CHAPTER 15

Natural Environment

To assist in providing orderly, intelligent, and efficient growth for Cumberland County, it is essential that appropriate features of the natural environment be described, and that this information be integrated with other applicable planning tools and procedures. The purpose of this chapter is to provide a practical compilation of available environmental data as an aid to planning for the County. It is important that government decision-makers and the public be aware of the constraints that the natural environment may impose upon future development of the County.

Climate

Cumberland 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 orographic 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, originates in the Gulf of Mexico and travels northward through the County. The moist airflow from the Atlantic Ocean is a modifying rather than a controlling climatic factor. Periodically, considerable moisture is picked up by storms developing and moving up along the southeastern coastline of the United States. A disturbance of this type usually brings moderate to heavy precipitation to the Lower Susquehanna River Area due to the general upslope 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 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 cyclonic 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 in 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 are measurable quantities that 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 of 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 is variable, ranging between 170 days in the mountains to 180 days in the lowlands. The summer mean temperature is about 76 degrees F, and the winter mean about 32 degrees F.

Winds are important hydrologic factors because of their evaporative 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 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.

The climate should be considered when developing in the County. Tree lines and high ground should be on the northwest side of buildings to take advantage of the 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, buildings 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 for energy conservation purposes.

Hydrology

Management of water resources requires knowledge of the quantity of water, which is available for use and which must be managed in order to provide for the safety and welfare of the public. For studies of water use and quality, low flow conditions are of general concern, however for flood management, it is necessary to know the high flow characteristics of streams.

Watersheds most appropriately manage water resources. A watershed is the entire land area drained by a particular watercourse. Land use activities and waste water discharges within the watershed determine the quality of the water, which eventually flows out of the drainage area. The concept of the watershed has practical planning application, as it is the primary geographic region in which to collect water resource related information. Watershed associations are organizations concerned with water quality and quantity issues within a particular watershed. They are a very efficient way of dealing with water resource issues.

There are two main watersheds in Cumberland County. The Conodoguinet Creek Watershed drains the northern half of the County and the Yellow Breeches Creek watershed drains the southern half of the County. Both of these streams drain from west to east, eventually flowing into the Susquehanna River. There are numerous sub-basins within the two main watersheds. For example, the Big Spring Creek watershed is a sub-watershed draining a portion of the Conodoguinet Creek watershed.

The first factor affecting water flow conditions is runoff, which is primarily influenced by precipitation distribution. However, other factors such as land cover and use, geology and topography 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.

Low water 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.

Floodplains

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 Cumberland County, those areas delineated by the Federal Emergency Management Agency as within the 100-year flood boundary and those areas delineated as flood plain soils in Table 16 of the Soil Survey of Cumberland and Perry Counties, Pennsylvania, issued April 1986, should be considered as flood plains (Figure 15.1).

Flood plains are an intrinsic and beneficial aspect 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.

Benefits to preserving flood plains are as follows:

> To prevent unnecessary property damage,
>
> To minimize danger to the public health by protecting the water supply and promoting safe and sanitary drainage,
>
> To reduce the financial burdens imposed on communities by flooding,
>
> To comply with provisions of the National Flood Insurance Program and the Pennsylvania Flood Plain Management Act,
>
> To provide sufficient drainage courses to carry abnormal flows of storm water during periods of heavy precipitation, and
>
> To provide areas for groundwater absorption for recharge of subsurface water supplies.

Wetlands

Wetlands are defined in terms of a combination of hydrology, soils and vegetation. The definition used by the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers is as follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adopted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

Wetlands have unique environmental characteristics. They act as natural flood control devises to store flood waters, slow and help purify runoff, and act to recharge groundwater. Wetlands also provide critical wildlife habitat and recreational opportunities in Cumberland County (Figure

15.1).

Groundwater

The topography, or physical land features, of the study area determines the drainage patterns and surface flow characteristics. Steeper slopes cause increased runoff and erosion and discourage infiltration to 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, porosity, permeability, 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 primarily located within the Ridge and Valley physiographic Province. The mountains forming the northern and southern borders of the County are part of the ridge portion of the province. Rock types in the ridge section are quartzite, sandstones, and conglomerates. Most of these 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 County is recognized as the Great Valley. Located within the Ridge and Valley Province, it is composed of limestone and dolomite. Often in the Great Valley where limestone and dolomite occur at the surface or subsurface, serious problems may be expected from subsidence and sinkholes. Surface drainage passes directly into the groundwater systems through sinkholes creating a high potential for groundwater pollution.

Limestone geology usually produces a high groundwater yield. Two of the highest yielding springs in Pennsylvania are located in Cumberland County – Big Spring in North Newton Township and Boiling Springs in South Middleton Township.

The remaining portion of the County is composed of Martinsburg shale. The Martinsburg shale provides about half of the wells of the Great Valley with an adequate amount of groundwater for domestic needs. The pore spaces in these shales are very small. Fortunately, 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.

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 Cumberland County showing the most prominent topographic relief are Blue Mountain, which forms the northern boundary of the County, and South and Piney Mountains, which form the southern boundary. Steep slopes greater than 15 percent characterize the terrain here. The foothills of the mountains consist of a 2 to 4 mile strip of land running the length of the County and having moderate slopes between 8 and 15 percent. The central valley floor, a broad expanse of land running east to west through Cumberland County, has generally mild slopes of less than 8 percent. However, a considerable number of localized ridges and steep slopes are evident within the Valley, especially between Carlisle and Shippensburg.

Topography has been a determining factor in the distribution of population throughout Cumberland County. Due to the relative ease of development in flatter areas, the more desirable lands are those located in the central valley. Thus, the more densely populated and urbanized areas are located on these mostly level lands. The steeper 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.

Agricultural uses also occur predominantly in the more level areas, as these lands allow for more efficient farming operations. In Cumberland County, this factor is enhanced by the occurrence of the best agricultural soils with 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 planning for the development of an area, the slope of the land is a major factor. Figure 15.2 shows those areas of slope between 15 to 24.9 percent and 25 percent and over.

In discussing the slope of the land, it is important to keep in mind that erosional forces trying to establish a stable condition creating the natural gradients. Sometimes when these slopes are altered through development, the balance can be upset and landslides, rock falls, mudslides, and soil creep may result as nature tries to restore equilibrium.

In the County, soil creep is prevalent and may at times be severe in areas where shales occur. Adequate drainage leading water away from the face of a steep slope and keeping it from entering the top of the slope is advisable where it is necessary to curtail the soil creep.

Geology

Geologists state 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 sedimentary rocks of shale, limestone, and sandstone. Continued deposition of sediments exerted extreme pressure on the deeper layers forming flat hard sheets. This was followed by a period of upward movement caused by great horizontal compression. Folding and faulting of the flat sheets of rock formed a series of ridges and valleys, which follow a parallel pattern northeast to southwest. Most of Cumberland County is composed of sedimentary rock formations.

In a later period, molten material, originating within the earth, heated the sedimentary rocks and caused them to expand and crack. The molten material filled the cracks and cavities in the surface and solidified to form igneous rock. Cumberland County contains very little of this type of rock. The most prominent igneous formation is a diabase dike, oriented north – south through the County. Metamorphic rocks result from the intense heat and pressure associated with tectonic activity changing the texture and/or component minerals of sedimentary and igneous rocks. Metamorphic rock formations are located primarily in the southern portion of the County and comprise much of South Mountain.

The rocks found in Cumberland County were formed during six periods of geologic time (Figure 15.3). The following information describes the major geologic Formations in Cumberland County.

The oldest rocks in the County are from the Precambrian Age and are represented by three formations in the South Mountain area. The Metabasalt is made up of basalt flows. Metarhyolite, of altered gray to red rhyolite flows, shows a flow of banded quartz and feldspar phenocrysts. Greenstone Schist forms belts in rhyolite areas.

The next younger geologic period is called the Cambrian. The eight identified formations of this period include four containing limestone and dolomite.

> The Shadygrove Formation is a light-gray to pinkish-gray micritic limestone with abundant nodules of brown chert.
>
> The Zullinger Formation is composed of thick beds of medium-gray, sand to pebble-sized detrital limestone.
>
> The Elbrook Formation is a light gray to yellowish gray fine laminated siliceous limestone with interbeds of dolomite; weathers to earthy buff soil.
>
> The Tomstown Formation is a massive dolomite with thin shaly interbeds.

Limonite, an iron-bearing mineral, is found on the upper part of Tomstown dolomite formation. In the past, it was mined at Pine Grove Furnace. Magnetite, a high-grade iron ore, was also mined at one time in this same area. The remaining Cambrian formations are listed below.

> The Antietam formation is a gray to buff weathered quartzite and quartz schist.
>
> The Harpers formation is a dark greenish gray phyllite schist with thin quartzite layers.

The Weverton formation is a gray to purplish gray, feldspathic quartzite and quartz conglomerate.

The Waynesboro formation is an interbedded red to purple shale and sandstone with some beds of dolomite and impure limestone.

These formations occupy approximately 60 percent of the South Mountain area. The quartzite has been used chiefly for building stones. The Antietam Formation in highly weathered areas is quarried for sand. On top of the Antietam is sericite schist weathered to white clay, which is quarried and used as filler for paper.

The next younger geologic formations are of the Ordovician Age, which underlies the northern half of the County. It includes eleven identified formations.

The Juniata and Bald Mountain Formations comprise the slopes of Blue Mountain and are fine grained to conglomeritic quartzitic sandstone with red shale interbeds. Large fragments of this sandstone occupy very steep slopes near the mountaintops. Little use has been made of the Juniata and Bald Eagle formations.

The Martinsburg Formation is a gray to dark gray, light gray to olive, easily weathered shale underlying 30 percent of the County's land area. The rolling shale hills are adaptable to real estate development. Construction of roads, cuts and fills, grading for homes, schools, and industrial sites is not difficult, but extensive grading may be necessary. The Martinsburg shale is used as an ingredient in cement manufacture, and in a mixture of topsoil and shale for seedbed preparation of road cuts and fills. The broken shale is used in the sub grade of roads to insure adequate under-drainage and firm foundation.

Limestone and dolomites are found in eight identified formations of the Ordovician period. The limestone and dolomites of the Cambrian and Ordovician geologic periods form a band of five to ten miles wide from east to west occupying 45 percent of the County’s area. These limestone and dolomites have long been a source of building stone, coarse aggregate in concrete, cement manufacture, and agriculture lime. Concrete, road building and steel industries have increased their use tremendously. Clay, a by-product of limestone weathering, is used in brick manufacturing. The Ordovician limestone and dolomites include the following formations.

The Chambersburg Formation is a dark gray, thin-bedded limestone at the top; a gray argillaceous limestone in the middle; and dark gray, cobbled and thin irregularly bedded limestone at the bottom.

The Hershey and Myerstown Formations are a dark gray to black, thin-bedded argillaceous limestone.

The St. Paul Group is a buff colored, even grained dolostone, containing numerous layers of blocky chert.

The Pinesburg Station Formation is a thick bedded, light to medium gray laminated

dolomite with interbeds of blue-gray limestone.

The Epler Formation is a very fine crystalline, bluish gray limestone, interbedded with gray dolomite; coarse crystalline limestone lenses are present.

The Rockdale Run Formation is a medium bedded, finely laminated to homogeneous chert bearing micritic limestone.

The Stonehenge Formation is a gray finely crystalline limestone and dark gray laminated limestone with numerous edgewise-conglomerate beds.

These limestone and dolomite weathered formations have given rise to a highly productive soil area. Flow from springs and streams are excellent in these limestone dolomite areas, but the potential for pollution of springs and underground water supplies is high.

The Silurian Age is the next younger period and is represented only by the Tuscarora Formation. It is a very hard, fine grained, white to gray, medium to thick bedded rock that caps Blue Mountain on the northern and western boundary of the County. This sandstone is used as a source of silica for silica brick and sand. The bottom fifty to one hundred feet is a mixed color of white and red; a property making it highly sought for by homebuilders.

The second youngest formation is from the Triassic period, which is represented by the Gettysburg Formation. It is composed of a red to brown, fine to coarse-grained quartz or sandstone with red shale and limestone conglomeritic interbeds. Because of its resistance to weathering, the limestone conglomerate has often been utilized in construction.

The youngest rocks in Cumberland County are igneous from the Triassic and Jurassic Ages and include the diabase and diabase dikes. One narrow dike about 100 to 200 feet wide starts at the County's northern boundary east of Donnellytown and runs to the south, leaving the County about one mile southeast of Goodyear. Two small areas of diabase are found east of Shepherdstown.
Quarrying of these areas for commercial purposes is too costly because of the resistance to crushing and splitting. Fieldstone has been used in house construction. Small pockets of fine grain material have been quarried where the diabase weathered rapidly.

The geology of an area must be considered in land use planning, as the ultimate or best use of land is initially determined by its characteristics and quality. On-lot sewage disposal, drainage, and construction costs are some of the factors affected by bedrock geology. The rock types found in Cumberland County present some specific inherent limitations. For example, the porosity of the limestone formations 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 aspect of the bedrock geology is also important. These characteristics give an indication of such things as ease of excavation, cut-slope stability, and foundation stability. Generally, the rock formations in the County 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 and roads. Again, most of these problems would be site specific and require an on-site evaluation to determine the appropriateness of a project.

Soils

Soil 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 man's misuse of the land.

Soils have many properties by which they are identified. Knowledge of these properties is fundamental to an intelligent determination of land use. Some soils are deep and well drained and thus suited to most types of urban or agriculture uses. In contrast, shallow and poorly drained soils have definite use limitations. Applying various engineering practices to the land may alter such soils. This is always a costly and frequently unwarranted expenditure. It is to avoid such expenditures that people are increasingly using soil maps as a basis for land use decisions and planning.

The upland soils of Cumberland County are closely related to the underlying bedrock. Along the river valleys and on the benches adjacent to the main valleys, the soils are developed in material transported by running water and deposited with some degree of stratification.

The U.S. Dept of Agriculture, Soil Conservation Service, has made a detailed soil survey of Cumberland County. It 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. Soils change within short distances and the detailed soil survey shows many small areas.

Using Soil Associations, general soil information can be provided. These are groups of soils, which ordinarily occur together in the landscape. Each soil has its characteristic place depending on slope or kind of material. The Soil Associations of Cumberland County are shown in Figure 15.4.

The following Soil Associations occur in Cumberland County:

> BERKS-WEIKERT-BEDINGTON Association: 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.
>
> HAGERSTOWN-DUFFIELD Association: Deep, nearly level to moderately steep, well drained soils that formed in material weathered from limestone; on uplands.

HAZLETON-LAIDIG-BUCHANAN Association: 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.

MONONGAHELA-ATKINS-MIDDLEBURY Association: Deep, nearly level and gently sloping, moderately well drained to poorly drained soils that formed in alluvium; on terraces and flood plains.

MURRILL-LAIDIG-BUCHANAN Association: Deep, nearly level to moderately steep, well drained to somewhat poorly drained soils that formed in colluvium from gray sandstone, conglomerate, quartzite, and limestone, on uplands.

ATHOL-NESHAMINY Association: Deep, gently sloping and sloping, well drained soils that formed in material weathered from conglomerate, breccias, and diabase; on uplands.

HAZLETON-CLYMER Association: Deep, nearly level to very steep, well drained soils that formed in material weathered from gray sandstone and quartzite; on uplands.

HIGHFIELD-GLENVILLE Association: Deep, nearly level to moderately steep, well drained to somewhat poorly drained soils that formed in material weathered from schist and rhyolite; on uplands.

The Soil Survey of Cumberland and Perry Counties, published in April 1986, is the primary source for information regarding soils in the County. The Soil Survey has established capability classes for soils and are designated by Roman numerals I through VIII. The higher the numeral, the greater the limitations for agricultural use. The classes are defined as follows:

> **Class I** – few limitations that restrict their use.
> **Class II** – moderate limitations that require moderate conservation practices.
> **Class III** – severe limitations that require special conservation practices.
> **Classes IV – VIII** – very severe limitations that require careful management or are unsuitable for cultivation.

"Prime Farmland" in Cumberland County includes Class I and Class II soils (Figure 15.5). The Soil Conservation Service has identified approximately 110,000 acres, or 31% of the County, as prime farmland. These are the most productive soils for crop production, are well drained, not highly erodible, and do not flood during the growing season

Pennsylvania has also classified many of the Class III soils as "soils of statewide importance" due to their productive capabilities. About 60% of Cumberland County is covered by productive soils in the categories of Class I, II, and III soils. Much of this land is currently in crop production, however, recent trends indicate that large tracts are being lost to development. Because these desirable agricultural soil areas coincide with flat, level topographic features, development pressure will continue to affect the prime farmlands.

Historically, agriculture has been very important to the culture and economy of Cumberland County. Agriculture is dependent upon the quality of the soil, and once prime agricultural soils are taken out of production by development they cannot be replaced. The Plan and Implementation section of this comprehensive plan addresses policy on farmland preservation.

A few of the soil types are known to pose severe limitations on development and major construction projects. These limitations include 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. The majority of the County can expect unsatisfactory performance of septic tank absorption of effluent; surfacing of effluent, and hillside seepage all of which can effect public health (Figure 15.6).

Groundwater can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field; if slope is excessive; or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively or the groundwater will become polluted.

Woodlands

Prior to clearing by European settlers, most of Cumberland County was covered by forests. Today about 107,500 acres or 46 percent of the land area is wooded. Most of the forested areas are concentrated on the slopes and ridges of the mountains on the northern and southern boundaries of the County. There are scattered areas of woodland throughout the remaining areas of the County.

The Michaux State Forest, part of which lies in the County, accounts for 34,882 acres of woodland on South Mountain. Smaller acreages of woodland are contained within the boundaries of Tuscarora State Forest (4,988 acres) on Blue Mountain. There are also four State Game Lands in the County with approximately 4,445 acres in woodland.

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 affect water resources in both a protective and a depletive manner. They offer protection from floods and erosion, while at the same time contributing to the depletion of stream flows. The latter occurs primarily during the growing season.

Forest soils are covered with litter (leaves and twigs), which acts as a protective layer to the soil and reduces the possibility of sheet erosion. 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 retards runoff from heavy rainfall, thus reducing downstream flood peaks. However, where the forest floor becomes disturbed, particularly through activities associated with the construction of roads and basements, the potential for erosion increases. Soil loss then depends on soil erodibility, as well as, the length and steepness of slopes.

Wildlife

Cumberland 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, mourning dove, and various waterfowl. There are also red and gray fox, mink, muskrat, raccoon, weasel, opossum, and beaver. There is a total of 4,445 acres managed as State Game Lands and 39,870 acres of State Forests in Cumberland County.

Natural Areas Inventory

A Natural Areas Inventory (NAI) was completed for Cumberland, Dauphin, and Perry counties by the Pennsylvania Science Office of The Nature Conservancy in 2000. Subsequently in 2003, an update was completed for Cumberland County. The NAI report outlines known outstanding natural features including floral, faunal and geologic features. The inventory attempts to identify rare, threatened, and endangered species and the highest quality natural habitats in the County. The 2003 NAI update identified forty-five sites of statewide or local significance. Of these forty-five sites, nine areas were identified as top priority natural areas. These sites are critical for maintaining biodiversity.

The Natural Areas Inventory is intended to be used as a tool for local decision-making. The site specific information and maps are useful to guide land use planning, for preserving open space and for setting priorities for the preservation of vulnerable natural areas. The NAI includes general management recommendations that would help to ensure the protection and continued existence of these rare plants, animals and natural communities.

Mineral Resources

Important mineral reserves within Cumberland County are extremely limited. Although many types of minerals can be found in the County, most of these are of interest only to the student or collector. Limestone is quarried for use in construction and industrial operations. Sand and gravel are also extracted from the South Mountain region for use in building and manufacturing.