially included were:

6. **BOWERS MOUNTAIN SITE EAST – JACKSON TOWNSHIP:**

7. **BOWERS MOUNTAIN SITE WEST – JACKSON AND TOBOYNE TOWNSHIPS:**

8. **COVE MOUNTAIN SLOPES – PENN TOWNSHIP:**

9. **FOWLER HOLLOW ROAD SITE – TOBOYNE TOWNSHIP:**

10. **MILLIGAN RIDGE PONDS – SPRING TOWNSHIP:**

11. **PEPPERBUSH HILL PONDS/LIBERTY VALLEY POOLS – NORTHEAST MADISON TOWNSHIP:**

12. **WHITE RUN VALLEY – MILLER TOWNSHIP:**

13. **JUNIATA RIVER AT HALF FALLS/HALF FALLS MOUNTAIN – BUFFALO, HOWE, MILLER, AND WATTS TOWNSHIPS:**

14. **JUNIATA RIVER AT NEWPORT – HOWE AND OLIVER TOWNSHIPS AND NEWPORT BOROUGH:**

15. **JUNIATA RIVER SCOUR AT TRIMMERS ROCK – HOWE, MILLER, AND OLIVER TOWNSHIPS:**
16. JUNIATA RIVER – MILLERSTOWN TO OLD FERRY STATION – GREENWOOD, OLIVER, AND TUSCARORA TOWNSHIPS AND MILLERSTOWN BOROUGH:

17. LIMESTONE RIDGE WOODS – CENTRE TOWNSHIP:

18. THREE SQUARE HOLLOW PONDS – TOBOYNE TOWNSHIP:

In 2005, the NAI was revisited at which time twelve (12) sites were added to the overall list. These twelve sites were as follows:

1. Conococheaque Mountain Site – Toboyne Township
2. Susquehanna River at Fort Hunter-Rockville – Marysville Borough
3. Susquehanna River at Speecville – Penn Township
4. Waggoners GAP – Spring and Tyrone Townships
5. Flat Rock Site – Tyrone Township
6. Gunter Valley and Ridges – Toboyne Township
7. Susquehanna River at Halifax – Buffalo Township, New Buffalo Borough and Watts Township
8. Susquehanna River at Millersberg - Liverpool Borough and Buffalo Township
9. Susquehanna River at State Game Lands #258 – Liverpool Borough and Township
10. Three Square Hollow East – Duncannon Borough, Penn Township, and Watts Township
11. Big Knob – Jackson Township
12. Tuscarora Trail Site – Tyrone Township

In an effort to conserve space in this Plan, the reader is referred directly to the NAI of Perry County for this additional information and descriptions offered.

Natural Areas in Perry County with Local Significance

Within the revised NAI three (3) additional sites were added which were considered natural areas in Perry County having local significance. The three sites were as follows:

1. Bull Run School Cliffs – Jackson Township: This site consists of approximately 150 meters of exposed geology along Shermans Creek. The outcrop of cliffs are a scenic feature to view.

2. Pine Ridge Swamp – Penn and Rye Townships: This is a forested swamp which contributes water to Trout Run. The swamp is located in a narrow valley between Cove Mountain and Pine Ridge. The swamp is fed by many springs and seeps in the area.

3. Gibsons Rock Woods – Carroll Township: This site includes 11 pools and wet depressions at the base of Sherman Mountain, near the headwaters of Laurel Run.
Significant forestlands exist around the pools and depressions. The site is entirely within the Tuscarora State Forests. (Newburg USGS quadrangle)

Map 3-7 graphically depicts the location of these sites.

AGRICULTURAL SECURITY AREAS

The Agricultural Area Security Law (Act of June 30, 1981, P.L. 128, No. 43)(3 P.S. §§ 901-915), as amended allows any owner or owners of land used for agricultural production totaling at least 500 acres to submit a petition to their governing body for the creation of an Agricultural Security Area. If the petition is approved the participating landowners agree to keep their lands for agricultural use in return for certain benefits that the municipality will give.

Municipalities are to perform a review of their Agricultural Security Areas once every seven years according to the law.

Benefits of an Agricultural Security Area are:

1. Local governments are not to pass ordinances that unreasonably restrict farm structures or properties.
2. Prevents local governments from defining or prohibiting as a “public nuisance” agricultural activities and operations within the security area.
3. Protects farm operations by discouraging condemnation of agricultural land through eminent domain.
4. Acreage in the security area can participate in the Agricultural Easement Program.

Participation in the Agricultural Security area is purely voluntary. There are no penalty provisions for an individual who changes land use while in a security area. The term of an Agricultural Security Area is seven years followed by a re-certification process. By April, 2013, there were 897 parcels of farmland comprising 80,989 acres in 20 municipalities, recorded with the County as an Agricultural Security Area.

AGRICULTURAL PRESERVATION EASEMENT AREAS

Recognizing the need for local leadership to conserve and protect remaining viable agricultural land, the Perry County Board of Commissioners appointed a Perry County Agricultural Land Preservation Board in January of 1990. The Board’s purpose is to preserve farmland through stewardship to protect farmland and to provide leadership and support to County agricultural land preservation efforts.
In an effort to stem the need to sell off land for a profit, the agricultural easements are a reasonable option. The program is structured to place capital in the hands of the landowner in exchange for the signing over of the property’s development rights.

As of April, 2013, 28 Perry County farms were preserved through the purchase of agricultural easements accounting for 5,781 acres of land. This represents approximately 14 percent of the County’s land area. The contiguity of viable agricultural lands and community must be maintained and strengthened where possible if the County is to retain agriculture as its principal revenue generating industry. An additional 23 farms have been preserved by way of donated agricultural easements. These farms consist of an additional 2,176 acres.

**Map 3-8** shows the location of the easements and Agricultural Security Areas as identified by the Perry County Conservation District’s records.
Chapter 3  Natural Environment and Resources

GREENWAYS & TRAILS

Introduction

In 1998, then Governor Tom Ridge called for the state to research linear corridors of open space and the potential establishment of greenways throughout Pennsylvania. This vision culminated in the publication: Pennsylvania Greenways: An Action Plan for Creating Connections. This plan was designed to advance a Pennsylvania greenways partnership program, and was developed by DCNR in conjunction with the Department of Environmental Protection (DEP), the Department of Transportation (PennDOT), and the Pennsylvania Greenways Partnership Commission. The plan defines a greenway as:

A greenway is a corridor of open space. Greenways vary greatly in scale, from narrow ribbons of green that run through urban, suburban, and rural areas to wider corridors that incorporate diverse natural, cultural, and scenic features. They can incorporate both public and private property, and can be land- or water-based. They may follow old railways, canals, or ridge tops, or they may follow stream corridors, shorelines, or wetlands, and include the water trails for non-motorized craft. Some greenways are recreational corridors or scenic byways that may accommodate motorized and non-motorized vehicles. Others function almost exclusively for environmental protection and are not designed for human passage. Greenways differ in their location and function, but overall a greenway will protect natural, cultural, and scenic resources, provide recreational benefits, and enhance natural beauty and quality of life in neighborhoods and communities, and stimulate economic development opportunities.

The definition of “greenway” contained in the introductory section of this plan is derived directly from the above stated definition. The system of green infrastructure in Perry County can be thought of as an interconnected system of hubs and spokes. The hubs are represented by significant natural areas in the County including open space, woodlands, parks, water resources, and sites contained in the Natural Areas Inventory. Hubs can also be destinations for human activity such as population and commerce centers, and historic or cultural sites. Greenways can be thought of as the spokes that connect the hubs and complete the system.

Greenways can serve many purposes and provide many ecological, social, and economic benefits. Greenways can take the form of conservation greenways which provide habitat or migration corridors for wildlife and plant species; these areas should be earmarked for preservation or conservation based on their level of significance and quality as a natural resource, and may not be suitable for human use. In other cases, greenways may be used very actively by humans, and their importance as a natural corridor may be secondary to
their functioning for passive recreation or alternative transportation. Recreational greenways are often thought of as some type of “trail”, but it should be noted that greenways that function for more natural purposes can have recreational components without an actual trail being present. Where a defined trail is present, the type and purpose of the trail, as well as the type of user, can vary significantly. Trails are usually described by the type of user, such as hiking trails or equestrian trails. A trail’s level of use depends on the amenities offered along the trail (availability of fitness stations, picnic areas, parks, trash receptacles, lodging, supplies stores, etc.), its length, the proximity of population centers, access points, the terrain it passes through, and the trail surface. The many benefits of greenways and trails are listed in the introductory section of the 2011 Perry County Greenways, Parks, Recreation, and Open Space Plan.

The establishment and recognition of greenways throughout Perry County will greatly contribute to the quality of life for all Perry County residents as well as visitors. Some of the envisioned benefits greenways planning will yield are:

- Greenways will further Perry County’s sense of place.
- Greenways will support the retention of Perry County’s scenic beauty.
- Greenways will protect Perry County’s water resources. Their establishment and protection will aid in buffering non-point sources of pollution as well as protect critical recharge areas.
- Greenways will establish a means of protecting and managing wildlife in Perry County, as well as species habitat, such as forests and other ecosystems.
- Greenways can provide recreational opportunities in Perry County for those of all ages and abilities.
- Greenways can provide transportation alternatives, and as such reduce traffic congestion.
- Greenways will offer an added positive contribution to Perry County’s economic climate.
- Greenways are a key component in Perry County’s strategy to foster health and wellness.
- Greenways offer a sensible solution to protecting human health, safety, and general welfare in Perry County.
- Greenways will lay the foundation for cooperation in Perry County from its citizens.

**Greenways and Trails**

Although conceptually the location of a greenway corridor may seem logical and feasible, the actual placement and designation of the greenway, its degree of protection, and its permitted level of public use may be impacted by several factors. These factors include the property owner or owners (private owners vs. publicly owned vs. owned by a conservancy or not-for-profit organization), existing protection (state/federal regulations, easements), and local municipal planning and zoning.
Property ownership is often a large hurdle to surmount when designating greenways and developing trails. Residents who value and support trail development may think differently when a trail is proposed on their property. Reasons for the animosity include concerns over liability, and loss of privacy and private property rights. When evaluating the location of greenways and trails, it is important to identify existing property owners and involve them in these discussions from the outset. This will encourage buy-in to the project’s concept and open the door for acquisition or land donation discussions if the trail is part of a larger initiative. When land is owned by a conservancy or not-for-profit organization, or an easement has been placed on the property, certain restrictions may exist on how that property may be used. For example, land that has been preserved for agriculture may not be able to be used for human recreation purposes. It is important to understand the restrictions that are placed on such properties when determining greenway and trail locations.

The existing level of protection may impact the proposed use of the greenway or trail. For example, wetlands and species of special concern are protected by state and federal regulations. Where these and other features are present, human use may be limited. Conversely, linear corridors that are part of a larger greenway but do not contain these protected features may be more vulnerable to development and should be considered priorities for protection. Losing these segments will impact the continuity of the larger greenway.

Municipal planning and zoning can also influence greenway and trail development. Municipal officials may place certain restrictions on how land may be developed that contains certain natural features such as floodplains, steep slopes, and wetlands, through a conservation district or conservation overlay in their zoning ordinance and accompanying regulations. Municipal officials also have the opportunity to designate the location of trails in a comprehensive plan or on an official map.

A Closer Look at Greenways

PADCNR has designated five mega-greenways in Pennsylvania that are 100 miles or more in length, pass through multiple counties and regions, and are recognized in the state plan. Perry County is fortunate in that it has three state recognized mega-greenways that traverse the county. These greenways provide opportunities for open space conservation, recreation, and ecological systems management, as well as economic development and tourism. It will be important for Perry County to develop collaborative partnerships with the Commonwealth, local municipalities in which the greenways are located, and other public, private, and non-profit groups and organizations to ensure proper management and protection of these valued resources. Through the development of this plan, Perry County will look to develop a network of regional and local greenways that tie into the designated mega-greenways and form an integrated green infrastructure network. Greenways and Trails are shown on Map 3-11.

Kittatinny Ridge Greenway - The Kittatinny Ridge Greenway follows the Kittatinny Ridge, also known locally as Blue Mountain, for approximately 53 miles along Perry
County’s boundary with Cumberland County. The greenway then extends south into Maryland, crossing Franklin and Fulton Counties; and northeast to New Jersey, crossing Dauphin, Lebanon, Schuylkill, Berks, Carbon, Leigh, Northampton, and Monroe Counties. In Perry County, The Kittatinny Ridge Greenway traverses Carroll, Jackson, Rye, Southwest Madison, Spring, Toboyne, and Tyrone Townships and Marysville Borough. As noted previously, Waggoner’s Gap is located along this greenway, and the greenway has also been designated as an Important Bird Area, due to its significance as a major flyway for migrating raptors, vultures, and songbirds.

*Pittsburgh to Harrisburg Mainline Canal Greenway* - The Pittsburgh to Harrisburg Mainline Canal Greenway is a 320-mile long, 2-mile wide corridor that follows the path of the historic Pennsylvania Mainline Canal from Pittsburgh to Harrisburg. It traverses Perry County via the Juniata River in the northeastern part of the county. The Pittsburgh to Harrisburg Mainline Canal Greenway runs concurrent with the Juniata River Water Trail; in Perry County the two run for 18 miles to the Juniata River’s confluence with the Susquehanna River. From that point, it shares its designation with the Susquehanna Greenway for an additional 10 miles to the Perry-Cumberland County Boundary line. In total, this greenway travels approximately 28 miles through Perry County in parts of Buffalo, Greenwood, Howe, Rye, Miller, Oliver, Penn, Tuscarora, and Wheatfield Townships, and Duncannon, Marysville, Millerstown, and Newport Boroughs.

*Susquehanna Greenway* - The Susquehanna Greenway follows the Susquehanna River approximately 17 miles to contact with Reed Township, Dauphin County. The Susquehanna Greenway reemerges in the County at the confluence with the Juniata River. From there it picks up for an additional 10 miles south to the Perry - Cumberland County boundary line. Combined, the greenway runs nearly 27 miles through the county. The Perry County municipalities within this greenway corridor include Buffalo, Liverpool, Penn, and Watts Townships, and Duncannon, Liverpool, Marysville, and New Buffalo Boroughs. The Susquehanna Water Gap and Susquehanna Water Trail are also within the greenway.

**Building Our Greenway Connections with Our Neighbors**

As of the date this plan was undertaken, all of Perry County’s surrounding counties have adopted greenways plans. The dates associated with these plans range from 2006 - 2009

**Cumberland County**

In April 2006, Cumberland County coordinated the preparation of Land Partnerships a Countywide Strategy for Open Space Preservation and Smart Growth. With the adoption of this plan County recognition of two of Pennsylvania’s “Mega” Greenways will be shared with this neighbor county. They include the Kittatinny Ridge Greenway and the Susquehanna Greenway. Another greenway considered from Cumberland County’s plan is the one buffering the Appalachian Trail.
Within Cumberland County’s plan the Kittatinny Ridge was highlighted as a continuous greenway the entire length of the northern and common shared border with Perry County. This plan serves to recognize this feature by mirroring Cumberland County’s vision.

The Susquehanna Greenway covers the entire eastern end of Cumberland County. Perry County’s plan will repeat the same to form a northern extension.

As previously mentioned, the Appalachian Trail has been assigned a greenway designation in Cumberland County. As with the Susquehanna Greenway, this plan intends to extend greenway focus along the trail running north.

**Dauphin County**

In April 2009, Dauphin County completed the Dauphin County, Parks, Recreation, Open Space and Greenways Study. As with Cumberland County, Perry County will share two “Mega” Greenways with Dauphin County. They are also the Kittatinny Ridge Greenway and the Susquehanna Greenway. Like Cumberland County, the Appalachian Trail was also considered for the purpose of greenway designation.

In Dauphin County’s plan the Kittatinny Ridge was highlighted as the Darlington Trail Greenway and does not continue to its eastern boundary for termination. The greenway intersects the Susquehanna Greenway.

The Susquehanna Greenway covers nearly all of the entire western side of Dauphin County. Perry County’s plan will reflect recognition on the County’s eastern side. The only exception to this arrangement is the area occupied by Reed Township, Dauphin County, which is on the western shore.

As previously mentioned, the Appalachian Trail has been assigned a greenway designation in Cumberland County. As with the Susquehanna Greenway, this plan intends to extend greenway focus along the trail running north.

**Franklin County**

According to the Greenways Plan for Franklin County, over 80% of the Franklin-Perry border is shaded green on the map suggesting greenway consideration and substantially compatible land use at this shared boundary line. The Horse Valley, the only other observable anomaly is a pie slice-shaped area just north of SR 274. The Plan also reveals efforts to identify existing trail linkages with Perry County. Both the Tuscarora Recreation Greenway and an Iron Horse to Tuscarora Greenway are mentioned.
Chapter 3  Natural Environment and Resources

Juniata County

In December 2009, Juniata concluded its joint planning process with Mifflin County. The resulting document was entitled Juniata/Mifflin County Greenway, Open Space and Rural Recreation Plan. From the Plan, Juniata County and Perry County will share the Pittsburgh to Harrisburg Mainline Canal Greenway as a Pennsylvania “Mega” Greenway.

The Pittsburgh to Harrisburg Main Line Canal Greenway covers nearly all of the entire western side of Dauphin County. Perry County’s plan will replicate this on its eastern side. The only exception to this arrangement is that of Reed Township.

Within Juniata County’s portion of its joint plan, the Backlog Mountain/Shade Mountain Greenway was highlighted as a continuous greenway the entire length of the southern and common shared border with Perry County. This plan serves to recognize this feature by shadowing Juniata County’s pursuit.

Trails

Creating Connections, developed by the Pennsylvania Greenways Partnership in 1998, lists and describes the following types of trails:

- **Hiking Trails** – Hiking trails are often located in wooded or wilderness areas, are at least several miles in length, and may be only a narrow footpath with minor improvements to the trail bed. Hiking trails vary in their ease of navigation and terrain.

- **Nature Trails** – Nature trails are usually shorter trails of a mile or two in length and are likely to form complete loops. They often have interpretive signs, observatory areas, or indoor or outdoor learning centers associated with them.

- **Hike-and-Bike Trails** – Hike and bike trails exclude motorized vehicles, with the exception of maintenance and emergency vehicles. Flatter, wider trails with improved surfaces appeal to a wider audience of pedestrians, mountain bikers, horseback riders, and cross-country skiers.

- **Multi-use Trails** – Multi-use trails may allow multi-uses including equine and motorized conveyances and, in general, provisions are made to separate motorized vehicles, non-motorized conveyances, and pedestrians. This separation may be accomplished through the designation of different lanes for different types or users, or through the establishment of parallel trails at different grades.

- **Exercise Trails** – Exercise trails are close to population centers and may attract joggers, runners, and walkers. They may also incorporate elements of a fitness course.

- **Bike Paths** – Bike paths are separate paths designed for bicycles only.

- **Bike Routes** – Bike routes are usually identified routes that utilize the existing roadway network that indicate to bicyclists that these routes are preferred over other routes. Bike routes can utilize existing shoulders, incorporate share-the-road
signage, have a separate, designated bicycle lane, or provide a paved, parallel trail for bicyclists off of the main road.

- **Rail Trails** – Rail trails utilize inactive railroad corridors and railroad rights-of-way for greenways and trail development. The once-extensive railroad network in Pennsylvania has resulted in numerous opportunities for multi-use trail development. In some cases, a trail can coexists with an active rail line; the trail and the rail line run parallel to each other either grade separated or at-grade.

- **Tow paths** – Tow paths were once used by mules to pull canal boats. Although not as vast as the system of railways, canals were once an integral component of Pennsylvania’s transportation network.

- **Snowmobile and ATV Trails** – Snowmobile and ATV trails are increasing in popularity in Pennsylvania and the state has developed several resources for riders including trail maps and legislation pamphlets for riders. Currently, there are no ATV trails in Perry County.

- **Utility Corridors** – Utility corridors can offer opportunities for trail development similar to railroad rights-of-way.

Trails in Perry County may fall into one or more of these specific trail types. This plan looks at trails in terms of their geographic level of significance. The following trails are located in Perry County. These features are shown on Map 8-9.

**National Hiking Trails**

*Appalachian National Scenic Trail* - The Appalachian National Scenic Trail is a continuous, marked footpath extending along the Appalachian Mountain system for more than 2,100 miles between Katahdin in Maine and Springer Mountain in Georgia. The National Trails System Act authorized new, broader agreements among federal agencies, states, and non-federal entities to manage the trails. The Appalachian Trail Conservancy and Appalachian Trail Park Office, in partnership with the United States Department of Agriculture Forest Service, and numerous volunteer organizations, share responsibility for general trail management and operations; resource management; facilities and use management; information, interpretation, education, and outreach; and technical program support. The Appalachian National Scenic Trail enters Perry County from the south at the Darlington Shelter in Rye Township and travels northeast through Rye and Penn Townships, and Duncannon Borough, where it crosses the Susquehanna River into Dauphin County via the Clarks Ferry Bridge. The total length of the Appalachian Trail in Perry County is 12 miles. Of the three municipalities that the trail passes through in Perry County, Duncannon Borough provides hikers with such amenities

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1 The Appalachian Trail Conservancy. [www.appalachiantrail.org](http://www.appalachiantrail.org).
as mail pick-up and drop off, and food and lodging; thereby, making Duncannon Borough a quaint essential Appalachian Trail town.

The Apple Tree Alley Walk is a demonstration project of the Susquehanna Greenway Partnership. This is one of the first projects to be undertaken to implement the Susquehanna Greenway in Pennsylvania. The trail would extend along Apple Tree Alley from Fritz Street to Noye Park in Duncannon Borough. The trail follows the path of an abandoned rail line and other municipal streets and rights-of-way. The trail will provide a pathway through the Borough for use by pedestrians, including through hikers on the Appalachian National Scenic Trail. The trail will allow hikers to experience Duncannon’s riverfront history and will provide access to local businesses including those concentrated in the historic Duncannon Square.

On June 11th 2008, then Governor Rendell signed House Bill 1281 amending the Appalachian Trail Act of 1978. HB 1281 is now known as Act 24 of 2008 and became effective on August 10th, 2008. The amended act now requires municipalities within which the Appalachian Trail passes to adopt and enforce zoning ordinances that preserve the “natural, scenic, historic and esthetic values of the trail and to conserve and maintain it as public resource”. Fortunately, Rye Township, Penn Township, and Duncannon Borough have all adopted a zoning ordinance, which will be required to be updated to be in compliance with Act 24.

State Recognized Hiking and Land-Based Trails

**Tuscarora Trail** - The Tuscarora Trail was originally created as a new route for the Appalachian Trail. It branches off of the Appalachian Trail at Deans Gap at the Cumberland-Perry County line, and follows the Blue Mountain ridge top southwesterly to Maryland, where it connects to the Big Blue Trail before joining the Appalachian Trail again in Shenandoah National Park. The trail is over 250 miles, with 110 miles in Pennsylvania. Approximately 30 miles are located in Perry County. Sections of the trail are maintained by the Potomac Appalachian Trail Club – North Chapter.

**Darlington Trail** - The Darlington Trail runs for 7.74 miles from the Appalachian and Tuscarora Trail junction at the western end, to Tower Road at the eastern end. The trail is located within State Game Lands #170 and maintained by the Susquehanna Appalachian Trail Club. Parking areas are located along Lamb’s Gap Road, Miller’s Gap Road, and Tower Road. Expansion of the trail to Marysville Borough is planned upon completion of the Rockville Estates subdivision on Marysville Borough.

**Iron Horse Trail** - The Iron Horse Trail is located in the Tuscarora State Forest and consists of a 10-mile loop between Big Spring State Park and the Eby Cemetery along SR
274. The trail follows the grade of the Perry Lumber Company and the Path Valley Railroads.

**Little Buffalo State Park Trails**

Little Buffalo State Park has approximately 8 miles of hiking trails that include:

- **Little Buffalo Creek Trail** – located at the west end of the park, this one mile trail offers hikers the beauty and sounds of water and good opportunities for seeing wildlife.
- **Exercise Trail** – a 1.2 mile loop trail with 18 permanent stations.
- **Blue Ball Trail** – a paved, ADA accessible .25 mile trail that runs from the East Picnic Area to the Blue Ball Tavern.
- **Fisherman’s Trail** – a 1 mile, easy hiking trail that wanders through a mature hemlock forest. A vista overlooking the lake and dam is located at the east end of the trail.
- **Mill Race Trail** – this trail can be accessed by Shoaff’s Mill and by the environmental interpretive center. It follows Furnace Run and the mill race for .5 miles.
- **Middle Ridge Trail** – a 2.5 mile difficult trail that runs from the Exercise Trail to the west end of the park. It offers many short, steep climbs while traveling through a variety of habitats.
- **Buffalo Ridge Trail** – a 1.5 mile difficult trail that runs from the East Picnic Area to the Newport and Sherman’s Valley Railroad Trace and offers glimpses of the industrial history of the area.

**Newport and Sherman’s Valley Railroad Trace** - Included in the seven-mile network of trails in Little Buffalo State Park are two small sections of rail-trail. Together they are called the Newport and Sherman’s Valley Railroad Trace. Highlights alongside the trace include a covered bridge over Furnace Run, Shoaff’s Grist Mill, and an original rail car.

**Fowler’s Hollow State Park Trails** - Alfarata and Beaston Trails, which are extensive trails in the Tuscarora State Forest, meet in Fowler’s Hollow State Park. There are 6 miles of trails within the park and this area is a trailhead for a variety of hiking trails within the Tuscarora State Forest. The Tuscarora Big Blue Trail and Perry Lumber Trail are located nearby.

**Big Spring State Park Trails** - Big Spring State Park contains a 1 mile loop trail and serves as the trail head for the Tunnel Trail. This trail leads to a partially completed railroad tunnel. Historic interpretation is provided at the trail head. The park also provides access to the Iron Horse Trail.

**Tuscarora State Forest Trails** - In addition to the Tunnel Trail, Tuscarora Trail, and Iron Horse Trail, an additional 167 miles of short, local hiking trails are located throughout the Tuscarora State Forest. The majority of these trails have signs at the starting and terminal points. Most of the trail maintenance is done by volunteers.
In addition to hiking trails, the Tuscarora State Forest offers a snowmobile trail system of more than 100 miles that provides excellent snowmobiling during snowy winter months. A cross-country ski area is located in Fowler’s Hollow that follows 11 miles of trails and old railroad grades.

A Closer Look at Water Trails

In addition to the hiking and land based trails described above, Perry County also contains two state-recognized water trails that provide opportunities for water based recreation. The Pennsylvania Fish and Boat Commission (PFBC) define water trails as boat routes suitable for canoes, kayaks, and small motorized watercraft. Like conventional trails, water trails are recreational corridors between specific locations. Water trails are comprised of access points, boat launches, day use sites and potential overnight camping area, enabling the water trail to be used for single day and multiple day trips. Water trails also provide connections to history, ecology, geology, heritage, and wildlife. PFBC is the sole agency to designate official water trails; however, individual trails and trail corridors are conceived and maintained by a network of volunteers, property owners, civic groups, and associations. Water trails are a special type of greenway and offer various benefits to local communities and Perry County including enhancing opportunities for tourism and economic development, providing recreational amenities, and encouraging restoration and conservation through proper stewardship of the resource. All designated water trails abide by “leave no trace” principles.

Susquehanna River Water Trail - The Middle Susquehanna River Water Trail is located along 51 miles of the Susquehanna River between Sunbury and Harrisburg. In 2008, the Middle and Lower Sections of the Susquehanna River Greenway and Water Trail were designated as a National Recreation Trail. The Susquehanna River Trail Association manages the Middle Section of the water trail. Official access points are located in Duncannon and Marysville in Perry County. In addition to the official access points, there are other access points to the Susquehanna River, such as Pennsylvania Fish and Boat Access areas, private campgrounds, and other privately owned properties that provide access to the river.

The Susquehanna River offers numerous recreational opportunities; however, access to the river along the Perry County shore is limited by U.S. 11/15 and the Norfolk Southern rail line. Additionally, seasonal variations in water depth limit the river’s capacity as a recreational resource.

Juniata River Water Trail – Lower Section - The Lower Section of the Juniata River Water Trail travels through Perry County from the Juniata County boundary to the river’s confluence with the Susquehanna River. The ability to paddle the river varies throughout
the year based on water flow. There are also many cobble bars on the river than may
ground a boat if the water is too low, and there are also several “pools” that may retain
adequate water year round. The following access points to the Juniata River Water
Trail are located in Perry County:

- Millerstown – Primitive access at Millerstown Community Park that includes
  parking and carry-in canoe access.
- Greenwood Township – PFBC surfaced ramp access.
- Newport – Primitive access.
- Howe Township Park – Primitive access.
- Green Valley – Surfaced ramp access in campground.

Artisan Trail - The Perry County Council of the Arts (PCCA) is an active participant in
the RT 15 Byway of the Arts. The Byway of the Arts serves to provide linear connection
to arts-related places in relatively close proximity to the RT 15 corridor. In Perry County
there are presently four identified destinations for the traveling public to visit along the
trail.

In 2010, a dual exhibit of area artisan works was held at the PCCA Gallery and the
Landis House both in Newport. Aside from this pair of PCCA properties, a few Perry
County businesses also participate. These include places like Hunters Valley Winery and
Expresso Yourself Café.

Bicycle Routes

- **Bicycle PA Route J**: US Traffic Route 11/15 from Reed Township, Dauphin
  County north to the Perry County - Juniata County boundary line. This is the only
  bicycle route for Perry County presently recognized by the Commonwealth of
  Pennsylvania in its current Bicycle Pedestrian Plan.

- **Shermans Creek Ride**: One of the most scenic and amenable bike rides in south-
  central Pennsylvania is found along Shermans Creek near Dellville. Although not
  established as a formal bikeway, the route offers nearly ideal riding conditions for
  bicycle enthusiasts. The total distance of the ride is about 8 miles.

Heritage Trails – The self-guided tour of Perry County takes you through some of the
most beautiful scenery in Pennsylvania. The entire tour covers approximately 200 miles
and it starts and ends at Amity Hall. Along the way the tour points out historical sites and
buildings of Perry County. The Perry County Historical Society has developed the self-
guided tour trial and it is fully described in the **A Self-Guided Driving Tour of Perry
County** book.

Covered Bridges Trail - Perry County has fourteen covered bridges located throughout the county. These

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2 Historical Society of Perry County
bridges offer a glimpse of the past and are of great historic and economic value to the County. A detailed description and location of the County’s covered bridges can be found in a book titled Perry County, PA Covered Bridges Trail.

**Potential Considerations for Trail Linkage**

In addition to the greenways and trails discussed above, there are other types of linear connections within Pennsylvania that warrant discussion in this section. These linear corridors may or may not be part of a larger greenway or trail corridor. This includes PA scenic byways, connections within developed areas, and Heritage Corridors.

*Pennsylvania Byways* - Pennsylvania Byways are routes designated by PennDOT at the request of local communities that seek to highlight six qualities of a route: cultural, historical, recreational, archaeological, scenic, and natural qualities. The Pennsylvania Byways program parallels the Federal Highway Administration’s National Scenic Byways Program, and a route must first be a Pennsylvania Byway before it will qualify for designation in the national program. After a route has been designated by the state, there are several opportunities to promote the route and recognize the route, including placement on the PA Department of Community and Economic Development’s tourism website, the Pennsylvania Travel Guide, and the Transportation and Tourism Map of Pennsylvania. None of the routes in Perry County are currently designated as a Pennsylvania Scenic Byway.

*Connecting Boroughs and Developed Communities* - For the most part, the population of Perry County is concentrated in small developed clusters, in boroughs and villages throughout the county. This development pattern offers an opportunity to develop pedestrian level connections consisting of sidewalks, and walking and biking trails. These connections can occur between developed areas and parks, public building and facilities, downtowns or public gathering places such as a town square, and between boroughs and surrounding townships. Examples of these interconnections exist throughout the county; however, there needs to be a concerted effort between elected officials, property owners, developers, and other organizations to ensure these connections are identified and developed. The municipalities in the southeastern part of the County are experiencing the greatest development pressures and are at the most risk to lose the ability to make these connections as land is developed.

*State Heritage Areas* - Pennsylvania State Heritage Areas are large geographic regions or corridors that span two or more counties and contain a multitude of historic, recreational, natural, and scenic resources of state and national significance that collectively exemplify the heritage of Pennsylvania. Perry County is not currently included in a State Heritage Area.
Conclusions – Strengths, Challenges, and Opportunities

**Strengths:**

- Perry County is fortunate in that it has several greenway and trail resources of state and national significance. Three of the five state recognized mega-greenways traverse the county, and trail resources include the Appalachian Trail and a number of trails on state-owned land. These resources provide opportunities for natural resources conservation and recreation. Coincident with the greenways are the two officially designated water trails. The Susquehanna and Juniata Water Trails provide residents with opportunities for water based recreation.
- Perry County is fortunate in that it has a strong community spirit and a strong commitment to protect its manmade and natural resources. In order to maintain the manmade resources there are numerous Trail Clubs that spend untold number of hours maintaining the trails in the County.
- Perry County has many amenities, including major rivers, open space, beautiful landscapes, and small town charm to name a few, which can be enjoyed by residents and non-residents of the county.
- The main population centers of the County are its boroughs, some of which were former river towns. These towns are well connected by exiting roads, but more importantly, several of these towns are connected by undeveloped greenways and trails. These undeveloped greenways and trails will serve as the future connections that will encourage physical activity, community interaction, and tourism.

**Challenges:**

- Although the state-recognized greenways serve as a strong foundation upon which to build the system of regional and local greenways in Perry County, the county and its public and private partners may encounter challenges with designating and conserving greenways in other areas of the County due to private landowners.
- Lack of municipal regulations presents challenges for conserving sensitive natural resources and open space.
- Although the Susquehanna River contains great potential for recreational use, access to the river from Perry County is inhibited by U.S. 11/15 and the Norfolk-Southern rail corridor.
- Allaying fear of civil lawsuits for trail access.
- Funding.
- Preventing further fragmentation of properties through subdivision.

**Opportunities:**

- Perry County’s foundation of state designated trails and greenways will assist the County in developing a cohesive network of green infrastructure in the county. There is an opportunity for the County to build upon this foundation by
connecting other greenway corridors to these established routes, linking key hubs and destinations.

- It will be important for Perry County to consider its population centers when planning for greenways, trails, and linear connections. Green infrastructure in urban settings can increase the quality of life of the community and increase community sustainability. There are opportunities for the County to work with municipalities to increase safe pedestrian and bicycle routes within the boroughs and developed areas of the county. In doing so, the County will help to link people with destinations such as schools, parks and community facilities, and places of employment, offering opportunities for alternative transportation and increasing community health and wellness.

**Summary Conclusion**

With its greenway and trail amenities, Perry County has the advantage of increasing its attractiveness as a tourism destination.

There are several human introduced features to be considered for further trail development. The following is a basic list for consideration.

*Utility Corridors* - Numerous utility corridors crisscross Perry County’s landscape. The interconnected regional transmission lines require retention of wide swaths of rights-of-way. In some cases these rights-of-way widths even exceed two hundred feet. Periodically these areas are groomed to keep vegetation, particularly trees from maturing to the point where they could become a detriment to service.

Many of these areas have been deforested with little to no attention to environmental sensitivity, or for that matter aesthetics. For instance, Cove Mountain in Penn Township displays the prevalent scar of a clear-cut area serving the needs of one such right-of-way. This blemish to this unique Appalachian geologic formation is quite observable especially from the US 22/322 corridor in Dauphin County.

*Dirt and/or Gravel Roads* - Within the Tuscarora State Forest there are many miles of dirt and/or gravel roads. Because of their distances, these roads offer multiple serving uses. Visitors should find ample parking opportunities at numerous locations throughout the Tuscarora State Forest.

*Rail Corridors* - Railroad corridors offer long typically gradual distances of trail possibilities. In Perry County there is one active railroad. The railroad is the Norfolk-Southern Railroad. While this railroad is currently active, the feasibility of placing a trail within the corridor seems far too remote. However farfetched the thought may be, Perry County should not find itself in such a position to lose this possibility.

In its day, the Shermans Valley Railroad line was a tremendous linear feature. As a small service line, the economic viability of the railroad became too much for business to continue. The result was the discontinuation of operations and subsequent abandonment
of the railroad right-of-way. Had the right-of-way along the line remained intact it could have served to establish a multi-purpose trail linking the County’s village centers to the County’s western-southwestern recreation areas. Instead, this land area has since been subdivided and distributed to interested landowners.

**Towpaths** - Remnants of the towpaths associated with the Juniata Division of the Pennsylvania Main Line Canal system are highly visible. The development of this transportation ran from 1832 to 1888 according to information posted on the Pennsylvania Canal Society’s website. However, the downside is many of these lands have been subdivided and subsequently altered from their initial appearance. Getting a stretch of property owners to agree on a semipublic use of their land is also a tough sell. In Greenwood Township and Millerstown Borough, the community has embraced the potential connection of the canal’s towpath as a linkage for Millerstown Borough and the Millerstown Area Community Park.

The proximity of these towpaths to the river and the elevated vantage point each offers heightens their intrinsic value. Each segment of the former canal system has a high potential recreational yield value and should not be overlooked.

**School District Cross Country Trails** - Four of the five school districts serving Perry County have cross country trails within the county. Without a name, their identity and locations are typically unknown to the majority of the public not following the sport. For one district, use of these lands after normal school hours is not allowed.

**Logging Roads and Fire Breaks** - With the amount of public and private forest land in Perry County, there are many opportunities to take advantage of remnant paths of lumber extraction. These connected clearings in some places have the potential to provide great trails where proper thought and design went into their creation.

As with logging roads, fire breaks, and towpaths, property fragmentation by way of subdivision decreases chances of successfully coordinating such projects.

**SUMMARY AND CONCLUSIONS**

The natural environment and resources and the limitations they place on development are at the heart of differences in views over lands conducive to development and lands that subject land improvements and those that work or reside in the completed buildings to health and safety issues or subject others or their local environment to unnecessary hardship due to poor land choices. This Chapter was formulated to identify and clarify why certain areas are worth protecting or preserving in order to minimize the impact under regulated development might otherwise have on the County and its municipalities.