Strategic Statewide Resilience and Risk Reduction Plan

3 | PLANNING CONDITIONS

OVERVIEW

The Disaster Relief and Resilience Act (2020) directs the South Carolina Office of Resilience (SCOR) to develop, implement and maintain the Strategic Statewide Resilience and Risk Reduction Plan (Resilience Plan). This plan is intended to serve as a framework to guide state investment in flood mitigation projects and the adoption of programs and policies to protect the people and property of South Carolina from the damage and destruction of extreme weather events. This chapter provides an overview of the current and projected future conditions that must be considered in planning for resilience, including climate, land use, population and demographic trends that influence the risk and vulnerability of South Carolina's communities, economies and ecosystems.

CONTENTS

KEY FINDINGS

- South Carolina's hydrological footprint consist of eight major river basins: Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah. The hydrologic footprint extends beyond state boundaries, and includes those basins shared with neighboring states.

- There are eight major aquifers that are recharged by surface water that falls on permeable surfaces like the Sandhill region of South Carolina. The deeper aquifers are used for larger withdrawers, while the surficial aquifer is mostly used for minor withdrawers like private drinking water supply and smaller irrigation operations.

- Septic systems can be impacted by changes in the water table elevation caused by increased precipitation and or sea level rise.

- Urban and developed areas can experience flooding as natural systems are changed into non-permeable surfaces due to the change in land coverage. Developed settings decrease the storage capacity to the system and discharges water faster into the waterways.

- Changes in land uses at the wildland-urban interface can increase wildfire risk. In short, changing land use can put new development areas and existing areas at an increased risk for natural hazards.

- South Carolina's Population has increased to over 5.1 million people from an estimated 2.5 million in 1970 people in 1970.

- Population growth is expected to continue with the population reaching 6.2 million people by 2035.

- The explosive population growth in South Carolina is regionally disproportionate. Population growth has centered around coastal counties and urban areas. Many rural areas especially along the I95 corridor are experiencing population declines.

LAND USE, POPULATION, & DEMOGRAPHIC TRENDS AND PROJECTIONS

Planning must consider the role of physical characteristics of the environment as well as the role of the built environment on risk, vulnerability and resilience.

From an environmental perspective, this section contains an overview of South Carolina's physiography, river basins, soil and land cover. Concerning land use, studies indicate that "without policies to direct new development into safer areas, the contribution of population growth to future US flood risk exceeds that of climatic changes" due to the combination of an intensified hazard and increased exposure (Wing, et al., 2022).

This section considers the population and demographic trends and projections to understand how many people are at-risk and what areas and populations are most vulnerable to environmental changes and natural hazards.

LAND ACKNOWLEDGEMENT

The South Carolina Office of Resilience would like to gratefully acknowledge and pay respect to the Indigenous inhabitants of the land on which we work and live. Since time immemorial Tribes inhabited, protected, and preserved these lands. We respect their histories and the strong cultural ties that they maintain to the land. We also gratefully acknowledge and pay respect to the Gullah/Geechee people – descendants of those enslaved and a vibrant culture currently living in South Carolina.

Table 3.1 South Carolina's Recognized Native American Indian Entities (SC Commission for Minority Affairs)

Federally Recognized Resident Tribes	State Recognized Tribes	State Recognized Groups
Catawba Indian Nation	Beaver Creek Indians	Chaloklowa Chickasaw Indian People
	Edisto Natchez-Kusso Tribe of South Carolina	Eastern Cherokee, Southern Iroquois and United Tribes of South Carolina
	Pee Dee Indian Nation of Upper South Carolina	Natchez Tribe of South Carolina
	Pee Dee Indian Tribe	Pee Dee Indian Nation of Beaver Creek
	Piedmont American Indian Association	
	The Santee Indian Organization	
	Sumter Tribe of Cheraw Indians	
	The Waccamaw Indian People	
	The Wassamasaw Tribe of Varnertown Indians	

Table 3.2

Federally Recognized Tribal Nations with Ties to South Carolina	
Absentee-Shawnee Tribe of Indians of Oklahoma	Alabama-Quassarte Tribal Town
Eastern Band of Cherokee Indians	Cherokee Nation
Kialegee Tribal Town	Eastern Shawnee Tribe of Oklahoma
Muscogee (Creek) Nation	Miccosukee Tribe of Indians of Florida
Santee Sioux Nation (Santee Sioux Tribe of the Santee Reservation of Nebraska)	Poarch Band of Creek Indians
Thlopthlocco Tribal Town	Shawnee Tribe
United Keetoowah Band of Cherokee Indians of Oklahoma	Tuscarora Nation

PHYSIOGRAPHY AND RIVER BASINS

The United States Geological Survey (USGS) and South Carolina Department of Natural Resources (SCDNR) have mandates to study and describe the geologic, geomorphic, and hydrologic setting of South Carolina. Both have extensive descriptions of the hydrology and geology in the state that can be readily retrieved from the appropriate sources.

The state has three major physiographic provinces, the Blue Ridge, Piedmont, and Coastal Plain (Figure 3.1). The Blue Ridge is a small province in the northwestern portion of the state that is identified by elevations ranging from 1,000 to 3,300 feet and high slope. The Piedmont is in the central western portion of the State and is 450 to 1,000 feet above sea level with undulating terrains, albeit lower relief than the Blue Ridge, which has less energetic riverine flow. The Fall Line is the transitional boundary for the Coastal Plain, located in the eastern portion of the State. The Coastal Plain is described by low slope, topographic relief between 0 to 450 feet above sea level.

South Carolina has eight major river basins, whose main rivers and numerous tributaries comprise of 30,000 miles of waterways that drain 20-million acres of land into the Atlantic Ocean. These major river basins are: Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah (Table 3.2). It should be noted that the hydrologic footprint extends beyond state boundaries, and includes those basins shared with neighboring states. Only three of the basins' drainage is exclusively in South Carolina, the other five drain areas within Georgia and North Carolina. In 2013, the Department of Natural Resources (DNR) published a detailed report of the river basins in South Carolina (SC Department of Natural Resources, 2013).
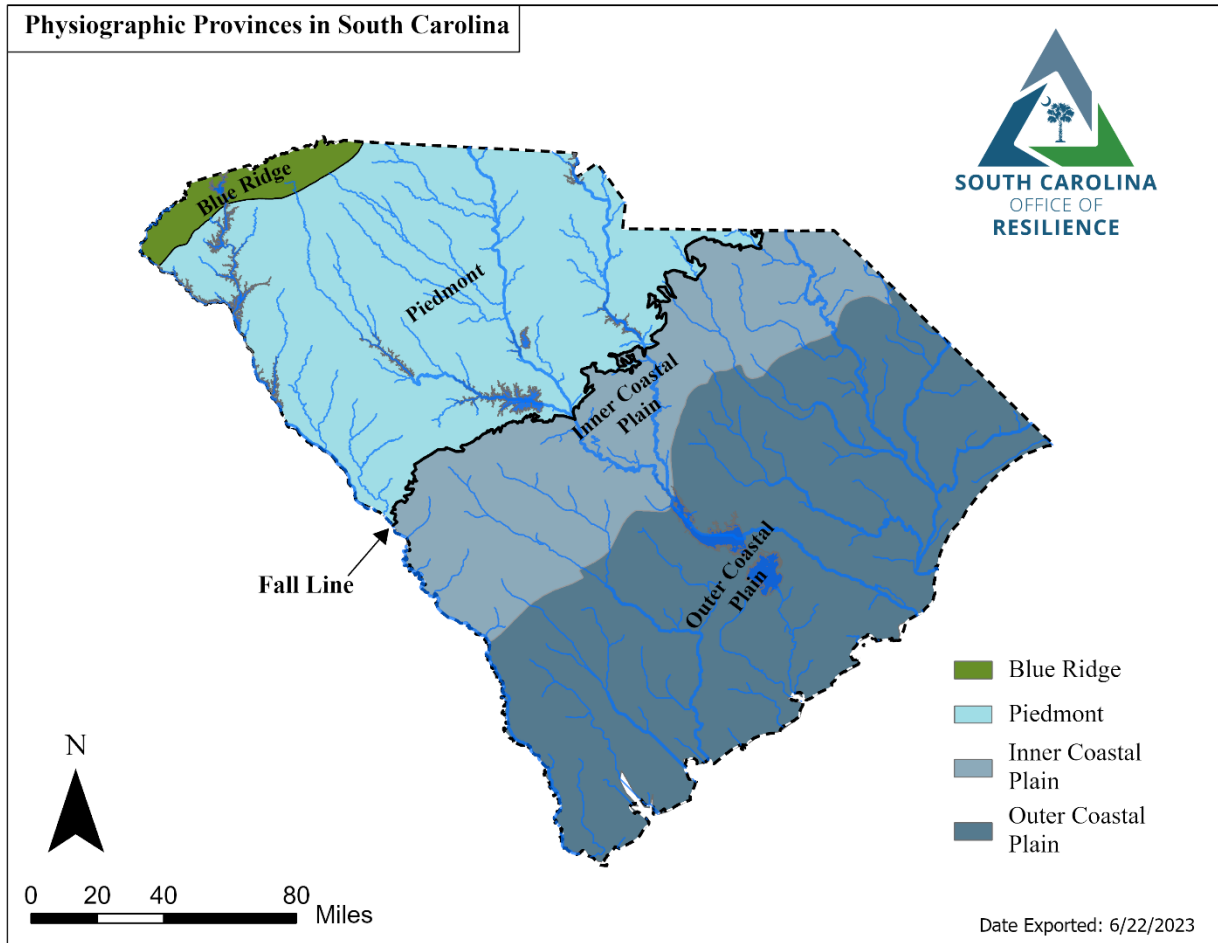
Figure 3.1: Physiographic Provinces of South Carolina (SCDNR)

RIVER BASINS

Drainage basins are the geographical extend of land where the water will flow and drain into the rivers and tributaries. Basins and watersheds are identified by hydrologic unit codes (HUC), starting with a 2-digit code that designates region down to subwatershed 12-digit HUC. At the HUC6 Basin designation, there are 4 basins in South Carolina. SCDHEC identifies 8 river basins, splitting the Santee Basin that drains the central part of the state into 4 separate subbasins (Figure 3.2)(SC Department of Natural Resources, 2013). It should be noted that the hydrologic footprint extends beyond state boundaries, and includes those basins shared with neighboring states. The eight SCDHEC basins are described by SC Department of Natural Resources (SCDNR, 2013) and are summarized below and in Table 3.3.
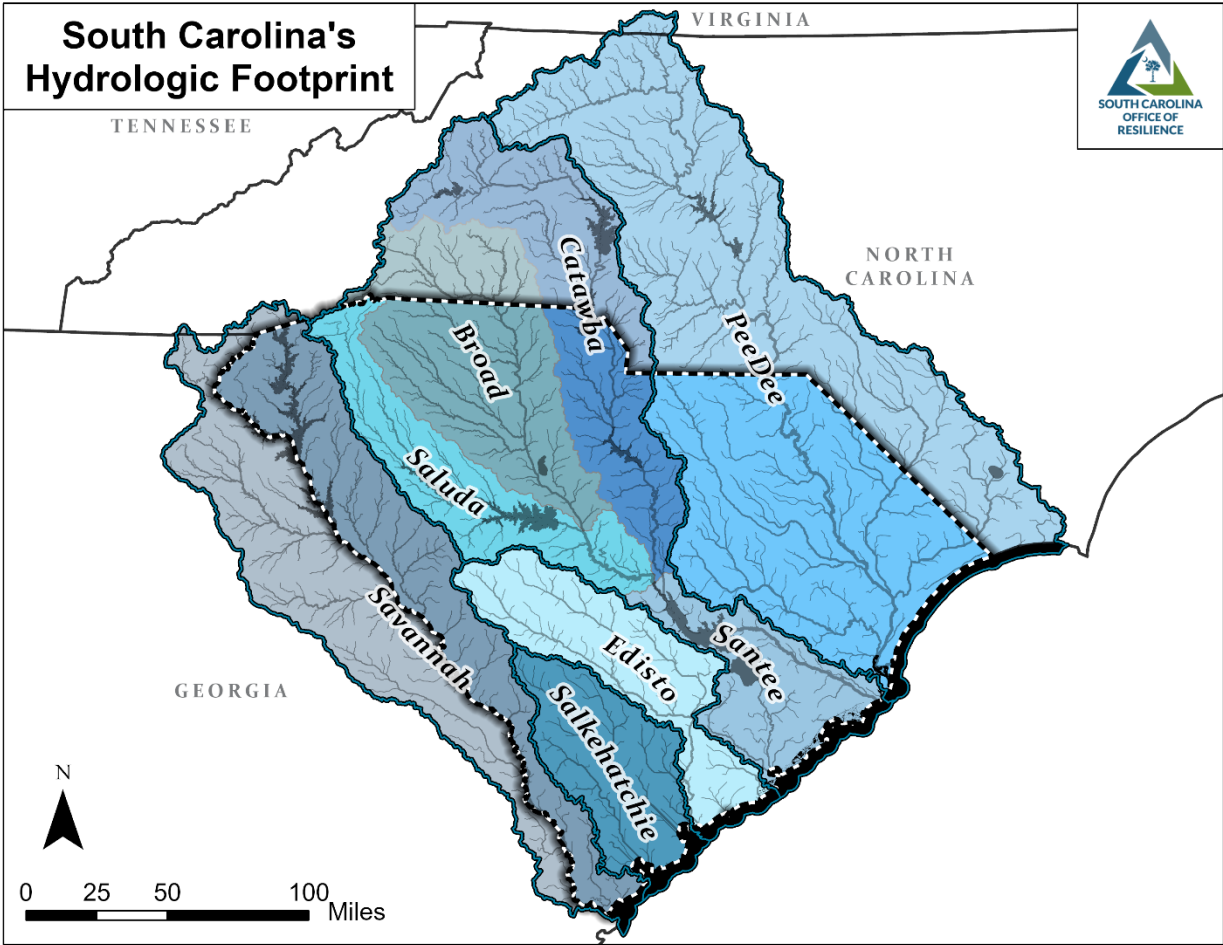
Figure 3.2: SCDHEC extended eight river basins of South Carolina, HUC 8 Basins

Table 3.3: Basin Extents as described in SCDNR (2013) river basin report.

Basin	Area (Square Mile)	Area in SC (Square Mile)	PERCENTAGE in SC	Percentage of SC covered by Basin
Broad	5,308	3,794	71.5%	12.0%
Catawba	5,612	2,323	41.4%	7.3%
Edisto	3,607	3,607	100.0%	11.4%
Pee Dee	18,868	7,854	41.6%	24.8%
Salkehatchie	3,006	3,006	100.0%	9.5%
Saluda	3,213	3,212	100.0%	10.1%
Santee	2,950	2,950	100.0%	9.3%
Savannah	10,972	4,955	45.2%	15.6%

EDISTO RIVER BASIN

The Edisto River basin is in south central South Carolina, including portions of Aiken, Bamberg, Barnwell, Berkeley, Calhoun, Charleston, Dorchester, Edgefield, Lexington, and Saluda Counties, and most of Colleton and Orangeburg Counties. The Edisto River basin is approximately 3,607 square miles and is wholly in South Carolina, covering about 11.4 percent of South Carolina (Table 3.3).

The Edisto River basin contains four major tributary streams: South Fork Edisto River, North Fork Edisto River, Edisto River, and Four Hole Swamp (University of South Carolina, 2022). The Edisto River basin reaches inland into the Coastal Plain region via the North Fork and South Fork. Four Hole Swamp is a blackwater river in the coastal zone and is a braided river system where the main channel is poorly defined. The low-lying nature of the Edisto River basin means that much of the basin is swamplands and becomes tidally influenced near the coast. The North Fork and South Fork of the Edisto River is primarily fed by groundwater discharge in the upper Coastal Plain region. This allows for consistent flows in drought times, as seen in 2011-2013.

PEE DEE RIVER BASIN

The Pee Dee River basin extends from a small section of Virginia, through North Carolina, enters South Carolina in the Northeast section of the state near the coastal plains and discharges into the Atlantic Ocean in Winyah Bay near Georgetown, SC and covers approximately 18,868 square miles (Table 3.3). In South Carolina, the Pee Dee Basin covers 7,854 square miles, or 24.8 percent of the state (Table 3.3), making it the largest basin in the State. The basin includes all or parts of 14 counties: Chesterfield, Clarendon, Darlington, Dillon, Florence, Georgetown, Horry, Kershaw, Lancaster, Lee, Marlboro, Marion, Sumter, and Williamsburg Counties (University of South Carolina, 2022).

The Pee Dee River is the main river in the basin with major tributaries including the Little Pee Dee and Lynches Rivers. The majority of the basin (48.4 percent) is in North Carolina. In North Carolina,

the Pee Dee River has six reservoirs with the last, Blewett Falls Lake, being near the South Carolina state border. In South Carolina, the Pee Dee River basin is free flowing and has four main tributaries: the Black, Little Pee Dee, Lynches, and Waccamaw Rivers.

The Black River is the southernmost river in the basin. It is a coastal river is bordered with extensive swamplands. Pocotaligo River, Scape Ore Swamp, Pudding Swamp, and Black Mingo Creek are the tributaries that feed into the Black River and have poorly defined and meandering stream channels. The Black River outlets directly into the Winyah Bay.

The Little Pee Dee River and a major tributary, the Lumber River, have their headwaters in the Sandhills region of North Carolina. The Lumber River runs north to south and passes through Nichols, SC, which has experienced devastating flooding in the last few years and converges with the Little Pee Dee River soon after. The Little Pee Dee River flows through Dillion and Marion Counties and after the convergence with the Lumber River, flows through Horry County through Galivants Ferry and Aynor. The Little Pee Dee River converges with the Great Pee Dee at the border of Georgetown, Horry, and Marion counties.

The Lynches River system extends inland through Kershaw, Lee, Darlington, and Florence before converging with the Great Pee Dee River. The tributaries include the Little Lynches River, Bay Swamp, Lake Swamp, and Sparrow Swamp.

The Waccamaw River is the major coastal river in the Pee Dee River basin. The headwaters are in North Carolina at Lake Waccamaw and flows southward across Horry County, converging with the Intercoastal Waterway and Sampit River before emptying into Winyah Bay.

SALKEHATCHIE RIVER BASIN

The Salkehatchie River basin consist of the Salkehatchie, Little Salkehatchie, Coosawhatchie, and Ashepoo Rivers. It is wholly contained within South Carolina and is approximately 3,006 square miles in area, covering about 9.5 percent of the South Carolina (Table 3.3). It includes parts of Aiken, Allendale, Bamberg, Barnwell, Beaufort, Colleton, Hampton, and Jasper Counties (University of South Carolina, 2022).

The Salkehatchie and Little Salkehatchie Rivers drain the tidally influenced Combahee River, while the Coosawhatchie River drains into the tidally influenced Broad River. The basin discharges into a tidal saltwater river that also receives drainage from surrounding marshlands and estuarine waters around St. Helena Sound and Port Royal Sound.

SANTEE RIVER BASIN

As noted above, DHEC splits the Santee Basin that drains the middle portion of the state into 4 separate subbasins, identifying the 4 sub-basins that flow into it: The Broad, Catawba, Lower Santee and Saluda. This basin flows from the mountains at the boarder of South Carolina and North Carolina all the way to the ocean in Charleston, SC. The waterways change dramatically across the basin from high energy mountain streams and rivers to broad braided channels in the marsh system at the coast. The sub-basins are described individually below.

BROAD RIVER BASIN

The Broad River basin is 5,308 square miles, with 3,794 square miles of it in South Carolina (Table 3.3) (University of South Carolina, 2022). It is in the northwestern part of the state sharing a section of the NC border. The Broad River's headwaters are in North Carolina and then flows into South Carolina where three major tributaries, the Pacolet, Tyger, and Enoree Rivers, converge into the main stem. Areas within Columbia, Gaffney, Greer, Spartanburg, Union, Winnsboro, and York are included within the basin. There are three reservoirs in the basin: Lake Monticello, Parr Shoals Reservoir, and Lake William C. Bowen.

CATAWBA RIVER BASIN

The Catawba basin has an orientation roughly North – South and matches the course of the Catawba-Wateree River from the North Carolina border south to the confluence with the Congaree River near Columbia, SC. The basin has an area of approximately 5,612 square miles, with 2,323 square miles or 41.4 percent in the state of South Carolina and is 7.3 percent of the State's total area (Table 3.3) (University of South Carolina, 2022).

The Catawba and Wateree rivers are the major hydrologic features in the basin with several smaller tributaries that feed into these two rivers. The Catawba River's headwater and a majority of the river's watershed (58.6 percent) is in North Carolina. In the upper reaches, the tributaries include: Fishing Creek, Rocky Creek, Big Wateree Creek, Sugar Creek, and Cane Creek. The Catawba River flows into the Lake Wateree in Kershaw, Fairfield, and Lancaster counties. At the outlet of Lake Wateree, the Catawba River's name changes to the Wateree River. Below Lake Wateree, tributaries along Wateree River include: Spears Creek, Colonels Creek, and Swift Creek.

Within the Catawba River Basin, there are eleven hydroelectric reservoirs, six in North Carolina and five in South Carolina. All eleven reservoirs are owned and operated by Duke Energy. Due to this, the flow of the Catawba – Wateree River's is regulated and managed through releases and holding water.

LOWER SANTEE

The Lower Santee River basin is one of the smaller basins in South Carolina, covering only 2,950 square miles, about 9.3 percent of South Carolina (Table 3.3), covering portions of Berkeley, Calhoun, Charleston, Clarendon, Dorchester, Georgetown, Orangeburg, Sumter, and Williamsburg counties (University of South Carolina, 2022). The upper portion of the basin is formed at the confluence of the Congaree and Wateree Rivers that then flow into Lake Marion and subsequently Lake Moultrie. Lake Marion and Lake Moultrie are both dam controlled, and discharges are maintained by Santee Cooper. Lake Moultrie is connected to the ocean by the Santee River and the Cooper River.

The Santee River flows oceanward along the northern boundary of the basin. The river splits into the North Santee River and the South Santee River about 10 miles from the coast and run parallel until they meet at Santee Bay at the Atlantic Ocean. Tidal impacts are measured on the Santee as far up as Jamestown, SC USGS Station 02171700 prior to splitting into the

North and South Santee. The outlet at Santee Bay and South Santee River is bordered by Winyah Bay to the north, the outlet of the Pee Dee basin, and Bulls Bay and surrounding marshes to the south.

The Tailrace Canal connects Lake Moultrie with the West Branch Cooper River. The Cooper River flows into the majority of the coastal portion of the basin and connects with the Ashley and Wando Rivers meeting the ocean at the Charleston Harbor. This section is tidally influenced and has a complex system of marshes and tidal creeks at the Atlantic Ocean.

SALUDA RIVER BASIN

The Saluda River basin is in the western-central portion of the state. It is wholly within South Carolina and covers 3,212 square miles and 10.1 percent of South Carolina (Table 3.3). It originates in the Blue Ridge and Piedmont portion of South Carolina and flows northwest to southeast where it terminates at the convergence of the Catawba basin and it converts into the Santee River basin. The Saluda River Basin passes through Abbeville, Aiken, Anderson, Calhoun, Edgefield, Greenville, Greenwood, Lexington, Laurens, Newberry, Pickens, Richland, and Saluda Counties (University of South Carolina, 2022).

The northwestern part of the basin flows into Lake Greenwood and then Lake Murray with the tributaries of the Bush, Little, Little Saluda, Rabon and Reedy River feeding into the Saluda River as it passes through these reservoirs. Below Lake Murray, the Saluda converges with the Broad River and shortly forms into the Congaree River in Columbia. Along with these large rivers, Cedar Creek, Congaree Creek, Gills Creek, and Toms Creek feed into the Congaree River before its outlets into Lake Marion in the Santee River basin.

SAVANNAH RIVER BASIN

The Savannah River basin follows the Savannah River that is the western border with Georgia. The basin is 10,972 square miles, with 15.6 percent, or 4,955 square miles (Table 3.3), in South Carolina. It passes though Abbeville, Anderson, Beaufort, Edgefield, Greenwood, Pickens, Saluda, Aiken, Allendale, Barnwell, Hampton, Jasper, McCormick and Oconee Counties (University of South Carolina, 2022).

The Savannah River is the main river in the basin and is fed by Chattooga River, Twelve Mile Creek, Rocky River, Little River, Stevens Creek, Horse Creek, Upper Three Runs Creek, and Lower Three Runs Creek on the South Carolina side. The Savannah River has six large reservoirs for hydroelectric power that control discharges throughout the basin.

GROUNDWATER

Groundwater is a resource that is used across South Carolina for private and public drinking water, irrigation, power supply, and other industrial sectors. Although there are groundwater resources throughout the state, the upstate region is mostly crystalline rock and groundwater moves very slowly. Moving towards the coast, the coastal plain of the state is where the majority of the groundwater resources are available. There are eight major aquifers (Figure 3.3) that are managed

and monitored by DHEC and SCDNR. The aquifers are recharged by surface water that falls on permeable surfaces like the Sandhill region of South Carolina. The deeper aquifers are used for larger withdrawers, while the surficial aquifer is mostly used for minor withdrawers such as private drinking water supply and smaller irrigation operations. The surficial aquifer can be more easily impacted by contamination due to the unconfined nature and influence from surface water, river stage, and tides (Gellici & Lautier, 2010).

Septic systems are often placed above the surficial aquifer and rely on the natural processes to treat and dispose of wastewater. When groundwater levels are high, it can affect the proper functioning of the septic system. High groundwater levels also can cause septic tanks and drain fields to become saturated, which can lead to backups and overflows of untreated wastewater. The soil surrounding the septic system becomes less effective at treating the wastewater, which can result in the discharge of pollutants and harmful pathogens into the environment. Coastal communities must also consider the tidal processes and how saltwater will additionally impact the septic systems. North Carolina Sea Grant has funded a series of studies to investigate how septic tanks in the coastal areas are impacted and included South Carolina communities like Folly Beach. South Carolina Sea Grant has also been working with Beaufort County to identify how local sea level rise is impacting their communities including the groundwater impacts on septic tanks that have been flooding. It is important to properly design and maintain septic systems, considering the local groundwater conditions. It is also important to regularly monitor the groundwater levels around the septic system and take necessary steps to prevent backups and overflows.
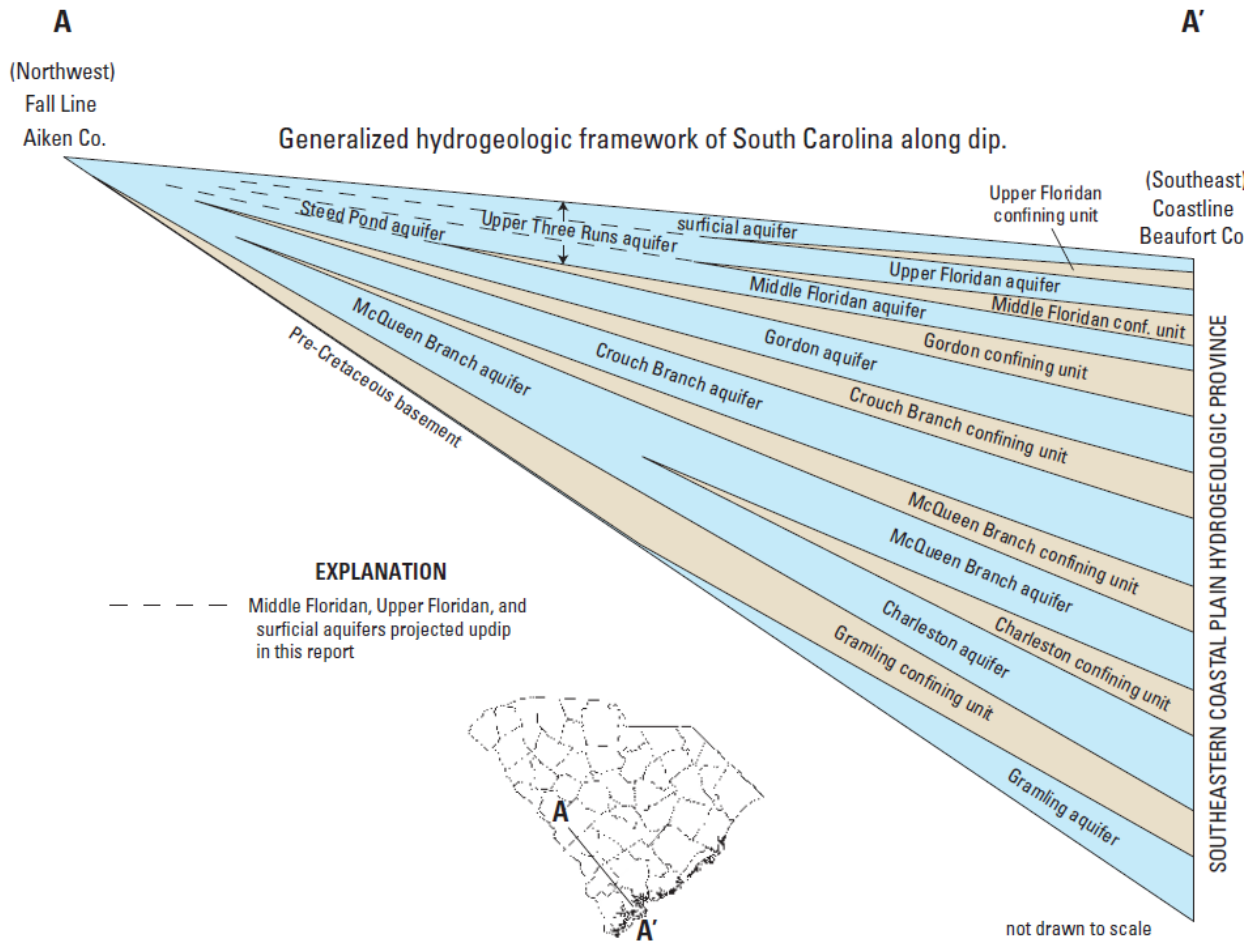
A

(Northwest)
Fall Line
Aiken Co.

Generalized hydrogeologic framework of South Carolina along dip.

A′

Upper Floridan
confining unit

(Southeast)
Coastline
Beaufort Co

Steed Pond aquifer

Upper Three Runs aquifer

surficial aquifer

Upper Floridan aquifer

Middle Floridan aquifer

Middle Floridan conf. unit

McQueen Branch aquifer

Gordon aquifer

Gordon confining unit

Pre-Cretaceous basement

Crouch Branch aquifer

Crouch Branch confining unit

McQueen Branch confining unit

McQueen Branch aquifer

EXPLANATION

– – – – Middle Floridan, Upper Floridan, and
surficial aquifers projected updip
in this report

Charleston aquifer

Charleston confining unit

Gramling confining unit

Gramling aquifer

SOUTHEASTERN COASTAL PLAIN HYDROGEOLOGIC PROVINCE

not drawn to scale

A

A′

Figure 3.3 Groundwater aquifers of South Carolina (Gellici & Lautier, 2010)

SOILS & LAND COVER

SOILS

The hydrologic soil group is used to describe how four different soil types transmit water through the soils. Soils are classified based on the components that makes up the material, including rock sediment and organic material. Organic material is often from the vegetation that grows, roots, or falls onto the ground and then decomposes and incorporates into the ground. The sediment components are comprised of eroded lithified rock that is classified into sizes as described by Wentworth (1922). In simple terms, the larger the grain size and voids between grains, the easier water will flow between the grains of sediment.

The four hydrologic soil groups are a continuum of the hydraulic conductivity labeled A-D (Natural Resources Conservation Service, 2009). Soil Group A have a high potential to absorb water and consist of 90 percent sand and gravel and 10 percent silts and clay. Group B soils also have relatively high transmissibility of water and consist of 50-90 percent sands and gravels and the other component being silts and clays. Group C contains 20-40 percent clay and less than 50 percent sand, with silty loams, sandy clay loam, clay loams; creating a moderately high runoff potential. Lastly, Group D soils contain greater than 40 percent clay and less than 50 percent sands.

South Carolina contains all four soils within the hydrologic boundaries (Figure 3.4). Group B and Group D soils are the most prevalent within the state. Group B and C soils are found mostly in the Upstate above the Fall Line covering 34.6 percent and 13.9 percent of the state respectively. Group A soils cover approximately 12.8 percent and are found primarily in the Midlands in the Sand Hill region of South Carolina.

Knowing how the soils behave prior to flooding occurring allows for better planning and design. Group A soils are the best soils for allowing water to infiltrate into the ground, slowing and capturing potential floodwaters from storms. These areas are also associated with groundwater recharge zones that supply water to much of the Lowcountry across the state. The Lowcountry and small areas in the Upstate are mostly Group D soils and cover 38.7 percent of the state. Hydraulically saturated soils are placed in Group D independently of their composition.
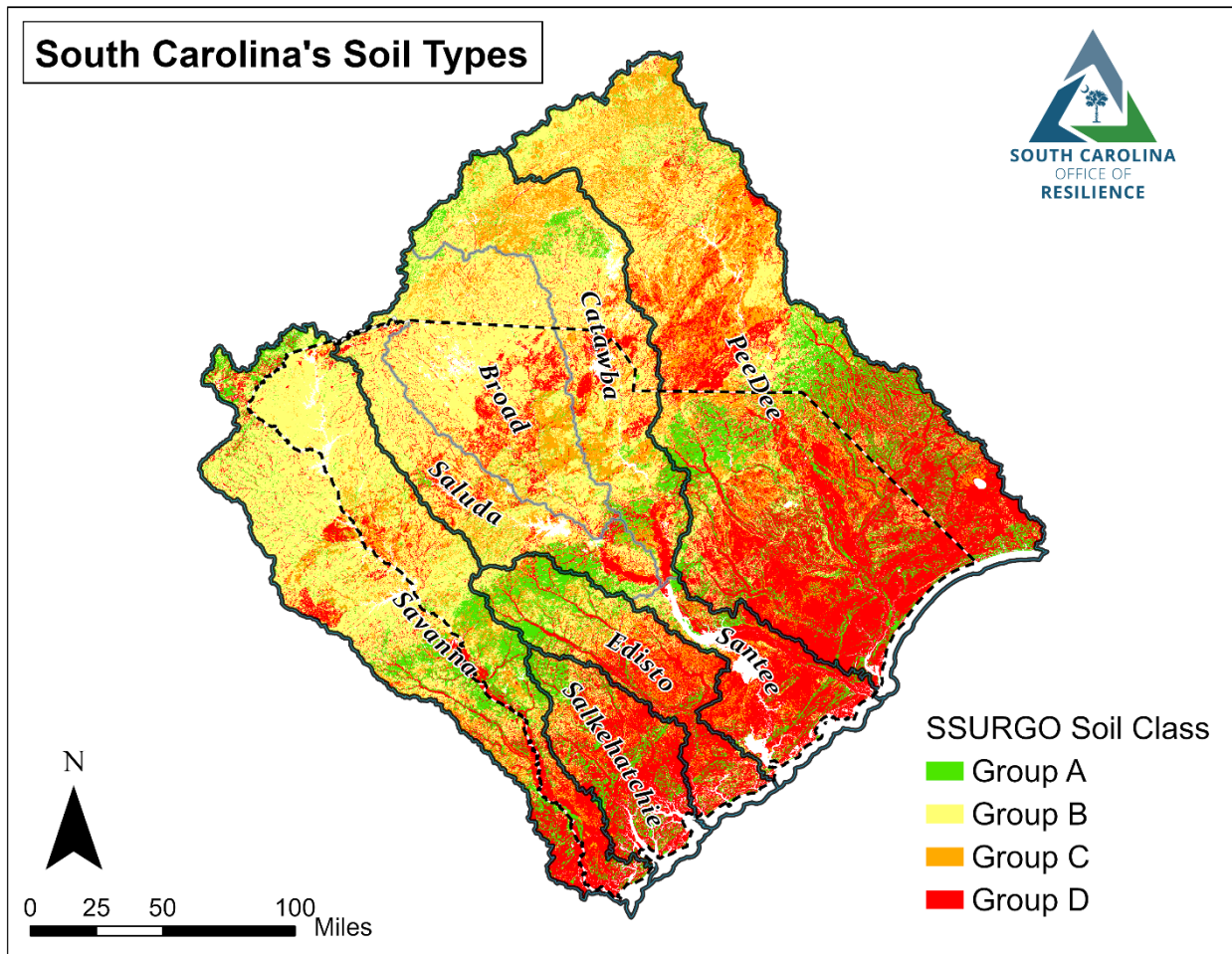
Figure 3.4: Hydraulic soil groups location in South Carolina.
*Group D soils include saturated soils (Group A-D, B-D, C-D) due to the inability to further drain water.

LAND COVER/DEVELOPMENT

Along with the soils, land use also strongly influences where floodwaters flow. In natural, undeveloped areas like forest, wetlands, and grasslands, water is absorbed by the soils until saturation is reached and then overland flow of the waters occurs into waterways such as rivers and streams. Trees, shrubbery, and grasses slow the overland flows that eventually flows into the rivers, streams, and waterways.

When these ecosystems are altered or changed (e.g., tree removal, imcreased impervious surfaces), the capacity to store rainfall changes as well (Konrad, 2003). Urban and developed areas experience an increase in flooding as natural systems are changed into non-permeable surfaces. In South Carolina, roughly 23.2 percent of the land cover is wetlands and 46.2 percent is undeveloped forest, shrub, or grasslands, 15.4 percent is agriculture, and 11.5 percent is developed, as seen in Table 3.4 and Figure 3.5 (US Geological Survey, 2019). As urbanization continues, pluvial flooding will most likely increase, especially in areas with high topographic relief where water will flow quickly across steep surfaces with low porosity. In low lying regions of the state, Lowcountry and Pee Dee, the topographic relief is lower, water slows and fluvial flooding becomes more of an issue. The effects of urbanization result in a faster flow of runoff into waterways with less filtration and storage capacity.
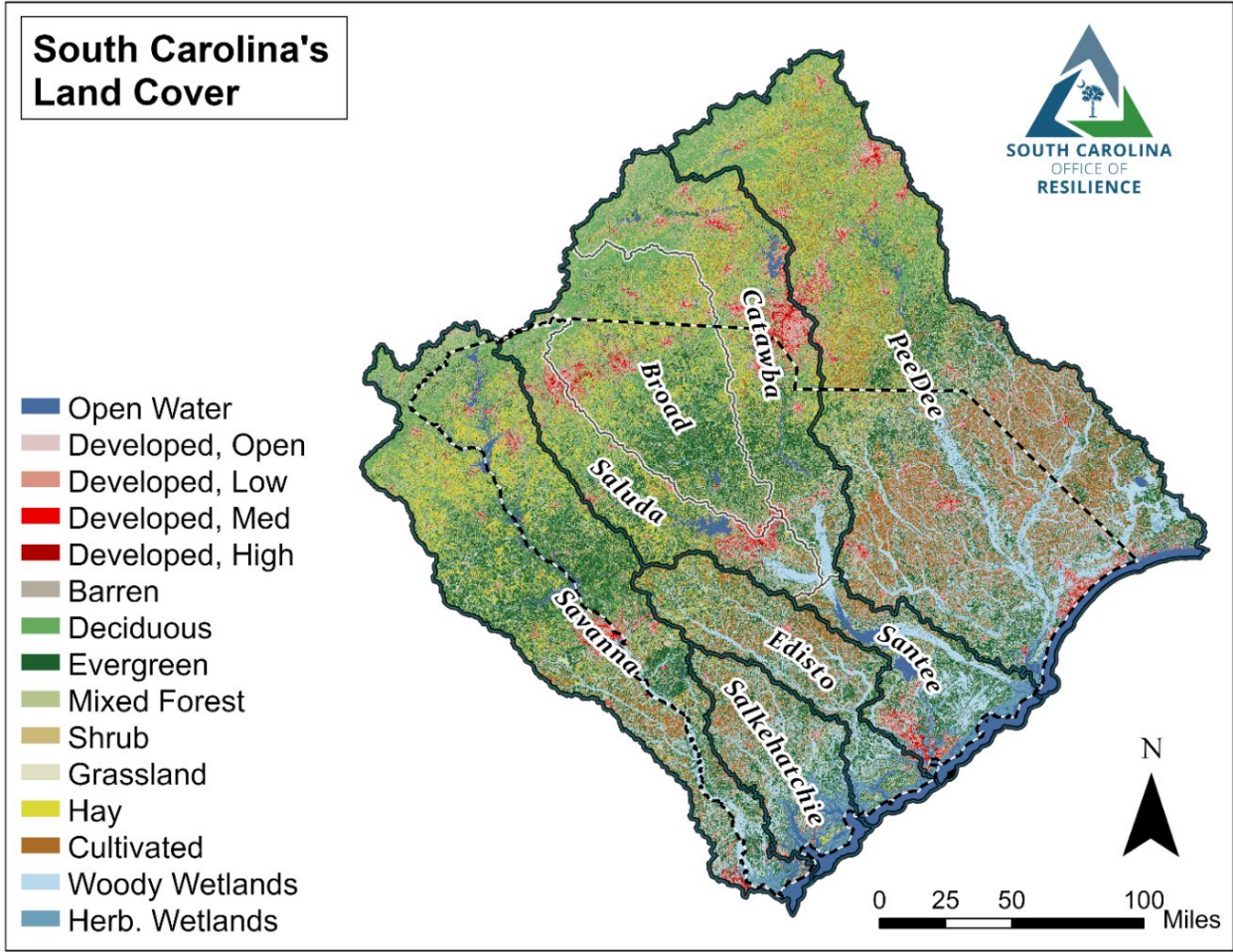
Figure 3.5: Land Cover in South Carolina (US Geological Survey, 2019)

Table 3.4: Percentage of land coverage by National Land Cover Dataset category in South Carolina (US Geological Survey, 2019)

NLCD Land Cover	Percent Area Coverage in SC (2019)
Open Water	3.5%
Developed, Open Space	6.0%
Developed, Low Intensity	3.5%
Developed, Medium Intensity	1.5%
Developed, High Intensity	0.5%
Barren Land	0.2%
Deciduous Forest	8.0%
Evergreen Forest	24.0%
Mixed Forest	5.6%
Shrub/Scrub	4.3%
Herbaceous	4.2%
Hay/Pasture	6.4%
Cultivated Crops	9.0%
Woody Wetlands	19.8%
Emergent Herbaceous Wetlands	3.4%

Land use changes are driven by development associated with population growth. Population growth, when coupled with unsustainable growth patterns, can lead to urban sprawl drastically increasing impervious surface. Increased impervious surface decreases the storage capacity to the system and discharges water faster into the waterways (Konrad, 2003). Changes in land uses at the wildland-urban interface can increase wildfire risk. In short, changing land use can put new development areas and existing areas at an increased risk for natural hazards.

Table 3.5: Percentage of developed land cover change by National Land Cover Dataset category in South Carolina

BASIN	PERCENT DEVELOPED 2001	PERCENT DEVELOPED 2019
Broad	13%	14%
Catawba	18%	20%
Saluda	14%	16%
Santee	14%	16%
Edisto	7%	7%
Pee Dee	11%	12%
Salkehatchie	7%	7%
Savannah	9%	10%

POPULATION TRENDS AND PROJECTIONS

While South Carolina has always been subject to natural hazard events such as hurricanes and floods due to natural processes, the impact of these events has increased due to the growth of populations located in the path of these events.

STATEWIDE TRENDS

Since the first United States Census in 1790, the population of South Carolina has steadily increased from 249,073 to over 5.1 million (2020) (Figure 3.6). Growth was gradual through the first half of the 19th century. By 1890, the state had surpassed 1 million residents. This growth intensified and spread northwest across the state during the 20th century. By 1970, the state population was estimated around 2.5 million, and over the next fifty years, this number doubled to over 5 million in 2020. Between 2010 and 2020 alone, SC's population grew 10.7%, compared to a 7.4% nationwide increase, making South Carolina the 10th fastest-growing state in the nation (U.S. Census Bureau, 2021). This growth continued during the COVID-19 pandemic. While many states saw decreases in population, SC saw a 1.4% increase in population between April 1, 2020 and July 1, 2021, the 5th highest in the nation (US Census Bureau, 2021).

According to the South Carolina Revenue and Fiscal Affairs Office, this increasing trend is expected to continue, at least through 2035 (2019). Using Census numbers, along with vital records and migration data, the office predicts that the statewide population will reach over 6.2 million in 2035 (Figure 3.6). This has important implications for planning for resilience.
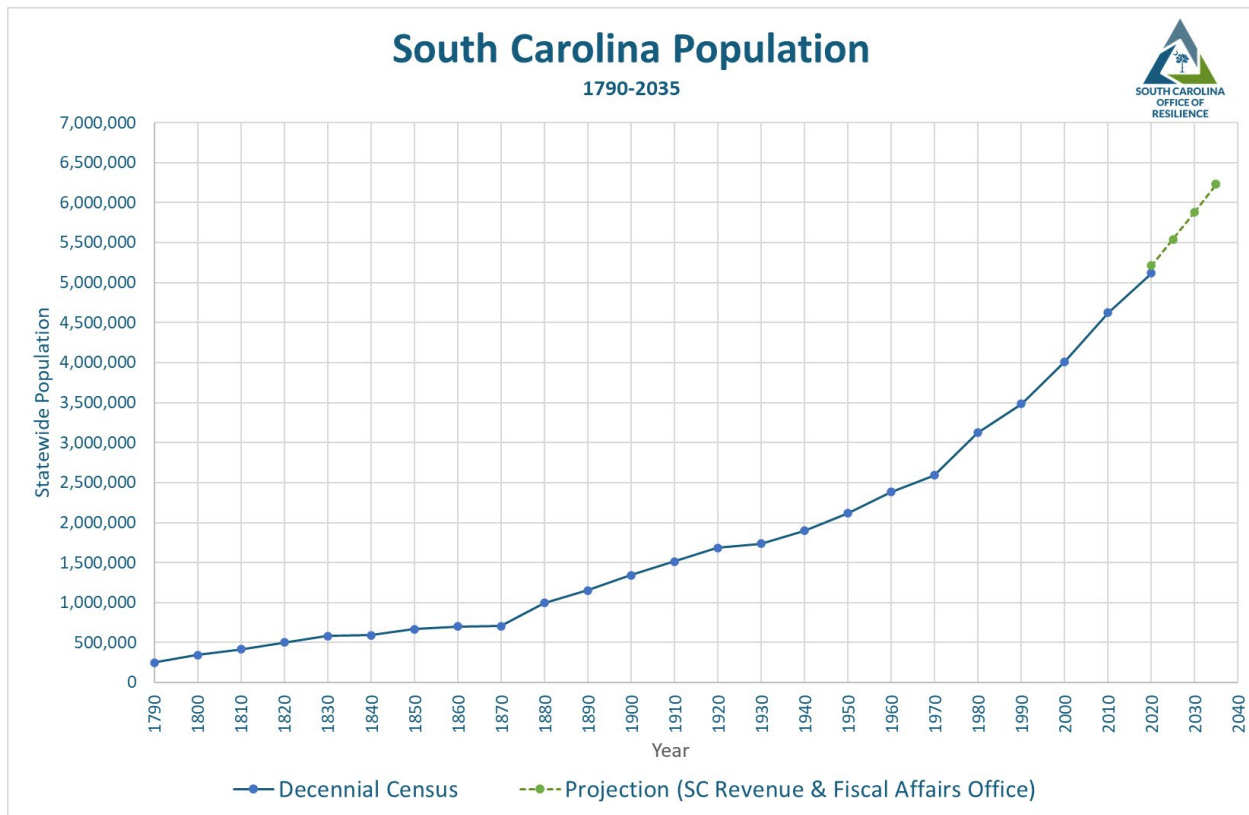
Figure 3.6 South Carolina population (with projections)

RECENT TRENDS IN COUNTY POPULATION

While the overall population of South Carolina is increasing, some counties are seeing explosive growth while others are seeing a steady decline. Knowing where populations are growing and the regional vulnerability to that population is key to keeping the residents of our state informed of the risk and safe from natural hazards. Identifying the location and hazards for growing regions will allow for resilient development and public services to be planned instead of reacting to events. Figure 3.7 shows this trend occurring in the past decade (U.S. Census Bureau, 2021), while Figure 3.8 shows that these trends are projected to continue through 2035 (SC Revenue and Fiscal Affairs Office, 2019). Coastal counties, as well as York and Lancaster Counties, due to the growth of the Charlotte metro area, are expected to see significant growth continue. Meanwhile, Pee Dee & Midlands counties such as Allendale, Bamburg, Williamsburg, Lee, and Marlboro are expected to see dramatic decreases in population.
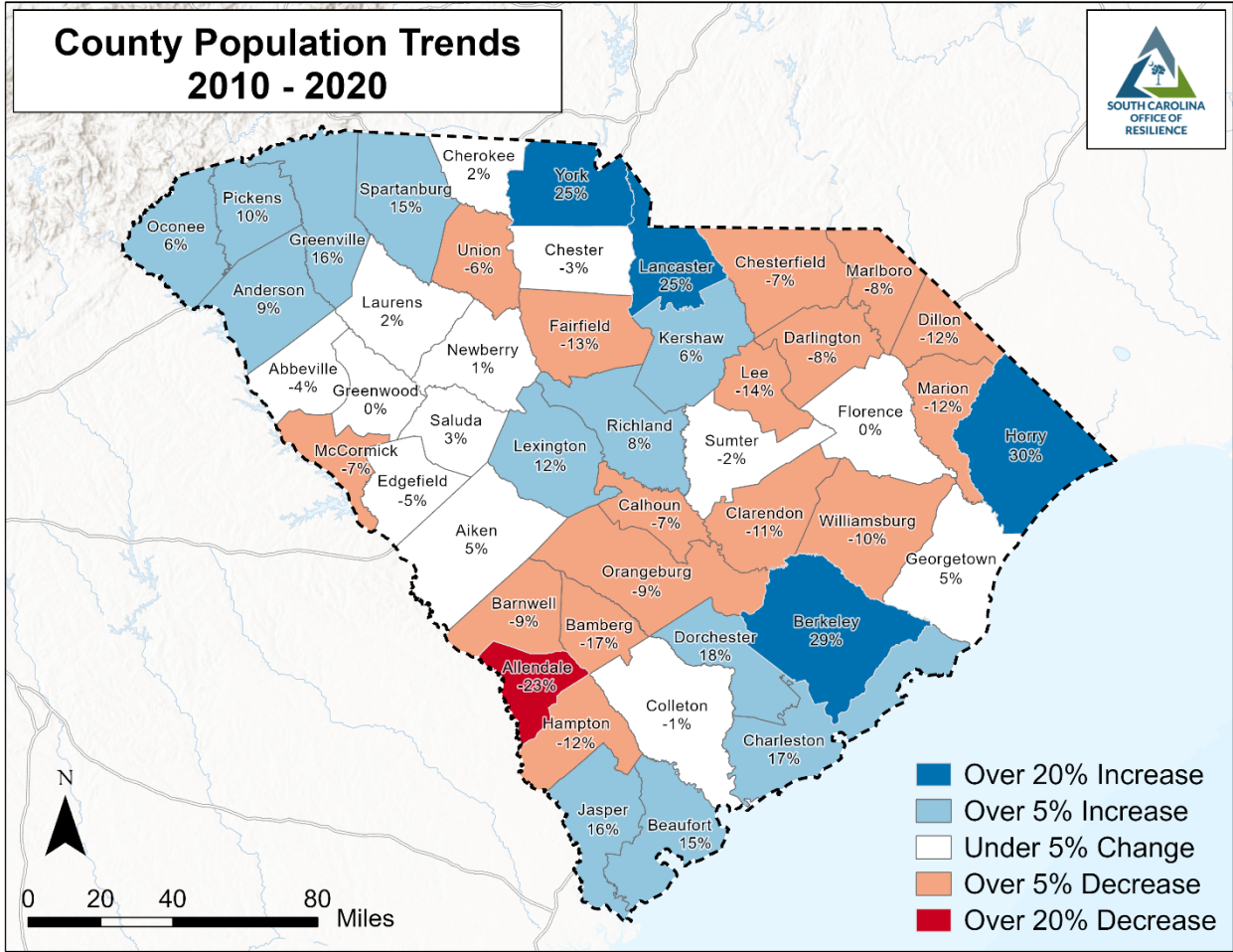
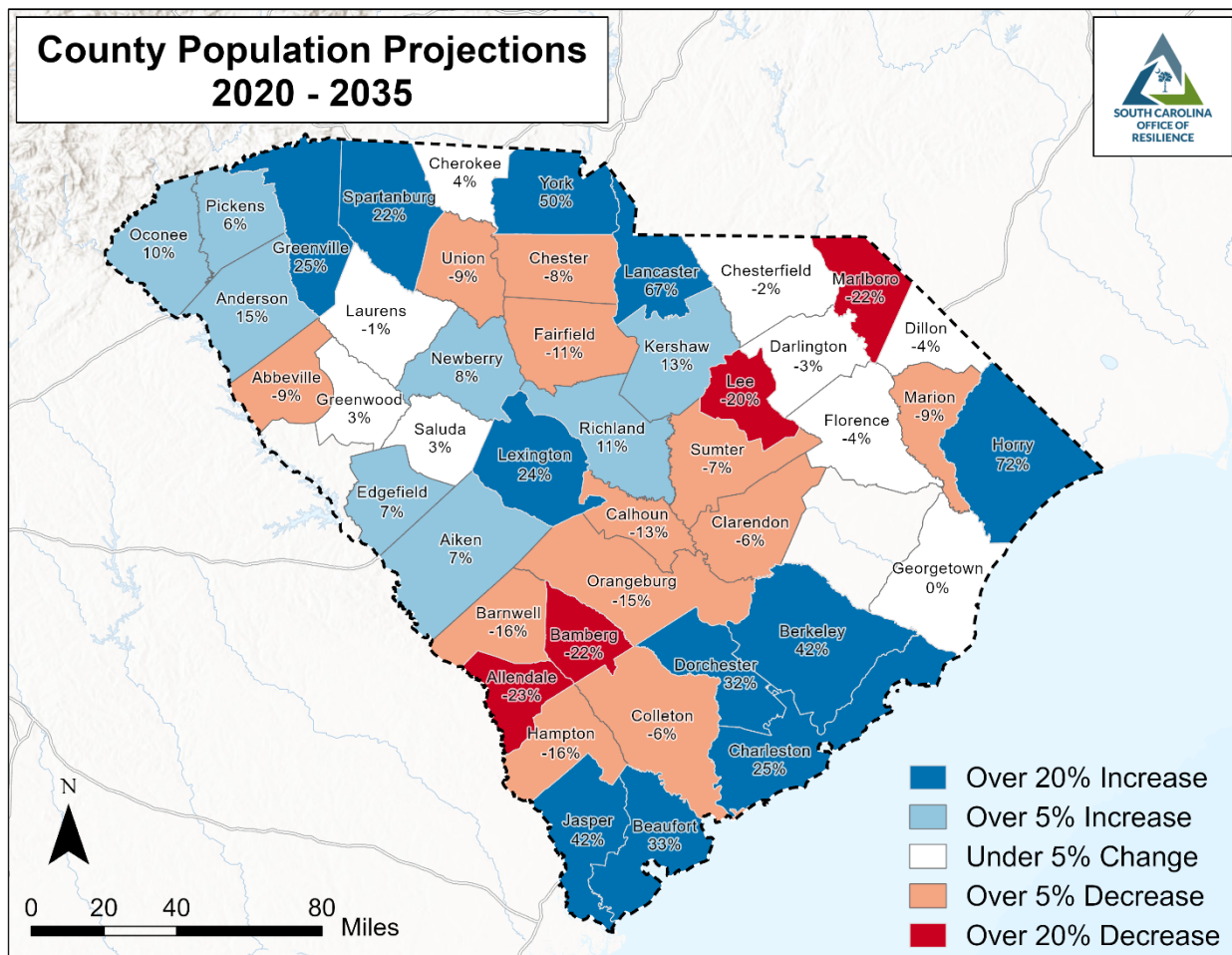Figure 3.7: Population trends for South Carolina from 2010-2020

Figure 3.8: Population projections for South Carolina from 2020-2035

REGIONAL POPULATION TRENDS

Population growth in the State is also regionally disproportionate. South Carolina can be separated into four regions: the Lowcountry and Pee Dee along the coast, and the Midlands and Upstate. Figure 3.9 shows the counties that make up each region. For this analysis, the following counties were included in each region:

1) **Lowcountry:** Allendale, Bamburg, Beaufort, Berkeley, Calhoun, Charleston, Colleton, Dorchester, Hampton, Jasper, and Orangeburg
2) **Pee Dee:** Chesterfield, Marlboro, Dillon, Marion, Horry, Darlington, Florence, Georgetown, Williamsburg, Clarendon, Sumter, Lee
3) **Midlands:** Barnwell, Aiken, Edgefield, Saluda, Lexington, Newberry, Fairfield, Richland, Kershaw, Lancaster, Chester, York
4) **Upstate:** Oconee, Pickens, Greenville, Spartanburg, Cherokee, Union, Laurens, Greenwood, McCormick, Abbeville, Anderson
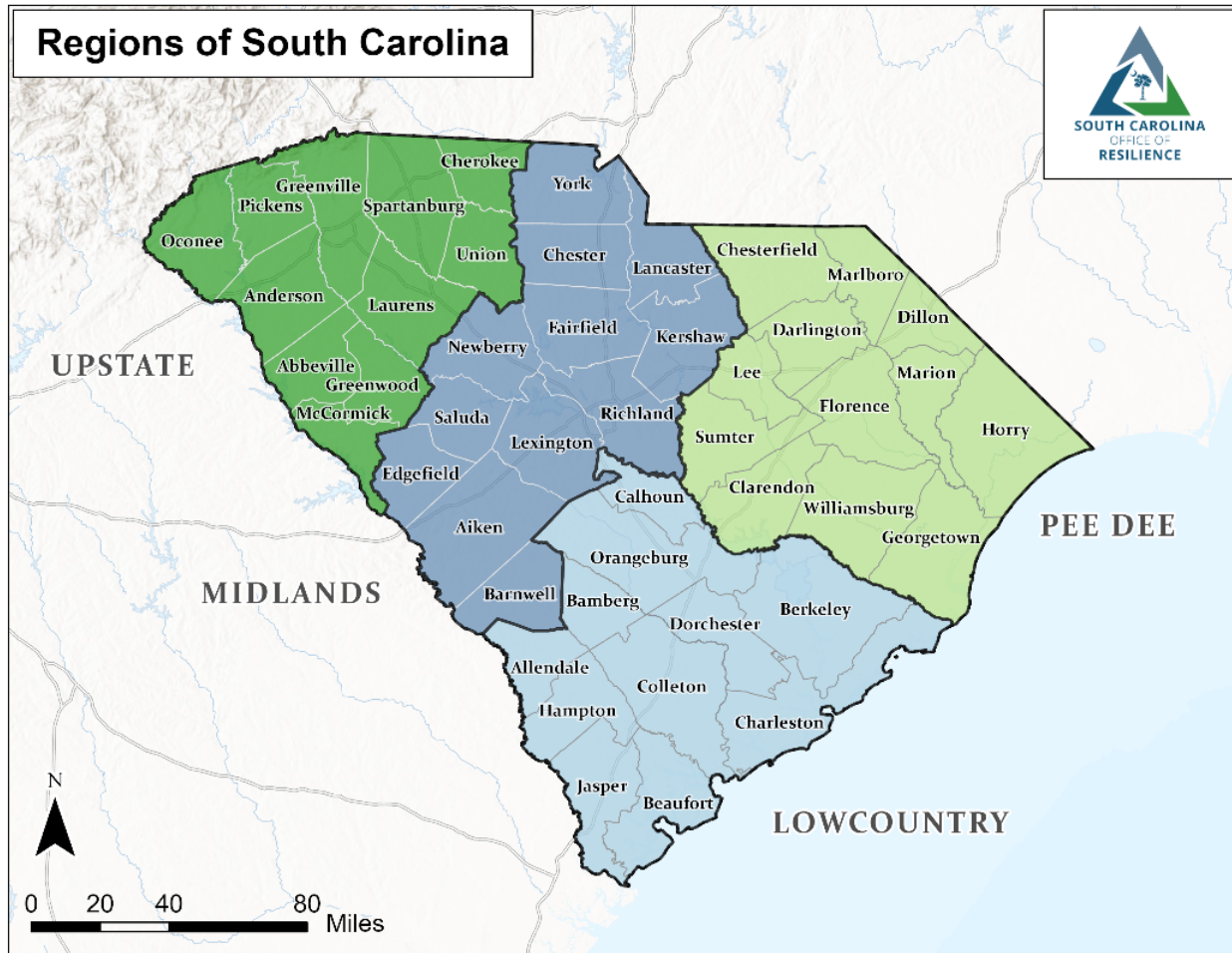
Figure 3.9: SC Regions

In recent years, the state population has shifted across these regions. In 2000, the Upstate and Midlands regions made up a higher percentage of the state population than the coastal regions, with the Lowcountry containing only 16% of the state's population (SC Revenue and Fiscal Affairs Office, 2019). However, by 2035, the Lowcountry is expected to grow to make up 24% of the state population, with other regions making up less of the state population.

UPSTATE COUNTY TRENDS

Many counties of the Upstate have seen rapid growth, especially since the 1990s, and are expected to see this growth accelerate in the next 15 years (Figure 3.10). Greenville is the region's most populous county, with Spartanburg, Anderson, and Pickens also seeing sustained growth. Meanwhile, other counties, such as McCormick, Abbeville and Union are expected to see their populations remain the same, as they have over the past few decades.
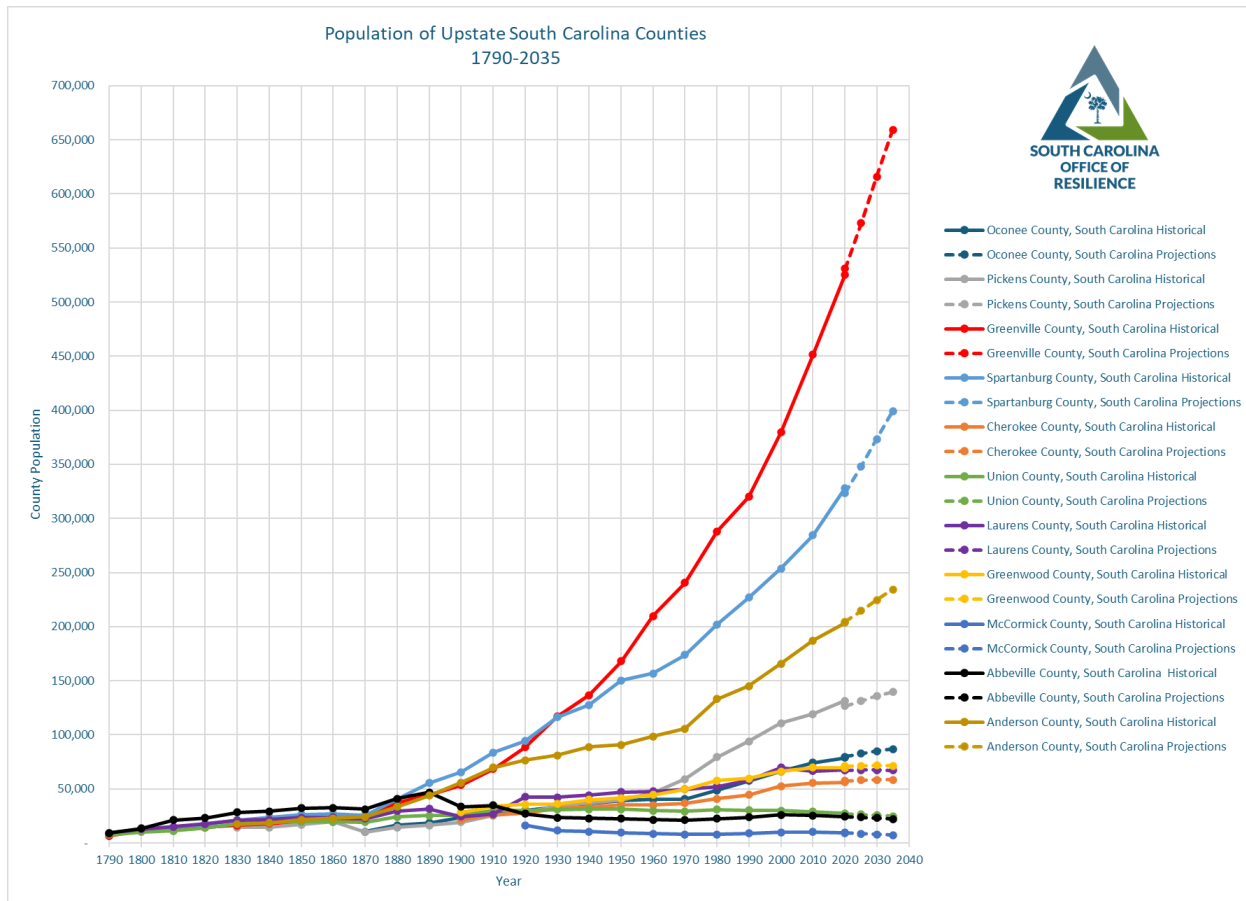

Figure 3.10: Upstate Population, 1790-2035

MIDLANDS COUNTY TRENDS

Population growth in the Midlands has been less linear than the Upstate, but similarly, there are several counties that stand out for their recent growth. Figure 3.11 illustrates significant growth in Richland, York, Lexington and Lancaster counties. Particularly of note is that in the next 15 years, York's population is set to steeply increase, surpassing Lexington to become the region's second most populous county. Other counties, such as Edgefield, Fairfield and Saluda, are expected to see stagnated growth or begin to see a decline in population.
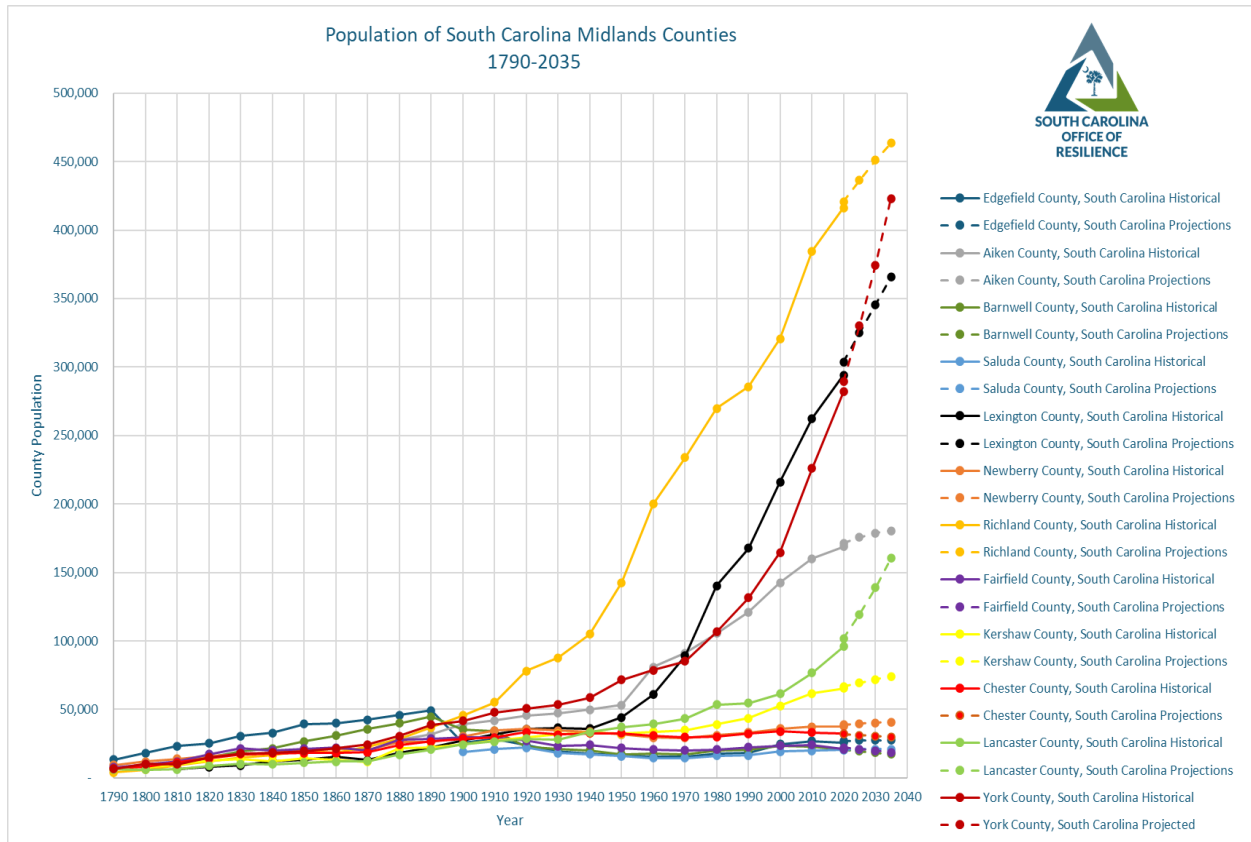

Figure 3.11: Midlands Population, 1790-2035

PEE DEE COUNTY TRENDS

Unlike other regions, the Pee Dee only has one county experiencing rapid growth, Horry County (Figure 3.12). In the 1980's, Horry surpassed Florence as the region's most populous county and has since seen dramatic growth. Other counties in the region, such as Darlington and Sumter, are expected to see their populations begin to decrease.
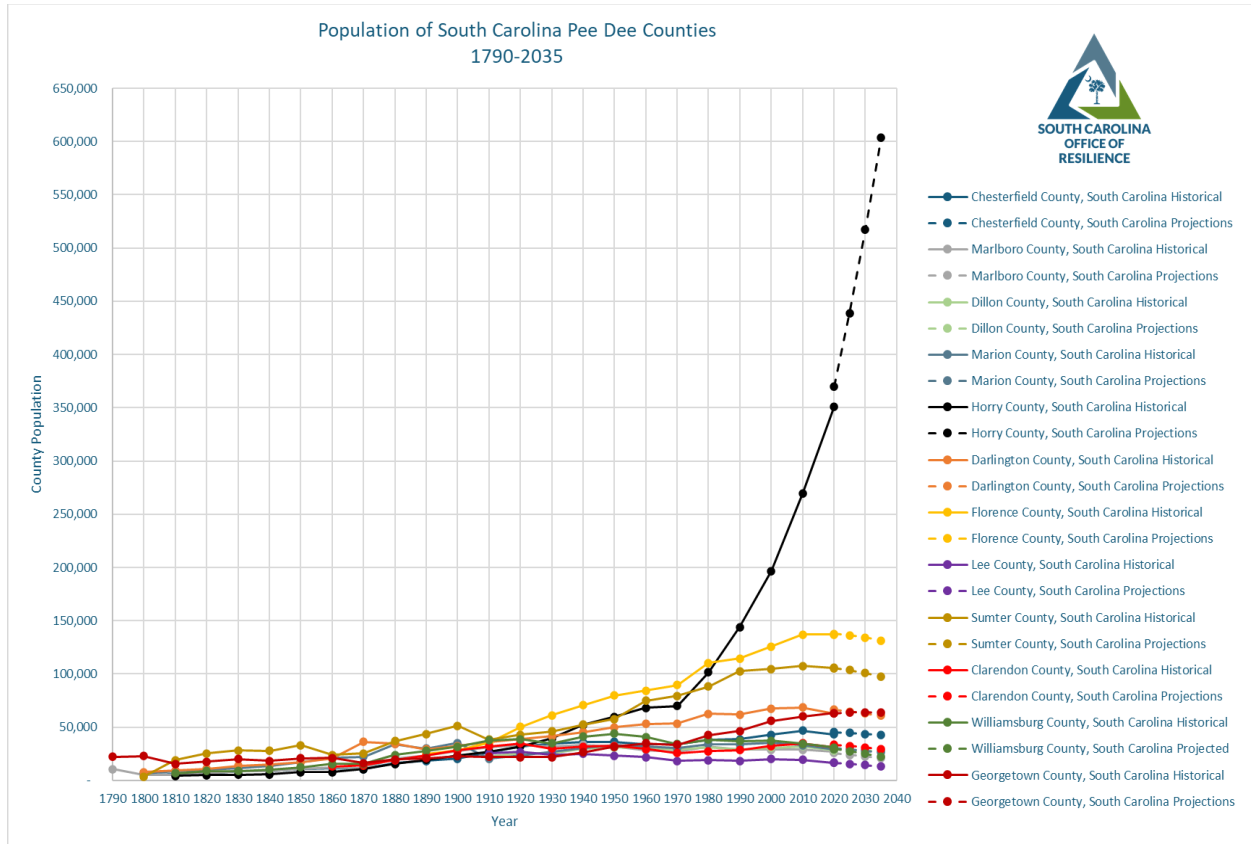

Figure 3.12: Pee Dee Population, 1790-2035

LOWCOUNTRY COUNTY TRENDS

Charleston County is seeing dramatic growth and is expected to see the population hit half a million people by 2035 (Figure 3.13). Charleston is not alone in seeing growth, Berkeley, Dorchester, and Beaufort counties are also seeing continued steep growth. Also of note is that Orangeburg County is expected to see a noticeable decrease in its population.
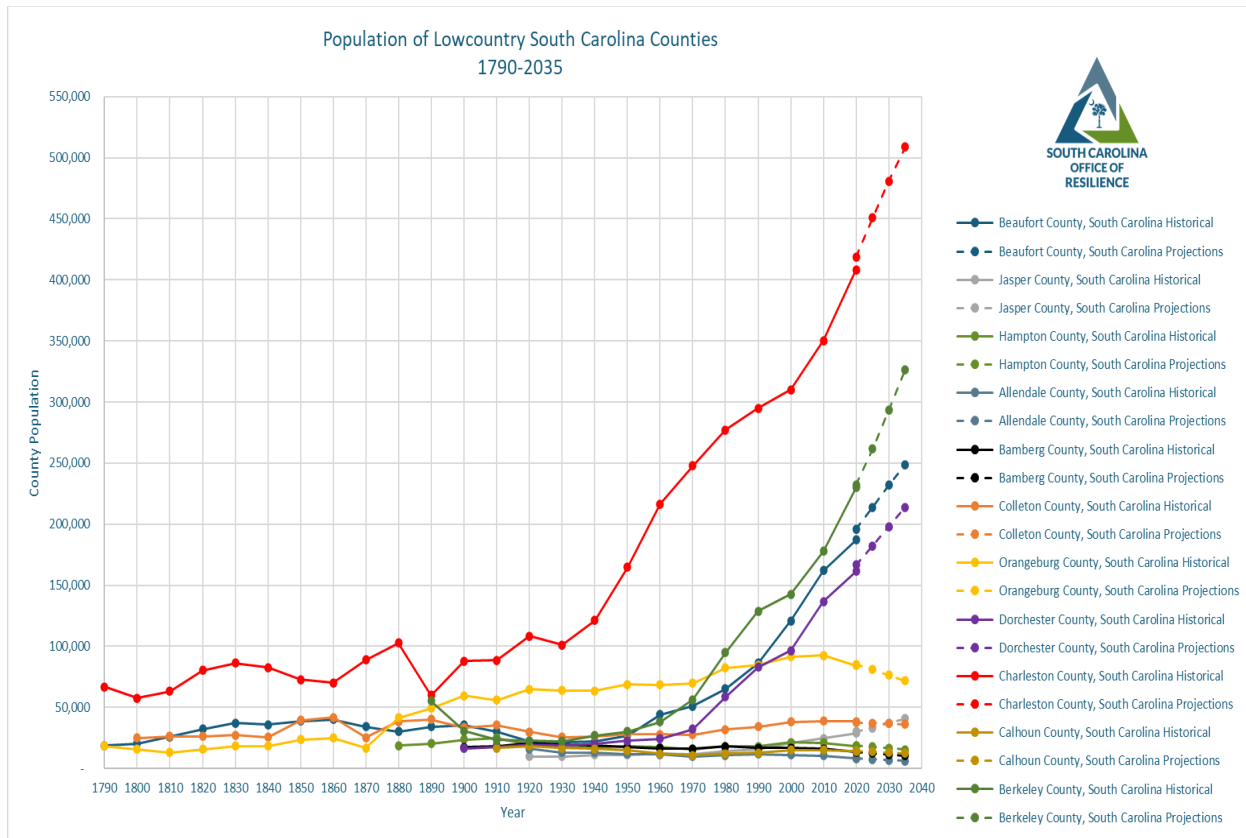

Figure 3.13: Lowcountry Population, 1790-2035

COASTAL POPULATION TRENDS

In considering population growth's role in resilience, it is important to consider population trends in the counties historically most vulnerable to tropical storms and increased flooding due to sea level rise, those counties in the coastal zone: Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry & Jasper (Figure 3.14).
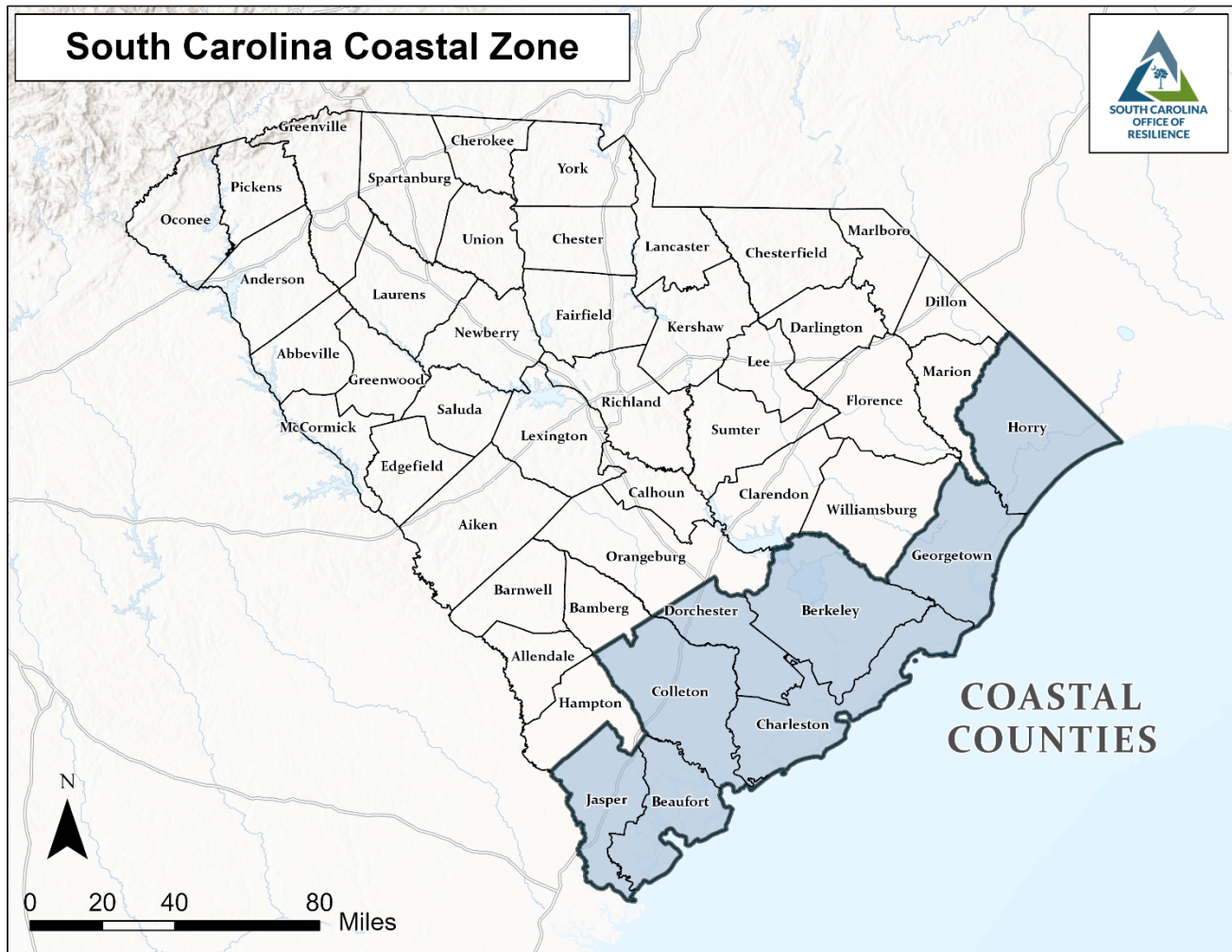

Figure 3.14: Coastal Zone Counties

Population growth in these counties has the potential to put more people in low-lying, vulnerable locations, exposed to coastal flooding and tropical storms. Figure 3.15 shows the share of the state's population living in these counties starting in 1790 and projected through 2035. In 1790, 43% of the state's population lived in these eight coastal counties. This is no surprise, as much of the population was still centered around the original colonial settlements such as Charleston, sustained by strong economic drivers such as the rice industry. As the cotton industry boomed in the upstate, the coastal zone's share of the statewide population decreased to just 15%. However, commercial and tourism growth along the coast has once again caused the share of the state's population living in the coastal

zone to increase to nearly 30% (U.S. Census Bureau, 2021). This increasing trend is projected to continue to 32% by 2035, a level not seen since 1820 (SC Revenue and Fiscal Affairs Office, 2019). However, unlike in the 1820s, this time, 32% of the state's population will be over a million people.
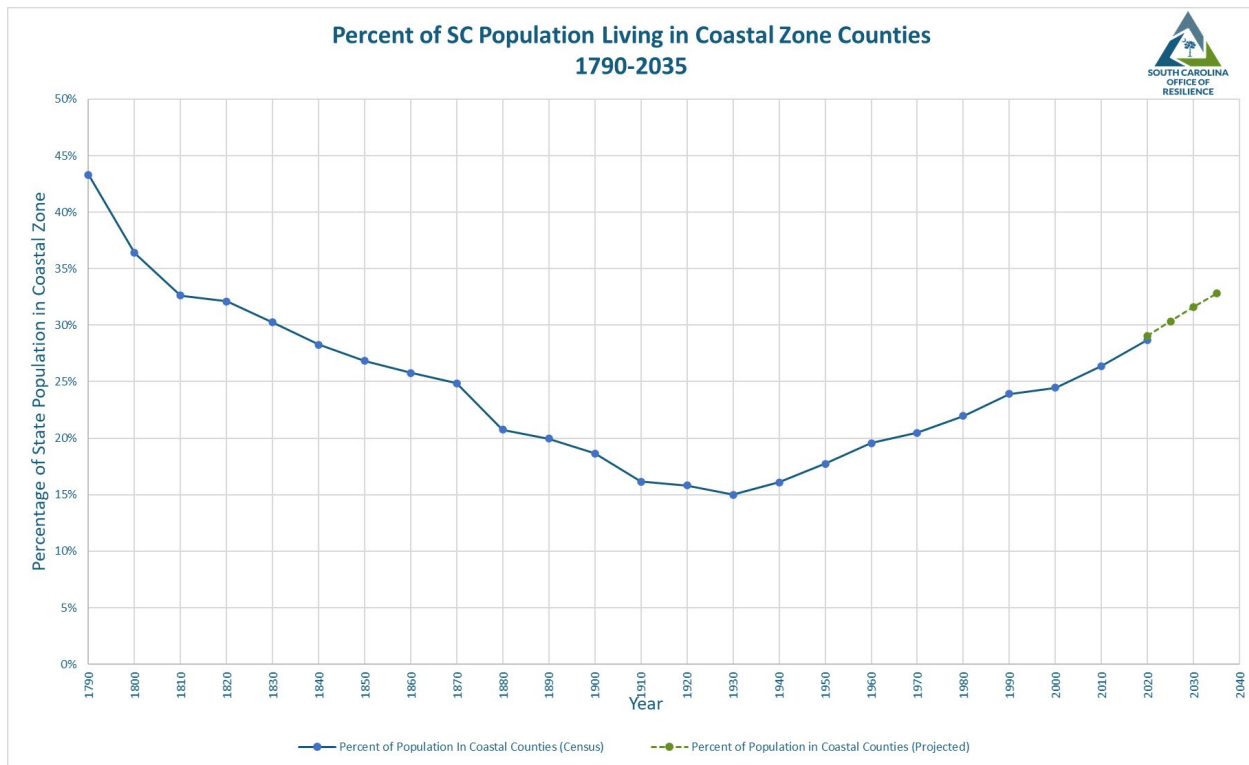

Figure 3.15: Percent of South Carolina Population living in the coastal zone counties 1790-2035 (SC Revenue and Fiscal Affairs Office, 2019; US Census Bureau, 2021)

Figure 3.16 provides a closer look at the population trend in each coastal zone county. Generally, most coastal counties have experienced continual growth since 1790, with some, such as Horry and Charleston County, seeing exponential growth starting in the mid-twentieth century. In looking at the projected growth between 2020 and 2035, Horry County stands out, with expected growth from around 350,000 people to over 600,000 people, surpassing Charleston County, which has historically been the most populous county along the South Carolina coast. The only coastal county expected to see its population decrease in the next 15 years is Colleton (SC Revenue and Fiscal Affairs Office, 2019).
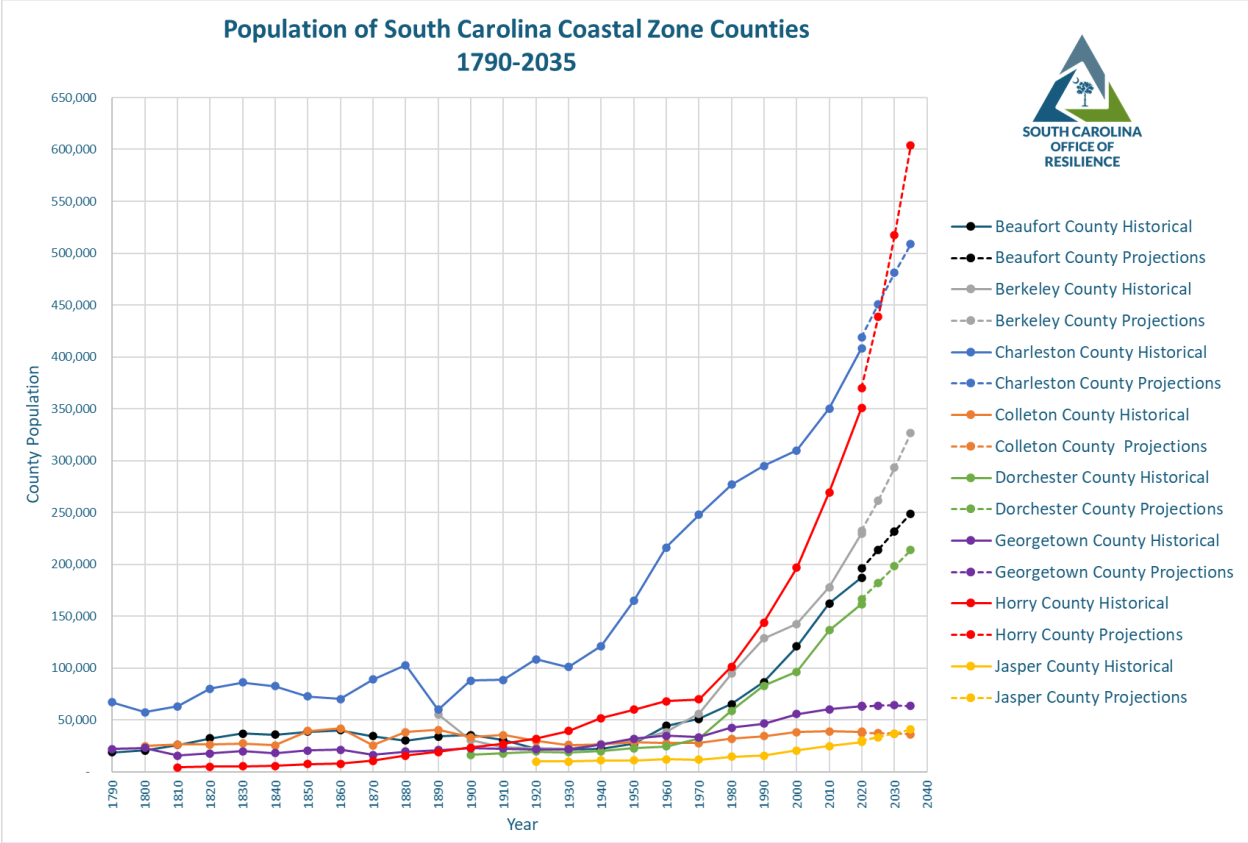
Figure 3.16: Population trends for the coastal zone counties in South Carolina 1790-2035

RURAL V. URBAN POPULATION

Historically, the state has had a mostly rural population, however a recent analysis of 2020 Census data shows that since 2010, South Carolina's rural population has decreased by 2.9% and its urban population has increased by 15.6% (Henderson, 2021). Disasters can result in rural areas further losing their already dwindling population. Studies indicate that "those settlements with populations under 2,500 were nearly three times as likely to experience population losses above 33%, while those exceeding 2,500 residents were over twice as likely to experience population growth during the decade of their destruction." While all communities are different, the article finds rural communities are more likely to lose population if they have already lost essential community components like schools (through consolidation, for instance), grocery stores, and gas stations (Cross, 2014). This supports the idea that "resilience in urban areas is primarily driven by economic capital, whereas community capital is the most important driver of disaster resilience in rural areas" (Cutter, Ash, & Emrich, 2016).

Figure 3.17 shows the U.S. Census Bureau's urban-rural classification, with urban areas representing densely population areas, encompassing residential, commercial and other non-residential urban land uses. This classification is delineated after each decennial census. According to the Bureau, "for the 2020 Census, an urban area will comprise a densely settled core of census blocks that meet minimum housing unit density and/or population density requirements. This includes adjacent territory containing non-residential urban land uses. To qualify as an urban area, the territory identified according to criteria must encompass at least 2,000 housing units or have a population of at least 5,000" (US Census Bureau, 2020).
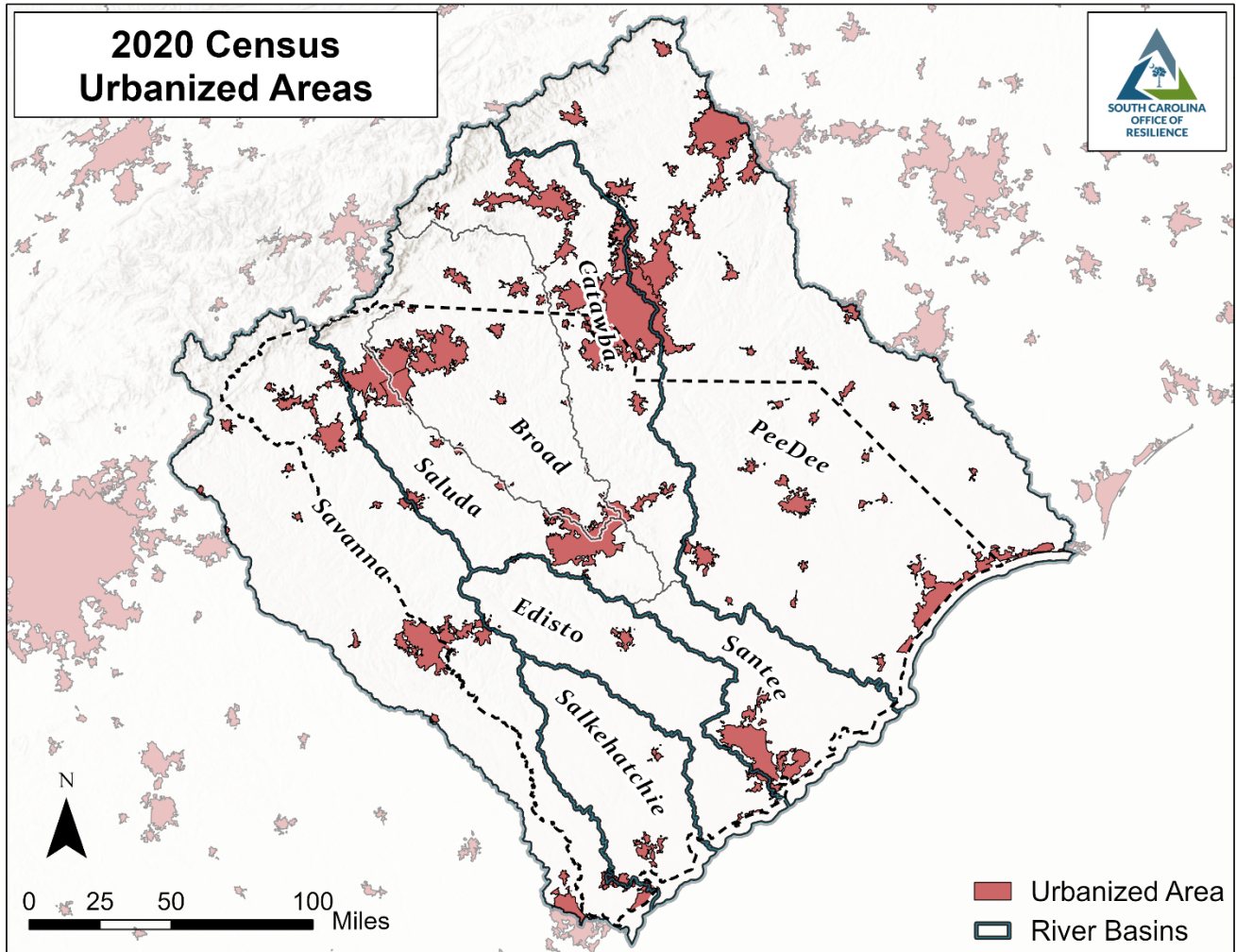
**2020 Census
Urbanized Areas**

Catawba

Broad

PeeDee

Saluda

Savanna

Edisto

Santee

Salkehatchie

N

0   25   50   100
Miles

Urbanized Area
River Basins

SOUTH CAROLINA
OFFICE OF
RESILIENCE

Figure 3.17 2020 Census Urbanized Areas

DEMOGRAPHICS

SOCIAL VULNERABILITY

The sensitivity of this population to natural hazards and its ability to respond to and recover from the impacts of hazards can be described by measuring social vulnerability (Cutter & Finch, 2008). The Social Vulnerability Index (SoVI®), compiled and processed by the Hazards Vulnerability and Resilience Institute at the University of South Carolina (HVRI), measures the social vulnerability of counties in the United States, providing information on "where there is uneven capacity for preparedness and response and where resources might be used most effectively to reduce pre-existing vulnerability" using 29 socioeconomic variables (University of South Carolina, 2022). More information on measuring social vulnerability and its relationship to resilience can be found in Chapter 2.

WEALTH/INCOME

Income is one of the most important determinants of disaster recovery and resilience. Those with lower incomes have less resources to prepare for and recover from a disaster. As seen in Table 5, South Carolina's median income is lower than the national average but has been steadily increasing.

The U.S. Census Bureau calculates the percentage of the population living below the poverty level using income thresholds that vary based on the size of a family and its composition. According to the U.S. Census Bureau ACS 5-year estimates (U.S. Census Bureau, 2020), South Carolina's poverty rate is 14.7%, higher than the national figure of 12.8%. However, there are areas of more concentrated poverty in South Carolina. The following counties have more than 25% of their population below the poverty level: Dillon (30.2%), Marlboro (29.4%), Allendale (28%), Barnwell (27.8%), Williamsburg (26.1%), Lee (25.7%). Table 3.5 below shows median household income and the percentage of population below the poverty level by county.

Table 3.6: Median Household Income and Poverty by County

County	Median Household Income (2020 5-yr)	% Pop Below Poverty Level (2020 5-yr)
United States	**$64,994**	**12.8%**
South Carolina	**$54,864**	**14.7%**
Abbeville	$43,090	17.7%
Aiken	$53,385	13.8%
Allendale	$26,074	28.0%
Anderson	$53,598	13.6%
Bamberg	$42,830	21.0%
Barnwell	$37,572	27.8%
Beaufort	$71,430	9.3%
Berkeley	$65,443	11.9%
Calhoun	$49,844	19.0%
Charleston	$67,182	12.8%
Cherokee	$37,787	17.9%
Chester	$43,985	18.5%
Chesterfield	$41,937	21.2%
Clarendon	$43,881	21.7%
Colleton	$36,748	19.9%
Darlington	$37,141	21.2%
Dillon	$36,429	30.2%
Dorchester	$63,501	12.0%
Edgefield	$52,491	15.2%
Fairfield	$43,861	18.5%
Florence	$49,645	17.4%
Georgetown	$52,488	16.1%
Greenville	$62,422	11.2%
Greenwood	$41,081	19.4%
Hampton	$38,178	17.9%
Horry	$51,570	14.3%
Jasper	$45,924	19.1%
Kershaw	$53,980	15.3%
Lancaster	$65,421	13.2%
Laurens	$44,374	20.4%
Lee	$32,851	25.7%
Lexington	$62,740	11.8%
McCormick	$47,402	15.3%
Marion	$30,791	22.9%
Marlboro	$31,528	29.4%
Newberry	$46,038	17.5%

Oconee	$49,691	15.3%
Orangeburg	$36,802	23.1%
Pickens	$51,032	16.4%
Richland	$54,441	16.5%
Saluda	$43,410	18.4%
Spartanburg	$53,757	14.4%
Sumter	$46,570	18.1%
Union	$41,117	19.9%
Williamsburg	$35,681	26.1%
York	$68,555	9.5%

Source: US Census Bureau 2020 ACS 5-Year Estimates Subject Tables

RACE & ETHNICITY

While the age makeup of the state population is changing, racial diversity has not changed much in recent years. While the state has a larger African American population when compared to the nation as a whole, South Carolina has relatively small populations of other racial groups (Table 3.6). Ethnically, South Carolina is 93.1% non-Hispanic and 6.9% Hispanic.

Table 3.7: Population distribution by race and ethnicity (U.S. Census Bureau, 2021)

	South Carolina	United States
White Alone	63.4%	61.6%
Black or African American Alone	25.0%	12.4%
Asian Alone	1.8%	6%
American Indian & Alaska Native Alone	0.5%	1.1%
Native Hawaiian & Other Pacific Islander alone	0.1%	0.2%
Some Other Race Alone	3.5%	8.4%
Two or More Races	5.8%	10.2%

ENGLISH LANGUAGE ABILITY

Language ability is another characteristic that can make people more vulnerable. Much of the traditional public communication about risk and disaster warnings are given in English only, leading to little-to-no understanding by non-English speakers, or misunderstanding by those with limited English language proficiency. Table 3.8 shows what language people speak at home. Compared to nation as a whole, South Carolina has fewer people who speak a language other than English at home, but that does not diminish the need for multi-language communication. This is particularly important in those counties that have a significantly higher percentage of residents who speak a language other than English at home. For example, in Jasper, 13.8% of those over five years of age speak a language other than English at home (U.S. Census Bureau, 2020).

Table 3.8: Language Spoken at Home, population 5 years and older US Census Bureau 2020 Five-Year Estimates)

	South Carolina	United States
Speak only English	92.6%	78.5%
Speaks Spanish	4.6%	13.2%
Speaks some other language	2.8%	8.3%

AGE

Age is an important factor of individual resilience. From a health and safety standpoint, older adults are more likely to be isolated and have conditions, limitations, and disabilities that make it harder for them to prepare for and recover from disasters (Shih, et al., 2018). Similarly, there are special considerations for young dependent children as well.

When compared to the 2010 Census, the 2020 Census shows that South Carolina's population is getting older. In 2010, 23.4% of residents were under the age of 18, while in 2020, only 21.6% of residents were under 18. In the same period, the state saw a 13.2% increase in the adult population. This is consistent with national trends, showing the nation's young population (under 18) decreasing 1.4% in the last decade while there has been a 10.1% increase in the adult population (U.S. Census Bureau, 2021).

According to the South Carolina Department on Aging (SCDOA), the senior population is expected to double by 2030 to 1.8 million. Additionally, SCDOA reports that 11.5% of our state's seniors live in poverty, with about a third living only on their Social Security income (South Carolina Department on Aging, n.d.).

EMPLOYMENT

Those that are unemployed generally have limited financial resources to recover from a disaster, and many also do not have benefit plans or insurance that would otherwise provide income and healthcare assistance in the case of injury or death (Edgemon, et al., 2020).

The sectors in which employment is concentrated is also important to measuring resilience. Diversified industry and employment in an area allows the overall economy to recover even if certain areas take are adversely impacted.

Table 3.9 below shows how South Carolina's major industries by employment (U.S. Census Bureau, 2020).

Table 3.9: Employment by Industry (U.S. Census Bureau, 2020)

	South Carolina	United States
Agriculture, forestry, fishing and hunting, and mining	0.9%	1.7%
Construction	6.9%	6.7%
Manufacturing	13.4%	10.0%
Wholesale Trade	2.4%	2.5%
Retail Trade	11.8%	11.0%
Transportation & Warehousing, and Utilities	5.3%	5.5%
Information	1.5%	2.0%
Finance & Insurance, real estate & rental & leasing	5.7%	6.6%
Professional, scientific, & management & administrative and waste management services	10.5%	11.7%
Educational services & health care & social assistance	22.1%	23.3%
Arts, entertainment, recreation, accommodation & food services	10.0%	9.4%
Other services, except public administration	5.1%	4.8%
Public administration	4.5%	4.7%

SPECIAL NEEDS POPULATIONS

According to the U.S. Census Bureau, 14.5% of the total civilian noninstitutionalized population of SC has a disability. The U.S. Census Bureau define that a disability "exists where the interaction between individuals; their physical, emotional, and mental health, and their physical and social environment results in limitations of activities and restrictions to full participation at school, at work, at home, or in the community." The figure represents those with serious difficulty with four basic areas of functioning: hearing, vision, cognition, and ambulation (U.S. Census Bureau, 2019). The disability rates in several South Carolina counties are much higher than the state average; For example, in Allendale approximately 27% of the population has a disability (U.S. Census Bureau, 2020).

HEALTH INSURANCE

According to the U.S. Census Bureau, 89.5% of the state civilian population has health insurance coverage. This is slightly lower than the national percentage (91.2%). Health insurance coverage can be vastly different across groups based on age, race, ethnicity, and employment status. Due to government programs such as Medicare and Medicaid, over 95% of children under 19 and 95% of seniors over 65 in South Carolina have health insurance coverage. The age group with the lowest percentage insured is 26-34 (80.4%). Coverage is also vastly different across racial groups. In South Carolina, this is most notable between the "White alone, not Hispanic or Latino", which has an insured rate of 91.6%, and the "Hispanic or Latino of any race" group, with 71.4% insured. One of the largest factors that can influence whether a person has health insurance is their employment status. For the population considered in the labor force, only 60.3% of the unemployed have health insurance (U.S. Census Bureau, 2020).

EDUCATIONAL ATTAINMENT

Educational attainment has an impact on outreach and risk communication as well. It is important to ensure that warnings and other informative materials can be understood by all education levels. After a disaster, assistance processes should be clear and easy to navigate. Table 3.10 shows statewide educational attainment (U.S. Census Bureau, 2020).

Table 3.10 US Census 2020 ACS Five-Year Estimates Educational Attainment (population 25 and over)

	South Carolina	United States
Less than 9th Grade	3.7%	4.9%
9-12th grade, no diploma	8.0%	6.6%
High School Graduate	28.9%	26.7%
Some College, no degree	20.6%	20.3%
Associate's degree	9.9%	8.6%
Bachelor's degree	18.2%	20.2%
Graduate or professional degree	10.8%	12.7%

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