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 Henderson County continues 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

Henderson County, located in western Kentucky along the Ohio and Green Rivers, has an area of 440 square miles and is ranked 23rd out of 120 counties in terms of land area. A change in the river's course has isolated a small portion of the county on the opposite shore of the Ohio River. Therefore, the most prominent geologic hazard is flooding. The City of Henderson is the county seat and is located on the Ohio River at the junction of U.S. 60 and U.S. 41. Henderson's location on the Ohio River, just below its confluence with the Green River, has made it an important river port. However, since the city was built on a bluff, it has not suffered flood damage as have many other



Kentucky Ohio River towns. The county has two additional incorporated cities, Corydon and Robards. Corydon, located along U.S. 60 in the western portion of Henderson County, is a fifth class city that was incorporated in 1868. Robards, located along U.S. 41 in the southern portion of Henderson County, is a sixth class city that was not incorporated until 1997.

CLIMATE

The climate in Henderson is temperate and humid. Prevailing wind direction is from the south-southwest. The most common severe weather conditions are in the form of mild droughts or thunderstorms which can bring heavy flooding along the rivers and creeks. 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 county is available from a Henderson Weather Station (#153762- Henderson_7_SSW) located off of KY 1217 south of the City of Henderson. Weather data is available from this station from the year 1932 to 1997 for extremes and from 1961 to 1991 for averages. The coldest days occur in January when the average monthly temperature is 32.2 degrees F. The warmest days occur in July with an average monthly temperature of 77.8 degrees F. During the period from May to October, an average of 43.6 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 86 days from October through April. The coldest temperature on record is -20 degrees F on January 19, 1994. The hottest recorded temperature was 113 degrees F on July 13, 1936.

Precipitation averages 44.8 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 twelve (11.9) days per year will have precipitation of one inch or more.

PHYSIOGRAPHY AND GEOLOGY

Henderson County is located in the Western Kentucky Coalfield Physiographic Region. The outcrop of the Pennsylvania strata, shown on the geologic map, defines the limits of the Eastern and Western Kentucky Coal Fields. The Western Kentucky Coal Field is smaller than its eastern counterpart. It comprises the southern edge of a larger geologic feature called the Illinois or Eastern Interior Basin, which includes the coal fields in Indiana and Illinois. As in eastern Kentucky, the border of the Western Kentucky Coal Field and the Mississippi Plateau is commonly marked by an escarpment because the thick Pennsylvanian-age sandstones are resistant to erosion. However, because this coal field is not adjacent to the Appalachian Mountains, and the sandstones are less continuous, the escarpment is not as dramatic as along the Cumberland Escarpment of the Eastern Kentucky Coal Field. Quaternary sediments are also present. They are the youngest deposits in Kentucky and are mostly restricted to the floodplains of rivers and creeks. These sediments consist mostly of silts, sands, gravel, and clay eroded from Paleozoic rocks. However some contain rocks that were transported into areas along the Ohio River by meltwaters from glacial ice.



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100 Miles

Henderson City - County



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The faults along the southern border of the Western Kentucky Coal Field (part of the Illinois Basin in Kentucky) include the Pennyrile Fault System. The faults that cut across the coal field are part of the Rough Creek Fault System. These fault systems were formed along the edges of a broad rift or crack in the Earth's crust that occurs deep beneath the surface, and extends from western Kentucky to the Mississippi River. Through millions of years, strata have gradually dropped downward above the rift, along the southern edge of the Rough Creek faults and the northern edge of the Pennyrile Faults. None of the faults in Henderson County are active. However the proximity of active seismic zones, such as the New Madrid, Wabash, and East Tennessee, mean that precautions should be taken to mitigate earthquake damage.

The topography in Henderson County is characterized by flat lowlands and rolling uplands as shown in Figures 4-1 and 4-2. The flat lowlands are typically associated with Ohio River flood deposits and are mostly used for cropland. Land use in these areas is limited due to seasonal flooding. The rolling uplands in the county are typically associated with eroded loess deposits and are used for cropland, pastureland, residential and commercial development. The broad flood plain along the Ohio River has elevations of 350 to 370 feet. The normal pool of the Ohio River is 331 feet which makes it the lowest elevation in the county. South of the floodplain the terrain is rolling The greatest local relief and highest elevations are found in the bluffs adjacent to the floodplains of the Ohio and Green Rivers. The highest elevation in the county, 588 feet, is in Wolf Hills, northeast of Henderson, This point is more than 200 feet above the adjacent floodplain. The highest point in nearby Audubon Memorial State Park is 567 feet. In the interior part of the county ridgetop elevations are generally between 450 and 500 feet. The slopes are more gradual than those of the ridges adjacent to the Ohio River floodplain. Valleys of the small tributary streams appear wide but the gradients are low. The county courthouse in the City of Henderson is at approximately 400 feet.

There are several underground coal mines in Henderson County. The locations of known mine workings and shafts are shown on Figure 4-3 which is the, "Generalized Geologic Map for Land Use Planning: Henderson County, Kentucky" which was developed in 2004 by the University of Kentucky, Kentucky Geological Survey. This map shows abandoned underground mines, abandoned surface mine areas, gas wells, oil or oil and gas wells, Class II injection wells, and mine shafts. Precautions should be required when proposals are submitted for developing over old mined area because of the possibility of subsidence. Mine subsidence insurance is available in Kentucky and should be required for properties developed in these areas. As surface coal mine areas are prone to settling after reclamation, any constrution on reclaimed soils must be properly engineered to prevent damage to structural foundations and roads. Surface mine areas also lack soil structure which can inhibit growth of vegetation during summer months.

SOILS

Detailed soil information and soil maps can be found in the Soil Survey of Henderson 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 seven soil associations in Henderson County as described below. More specific soil information is shown on Figures 4-4 and 4-5 which show soils for the county and cities of Henderson and Corydon.

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 seven associations found within the Soil Survey of Henderson County, Kentucky.





HUNTINGTON-EGAN-NEWARK - The Huntington-Egan-Newark soil association is a brown, nearly level, dominantly well-drained soil, that is located in the northern part of Henderson County along the floodplain of the Ohio River including some swampy areas. This soil association is prone to yearly flooding by the Ohio River except during the summer. Few people have constructed homes in this area since the 1937 flood. Most of the land is farmed to grow corn or soybeans.

GINAT-MELVIN - The Ginat Melvin soil association is also located in northern Henderson County along the floodplain of the Ohio River. This association is brown or gray, poorly drained, and silty located in areas that are mostly flat with the exception of some mild sloping. A large portion of the land is cultivated with corn and soybeans while some acreage is used for hay, tobacco, pasture and grain. Farms located in this area average about 175 acres in size. About 40% of the area is flood prone; however, flooding generally occurs during the winter or spring so most crops are not affected.

UNIONTOWN-DEKOVEN-HENSHAW- The Uniontown-Dekoven-Henshaw soil association is located in the area of level terraces and bottoms along Canoe Creek, Highland Creek, and Lick Creek. These terraces are up to two miles wide with bottoms ranging from narrow to wide. These soils are very dark grayish brown to brown, level or nearly level, and very poorly drained to well-drained, silty soils on terraces and bottom lands along creeks. This association has been cleared of trees and is used mostly for corn and soybeans. A total of 40% of this association is subject to flooding in the spring and winter when there are no crops on the land. The soils on the terraces are above flood level.

LORING-GRENADA- Loring-Grenada is the most extensive soil association in Henderson County. This association is a brown, nearly level to sloping and moderately to well-drained soil of the loess uplands. Most of the area included in this association is cultivated and is suited to general farming. The main crops grown are corn, soybeans, small grain and scattered areas of tobacco. Farms are prevalent in this area and are large in size.

MEMPHIS-WAKELAND- The Memphis-Wakeland soil association is comprised of brown, strongly sloping to steep, dominantly well-drained, silty soils on bluffs, terraces, and bottom lands. This association is found in spotty areas in Henderson County. Most bluff area are wooded and not suitable to agricultural uses; however, the bottomlands are used to grow corn and soybeans. Some of the sloping areas are grassed and used for pasture.

LORING-ZANEVILLE-WELLSTON- The Loring-Zaneville-Wellston soil association is located in the southeastern part of the county. The soils in this association are typically brown mostly gently sloping to strongly sloping, well-drained and moderately well-drained and primarily developed from loess. Only one-third of this association is farmed, due to steep slopes and heavy brush areas. The crops commonly farmed in this area include corn, tobacco, and hay. This land is also suitable for pasture.

MARKLAND-SHARKEY-NEWARK- The Markland-Sharkey-Newark soil association is located in the southeastern portion of Henderson County. These clayey or silty soils are brown or gray in color. They are level and well-drained to poorly drained, due to their location along the Green River bottom lands. The lower-lying areas are mostly wooded and are not suitable to cultivation. However, the better drained areas are farmed. Corn and soybeans are the dominant crops on farms, which average 100 acres in size.

It is important to note that soil piping, or the removal of soil by subsurface water, can occur in various soil types but particularly in alluvium and loess which is present in most of the Henderson County. Soil piping can produce small to large holes if left untreated. These holes can occur along linear paths as well. According to the map produced by the University of Kentucky Geological Survey, the only way to treat soil piping is to fill the holes with rock or soil to keep the holes from enlarging, and to divert drainage from the area.



HYDRIC SOILS AND WETLANDS

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. Wetlands as defined by the US Fish and Wildlife Service have been mapped as part of the National Wetland Inventory Program. The Kentucky Environmental and Public Protection Cabinet has prepared maps of these wetland areas in Kentucky. Figures 4-6 and 4-7 show these mapped wetlands for the City of Henderson and Henderson County. 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. Hydric Soils in the county are listed as follows:

- Bc Birds silty clay loam (hydric due to saturation)
- Bd Birds silt loam (hydric due to saturation)
- De DeKoven silt loam (hydric due to saturation)
- Dk DeKoven silty clay loam
- Dw DeKoven and Wakeland silt loams (hydric due to saturation)
- Gn Ginat silt loam (hydric due to saturation)
- Go Ginat silty clay loam (hydric due to saturation)
- Mm Melvin silt loam (hydric due to saturation)
- Mn Melvin silty clay loam (hydric due to saturation)
- Pa Patton silt loam (hydric due to saturation)
- Po Patton silt loam, overwash (hydric due to saturation)
- Ps Patton silty clay loam (hydric due to saturation)
- Rn Robertsville silt loam (hydric due to saturation)
- Sk Shrkey silty clay (hydric due to saturation)
- So Sharkey silty clay loam, overwash (hydric due to saturation)
- Sw Swamp (hydric due to saturation and seasonal ponding)
- We Waverly silt loam (hydric due to saturation)

Other hydric soils in Henderson County include all soil map units occurring at elevations below approximately 350 feet on the lower end (near Union County line) and about 364 feet on the upper end (near Daviess County line) along the Ohio River. In addition other hydric soils occurring at elevations of about 360 feet at the mouth and about 367 feet on the upper end (near Webster

County line) along the Green River and some tributaries are estimated to be hydric due to frequent flooding for long durations. Principle soils that fall into this category but are not included in the list above are:

- Bk Breaks and Alluvial lands
- BrA Bruno loamy fine sand, 0-4% slopes
- BrC Bruno loamy fine sand, 4-10% slopes
- CnA Captina silt loam, 0-2% slopes CnB Captina silt loam, 2-6% slopes
- Ea Egam silt loam
- Ea Egam silt loam Ec Egam silty clay loam
- EkA Elk silt loam, 0-2% slopes
- EkB Elk silt loam, 2-6% slopes
- Fa Falaya silt loam
- HnA Huntington fine sandy loam, 0-4% slopes
- HsA Huntington silt loam, 0-4% slopes
- HsC Huntington silt loam, 4-16% slopes
- Ld Lindside silt loam
- Le Lindside silty clay loam
- Ma Made land
- MkE Markland soils, 12-35% slopes
- Ne Newark silt loam
- Ns Newark silty clay loam
- Ra Riverwash
- SeA Sciotoville silt loam, 0-2% slopes
- SeB Sciotoville silt loam, 2-6% slopes
- Ta Taft silt loam
- Wh Weinbach silt loam
- WpA Wheeling silt loam, 0-2% slopes

Other soil map units that may have inclusions of hydric soils are as

follows:

Symbol	Name	Probable position of Hydric Inclusions	
Fa	Falaya silt loam	Waverly soils in low spots	
Ne	Newark silt loam	Melvin soils in low spots	
Ns	Newark silty clay loam	Melvin soils in low spots	
Wa	Wakeland silt loam	Birds soils in low spots	



In Henderson County all 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 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 Henderson County are considered to be potential prime farmland soils:

- Ad Adler silt loam (1)
- As Ashton silt loam
- Bc Birds silty clay loam (1, 2)
- Bd Birds silt loam (1,2)
- CaA Calloway silt loam, 0-2% slopes (2)
- CaB Calloway silt loam 2-6% slopes where drained
- CnA Captina silt loam, 0-2% slopes
- CnB Captina silt loam, 2-6% slopes
- Co Collins silt loam (1)
- De Dekoven silt loam (1, 2)
- Dk Dekoven silty clay loam (1,2)
- Dw Dekoven and Wakeland silt loams (1, 2)
- Ea Egam silt loam (1)
- Ec Egam silty clay loam (1)
- EkA Elk silt loam, 0-2% slopes
- EkB Elk silt loam, 2-6% slopes
- Fa Falaya silt loam, (1,2)
- Gn Ginat silt loam (2)
- Go Ginat silty clay loam (2)
- GrA Grenada silt loam, 0-2% slopes

GrB GrB2 He HnA HsA Ld	Grenada silt loam, 2-6% slopes Grenada silt loam, 2-6% slopes eroded Henshaw silt loam (2) Huntington fine sandy loam (0-4% slopes (1) Huntington silt loam, 0-4% slopes (1) Lindside silt loam (1)
Le LnA LnB MdB MhB2 MhC2 Ml Mm Mn Mn MoB MoB2 Mr	Lindside silty clay loam Loring silt loam, 0-2% slopes Loring silt loam, 2-6% slopes Loring silt loam, 2-6% slopes Markland silt loam, 2-6% slopes Markland silty clay loam, 2-6% slopes Markland silty clay loam, 2-6% slopes eroded McGary silt loam (1, 2) Melvin silt loam (1,2) Melvin silty clay loam (1,2) Memphis silt loam, 2-6% slopes Memphis silt loam, 2-6% eroded Morganfield silt loam (1)
Ne	Newark silt loam (1,2)
Ns	Newark silty clay loam (1,2)
Pa	Patton silt loam (2)
Ро	Patton silt loam, overwash (2)
Ps	Patton silty clay loam (2)
Rn	Robertsville silt loam (2)
ScA	Sciotoville fine sandy loam, 0-2% slopes
SeA	Sciotoville fine sandy loam, 206% slopes
SeB	Sciotoville silt loam, 2-6% slopes
SeB2	Sciotoville silt loam, 2-6% slopes eroded
ShA	Sequatchie loam, 0-2% slopes
ShB	Sequatchie loam, 2-6% slopes
Sk	Sharkey silty clay loam 91.2)
So	Sharkey silty clay loam, overwash
Та	Taft silt loam (2)
UnA	Uniontown silt loam, 0-2% slopes
UnB	Uniontown silt loam, 2-6% slopes
UnB2	Uniontown silt loam, 2-6% slopes eroded
Wa	Wakeland silt loam (1.2)
We	Waverly silt loam $(1,2)$
Wh	Weinbach silt loam (1.2)
WpA	Wheeling silt loam, 0-2% slopes

WpB Wheeling silt loam, 206% slopes

1) Areas of this soil that are subject to flooding during the growing season more frequently than once in two years are not considered prime farmland.

2) Areas of this soil lacking adequate drainage to a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown are not considerd prime farmland.



In addition to prime farmland the Soil Conservation Service has also identified farmlands of statewide importance. This is land 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 Henderson County may indicate farmland of statewide importance:

- GrC2 Grenada silt loam, 6-12% slopes eroded
- HsC Huntington silt loam, 4-16% slopes
- LnC2 Loring silt loam, 6-12% slopes, eroded
- LoB3 Loring silty clay loam, 2-6% slopes severely eroded
- MhC2 Markland silty clay loam, 6-12% slopes eroded
- MoC2 Memphis silt loam, 6-12% slopes, eroded
- MpC3 Memphis silty clay loam, 6-12% severely eroded
- UnC2 Uniontown silt loam, 2-12% slopes, eroded
- UoB3 Uniontown silty clay loam, 2-6% slopes, severely eroded
- WpC2 Wheeling silt loam, 6-12%, slopes eroded
- ZaC2 Zanesville silt loam, 6-12% slopes, eroded

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 must forego. 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. Henderson County's topography has structured the form of its small communities and guided the location of major transportation routes. The suitability of different degrees of slope for development is shown in Table 4-1. Figures 4-1 and 4-2 show the topography of the City of Henderson and Henderson County. 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 12%. 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 Henderson County has occurred on land with minimal slope or in areas that include steeper slopes within residential subdivisions. These steep sloped areas are typically used as the undeveloped rear portions of house lots or as common open space. Steep sloped areas are located in Wolf Hills, Spottsville, Hebbardsville, to the east of Robards, and south of Dixie.

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

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FLOODPLAINS

Floodplains are low lying areas that are susceptible to flooding. Henderson County has areas that have been officially designated by the Federal Emergency Management Agency (FEMA) as flood hazard areas. The Flood Insurance Rate Maps (FIRMs) have been in effect for the City of Henderson since 1986 (FIRM#210109) and for the county (FIRM#210286) since 1991. It is important to note that FIRMs have not been prepared the Cities of Corydon or Robards as there are not any floodplains located within the incorporated city limits.

Although the City of Henderson is not subject to backwater flooding from the Ohio River, flooding in other parts of Henderson County is common. Henderson County has approximately 280,000 acres of land with 242,843 acres being drained by nine watersheds. A large amount of land (109,797 acres) is subject to headwater flooding which is the most severe flooding problem in all nine watersheds. The most significant watershed is Canoe Creek which covers approximately 75,000 acres and drains the City of Henderson.

Figures 4-8 and 4-9 show the location of flood hazard areas in Henderson County and the City of Henderson. A large amount of land along the Ohio and Green Rivers (to the north and east) is within the 100-Year Flood Boundary. In addition a large portion of central Henderson County is subject to flooding along Canoe Creek. Other areas within the flood boundary include an area to the east of Baskett, a large area to the west of Bluff City, and areas to the west of Corydon.

Due to the large percentage of flat to gently sloping areas associated with the Ohio and Green Rivers, subdivision or other higher intensity uses can cause flooding if proper storm water management techniques are not implemented during the planning and development process. Watersheds can also be impaired from improper sewage treatment and storm water run-off.

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 2004 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 2004 network included 99 monitors in 33 counties (this total includes monitors operated by the Louisville Metro Air Pollution Control District and the National Parks Service at Mammoth The monitoring station locations are selected with U.S. Environ-Cave). mental 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 five criteria pollutants including carbon monoxide, sulfur oxides, nitrogen dioxide, ozone, and particulate matter. In 2004, all Kentucky counties were in attainment for carbon monoxide, sulfur dioxide, and nitrogen dioxide. Although there were no exceedances for particulate matter in 2004, the EPA considers Jefferson, Bullitt, Boone, Kenton, Campbell, Boyd and a portion of Lawrence counties as non-attainment areas based upon 2002-2004 data. There were also some exceedances for ozone standards in 2004 in the counties of Boyd, Bullitt, Campbell, Hancock, and Jefferson.

Henderson County is located within the Evansville-Henderson Interstate Air Quality Control Region which includes the seven counties of Daviess, Hancock, Henderson, McLean, Ohio, Union and Webster. In this area the Air Quality Surveillance Network has five monitors as follows:

LOCATION

AIRS ID

716 Pleasant Valley Road-Owensboro, Daviess County21-059-0005Lewisport Elementary School-Lewisport, Hancock County21-091-0012Baskett Fire Department-Baskett, Henderson County21-101-0014

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3962 KY 815 Tichenor Farm-Guffie, McLean County	21-149-0001
Keytown Road-Echols, Ohio County	21-183-0032

The only air monitoring station located in Henderson County is at the Baskett Fire Department in a trailer located in front of the department with sample inlets 13' above ground level and 25' from the nearest street. This site contains a special ozone monitor and a SLAMS sulfur dioxide monitor which operate continuously. A SLAMS particulate matter sampler also operates for 24 hours every third day. In addition, a special purpose continuous TEOM particulate matter sampler provide 24-hour sample values.

It is important to note that the Division of Air Quality also has an Air Quality Index (AQI). The AQI is an index for reporting daily air quality for the five major air pollutants regulated by the Clean Air Act: ground level, ozone, particulate pollution, carbon monoxide, sulfur dioxide, and nitrogen dioxide. An AQI value of 50 represents good air quality with little potential to affect public health while an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard. Therefore, AQI values of 100 are generally satisfactory while values above 100 are considered to be unhealthy- at first for certain sensitive groups of people, then for everyone as AQI values get higher. As part of the 2004 Kentucky Ambient Air Quality Report, a map is generated showing the Air Quality Index for number of days that AQI is above 100 for each county where data is available. On this map, it shows that Henderson County did not have any days above an AQI of 100. Therefore it can be assumed that air quality in the county is good.

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 or noise abatement around airports and greater minimum setbacks from railroads, highways and higher intensity commercial and industrial uses. 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 Henderson County, the major facilities of concern are the Henderson City-County Airport, CSX Railroad, mining areas where blasting occurs, Edward T. Breathitt Parkway, Audubon Parkway, US 60, US 41, US 41 A, industrial areas, and strip commercial 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 thirty-nine (39) species of potential concern listed in Henderson County according to the Kentucky Department of Fish and Wildlife Resources. Of this number, 25 are birds, three are frogs, three are snakes, four are mollusks (or freshwater mussels), one each is a salamander, shrew, turtle, and fish. The species are listed as follows:

American Bittern (Botaurus Lentiginosus) Class: Aves (Bird) Status: No Federal Status State Historic





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American Coot (Fulica Americana) Class: Aves (Bird) *Status:* No Federal Status State Endangered Bald Eagle (Haliaeetus Leucocephalus) Class: Aves (Bird) Status: Federal Partial Status, Listed Threatened, Proposed for de-listing State Threatened **Bank Swallow** (*Riparia Riparia*) Class: Aves (Bird) Status: No Federal Status State Special Concern **Bird -Voiced Treefrog** (Hyla Avivoca) Class: Amphibia (Frog) Status: No Federal Status State Special Concern **Blue Winged Teal** (Anas Discors) Class: Aves (Bird) Status: No Federal Status State Threatened Brown Creeper (Certhia Americana) Class: Aves (Bird) Status: No Federal Status State Endangered **Cinereus Shrew** (Sorex Cinereus) Class: Mammalia (Shrew) Status: No Federal Status State Special Concern Common Moorhen (Gallinula Chloropus) Class: Aves (Bird) Status: Federal Partial Status State Threatened **Copperbelly Watersnake** (Nerodia Erythrogaster Neglecta) Class: Reptilia (Snake) Status: Federal Partial Status, Listed Threatened State Special Concern **Dark-Eyed Junco** (Junco Hyemalis) Class: Aves (Bird) Status: No Federal Status State Special Concern **Double-Crested Cormorant** (*Phalacrocorax Auritus*) Class: Aves (Bird) Status: No Federal Status State Endangered **Eastern Hellbender** (Cryptobranchus Alleganiensis Alleganiensis) Class: Amphibia (Frog) Status: No Federal Status State Special Concern Eastern Ribbon Snake (Thamnophis Sauritus Sauritus) Class: Reptilia (Snake) Status: No Federal Status

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State Special Concern

Fat Pocketbook (Potamilus Capax) Class: Bivalia (Freshwater mussel) Status: Federal Listed Endangered State Endangered
Fish Crow (Corvus Ossifragus) Class: Aves (Bird) Status: No Federal Status State Special Concern
Great Blue Heron (Ardea Herodias) Class: Aves (Bird) Status: No Federal Status State Special Concern
Great Egret (Ardea Alba) Class: Aves (Bird) Status: No Federal Status State Endangered
Green Treefrog (Hyla Cinerea) Class: Amphibia (Frog) Status: No Federal Status State Special Concern
Henslow's Sparrow (Ammodramus Henslow III) Class: Aves (Bird) Status: No Federal Status State Special Concern
Hooded Merganser (Lophodytes Cucullatus) Class: Aves (Bird) Status: No Federal Status State Threatened
King Rail (Rallus Elegans) Class: Aves (Bird) Status: No Federal Status State Endangered
Lake Chubsucker (Erimyzon Sucetta) Class: Osteichthyes (Fish) Status: No Federal Status State Threatened
Least Bittern (Ixobrychus Exilis) Class: Aves (Bird) Status: No Federal Status State Threatened
Little Blue Heron (Egretta Caerulea) Class: Aves (Bird) Status: No Federal Status State Endangered
Little Spectaclecase (Villosa Lienosa) Class: Bivalia (Freshwater mussel) Status: No Federal Status State Special Concern
Longsolid (Fusconaia Subrotunda) Class: Bivalia (Freshwater mussel) Status: No Federal Status State Special Concern



Midland Smooth Softshell (Apalone Mutica Mutica) Class: Reptilia (Turtle) Status: No Federal Status State Special Concern Northern Crawfish Frog (Rana Areolata Circulosa) Class: Amphibia (Frog) Status: No Federal Status State Special Concern Northern Harrier (Circus Cyaneus) Class: Aves (Bird) Status: No Federal Status State Threatened Northern Shoveler (Anas Clypeata) Class: Aves (Bird) Status: No Federal Status State Endangered **Penegrine Falcon** (Falco Peregrinus) Class: Aves (Bird) Status: Federal Partial Status, Listed Endangered State Endangered Pied-Billed Grebe (Podilymbus Podiceps) Class: Aves (Bird) Status: No Federal Status State Endangered **Rabbitsfoot** (*Quadrula Cylindrica Cylindrica*) Class: Bivalia (Freshwater mussel) Status: No Federal Status State Threatened Sedge Wren (Cistothorus Platensis) Class: Aves (Bird) Status: No Federal Status State Special Concern Sharp-Shinned Hawk (Accipiter Striatus) Class: Aves (Bird) Status: Federal Partial Status State Special Concern Spotted Sandpiper (Actitis Macularia) Class: Aves (Bird) Status: No Federal Status State Endangered Western Mud Snake (Farancia Abacura ReinwardtII) Class: Reptilia (Snake) Status: No Federal Status State Special Concern Yellow-Crowned Night-Heron (Nyctanassa Violacea) Class: Aves (Bird) 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 Henderson County 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 Henderson County 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 incorporated cities annex additional land. As part of this process, areas that are categorized as environmentally sensitive, wildlife refuge, or scenic should be identified and mapped within the Henderson 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 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, wildlife refuges, and scenic areas, the planning commission may want to evaluate existing requirements for storm water runoff and erosion control. The numerous Wildlife Management Areas in Henderson County will be covered in more detail as part of the Community Facilities and Services, and Land Use Chapters of the Comprehensive Plan.

