

## CHAPTER FOUR

### INTRODUCTION

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 construction and are determining factors in assessing an area's suitability for a given type of development or use. The purpose of this comprehensive plan element 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 Adair County and the City of Columbia 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 affect 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 an area and are unrecoverable once a parcel of land is developed. In addition, these type of amenities also provide less visible qualities, such as cleaner air, recreational areas and wildlife habitat all of which are equally important to the community.

### LOCATION

The City of Columbia is located near the center of Adair County in South Central Kentucky. The city is situated at the intersection of the Cumberland Parkway, KY 80, KY 61, and KY 55. In addition, Columbia is located between two major man-made lakes, Green River Lake and Lake Cumberland. Green River Lake (8,200 acres) is located northern Adair County, approximately eight miles north of Columbia. Lake Cumberland (50,250 acres) is located approximately 21 miles south of Columbia.

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## **CLIMATE**

The climate in the vicinity of the City of Columbia is temperate and humid. 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 condition which occur 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 for the vicinity of Columbia is available from the Greensburg Weather Station. The following discussion is based on the period from 1961 to 1990 for averages and 1932 to 1995 for extremes. The coldest days occur in January when the average monthly temperature is 32.1 degrees F. The warmest days occur in July with an average monthly temperature of 77.2 degrees F. During the period from May to September, an average of 46 days will have a maximum temperature of 90 degrees F or higher. The minimum temperature is expected to be 32 degrees F or less for an average of 105 days from October through April. The coldest temperature on record is -25 degrees F on January 24, 1943. The hottest recorded temperature was 108 degrees F on July 10, 1936 and August 21, 1936.

Precipitation averages 52.9 inches annually. Records indicate that May tends to be the wettest month and October the driest. Precipitation is generally evenly distributed throughout the year. An average of fourteen (13.7) days per year will have precipitation of one inch 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 2003 to measure

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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 2003 network included 101 monitors in 33 counties (this total includes monitors operated by the 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 of air pollution sources. Each year the sites are reviewed to ensure that adequate coverage is being provided. Overall, the division monitors compliance of six criteria pollutants including carbon monoxide, sulfur oxides, nitrogen dioxide, lead, ozone, and particulate matter. In 2003, all Kentucky counties were in attainment for carbon monoxide, sulfur oxides, nitrogen dioxide, and particulate matter. However, there were 25 exceedances of the 8-hour ozone standard in the counties of Boone, Boyd, Campbell, Carter, Edmondson, Fayette, Graves, Greenup, Jefferson, Jessamine, Kenton, Livingston, McCracken, McLean and Oldham.

Adair County is located within the South Central Air Quality Control Region which includes 20 counties in south-central Kentucky. In this area the Air Quality Surveillance Network has four monitors as follows:

<b>LOCATION</b>	<b>AIRS ID</b>
Somerset Gas Company (Pulaski County)	21-199-0003
KY DOT Garage, Franklin (Simpson County)	21-213-0004
Kereiakes Park, Bowling Green (Warren County)	21-227-0007
Oakland School, Oakland (Warren County)	21-227-0008

The closest air monitor, established in 1992, to Adair County and the City of Columbia is located in Somerset. This special purpose ozone monitor operates continuously using the UV photometric method of analysis. A special purpose Particulate Matter sampler operates for 24 hours every sixth day.

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## **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 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 noises 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. 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 requiring greater minimum setbacks from major highways and railroads. For example, HUD recommends that no occupiable building 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 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 Adair County, the major facilities of concern are the Cumberland Parkway, KY 80, KY 55, KY 61, KY 206, KY 551, the Columbia-Adair County Airport, the Columbia central business district, and strip commercial areas.

## **PHYSIOGRAPHY AND GEOLOGY**

Adair County and the City of Columbia are located in the Highland Rim section of the Interior Plateau Province physiographic region. In Ken-

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tucky, the Highland Rim is commonly referred to as the Pennyroyal Plain of the Mississippian Plateau. It is underlain by sedimentary rocks of Devonian and Mississippian age.

In the extreme northeastern part of the county, there is a small deposit of sandstone of unknown age which appears to be composed of debris from Pennsylvanian sandstone. A mantle of silt covers the uplands throughout the county with Chattanooga black shale of the Devonian system being exposed along the streams. Also predominate is the New Providence gray clay shale which ranges in thickness from 3 feet in the southern part of the county to 35 feet at points along the Green River. The Fort Payne formation, just above the New Province bed, is gray limestone with abundant chert and is typically 100 to 150 feet thick. Immediately above the Fort Payne Formation is Warsaw limestone which is typically 50 feet to 100 feet thick in places. Cherty limestone of the St. Louis formation is located on the high ridge tops. The St. Louis formation is most extensive in the southern and western parts of Adair County.

The topography in Adair County ranges from nearly level to very steep. The county is mainly located on a dissected plateau. In most dissected parts the ridges rise from 400 to 490 feet above the valley floors. The highest point, located three-fourths of a mile north of Breeding, is 1,214 feet above sea level. The lowest points in the county are along the Green River. The elevations in the City of Columbia range from 720 feet along Russell Creek to 920 feet at the water tower. The elevation at the city square is 790 feet. There are a moderate amount of sinkholes and subsurface-drained depressions in and around Columbia. Some sinkholes open into underground drainage systems. Others are clogged by debris and soil. Surface water collects in clogged sinkholes and forms wet weather ponds. Although 85% of drainage occurs by surface drains, there is some subterranean drainage made up of karst topography underlain by cavernous limestone.

Karst topography is an area which is underlain by limestone that 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

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form depressions known as sinkholes at the surface. An area with karst topography is characterized by extensive development of sinkholes, underground drainage, lack of surface streams, caverns, solution sculptured rock and large springs. Karst topography is common in Adair County due to the underlying limestone. According to *Caves and Karst of Kentucky*, published in 1985 by the Kentucky Geological Survey, there are 35 known caves in Adair County with six 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 blasting or construction sometimes causes overburden collapses over a cavity, groundwater fluctuations are the most common cause. In karst areas, the water table provides buoyant support for overburden arches. Droughts, high volume groundwater pumping, and sometimes land use changes that affect water storage can result in a lowered water table and overburden 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 miles per day. This can cause rapid and extensive contamination of wells and springs that may be a source of water supply for homes and livestock.

As a matter of policy, the city should therefore, strictly prohibit the dumping of garbage or other waste materials, especially those containing hazardous waste into sinkholes. Construction sites that have sinkholes should provide for adequate surface drainage. The planning commission may request that storm water calculations be submitted prior to approving preliminary plats or improvement plans. In addition, the submission of geotechnical reports may be necessary in some of the environmentally sensitive areas prior to approval of a development.

## SOILS

Detailed soil information and soil maps can be found in the Soil Survey of Adair County, Kentucky published by the U.S. Department of Agriculture, Soil Conservation Service. The general soil map found in the Soil Survey shows that there are five soil associations in Adair County with one primary association within the City of Columbia planning area. It is important to note that the area within the 1964 city limits of Columbia was not mapped by detailed soil type. The general soils map for Adair County is shown on page 4-9.

Soil associations are generalized groupings of similar soils with common relief and drainage patterns. While specific soil information must be consulted to determine the suitability of a particular site for various land uses, the associations can provide information for general planning purposes. The following paragraphs summarize the five associations found within the Soil Survey of Adair County, Kentucky.

### *WESTMORELAND-CANEYVILLE BAXTER ASSOCIATION*

This soil association is typically located on narrow, sloping ridge tops and narrow valleys that have steep walls. The association is characterized as dominantly steep, well-drained or somewhat excessively drained soils that have a clayey subsoil and are on dissected uplands. The soils on the steep walls of valleys are predominately Westmoreland soils. These soils are shallow over limestone and calcareous shale. The Caneyville soils occupy positions above and adjacent to the Westmoreland soils. They are moderately deep, well-drained, very rocky soils that have a red clayey, plastic subsoil. The Baxter soils, which are cherty and deep over bedrock, are predominant on the ridge tops and on the upper parts of the valley walls. These soils are well-drained and have a red, clayey subsoil. Minor soils on the uplands in this association are the well-drained Christian, Mountainview, Bewleyville, Needmore and Talbott soils and the moderately well-drained Dickson and Sango soils. Minor soils on the foot slopes and in narrow strips along the streams are the well-drained Humphreys, Huntington and Staser soils, the moderately well drained

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Landisburg and Lindside soils, and the somewhat poorly drained Newark and Taft soils. The Westmoreland-Caneyville-Baxter association occupies about 28% of the county and extends along the southern and western boundaries. The Westmoreland soils make up about 30% of the association, the Caneyville soils about 24% and the Baxter soils about 16%. The Christian soils are less extensive, but comprise about 11% of this association.

Approximately 63% of this association remains in forest. About three-fifths of the cleared acreage is in hay and pasture, and nearly one-fifth is used for row crops. One-fourth of the acreage is suited to cultivated crops. Fair to good yields are obtained of tobacco, corn and other row crops grown on the soils of the floodplains and gently sloping uplands.

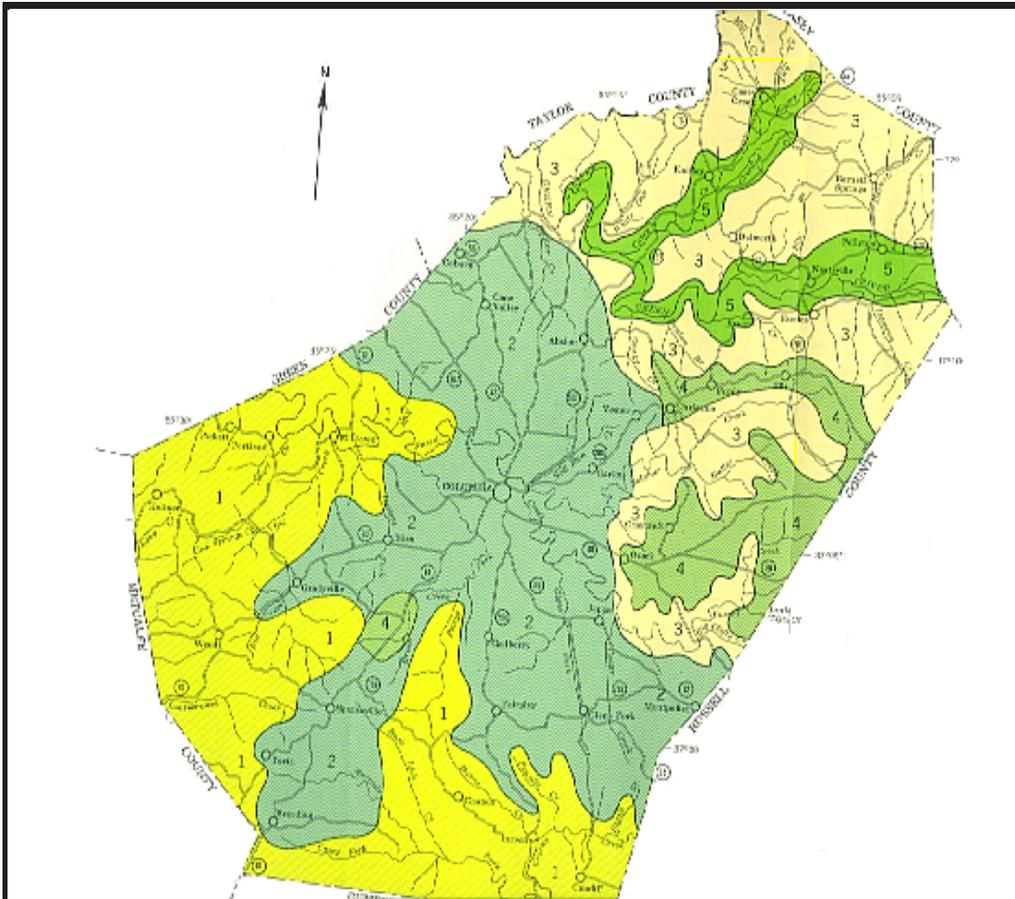
## *BAXTER-CHRISTIAN- BEWLEYVILLE ASSOCIATION*

This association is characterized as rolling with dominantly well-drained soils that have a deep root zone and a clayey subsoil. The association occupies about 32% of the county and extends in a northwesterly direction through Glens Fork, Columbia, and Cane Valley.

The topography associated with this soil association is irregular. In many places there is karst topography which ranges from nearly level to steep. Sinkholes and depressions are common in these areas. Many of the creeks that flow through the county originate in this area. Russell Creek, the largest, flows from east to west. The soils along the creek and its tributaries are among the most productive of the soils located within the floodplains.

The soils of the Baxter, Christian and Bewleyville series' are the most extensive soils in this association and are gently to strongly sloping. The Baxter soils were formed in material weathered from cherty limestone and have a red, clayey subsoil with chert throughout their profile. The Christian soils were formed in weathered products of mixed limestone, sandstone and shale. These soils contain more sand and less chert than the Baxter soils. The Bewleyville soils formed partly in loess and partly in the underlying material weathered from limestone, have a yellowish red subsoil of silty clay loam.

Figure 7-1  
Adair County Soil Map



- 1** Westmoreland-Caneyville-Baxter Association
- 2** Baxter-Christian-Bewleyville Association
- 3** Frankstown-Bodine-Westmoreland Association
- 4** Sango-Mountainview-Lawrence Association
- 5** Staser-Taft-Landisburg Association

Map produced by the U.S. Department of Agriculture  
Soil Conservation Service. May 1963

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The Baxter soils account for approximately 30% of the association; the Christian soils, 15%; and the Bewleyville soils about 11%. Minor soils account for the remaining acreage in this association.

Approximately 28% of this association is in trees, usually along the steeper slopes above creeks and in wooded areas on farms. A large part of the association is in hay and pasture or is used to grow corn, tobacco and small grains. Nearly two-thirds the acreage that has been cleared is used for hay and pasture. The remainder of the acreage is used mostly for row crops, although some acreage is idle.

## *FRANKSTOWN-BODINE- WESTMORELAND ASSOCIATION*

The soil association of Frankstown-Bodine-Westmoreland is typically located on sloping ridge tops separated by narrow valleys that have steep walls. The largest area of this soil association extends from south of Green River north toward the boundaries of Taylor and Casey Counties. A smaller area, located in the east central part of the county extends along Big Clifty Creek to the Russell County line.

Some of the broad ridge tops are occupied by the Frankstown soils. Bodine and Westmoreland soils are located on the steep walls of the valleys. The composition of the Frankstown- Bodine-Westmoreland soil association is described as deep, sloping, well-drained, cherty soils on ridge tops and shallow, steep, somewhat excessively drained or excessively drained soils on hillsides.

The Frankstown soils are deep, well drained, cherty and have a subsoil of yellowish brown silty clay loam. The Bodine soils are also cherty but are shallow and excessively drained. The Westmoreland soils, which lie below the Bodine soils, are shallow over calcareous shale. They partly contain weathered fragments of shale. These soils are almost neutral.

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This soil association occupies approximately 26% of the county. The Frankstown soils comprise 29% of the association; the Bodine soils, 22%; and the Westmoreland soils, 21%. Minor soils account for the remainder of the association.

Approximately 65%, mainly in the steep areas of this association, remain in trees. Three-fourths of the acreage, located on ridge tops, has been cleared and is used chiefly for corn, tobacco, hay and pasture. Almost two-thirds of the acreage has been cleared and is used for row crops. The rest of the land in this association is idle.

## *SANGO-MOUNTAINVIEW-LAWRENCE ASSOCIATION*

This association consists of large flats and gentle slopes in the uplands. Generally, the association is described as being comprised of soils that are nearly level to sloping on broad ridge tops, are somewhat poorly drained or moderately well drained soils with a pan or as deep well-drained soils. The somewhat poorly drained Lawrence soils and the moderately well drained Sango soils are dominant in the flat areas, and the well drained Mountainview Soils are practically free of the gray mottles that are typical of the Sango and Lawrence soils, and they lack a fragipan. The fragipan in the lower part of the subsoil in the Sango and Lawrence soils causes water to move slowly through the profile and as a result, these soils are wet in rainy seasons. The Sango, Mountainview and Lawrence soils were formed partly in loess and partly in the underlying material weathered from cherty limestone. They are strongly acidic.

This association occupies approximately 8% of the county. It is located in the east-central part of the county and extends from the small communities of Ozark and Purdy to the Russell County line. Another small concentrated area of this association, known as Flatwoods, is south of Columbia. The Sango soils make up about 32% of the association; the Mountainview soils, 21%; and the Lawrence soils, 12%. The remainder of the soil association consists of minor soils.

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Approximately 53% of this association is in trees. The wet flats and the steeper slopes are mostly covered in hardwoods, chiefly oak, gum, maple, poplar, and hickory. These soils are strongly acidic and are low in natural fertilizer. It is for this reason that only low to fair yields of the commonly grown crops are obtained on the soils in this association.

## *STASER-TAFT-LANDISBURG ASSOCIATION*

The Staser-Taft-Landisburg Association is generally characterized as somewhat poorly drained to well drained soils on nearly level floodplains and gently sloping to sloping stream terraces and foot slopes. This association can be found along the Green River and Casey Creek in the northern part of the county.

The association is prevalent in approximately 6% of the total acreage in the county. About 28% of the association consist of Staser soils; about 16% are Taft soils; and 15% are Landisburg soils. The well-drained Staser soils, which have a surface layer of grayish-brown silt loam, loam or gravelly loam, are dominant on the first bottoms. The somewhat poorly drained Taft Soils are extensive on the stream terraces. The Taft soils have a surface layer of grayish-brown silt loam and the lower part of their subsoil is mottled and compact. The moderately drained Landisburg soils are on the nearly level to strongly sloping stream terraces to foot slopes. They have a surface layer of grayish-brown silt loam that is cherty in places. Their subsoil is light yellowish brown silty clay loam to silt loam and has a compact pan in the lower-part

Approximately 24% of this association is in trees. Almost half of the acreage, that has been cleared, is used for row crops; about 45% is used for hay and pasture with the remainder being idle. Almost all of the acreage in this association is suited to cultivated crops. However, 35% of the soils in this association are poorly drained and wetness becomes the major management problem.

## 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 part. 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. Wetland 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. There are four hydric soils in Adair County; Dunning silt loam (Du), Gutherie silt loam (Gu), Melvin silt loam (Me) and is Robertsville silt loam (Rb). All of these soils have been classified as hydric due to saturation. In addition, there is one other soil, Newark gravelly silt loam (Ng), which may have inclusions of hydric soils. This means that an area mapped as this soil type may include small areas of hydric soils in poorly drained low spots. In Adair County, these hydric soils support or would have supported woody vegetation under natural conditions except those as identified as swamp or ponded phases.

## 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 land other than those used for urban purposes or covered with 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

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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 Adair County are considered to be potential prime farmland soils:

- BaB -Baxter cherty silt loam, 2-6% slopes
- BeB -Bewleyville silt loam, 2-6% slopes
- CbB -Captina silt loam, 2-6% slopes
- ChB -Christian silt loam, 2-6% slopes
- DcB -Dickson silt loam, 2-6% slopes
- Du -Dunning silt loam
- EtB -Etowah silt loam, 2-6% slopes
- FtB -Frankstown cherty silt loam, 2-6% slopes
- HcB -Humphreys cherty silt loam, 2-6% slopes
- Hf -Huntington fine sandy loam
- Hg -Huntington gravelly loam,
- Hu -Huntington silt loam
- LaA -Landisburg cherty silt loam, 0-2% slopes
- LaB - Landisburg cherty silt loam, 2-6% slopes
- LdA - Landisburg silt loam, 0-2% slopes
- LdB - Landisburg silt loam, 2-6% slopes
- Lr - Lawrence silt loam
- Ls - Lindside silt loam, 0-6%
- Me - Melvin silt loam
- MoB - Mountainview silt loam, 2-6%
- MsB - Mountainview silt loam, shallow 2-6% slopes
- NAB - Needmore silt loam, 2-6% slopes
- Ng - Newark gravelly silt loam
- Nk - Newark silt loam
- Rb - Robertsville silt loam
- SaA - Sango silt loam, 0-2% slopes
- SaB - Sango silt loam, 2-6% slopes
- SeB -Sequatchie silt loam, 0-4% slopes
- Sg -Staser gravelly loam
- Sm -Staser loam
- St -Staser silt loam
- Ta -Taft silt loam
- Wt -Whitwell silt loam
- Wv -Wolftever silt loam

In addition to prime farmland, the Soil Conservation Service has also identified farmlands of statewide importance. This is land, in addition to prime farmland, that is of statewide importance for the production of food, feed, fiber, forage and oilseed 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 of a yield as prime farmlands when conditions are favorable. The following soils found in Adair County may indicate farmland of statewide importance:

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- BaC -Baxter cherty silt loam, 6-12% slopes
- BaC2 -Baxter cherty silt loam, 6-12% slopes, eroded
- BeC -Bewleyville silt loam, 6-12% slopes
- BeC2 -Bewleyville silt loam, 6-12% slopes, eroded
- CfC2 -Christian fine sandy loam, 6-12% slopes, eroded
- ChC -Christian silt loam, 6-12% slopes
- ChC2 -Christian silt loam, 6-12% slopes, eroded
- CsC2 -Christian-Baxter cherty loams, 6-12% slopes, eroded
- CvC2 -Cookeville silt loam, 6-12% slopes, eroded
- EtC -Etowah silt loam, 6-12% slopes
- FtC -Frankstown cherty silt loam, 6-12% slopes
- FtC2 -Frankstown cherty silt loam, 6-12% slopes, eroded
- HcC -Humphreys cherty silt loam, 6-12% slopes
- HcC2 -Humphreys cherty silt loam, 6-12% slopes, eroded
- HdC -Humphreys silt loam, 6-12% slopes
- LaC -Landisburg cherty silt loam, 6-12% slopes
- LaC2 -Landisburg cherty silt loam, 6-12% slopes, eroded
- LdC -Landisburg silt loam, 6-12% slopes
- LdC2 -Landisburg silt loam, 6-12% slopes, eroded
- MoC -Mountainview silt loam, 6-12% slopes
- MoC2 -Mountainview silt loam, 6-12% slopes, eroded
- MsC -Mountainview silt loam, shallow, 6-12% slopes
- MsC2 -Mountainview silt loam, shallow, 6-12% slopes, eroded
- NdC -Needmore silt loam, 6-12% slopes
- NfB2 -Needmore silty clay loam, 2-6% slopes, eroded
- NfC2 -Needmore silty clay loam, 6-12% slopes, eroded
- PmC -Pembroke silt loam, 6-12% slopes
- TbC2 -Talbot silt loam, 6-12% slopes, eroded
- WeB -Westmoreland shaly silt loam, 2-6% slopes
- WeC -Westmoreland shaly silt loam, 6-12% slopes

## SLOPES

Land uses vary in their sensitivity to slope. Virtually flat land can be used for intensive activity, while slopes in excess of 20 percent 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, that industrial development must forego. In addition, the location and concentration of slopes in the form of hills, ridges, valleys and plains can force development into large clusters or break it up into dispersed patterns. The variation in topography that characterizes Adair County has structured the form of its small communities and guided the location of major transportation routes. The suitability of different degrees of

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slope for development is shown in Table 4-1. In addition, a map showing the topography of the City of Columbia and its planning area has been included on the following page.

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 of 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 twelve percent. Developers of residential property on such slopes should be required to prove that the construction techniques used can overcome a site's limitations. In certain instances, the planning commission should consider requiring the submittal of geotechnical reports prior to approving a site plan or subdivision plat.

To date, most development in Adair County has occurred on land with minimal slope. Within the City of Columbia, areas that include steeper slopes have been included within residential subdivisions. These steep sloped areas are typically used as the undeveloped rear portions of house lots or as common open space.

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

Limitations	Suitability Rating	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%+

*Source: Kiefer, Ralph W., "Terrain Analysis for Metropolitan Area Planning," Journal of the Urban Planning Division, Proceedings of the American Society of Civil Engineers, Dec. 1967*

Figure 4-2  
City of Columbia Steep Sloped Areas



 = Steep slopes

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## **FLOODPLAINS**

Floodplains are low lying areas that are susceptible to flooding. The Columbia planning areas does not contain any land that has been officially designated by the Federal Emergency Management Agency (FEMA) as a flood hazard area. However, there are areas within Adair County that experience flooding. These lands are primarily located along Russell Creek, Sulfur Creek and Petty's Fork. Areas that are subject to flooding are shown on the future land use map as environmentally sensitive areas.

## **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 a total of 25 species of potential concern listed in Adair County according to the Kentucky Department of Fish and Wildlife Resources. Of this number, 13 are birds, four are fish, three are bats, two are mollusks. The remainder are a bear, a snake, and a salamander. The species are listed as follows:

**American Black Bear** (*Ursus Americanus*)

Status: Federal Partial Status  
State Special Concern

**American Coot** (*Fulica Americana*)

Status: No Federal Status  
State Historic

**Bald Eagle** (*Haliaeetus Leucocephalus*)

Status: Federal Partial Status, Listed Threatened, Proposed for de-listing  
State Endangered

**Black Crowned Night-Heron** (*Nycticorax Nycticorax*)

Status: No Federal Status  
State Threatened

**Blue Winged Teal** (*Anas Discors*)

Status: No Federal Status  
State Endangered

**Dark-Eyed Junco** (*Junco Hyemalis*)

Status: No Federal Status  
State Special Concern

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**Double-Crested Cormorant** (*Phalacrocorax Auritus*)

Status: No Federal Status  
State Historic

**Eastern Hellbender** (*Cryptobranchus Alleganiensis Alleganiensis*)

Status: No Federal Status  
State Special Concern

**Gray Myotis** (*Myotis Grisescens*)

Status: Federal Endangered  
State Endangered

**Great Blue Heron** (*Ardea Herodias*)

Status: No Federal Status  
State Special Concern

**Great Egret** (*Ardea Alba*)

Status: No Federal Status  
State Endangered

**Hooded Merganser** (*Lophodytes Cucullatus*)

Status: No Federal Status  
State Threatened

**Indiana Bat** (*Myotis Sodalis*)

Status: Federal Endangered  
State Endangered

**Kentucky Creekshell** (*Villosa Ortmanni*)

Status: No Federal Status  
State Threatened

**Little Spectaclecase** (*Villosa Lienosa*)

Status: No Federal Status  
State Special Concern

**Longhead Darter** (*Percina Macrocephala*)

Status: No Federal Status  
State Threatened

**Mountain Brook Lamprey** (*Ichthyomyzon Greeleyi*)

Status: No Federal Status  
State Threatened

**Osprey** (*Pandion Haliaetus*)

Status: No Federal Status  
State Threatened

**Pied-Billed Grebe** (*Podilymbus Podiceps*)

Status: No Federal Status  
State Endangered

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**Rafinesque's Big-Eared Bat** (*Corynorhinus Rafinesquii*)

Status: No Federal Status  
State Special Concern

**Scarlet Kingsnake** (*Lampropeltis Triangulum Elapsoides*)

Status: No Federal Status  
State Special Concern

**Spotted Darter** (*Etheostoma Maclatum*)

Status: No Federal Status  
State Threatened

**Stargazing Minnow** (*Phenacobius Uranops*)

Status: No Federal Status  
State Special Concern

**Whooping Crane** (*Grus Americana*)

Status: Federal Listed Endangered, Nonessential experimental population  
State Extirpated

**Yellow-Crowned Night-Heron** (*Nyctanassa Violacea*)

Status: No Federal Status  
State Threatened

## SUMMARY

The purpose of this chapter is to identify development impacts on the environment within the planning period and to determine how the City of Columbia can continue to develop without destroying its natural resources and quality of life. The following paragraph summarizes recommendations that are a product of this chapter and the goals and objectives.

As the City of Columbia continues to grow it can be expected that physical changes to the environment will occur if the need for additional housing and commercial areas continue to increase and as the city annexes additional land. As part of this process, areas that are categorized as environmentally sensitive or scenic should be identified and mapped within the City of Columbia planning area. Once these areas are identified and mapped, development standards should be created that outline the procedures and methods necessary to protect the environment and mitigate the creation of additional environmental hazards. In addition, it is recommended that an inter-agency site plan and subdivision review process be established. The creation of this inter-agency review process would enable the planning commission to more accurately identify potential

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environmental concerns when considering land use changes, subdivision plats, proposed drainage facilities, erosion control methods, landscape and greenspace requirements. In addition to establishing procedures for the protection of environmentally sensitive and scenic areas, the planning commission may want to evaluate existing requirements for the control of noise, dust, and dirt on public rights-of-way. Erosion control requirements and inspection methods for all public and private construction activities should also be reviewed and revised as needed.

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