

CHAPTER II: Physical Environment

Topography: Helena lies within the general physiographical region known as the Alabama Valley and Ridge Region, which is comprised of a series of ridges and valleys that encompass the southern extent of the Appalachian Mountains. Sub-regions which traverse through the Helena area include the Cahaba Valley, and the Coosa Ridges to the valley's southeast and the Cahaba Ridges to the valley's northwest. Elevations range from 500 feet to approximately 1500 feet throughout the sub-regions within the Helena area. The primary valley in which Helena is situated is the Opossum Valley, which runs roughly along the CR 17/SR 261 corridor from city limit line to city limit line. To the east of this valley is the New Hope Mountain, which stretches generally along the border of Helena and Pelham. A series of ridges lie across the Cahaba River in the area of the county boundary beginning with Chestnut Ridge, followed by Pine Mountain and Shades Mountain, and then continuing with Bee Ridge and Bluff Ridge up to the city limits of Bessemer.

Waterways/Flood Areas: Helena is positioned within the Alabama/Cahaba River Basin as all small and large creeks that meander through Helena ultimately flow into the Cahaba River at some point. The Cahaba River is the primary waterway which crosses through the city limits from one end to the other; and as such, a large swath bordering the river as well as areas surrounding the creeks which flow into the river are situated within floodplains which are subject to periodic flooding. The Federal Emergency Management Agency (FEMA), as part of the National Flood Insurance Program (NFIP), adopted the base flood standard. A base flood is a flood that has a one percent chance of being equaled or exceeded each year; otherwise known as a 100 year flood. Base flood zone designations or Special Flood Hazard Areas found on the Flood Insurance Rate Maps (FIRM) within Helena are Zone A, which are determined by approximate methods of analysis and Zone AE, which are determined by detailed methods of analysis. Examples of Zone AE are the full lengths of the Cahaba River and Buck Creek, while examples of streams that have shared designations of both Zone A and Zone AE are Beaverdam Creek, Lee Brook, Prairie Brook, and Roy Branch. Instances with a designation of only Zone A include Hurricane Creek and the Ruffin Swamp area, and Black Creek within Jefferson County. Also included is Zone B, where a flood has a 0.2 percent chance of being equaled or exceeded each year; otherwise known as a 500 year flood. Such occurrences are found adjacent to the Zone A and Zone AE areas of the Cahaba River, Beaverdam Creek, Buck Creek, and Prairie Brook.



Hurricane Creek

Wetlands:

Important Definitions:

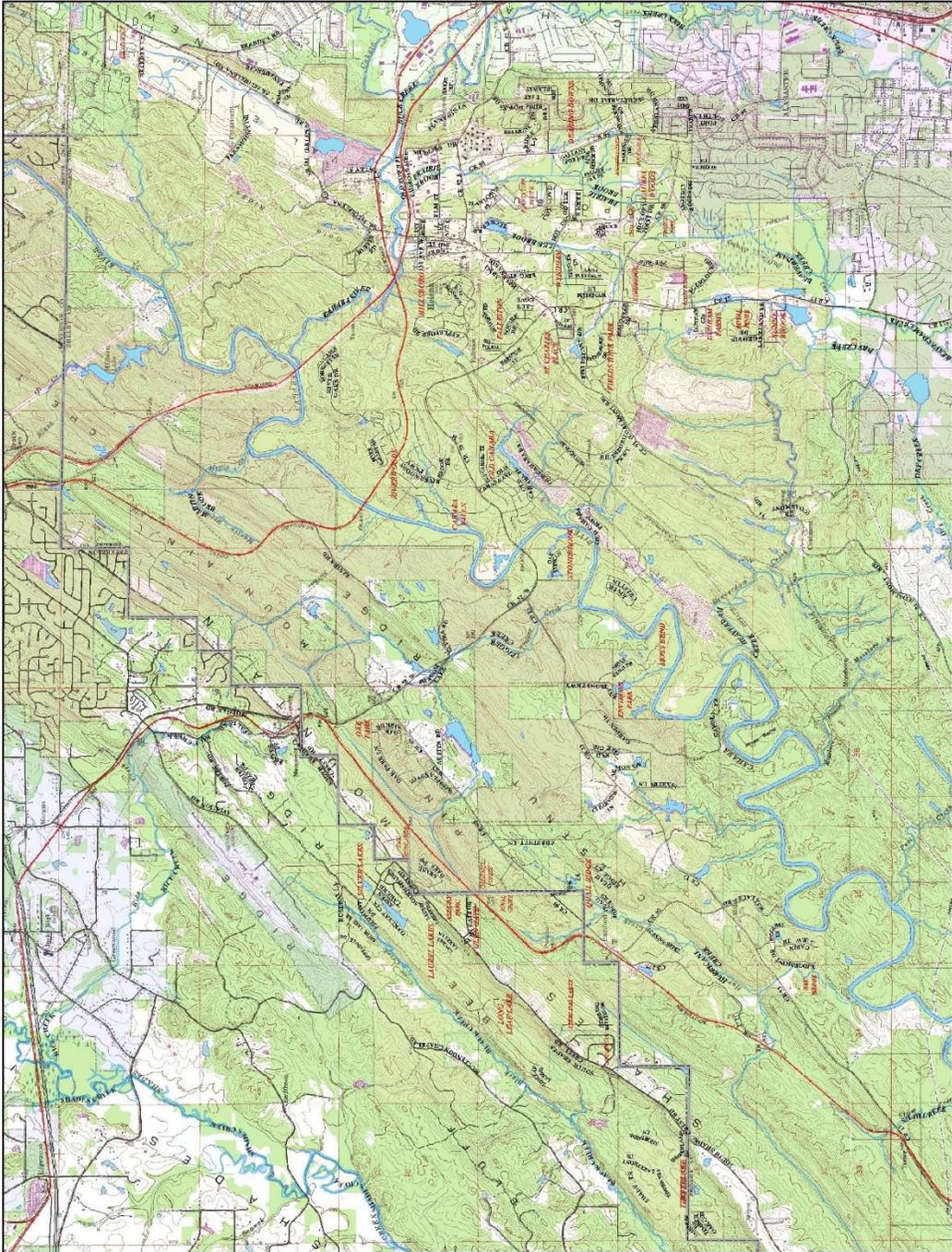
Wetlands: Land areas where saturation with water is the primary factor determining the nature of soil development and the types of fauna and flora living within and on top of the soil. Their common theme is that soil in these areas are periodically saturated with or covered with water.

Emergent Wetland: A wetland habitat dominated by soft-stemmed herbaceous plants called emergent. Water levels can range from a few inches to a few feet. Emergent wetlands, which can occur in isolation or in association with other water bodies, include deep and shallow marshes and wet meadows.

Forested Wetland: A wetland where the soil is saturated and often inundated, and woody plants taller than 20 feet dominate the vegetation, e.g. red maple, tamarack. Water tolerant shrubs and saplings often form a second layer beneath the forest canopy, e.g. red maple saplings, highbush blueberry, with an herbaceous layer below, e.g. cinnamon fern, sensitive fern. Forested wetland are also referred to as wooded swamps.

Within Helena's city limits, there exist two main types of wetlands, freshwater emergent wetlands and freshwater forested/shrub wetlands. Ruffin Swamp is the largest, approximately 91 acres, freshwater forested/shrub wetlands, while another sizeable freshwater forested/shrub wetland is situated along Prairie Brook. Another freshwater forested/shrub wetland is located along Beaverdam Creek west of Ruffin Swamp. The largest of the freshwater emergent wetlands is found off of Buck Creek and consists of less than five acres.

Within the above described areas the potential exists for Helena to develop an environmental interpretive center similar to the one at Ebenezer Swamp. Such a Center would encourage ecotourism, and provide educational opportunities for children and adults alike, while at the same protecting the wetlands from potential future development.

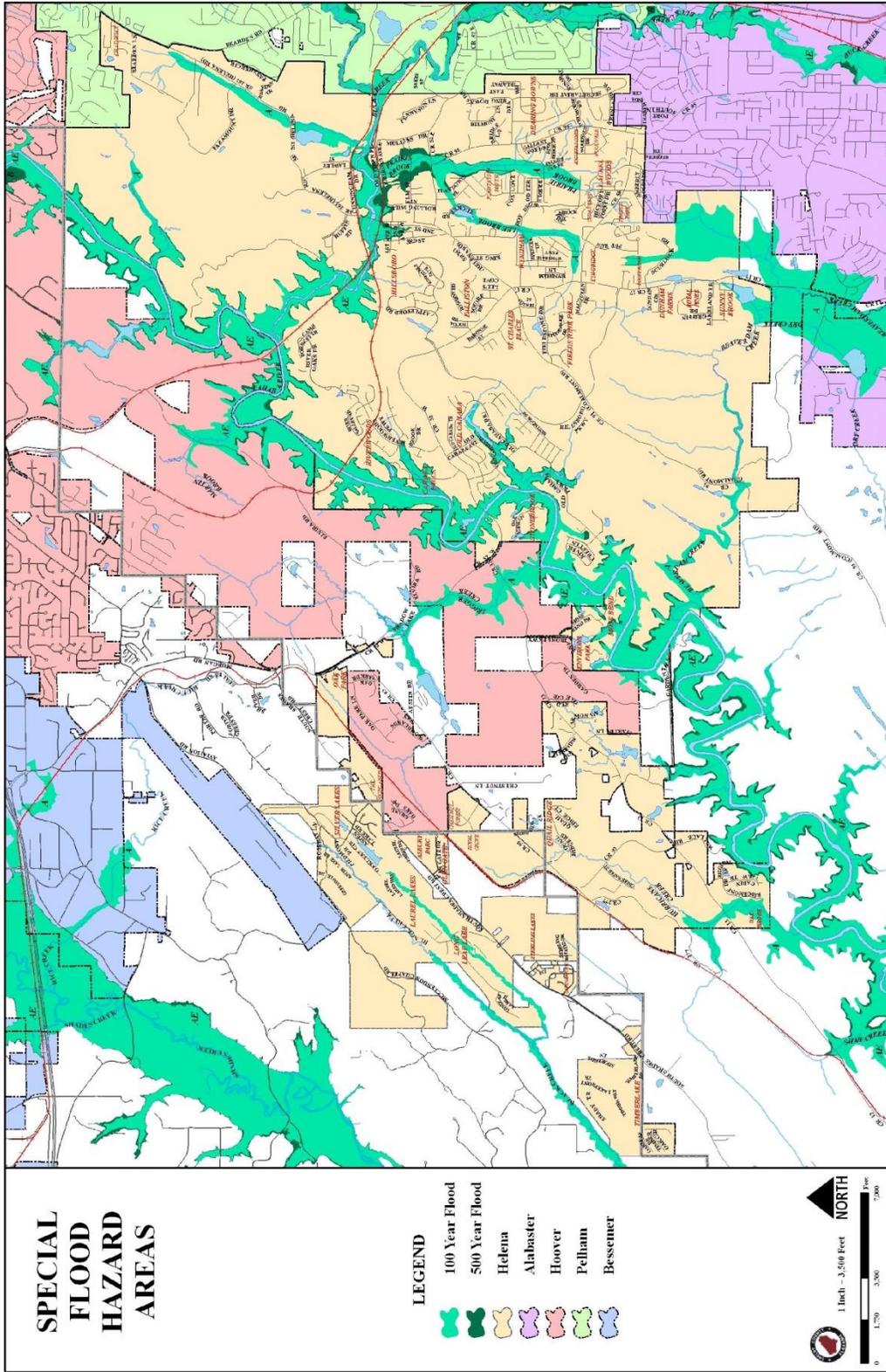


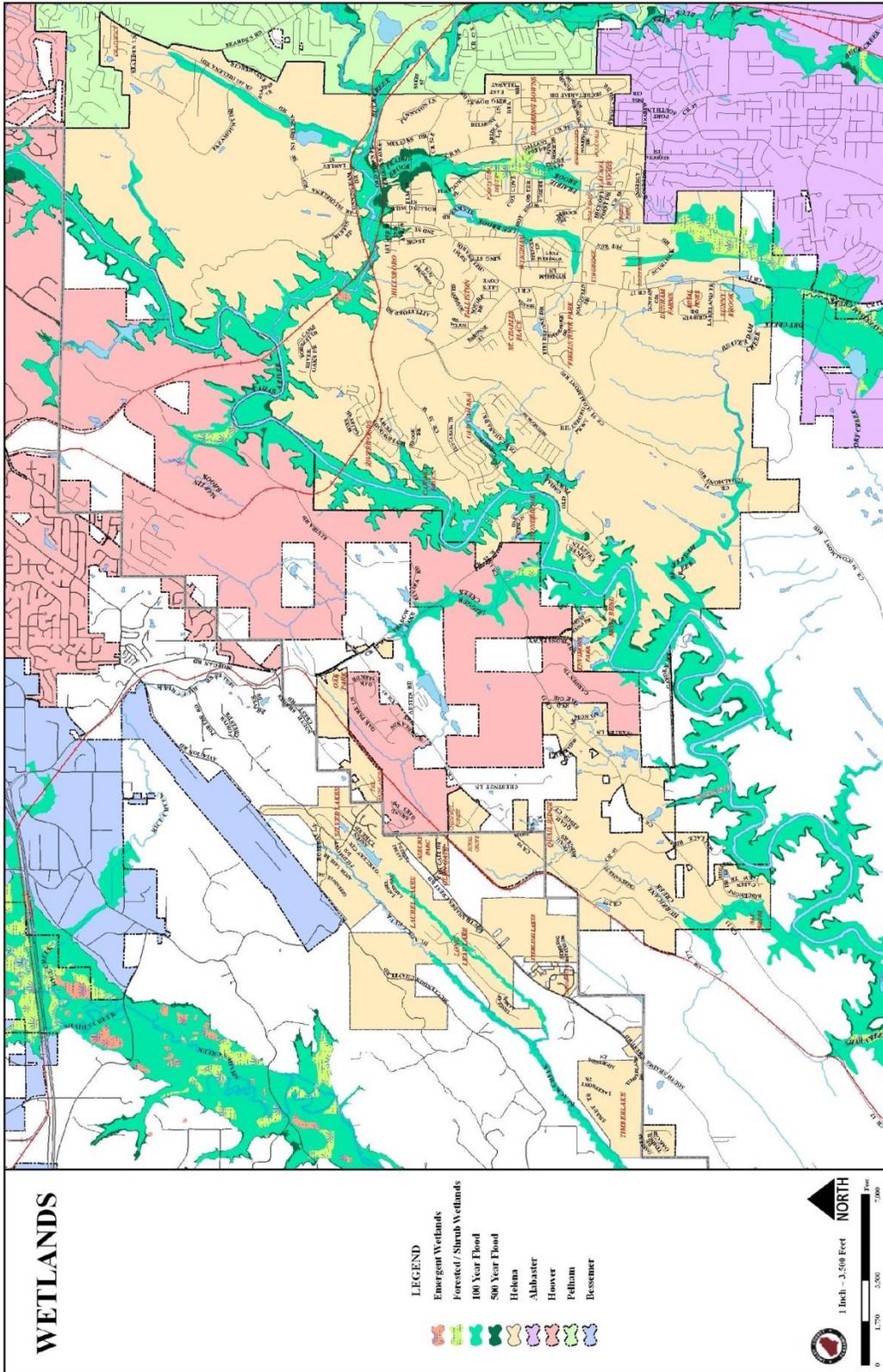
TOPOGRAPHY

LEGEND

- Helena
- Alabaster
- Hoover
- Pelham
- Bessemer







Soils: The Soil Conservation Service of the United States Department of Agriculture in cooperation with the Alabama Agricultural Experiment Station, the Alabama Soil and Water Conservation Committee, and the Alabama Cooperative Extension Service conducted fieldwork between 1970 and 1980 to produce Soil Surveys. Although completed nearly thirty years ago, the soil characteristics have generally remained the same in undeveloped areas, following streams, and along ridges. General soil mapping shows broad areas that have a distinctive pattern of soils, relief, and drainage but should only be used to compare the suitability of large areas for general land uses. Detailed soil mapping can be used to determine the suitability, limitations, and potential of soils for a specific use. The following tables provide a quick reference to soil types in both Shelby and Jefferson Counties within the city limits of Helena:

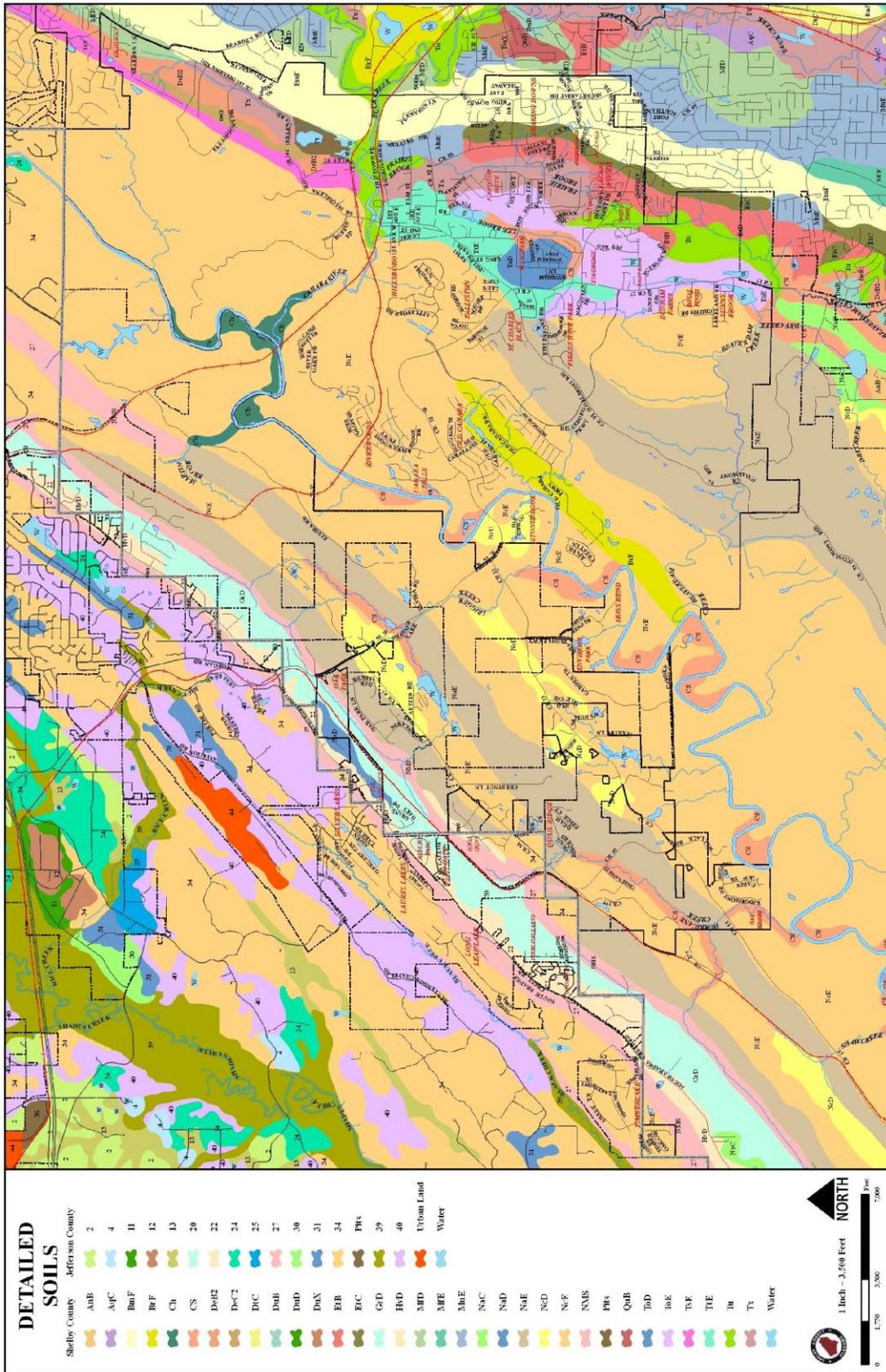
TABLE 1	
Shelby County Detailed Soil Map Units	
AnB Allen Loam, 2-6% Slopes	MfD Minvale-Fullerton Complex, 6-15% Slopes
AqC Allen-Quitman-Urban Land Complex, 0-10% Slopes	MfE Minvale-Fullerton Complex, 15-35% Slopes
BmF Bodine-Minvale Complex, 25-45% Slopes	MuE Minvale-Fullerton-Urban Land Complex, 6-25% Slopes
BrF Brilliant Very Channery Loam, 6-45% Slopes	NaC Nauvoo Loam, 2-8% Slopes
Ch Choccolocco Loam	NaD Nauvoo Loam, 8-15% Slopes
CS Choccolocco-Sterrett Association	NaE Nauvoo Loam, 15-35% Slopes
DeB2 Dewey Clay Loam, 2-6% Slopes	NcD Nauvoo-Sunlight Complex, 8-15% Slopes
DeC2 Dewey Clay Loam, 6-10% Slopes	NcE Nauvoo-Sunlight Complex, 15-25% Slopes
DtC Dewey-Tupelo-Urban Land Complex	NMS Nella-Mountainburg Association, Steep
DuB Decatur Silt Loam, 2-6% Slopes	QuB Quitman Loam, 0-4% Slopes
DuD Decatur Silt Loam, 10-15% Slopes	ToD Townley Silt Loam, 4-12% Slopes
DuX Decatur-Urban Land Complex, 2-10% Slopes	ToE Townley Silt Loam, 12-18% Slopes
EtB Etowah Silt Loam, 2-6% Slopes	TsE Townley-Sunlight Complex, 12-35% Slopes
EtC Etowah Silt Loam, 6-10% Slopes	TtE Townley-Urban Land Complex, 4-25% Slopes
GrD Gorgas-Rock Outcrop Complex, 6-15% Slopes	Tu Tupelo Loam, Frequently Flooded
HvD Hanceville Loam, 6-15% Slopes	Tx Tupelo-Dewey Complex
<i>Source: Soil Survey of Shelby County, Alabama -- 1984</i>	

The predominant soil within the city limits from the Soil Survey of Shelby County is the NcE Nauvoo-Sunlight Complex. This soil, which consists of moderately deep and shallow moderately steep well drained soils formed in residuum of sandstone and siltstone, encompasses a wide swath following the valley on both sides of the Cahaba River. NcE soil lies beneath the subdivisions of Hillsboro, Falliston, Riverwoods, Cahaba Falls, Moss Bend, Sunny Brook, and Old Cahaba, and the proposed subdivisions of Hillsboro South and Hillsboro North. Although areas of this soil are used for homes, NcE soil is poorly suited for residential development due to limitations related to slope, depth to rock, moderate permeability, and low strength.

Another soil found within the city limits from the Soil Survey of Shelby County that has been used for residential development even though it is poorly suited for urban development is the BmF Bodine-Minvale Complex. Dearing Downs Subdivision was built mostly on top of this soil. Other soils found that also have poor suitability for urban development that have been used for residential development include BrF Brilliant Very Channery Loam (Old Cahaba), NaE Nauvoo Loam (Oak Park, Quail Ridge), ToD Townley Silt Loam (Wyndham), ToE Townley Silt Loam (Kingridge, Rock Ridge), TtE Townley-Urban Land Complex (Old Town), and Tx Tupelo-Dewey Complex (Plantation South). The reasons for these soils poor suitability include slope, depth to rock, slow permeability, and low strength. Although these soils have development limitations, permeability is corrected through the use of a sewer system as opposed to using septic tanks, and building techniques such as reduced site disturbance and roadway design can be utilized to eliminate or minimize other limitations. Two other soils found along the Cahaba River and its tributaries, Ch Choccolocco Loam and CS Choccolocco-Sterrett Association, are also poorly suited for urban development but have not been built upon due to flooding.

The predominant soil within the city limits from the Soil Survey of Jefferson County is 34 Nauvoo-Montevallo Association which is found in the subdivisions of Silver Lakes, Long Leaf Lake, and Timberlake. Two soils along Shades Mountain, 20 Gorgas-Rock Outcrop Complex (Sterling Lakes, Asbury Parc) and 27 Leesburg-Rock Outcrop Complex, have poor suitability for residential development. These three soils have limitations to development which are related to slopes and shallow soil depths, but can be overcome through extensive excavation. Another soil along Shades Mountain, 22 Hanceville Fine Sandy Loam (Glen Gate, Saddlewood), is favorable for residential development.

TABLE 2	
Jefferson County Detailed Soil Map Units	
2 Albertville Silt Loam, 2-6% Slopes	25 Holston-Urban Land Complex, 2-8% Slopes
4 Allen Fine Sandy Loam, 8-15% Slopes	27 Leesburg-Rock Outcrop Complex, Steep
11 Decatur Silt Loam, 8-15% Slopes	30 Nauvoo Fine Sandy Loam, 2-8% Slopes
12 Decatur-Urban Land Complex, 2-8% Slopes	31 Nauvoo Fine Sandy Loam, 8-15% Slopes
13 Docena Complex, 0-4% Slopes	34 Nauvoo-Montevallo Association, Steep
20 Gorgas-Rock Outcrop Complex, Steep	39 Sullivan-State Complex, 0-2% Slopes
22 Hanceville Fine Sandy Loam, 8-15% Slopes	40 Townley-Nauvoo Complex, 8-15% Slopes
24 Holston Loam, 2-8% Slopes	
<i>Source: Soil Survey of Jefferson County, Alabama -- 1982</i>	



Climate: Helena lies within the Humid Subtropical Climate Zone, characterized by hot, humid summers and cool winters. Helena averages 210 days of sunshine and 103 days of precipitation, overwhelming in the form of rain, with the average annual rainfall of approximately 55 inches. The average annual temperature in Helena is 63 degrees Fahrenheit, with average high and low temperature ranges in January and July of 33 degrees and 92 degrees Fahrenheit, respectively. Typically, the first frost occurs in late October, to early November, while the last frost takes place in mid-March.

Air Quality: As amended in 1990, the Clean Air Act mandated that the Environmental Protection Agency (EPA) devise standards to regulate air emissions from stationary and mobile sources that negatively affect the public health and the environment. National Ambient Air Quality Standards (NAAQS) were formulated and federal limits were set to monitor the concentrations of ground-level ozone and particulate matter (PM). In order to check compliance with the NAAQS, the State of Alabama Department of Environmental Management (ADEM) operates monitors, which collect data to document concentrations of ground-level ozone and PM, except within Jefferson County and the City of Huntsville. The Jefferson County Department of Health (JCDH) oversees the monitors in the county.

As set in 2008, the federal limit for ground-level ozone is 75 ppm or parts per million. A violation of the NAAQS for ground-level ozone occurs when the three year average of the fourth highest daily maximum 8-hour average ground-level ozone concentrations measured at each monitor exceeds the limit. Such a violation would cause the county to be designated as non-attainment for ground-level ozone. In January 2010, EPA proposed lowering the federal limit to at least 70 ppm. One of the thirteen ozone monitors which ADEM operates is in Helena just off SR 261. The table below shows, that while this monitor exceeded the limit for 8-hour ozone over the two, three year average periods between 2006 and 2009, it has been below the limit for the two most recent three year averages. This has help Shelby County to allow the State to reach fully attainment for ground-level ozone. Within Jefferson County, nine ozone monitors are situated outside Helena in communities such as Hoover and McAdory. Jefferson County is also in violation as several of its monitors exceeded the federal limit over the last three year monitoring period. Statewide, only Jefferson and Shelby Counties are in nonattainment.

TABLE 3				
Eight Hour Ozone Three Year Averages				
Ozone Monitor	2009-2011	2008-2010	2007-2009	2006-2008
Helena	73	74	81	87
Hoover	75	75	80	87
McAdory	75	73	78	83

Source: State of Alabama Department of Environmental Management

PM2.5 or fine particle pollution is particulate matter with a diameter of 2.5 micrometers or less. ADEM operates fifteen PM2.5 monitors including one in Pelham. JCDH maintains eight PM2.5 monitors with the closest ones to Helena in McAdory and Hoover.

On December 14, 2012, the U.S. Environmental Protection Agency (EPA) significantly tightened the National Ambient Air Quality Standard (NAAQS) for PM2.5, revising the standard from 15 to 12 ug/m3 (micrograms per cubic meter), averaged over a year. Upon finalizing a new standard, the Clean Air Act requires all counties in the U.S. to be formally designated by EPA as either an “attainment” area, (in compliance of the new standard) or a “non-attainment area (not meeting the standard). On March 3, 2014, the Alabama Department of Environmental Management sent a letter to EPS stating that based on recent ambient air monitoring data, all monitors in the State of Alabama meet the new annual PM2.5 NAAQS. This letter recommended to EPA that the entire State of Alabama be designated as “attainment” for the new standard. (From: ADEM Memorandum dated For Immediate Release: Wednesday, March 12, 2014).

TABLE 4				
Annual PM2.5 Three Year Averages				
PM2.5 Monitor	2008-2010	2007-2009	2006-2008	2005-2007
Pelham	10.9	12.1	13.5	14.6
Hoover	11.4	12.5	14.2	15.4
McAdory	11.5	12.8	14.5	15.9

Source: State of Alabama Department of Environmental Management

Other Natural Occurrences:

Earthquakes - With its location being in the northern half of Alabama, Helena lies within an area of higher probability for earthquakes than other locations further south. Although the greatest likelihood of earthquakes exist in the northeastern and northwestern corners of the state, the area within fifty miles of the Helena city center has had its fair share of Minor Magnitude Class (3.0 - 3.9) and Light Magnitude Class (4.0 – 4.9) earthquakes within the past fifteen years. The most recent was a magnitude 3.6 earthquake which occurred in August 2004 just a little over eight miles southwest of the city center, while the largest within the abovementioned timeframe and distance, a magnitude 4.8 earthquake, occurred in January 1999 nearly 25 miles away. Other earthquakes of note were a magnitude 4.0 earthquake in December 1997 twenty nine miles away and a magnitude 3.8 earthquake in November 1999 almost twenty five miles away. Alabama’s largest recorded earthquake centered within the state, a Moderate Magnitude Class (5.0 – 5.9) earthquake with a magnitude of 5.1 was near Irondale in October 1916.

Tornadoes – Shelby County is a “Very High Risk” area for tornados. According to records the largest tornado in the Shelby County area was an F5 in 1977 that caused 130 injuries and 22 deaths. Tornado risk is calculated from the destruction path that has occurred within 30 miles of the location. On average there are three tornadic occur, and four fatalities in Shelby County annually. There have been 158 tornadoes in Shelby County since 1950.

Since 1995 the tornadic occurrences closest to Helena have been in the cities of Alabaster and Pelham; more recent occurrences (2011-2014) those occurrences have been in the City of McCalla in Jefferson County. (For additional information consult the National Weather Service Tornado Database)