

## CHAPTER FOUR

The physical geography of an area affects the amount, type, and direction of development. Natural factors such as climate, topography, geology, hydrology, and soils are important because they influence the costs of development and determine the suitability of an area for a given use. The purpose of this section of the comprehensive plan is the identification of environmental resources and the assessment of developmental impacts on these resources.

Rapid growth and development can have dramatic and long-term adverse effects on the physical and social environment. As Mercer County and the City of Harrodsburg continue to grow, many environmental issues will continue to arise. Issues such as water quality, air quality, noise and light pollution, increased storm water runoff and decreased open space can combine to effect the overall quality of life for residents. The depletion of natural features such as wooded hillsides, scenic valleys, rivers, creeks, and open fields will become increasingly important as residents realize that these elements contribute to the unique character of the area and are unrecoverable once a parcel of land is developed. In addition, these types of amenities also provide less visible qualities, such as cleaner air, recreational areas and wildlife habitat that are equally important to the community.

### LOCATION

Mercer County is located southwest of Lexington in central Kentucky in the Outer Bluegrass physiographic region. Mercer County was the sixth county in order of formation and has a land area of 250 square miles. The county was formed on December 15, 1785 from a portion of Lincoln County and was named in honor of General Hugh Mercer, a Scotsman who was killed in the Battle of Princeton in the Revolutionary War.

Harrodsburg, the first permanent pioneer settlement in Kentucky, is the largest city and county seat. Harrodsburg is a fourth class city. It was founded June 16, 1774 by James Harrod and thirty-one (31) other men. Harrodsburg is located in south central Mercer County at the intersection of U.S. 127 and U.S. 68. Burgin, the only other city in the county, is located east of Harrodsburg in southeast Mercer County. Burgin is a fifth class city.



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## CLIMATE

Mercer County has a temperate and humid climate. Southerly winds predominate bringing moist warm air. The most common severe weather conditions are in the form of mild droughts or thunderstorms. Tornadoes are the most devastating severe weather which occurs in the area. Tornadoes can occur almost anywhere in Kentucky and in any terrain, hilltop or valley bottom. Severe storms can occur in any month but are most frequent from March to July.

Long term climatological data is available for the Danville weather station. The following discussion is based upon the period between the years 1933 - 1995 for extremes and the years 1961 - 1990 for averages. The coldest days occur in January when the monthly average temperature is 30.8° F. The warmest days occur in July with a monthly average temperature of 75.4° F. During the period from June to September, an average of 26.7 days will have a maximum temperature of 90° F or higher. The minimum temperature is expected to be 32° F or less an average of 98.6 days from October through April. The coldest temperature on record for the period is -20° F on January 20, 1994. The hottest recorded temperature was 107° F on July 9, 1988 and June 29, 1936.

Precipitation averages 47.56 inches annually. Records indicate that July and May tend to be the wettest months and October and January the driest. Precipitation in general is evenly distributed throughout the year. An average of seven (7) days per month will have precipitation of .10 inches or more.

## AIR QUALITY

Air quality is monitored by the Division of Air Quality Control of the Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection. The “*Kentucky Ambient Air Quality Report*” which is produced by the Technical Services Branch of the Kentucky Division of Air Quality is issued annually. The last report issued summarizes statistical results of monitoring conducted during the year 2002 to measure outdoor concentrations of air pollutants in the Commonwealth. The primary source of data for the report is the Air Quality Surveillance Network operated by the Kentucky Division for Air Quality which has operated an air quality monitoring network since July 1967. The 2002 network included 117 monitors in 33 counties (this total includes monitors operated by the

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Louisville Metro Air Pollution Control District and the National Parks Service at Mammoth Cave). The monitoring station locations are selected with U.S. Environmental Protection Agency guidance and, in general, are established near high population areas or air pollution sources. Each year the sites are reviewed to ensure that adequate coverage is being provided. In the year 2002, the closest Kentucky Air Monitoring Sites to Mercer County were located in Fayette and Jessamine Counties. Overall, the division monitors compliance of six (6) criteria pollutants including carbon monoxide, sulfur oxides, nitrogen dioxide, lead, ozone, and particulate matter. However, different sites monitor for different pollutants. In Fayette County, several sites monitored carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone and particulate matter. The one (1) monitoring site in Jessamine County monitors for ozone attainment. In 2002, all Kentucky Counties were in attainment for carbon monoxide, sulfur dioxide, nitrogen dioxide, and ozone. There were three (3) exceedances of particulate matter standards. All three (3) occurrences were located in Louisville in 2002.

According to the U.S. EPA's *Aerometric Information Retrieval System* (AIRS), there are eight (8) facilities in Mercer County that produce and release air pollutants: Corning Incorporated, Createc (now closed), Hitachi Automotive Products, Kentucky Utilities Company, Mago Construction, Mercer Stone Company, and Modine Manufacturing Company. Of these facilities, EPA has only reported formal enforcement action against the Kentucky Utilities Company.

## NOISE

High noise levels can impact the health and safety of residents. Excess noise can cause impacts ranging from the nuisance of interrupting a conversation to causing physical and psychological harm. The primary consideration for noise in terms of new development is the community noise level. According to "The Noise Guidebook" issued by the Department of Housing and Urban Development, the main contributors to a community noise problem are transportation sources such as highways, railroads, and airports. These sources are the most pervasive and continuing of the noise sources. The main issues involved in any noise analysis are how much noise a site is exposed to, what types of activities are affected, and what design or attenuation measures can be used to keep noise to an acceptable level.



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Outdoor noise levels are of greatest concern in residential areas especially at night when sleep is disrupted.

The easiest way to mitigate noise is to separate noise sources from noise receptors. This can be accomplished by requiring buffer zones around airports and establishing minimum setbacks from major highways and railroads. For example, HUD recommends that no occupiable buildings be constructed within 100 feet of a railroad due to the impact of noise and vibration. Noise levels can also be attenuated by noise barriers, site design, and soundproofing of buildings. It is recommended that a noise analysis be conducted when noise sensitive uses such as residential development or hospitals are proposed near railroads, airports or highways with considerable truck traffic. In Mercer County, the major facilities of concern are the Norfolk-Southern Railroad and U.S. 127 within the Harrodsburg central business district along the by-pass. It is important to note that the county has an ordinance that establishes acceptable decibel levels for noise in the community.

## PHYSIOGRAPHY & GEOLOGY

Mercer County is located in the Bluegrass physiographic region with most of the county in the Inner Bluegrass. The county is underlain by rocks of Middle Ordovician age which are some of the oldest exposed rocks in Kentucky. The three (3) formations that predominate are the Cynthiana Formation, the Lexington Group, and the High Bridge Group.

The Cynthiana Formation is exposed in the western half of Mercer County. This formation consists of thin to thick bedded limestone with some interbedded thin shale. The Lexington Group is exposed mostly in the eastern half of the county. It consists of thin to medium beds of limestone with varying degrees of interbedded shale. The High Bridge Group is found along the Dix River which forms Herrington Lake and the eastern boundary Mercer County, and along the Kentucky River which borders the county to the north-east. The High Bridge Group consists of mostly massive limestone. The rocks of this group are more resistant to erosion than other rocks in central Kentucky. These rocks are responsible for the rugged topography of the gorge which forms the Kentucky River palisades and some of its tributaries including the Dix River. There are no major fault lines in Mercer County. Limestone is the most significant mineral source in the county with one (1) crushed stone quarry located just east of Harrodsburg.

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The topography in most of Mercer County is gently to moderately rolling upland with broad, flat valleys. The area in the vicinity of the Kentucky and Dix Rivers is characterized by steep slopes and high cliffs along relatively flat, broad valley floors. Elevations range from 483 feet in the north end of the county at the downstream end of the Kentucky River to almost 950 feet on hilltops to the southwest. The county is drained generally to the north by the Chaplin River, Salt River, Dix River, and Kentucky River. There is some underground drainage where limestone predominates. The county crosses three (3) watersheds, the Lower Kentucky (to the east), Salt River watershed (central portion of the county), and Rolling Fork to the west. Although the geology of Mercer County is varied, it consists of mostly limestone bedrock. The most sensitive geology to ground water pollution is found on the eastern edge of the county. In these areas, surface water more quickly penetrates the soil and impacts the water quality of lakes and streams.

## KARST TOPOGRAPHY

Karst topography describes an area which is underlain by limestone which has been dissolved by groundwater percolation through rock forming solution channels. These channels increase in size over extended periods of time to form caves and other cavities. As these cavities expand, it is common for them to form depressions known as sinkholes at the surface. An area with karst topography is characterized by the extensive development of sinkholes, underground drainage, lack of surface streams, caverns, solution sculptured rock, and large springs. Karst topography is common in Mercer County due to the underlying limestone. According to *Caves and Karst of Kentucky*, published in 1985 by the Kentucky Geological Survey, there are thirty-seven (37) known caves in Mercer County with four (4) of them mapped.

The major concerns with karst topography in developed areas are sinkhole flooding, overburden collapses, and groundwater contamination. Sinkhole flooding occurs when stormwater runoff exceeds the drainage capacity of the sinkhole. Flooding problems may increase when sinkholes are filled in with debris or soil when an area is graded. Development in a sinkhole drainage area which increases the amount of impervious surface such as roofs or paving can result in increased rates of runoff which then results in flooding problems. While overburden collapses are sometimes caused by blasting or construction over a cavity, groundwater



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fluctuations are a more common cause. In karst areas, the water table provides buoyant support for overburden arches. Droughts, high volume groundwater pumping and sometimes land use changes which affect water storage can result in a lowered water table and overburden or slumping or collapse. Groundwater contamination is also of particular concern in karst areas. Surface water normally percolates slowly through the soil before entering the groundwater allowing removal or containment of contaminants. However, in karst areas, surface water may become groundwater in a matter of minutes. Underground streams may flow as much as five (5) miles per day. This can cause rapid and extensive contamination of wells and springs which may be a water supply source for homes and livestock.

## **STEEP SLOPES**

Land uses vary in their sensitivity to slope. Virtually flat land can be used for intensive activity, while slopes in excess of 20% present limitations so great that development is not feasible, both practically and financially. Residential development can take place on small scattered sites utilizing land that industrial development, with its more expansive land requirements must bypass. In addition, the location and concentration of slopes in the forms of hills, ridges, valleys and plains can force development into large clusters or break it up into dispersed patterns. Visual indications of unstable slopes include previous slides or slumps; cracking of the top of the slope; tilting of fences, retaining walls, utility poles or trees; new cracks in foundations and sidewalks; and slowly developing and widening cracks in the ground or paved areas.

Development on steep slopes can accelerate erosion, increase runoff, and decrease the volume of water absorbed and filtered as groundwater. Damage to buildings and other man-made structures can occur on unstable slopes. Commercial and industrial development should be restricted on slopes steeper than 12%. Developers of residential property on such slopes should be required to prove that the construction techniques employed can overcome a site's limitations. In certain instances, the county may consider requiring a submittal of a geotechnical report prior to providing services to a new development or subdivision in order to ensure the safety of those utilizing the building being constructed. The suitability of different degrees of slope for development is show in Table 4-1 on the next page.

**TABLE 4-1**  
**SLOPE SUITABILITY FOR URBAN DEVELOPMENT**

Limitations	Suitability	Residential	Commercial	Industrial Park
Slight	Optimum	0-6%	0-6%	0-2%
Moderate	Satisfactory	6-12%	6-12%	2-6%
Severe	Marginal	12-18%	12-18%	6-12%
Very Severe	Unsatisfactory	18%+	18%+	12%+

Figure 4-1 is a generalized map showing the slopes in Mercer County. Steep slopes (greater than 12%) are found along the Kentucky River to the east and in the western third of the county. The western portion of the county is mostly moderately sloping (6 to 12% slopes). The remainder of the county is predominately gently rolling (slopes less than 6%) with some moderately sloping areas. Most development in Mercer County has occurred on land with a slope of 6% or less. Both Harrodsburg and Burgin were developed in areas of gently rolling land.

## FLOODPLAINS

Floodplains are low lying areas that are susceptible to flooding. Development must be restricted or prohibited in floodplains to prevent property damage. Floodplain maps have been prepared for Mercer County, Harrodsburg and Burgin by the Federal Emergency Management Agency (FEMA). In Harrodsburg, the area along Town Creek in the north end of the city is identified as being in the 100 year floodplain (Flood Insurance Rate Map, Community Number 210172). Town Creek is a tributary to Salt River. Flood hazard areas in the vicinity of Harrodsburg are shown in Figure 4-2. In Burgin, areas along Water Street and Cane Run, a tributary to the Dix River, are identified as flood hazard areas (Flood Hazard Boundary Map, Community Number 210171A). For the remainder of Mercer County, areas subject to flooding have been identified along Kentucky River, Dix River, Lake Herrington, Salt River, Chaplin River, Cane Run, Town Creek, Dry Fork, Deep Creek, Thompson Creek and Lyons Branch. These flood areas are shown on FEMA Flood Insurance Rate Maps (Community Number 210306; Panels 25,



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50, 55, 75, 100 and 125). Figure 4-3 is a generalized map showing the larger floodplain areas in Mercer County. It is important to note that FEMA maps should be consulted when reviewing development proposals in floodprone areas.

## SOILS

Detailed soil information and soil maps can be found in the *Soil Survey of Boyle and Mercer Counties, Kentucky* published by the U.S. Department of Agriculture, Soil Conservation Service. The general soils map found in the soil survey shows that there are seven (7) soil associations in Mercer County. Soil associations are generalized groupings of similar soils with common relief and drainage patterns (Figure 4-4). While specific soil information must be consulted to determine the suitability of a particular site for various land uses, soil associations can provide information for general planning purposes. Table 4-2 shows the major soil associations and their suitability for development.

## HYDRIC SOILS

Hydric soils are those soils which are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper layers. The presence of hydric soils is an indication that wetlands may exist in an area. Under currently accepted definitions, an area is considered a wetland if it has hydric soils, hydrophytic vegetation (plants that are adapted to growing in wet conditions), and wetlands hydrology. Wetlands hydrology means that the area is either permanently or periodically inundated or the soil is saturated to the surface at some time during the growing season. The only hydric soil in Mercer County is Dunning silty clay loam. It is hydric due to saturation. Four (4) other soil types, Boonesboro silt loam, McGary silt loam, Newark silt loam, and Nolin silt loam may have inclusions of hydric soils. This means that areas mapped as these soil types may include small areas of hydric soils in poorly drained low spots. In Mercer County, these hydric soils support or would have supported woody vegetation under natural conditions except those identified as swamp or ponded places.

Dunning silty clay loam is found only in limited locations in Mercer County. These



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areas include Shaker Creek near Shakertown, an unnamed tributary to Salt River near McAfee, a karst area just east of Stringtown, Cane Run near Burgin, and Salt River south of Harrodsburg. Wetlands or wet soils where wetland vegetation is missing may be a limiting factor for development in these areas of Mercer County.

## PRIME FARMLAND SOILS

According to the U.S. Department of Agriculture, Soil Conservation Service, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. Prime farmland can be cropland, pastureland, rangeland, forest land or other land but not urban built-up land or water.

Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time. They either do not flood frequently or are protected from flooding.

The following soils found in Mercer County are considered to be potential prime farmlands.

- Bo- Boonesboro silt loam, 2 to 6% slopes
- CaB- Caleast silt loam, 2 to 6% slopes
- CgB- Carpenter gravelly silt loam, 2 to 6% slopes
- CmB- Chenault gravelly silt loam, 2 to 6% slopes
- Du- Dunning silty clay loam (\*\*1,2)
- EkA- Elk silt loam, 0 to 2% slopes
- EkB- Elk silt loam, 2 to 6% slopes
- LoB- Lowell silt loam, 2 to 6% slopes
- MaA- Maury silt loam, 0 to 2% slopes
- MaB- Maury silt loam, 2 to 6% slopes



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- McB- McAfee silt loam, 2 to 6% slopes
- Mg- McGary silt loam (\*\*1,2)
- Ne- Newark silt loam (\*\*1,2)
- NtB- Nicholson silt loam, 2 to 6% slopes
- No- Nolin silt loam (\*\*1)
- Se- Sensabaugh gravelly silt loam (\*\*1)
- TIA- Tilst silt loam, 0 to 2% slopes
- TIB- Tilst silt loam, 2 to 6% slopes
- TpB- Trappist silt loam, 6 to 12% slopes

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1. *Areas of this soil that are subject to flooding during the growing season more frequently than once in two years are not considered to be prime farmland.*
  2. *Areas of this soil lacking adequate drainage to a sufficient depth during the cropping season allow cultivated crops common to the area to be grown are not considered prime farmland.*

In addition to prime farmland, the Soil Conservation Service has also identified farmlands of statewide importance. This is land other than prime farmland that is of statewide importance for the production of food, feed, fiber, forage, and oil-seed crops. Generally, farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

The following soils found in Mercer County may be farmland of statewide importance:

- CaC- Caleast silt loam, 6 to 12% slopes
- CgC- Carpenter gravelly silt loam, 6 to 12% slopes
- CmC- Chenault gravelly silt loam, 6 to 12% slopes
- FdC- Faywood silt loam, 6 to 12% slopes
- LoC- Lowell silt loam, 6 to 12% slopes
- MaC- Maury silt loam, 6 to 12% slopes
- McC- McAfee silt loam, 6 to 12% slopes
- TpC- Trappist silt loam, 6 to 12% slopes
- VeC- Vertrees silt loam, 6 to 12% slopes

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While specific determinations as to the location of prime farmlands and farmlands of statewide importance must be made on a site-by-site basis, the majority of these soils are found in six (6) of the general soil map units. These map units are Lowell-Faywood-Eden, Maury-Caleast, McAfee-Caleast-Fairmount, Caleast-McAfee-Maury, and Tilst-Trappist.

The recurring pattern of the conversion of the best agricultural land to other land uses not only eliminates this land as a potential source of income to both the farmer and county, but also encourages agricultural use of less productive land which could better be engaged in another activity. This type of trade off can force land which might possess severe environmental limitations such as steep slopes and high erosion hazards to be used for agricultural purposes. Unfortunately, land which is best suited to crop land or pasture land usually also offers the fewest limitations to urban type development.

It is critical for Mercer County to balance the appropriate uses of the land. Nearly 40,000 acres (34%) of Mercer County's land meets the USDA soil requirements for "prime farmland" with most fertile soils located in the east-central portion of the county. The crops grown on this land account for approximately one-fourth of the county's total agricultural income. As population grows and the demand for space increases, invariably prime agricultural land will be converted to an urban type of use. A point of equilibrium must be reached which will allow the best use of all land required to meet both the urban and agricultural needs of Mercer County. Decisions involving this type of transfer should be carefully considered by the planning commission and elected officials to ensure that a sound agricultural economic base will continue to be maintained in Mercer County.

## ENDANGERED SPECIES

The primary concern for the impacts of development on plant and animal life are the effects on rare and endangered species. There are four (4) animal species of potential concern in Mercer County according to the Kentucky Department of Fish & Wildlife Resources. A listing and a brief description of each species follows:



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**TABLE 4-3  
SPECIES OF CONCERN**

COMMON NAME	SPECIES	STATUS
Alabama Shad	<i>Alosa alabamae</i>	State endangered
Bewick's Wren	<i>Thryomanes Bewickii</i>	State special concern
Blackside dace	<i>Phoxinus Cumberlandensis</i>	Federal listed threatened State threatened
Bobolink	<i>Dolichonyx oryzivorus</i>	State special concern



The Alabama Shad is an elongated, silvery fish with 50-60 scales in the lateral series and 15-17 rays in the dorsal fins. This species is state endangered due to the degradation of its habitat caused by siltation and pollutants.



Bewick's Wren is a 13 -centimeter long bird with a long sideways-fitting tail edged with white spots. Declines probably related to interspecific competition, habitat changes, inclement weather, and predators.



The Blackside Dace is a small bony fish similar to a minnow. Threatened status is primarily due to the impacts of siltation from coal mining, silviculture, agriculture, construction, and impacts of unregulated acid mine drainage and impoundments. Additional threats include channelization and non-point source pollution.



The Bobolink is small 18 cm long bird with a stout, relatively short, pointed bill and sharply pointed tail feathers. The bird is still widespread and fairly common, but declining due to changing agricultural practices.

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While there are currently no state or local regulations protecting endangered species, projects which are federally funded or require significant federal actions (such as permits), must ensure that the proposed project does not negatively impact federally protected species.

