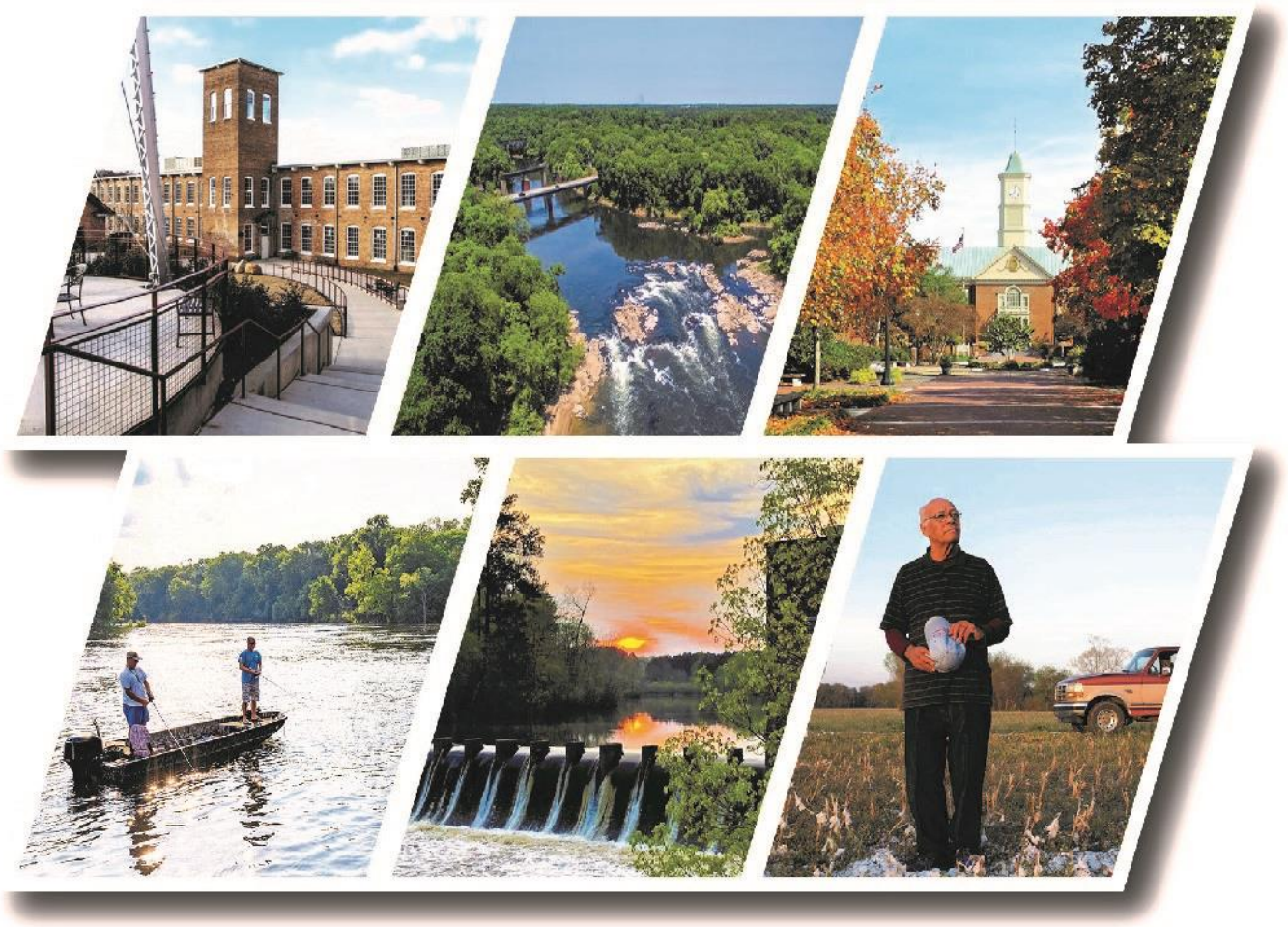
Climate Change and Natural Hazards

VULNERABILITY ASSESSMENT

for the

Upper Coastal Plain Region



December 2022

NC RURAL CENTER

UPPER COASTAL PLAIN COUNCIL OF GOVERNMENTS

NCORR
NORTH CAROLINA OFFICE OF RECOVERY AND RESILIENCY

KLEINFELDER

RISE
Regions Innovating for Strong Economies and Environment

EQUAL HOUSING OPPORTUNITY

DCN RAL22R140993

ACKNOWLEDGEMENTS

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A special thanks to the core team responsible for organizing the stakeholder partnership meetings in the Upper Coastal Plain Region: Andrea Webster, Dawn Daly-Mack, Ben Farmer, Ron Townley, Michael Hicks, and Julia Maron.

LAND ACKNOWLEDGEMENT

We wish to acknowledge and honor the Indigenous communities native to this region and recognize that this vulnerability assessment covers communities and structures that are built on Indigenous homelands and resources. We recognize the Occaneechi, Saponi, Lumbee, Skaruhreh/Tuscarora (North Carolina), Meherrin, Kauwets'a: ka, Chowanoke, and Moratok people as past, present, and future caretakers of this land. We also recognize the unnamed tribes that once oversaw these lands and have since relocated or been displaced.

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ACRONYMS

ACS	American Community Survey
AMI	Area Median Income
BRIC	Building Resilient Infrastructure and Communities
CDBG-DR	Community Development Block Grant – Disaster Recovery
CDBG-MIT	Community Development Block Grant – Mitigation
CDC	Centers for Disease Control
COG	Council of Governments
EAL	Expected Annual Loss
EMS	Emergency Management Services
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
HMP	Hazard Mitigation Plan
HUD	Housing and Urban Development
LEAD	Low-Income Energy Affordability Data
LEED	Leadership in Energy and Environmental Design
NCDC	National Climatic Data Center
NC	North Carolina
NCDEQ	North Carolina Department of Environmental Quality
NCDOT	North Carolina Department of Transportation
NCHPO	North Carolina Historical Preservation Office
NCNHP	North Carolina Natural Heritage Program
NCORR	North Carolina Office of Recovery and Resiliency
NHIS	National Health Interview Survey
NRHP	National Register of Historic Places
NRI	National Risk Index
PRI	Priority Risk Index
QCEW	Quarterly Census of Employment and Wages
RAPT	Resilience Analysis and Planning Tool
RCRA	Resource Conservation and Recovery Act
RISE	Regions Innovating for Strong Economies and Environment Program
ROW	Right-of-Way
SNAP	Supplemental Nutrition Assistance Program

SVI	Social Vulnerability Index
TMDL	Total Daily Maximum Load
TRI	Toxic Release Inventory
UCP	Upper Coastal Plain
WRAP	Wildfire Risk Assessment Portal
WUI	Wildland Urban Interface

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June 14, 2022

Dear Upper Coastal Plain region stakeholders, partners, and residents:

The Upper Coastal Plain region, strategically located equidistant between Miami and Maine, is full of diverse, welcoming, and historic communities each abundant with natural beauty, cultural heritage, and economic opportunity. Yet, not unlike our neighboring regions across eastern North Carolina, we are threatened by an increased risk of natural disasters such as flooding, drought, wildfire, extreme heat, hurricanes, severe weather, and more. We must work together to respond to, prevent, and prepare for these threats to ensure they do not lower our region's quality of life overall. Many of these impacts can be avoided.

In response to this tall order and in light of these challenges, our goal for the Upper Coastal Plain region is to take action to strengthen our resilience. This work includes reducing the immediate and long-lasting risks that natural and climate disasters pose for people, property, infrastructure, and natural resources. The Upper Coastal Plain Vulnerability Assessment uses a rigorous technical analysis combined with local knowledge to outline the major gaps in our region's preparedness for future natural hazards, climate events, and their impacts. Along with our Comprehensive Economic Development Strategy, it serves as an implementable framework that will guide a broad spectrum of stakeholders, including you, towards a more resilient and prosperous future for our region.

This Vulnerability Assessment is the result of numerous meetings with residents, elected officials, local leaders, the North Carolina Office of Recovery and Resiliency, North Carolina Rural Center, and Kleinfelder along with Upper Coastal Plain Council of Government staff. At a minimum, this report will be used to identify 10 resilience projects across the five Upper Coastal Plain counties. However, it is available for any use by the public, including the development of independent resilience efforts and grant applications. Such a use is strongly encouraged by the Upper Coastal Plain Council of Governments.

As you read through this review of our region's susceptibility to climate impacts, I hope you will think about ways you can prepare neighborhoods, communities, and the region. Please reach out to me or our Planning & Development Services staff if we can support your resiliency effort.

Sincerely,

Robert C. Hiett
Executive Director

1.0 Executive Summary

Over the next 30 years, the Upper Coastal Plain region must adapt to changing climate conditions. In the Coastal Plain region, climate scientists project that heavy rainfall and flooding will increase, severe weather will intensify, the number of very hot days will increase, and drought and wildfire will become more common occurrences. The region will also continue to face other hazards, such as high winds and ice storms. Proactive measures to build resilience are crucial because inaction may lead to serious consequences that threaten residents' health and livelihoods, along with communities, buildings, the local economy, and environment throughout the Upper Coastal Plain region.

To address these concerns, the Upper Coastal Plain region participated in the Regions Innovating for Strong Economies and Environment (RISE) program administered by the North Carolina Office of Recovery and Resiliency (NCORR). The RISE program helps advance resilience efforts in North Carolina by supporting multi-county vulnerability assessments and regional solutions that reduce risks from climate change and natural hazards. NCORR established the program in partnership with North Carolina Rural Center, the Upper Coastal Plain Council of Governments, and Kleinfelder, Inc.

1.1 Vulnerability Assessment Methodology

This Vulnerability Assessment provides a comprehensive analysis of the potential impacts of climate change and natural hazards in the Upper Coastal Plain region. It positions the Upper Coastal Plain region to prioritize its efforts to build resilience, based on the best available technical analysis and stakeholder input. It points to common challenges across local communities, challenges that may benefit from local- and regional-scale solutions. The main components of the vulnerability assessment include an analysis of natural hazards, risk and vulnerabilities, impacts across housing, health, the economy, and other sectors, and a brief identification of opportunities and next steps for increasing resilience in the context of natural hazards and climate change.

Review of Literature and Data

The project team gathered relevant content and data through existing reports and planning documents to identify key information about the region. NCORR provided the project team with a

compilation of reports to review for observed and projected changes related to climate hazards, such as heavy precipitation events, droughts, hurricanes, wind, and extreme temperatures. Additional data sources provided information related to socially vulnerable populations, floodplain extent, and natural environmental systems. A sample of reviewed plans is listed in the box (right) and a full list of sources can be found in 9.0 References.

Reports Included in the Literature Review

- Nash Edgecombe Wilson Regional Hazard Mitigation Plan (2020)
- Northampton Halifax Regional Hazard Mitigation Plan (2021)
- Hurricane Matthew Resilient Redevelopment Plans for Edgecombe, Halifax, Nash, Northampton, and Wilson Counties (2017)
- North Carolina Climate Science Report (2020)
- North Carolina Climate Risk Assessment and Resilience Plan (2020)
- Relevant County Plans (Comprehensive Economic Development Strategy, Land Use Plans, etc.)

Stakeholder and Public Engagement

Local knowledge and expertise were critical to developing the vulnerability assessment. The project team held monthly Stakeholder Partnership meetings from January through November 2022. The Stakeholder Partnership was comprised of individuals living or working in all five counties (Edgecombe, Halifax, Nash, Northampton, and Wilson) of the Upper Coastal Plain region and was open to anyone that wanted to participate. A local facilitator hired by NC Rural Center, the Upper Coastal Plain Council of Governments (COG), Kleinfelder, Inc., and the North Carolina Office of Recovery and Resilience (NCORR) jointly led these meetings.

Organizations Represented on the Upper Coastal Plain Stakeholder Partnership

- Edgecombe County Emergency Services
- Halifax County Emergency Management
- Nash County Emergency Management
- Northampton County Emergency Management
- Wilson County Emergency Management
- Town of Princeville
- Town of Tarboro
- Town of Nashville
- City of Wilson
- Nash County Economic Development
- Peanut Belt RPO
- Upper Coastal Plain RPO
- A Better Chance A Better Community (ABC2)
- Freedom Org

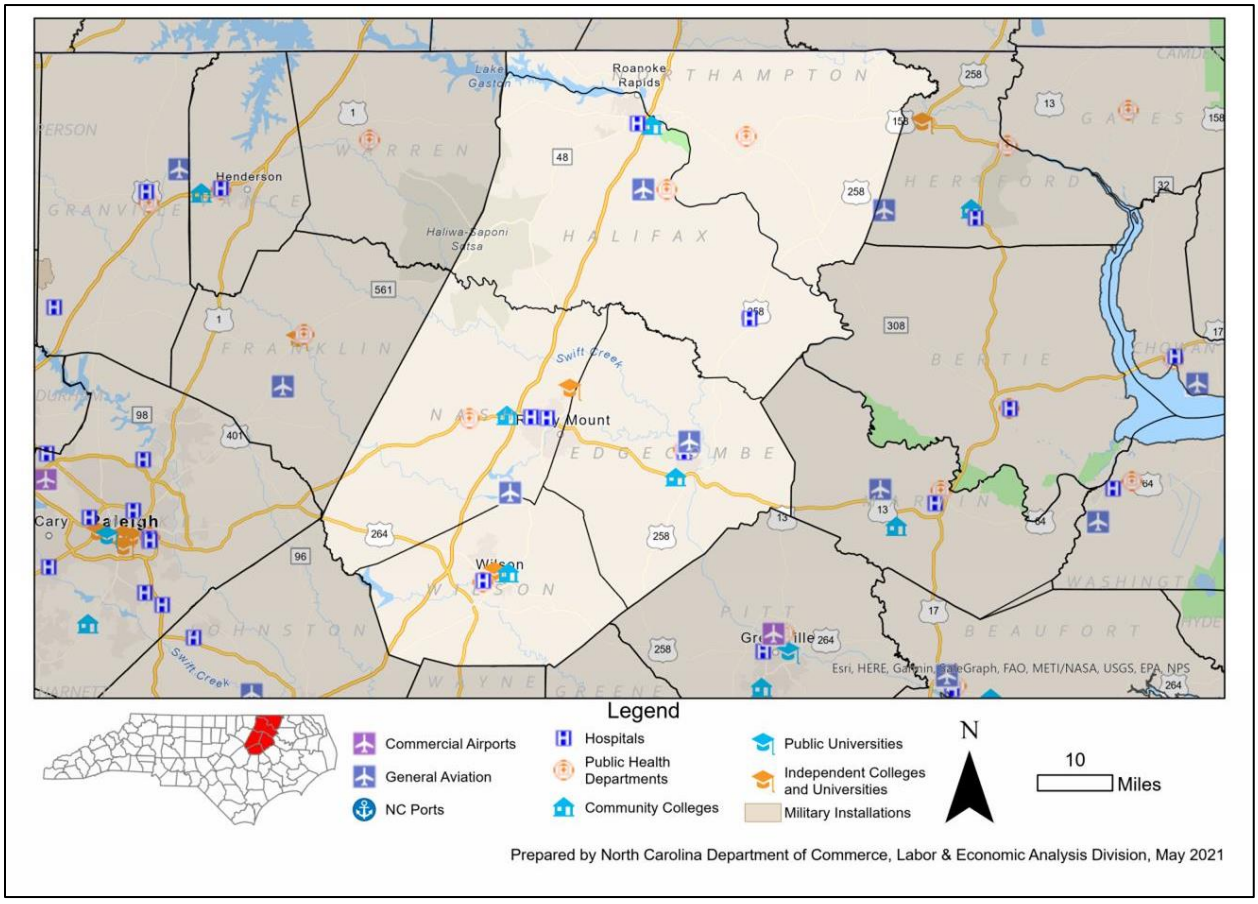
Two virtual public open house meetings were held in April 2022 to facilitate discussion about known vulnerabilities and personal experience with climate hazards. During Stakeholder Meetings, the project team

utilized a variety of engagement strategies, such as live polling, virtual collaboration using Google Jamboard, asynchronous surveys, and facilitated breakout discussions. Additional information related to project efforts was hosted on the Building Resiliency in the Upper Coastal Plain Region StoryMap for stakeholders and others interested in the RISE program to interact with. All of the stakeholders who participated in one or more of the monthly meetings contributed valuable insight on the strengths, weaknesses, and opportunities for the region and provided guidance in developing the Vulnerability Assessment. Stakeholders described issues in specific locations (e.g., streets, neighborhoods, creeks, etc.) and offered information related to previous and ongoing efforts to address some of the challenges the region faces from climate hazards.

1.1.1 The Upper Coastal Plain Region

The Upper Coastal Plain region, shown in **Figure 1**, is situated in northeastern North Carolina and touches the border of southern Virginia. Characterized by water bodies and large open tracts

Figure 1 - Upper Coastal Plain Five-County Region



Source: North Carolina Department of Commerce, Labor & Economic Analysis Division

of undeveloped land, the natural resources within the region, like Lake Gaston and the Roanoke and Tar Rivers, provide plentiful opportunities for residents. Land uses range from rural residential development, agriculture, recreation, forestland, and urban/suburban development in and around the larger towns. Most of the region is suburban and rural - the way most residents want to keep it, but certain areas of Nash and Wilson counties are experiencing residential growth due to proximity to the Raleigh metropolitan area. Vulnerabilities of the region include aging or inadequate infrastructure, slow growth-related issues (e.g., economic activity and employment), vulnerable populations, and limited resources. These challenges are likely to exacerbate the impacts of climate change. Programs such as RISE position communities to plan for climate change as a unified region with the same goals because climate change and natural hazards don't stop at political boundaries. Participation in RISE aims to create a more resilient region that can withstand the impacts of natural hazards while preserving its character and addressing its challenges.

1.2 Summary of Findings

1.2.1 Regional Strengths and Challenges

The Upper Coastal Plain has many strengths and challenges that impact its ability to deal with natural hazards that are made worse by climate change. The region's strengths include natural resources and ecosystems that manage flood waters, allow for an agricultural economy, and provide sanctuary for wildlife and drinking water sources, among other benefits. The region also has a comprehensive network of roads and other modes of transportation to support evacuation routes during emergencies. Furthermore, with nine higher education institutions and nearby military operations, residents have access to learning opportunities, technical support, and military support during recovery efforts from catastrophic events.

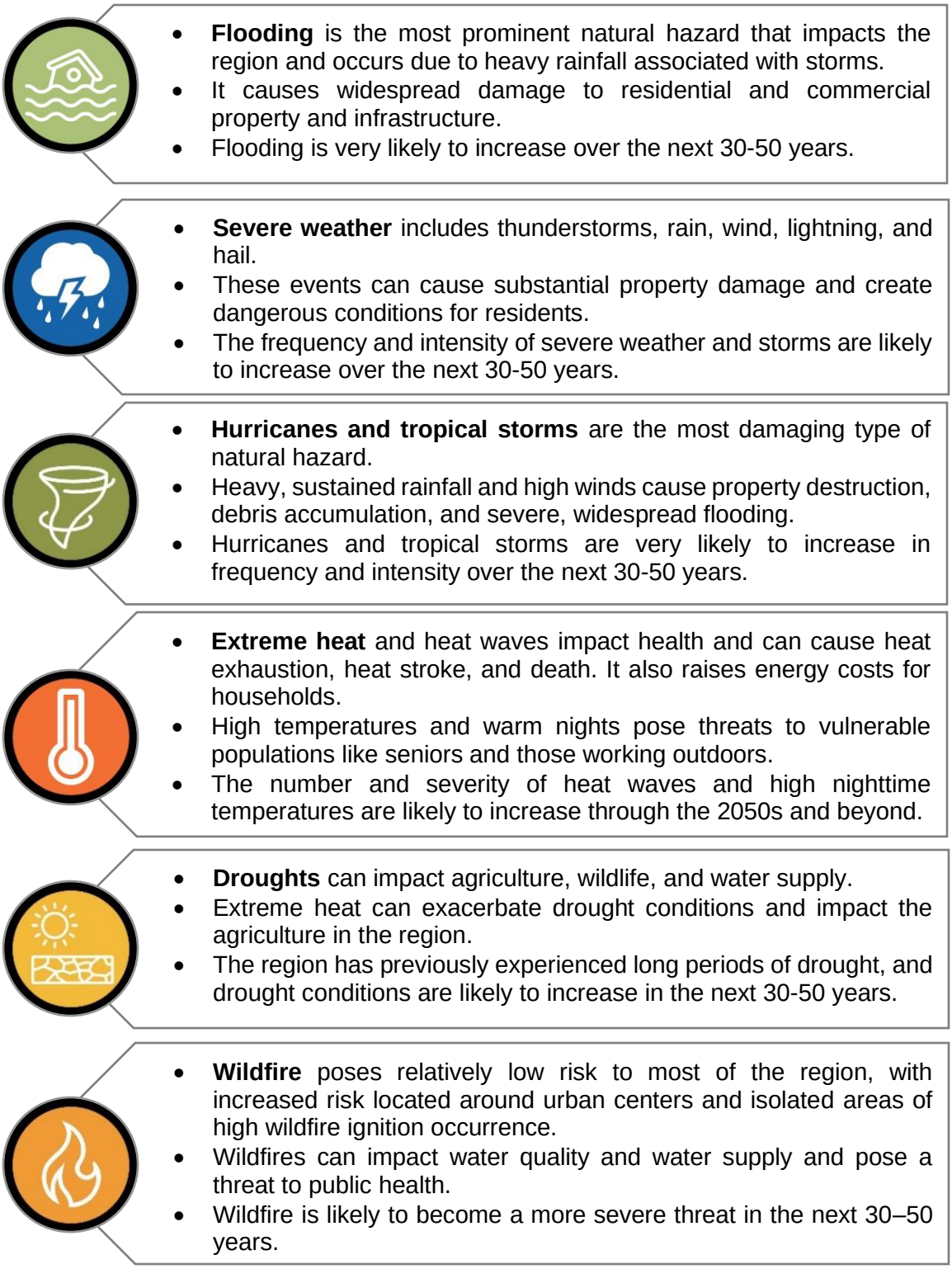
Many challenges in the Upper Coastal Plain make it hard for the region to increase its resilience to the impacts of climate change. Because of the labor and workforce mismatch, with high unemployment rates and a lack of skilled and available personnel in local governments and other sectors, many families have a hard time meeting their basic needs, let alone preparing for disasters. Additionally, despite visible stormwater management needs, local governments are wary of making needed investments because they cannot control water coming from outside their jurisdictional boundaries. Broadband and wireless communication services continue to be a

critical challenge, like in other parts of rural North Carolina. Furthermore, housing affordability and availability are significant stressors for the region. Many individuals are still displaced from Hurricanes Matthew and Florence. Public shelters are inadequately dispersed throughout the region and are often incapable of supporting those in need due to capacity and utility constraints. In the past, the region has been overwhelmed by evacuees from the North Carolina coast, leading to additional strains on shelter capacities. Finally, the rural nature of the region often makes it difficult for emergency service personnel to respond in a timely manner to vulnerable residents living in remote areas.

1.2.2 Natural Hazards

Based on research from scientific reports, regional planning documents, and localized knowledge obtained from the Stakeholder Partnership, the most prominent, high-impact climate hazards in the Upper Coastal Plain region today are flooding, hurricanes and tropical storms, and severe weather, specifically heavy rainfall, and winds. Extreme heat, heavy rain events, drought, winter storms, and wildfire are projected to occur more frequently by the 2050s and beyond. This vulnerability assessment explores these climate hazards and explains present-day and future risks for the region and impacts to the population, resources, buildings, and environment. Summary points for each hazard of concern are shown in **Figure 2** below.

Figure 2 - Hazard Impacts to the Upper Coastal Plain Region



1.2.3 Sector Impacts

As the hazards described above grow in strength and number of occurrences, the region can expect impacts to housing, critical facilities, the regional economy, historical and cultural resources, natural environmental systems, public health, and vulnerable individuals to get worse. The Upper Coastal Plain region's most significant vulnerabilities are illustrated in the graphics below.

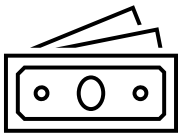
Housing

	• The housing stock in the Upper Coastal Plain region is particularly vulnerable because of the number of aging homes, mobile homes, and inefficient heating/cooling systems. Electric bills during the summer months are more than the monthly rent for some families. • Mobile and manufactured homes are also vulnerable as they may be less structurally capable of withstanding high winds and hurricanes. • Over 3,000 homes across the region lie in the 100-year or 500-year floodplain, mostly in Edgecombe and Nash counties. • The Upper Coastal Plain region is particularly vulnerable to drought given the prevalence of homes that rely on private wells for drinking water, and drought conditions are likely to increase by the 2050s.

Critical Facilities

- Critical facilities are susceptible to severe weather and flooding that cause business, school, and road closures; downed trees and powerlines; and structural damage.
- Many **houses of worship** act as last resort shelters during natural hazards and don't have the same resources as established shelters.
- There are currently **four** major critical facilities located in the 100-year floodplain – 1) Stoney Creek Fire & Rescue Department - Station 3 in Nash County, and 2) O.R. Pope Elementary School (used as emergency shelter), 3) Conetoe Volunteer Fire & Emergency Medical Services, and 4) Pattillo Middle School in Edgecombe County.
- There are **eight** major critical facilities located in the 500-year floodplain – 5 in Edgecombe County and 3 in Halifax County.

Regional Economy



- Flooding from hurricanes, tropical storms, and severe weather is the most significant hazard to the regional economy. Relatedly, residents report frequent power outages when it rains, which affects operations for businesses.
- Disruption to the supply chain, logisitics, and transportation routes caused by hazards like flooding, hurricanes, tropical storms, and severe weather can affect the manufacturing industry and regional economy.
- The Upper Coastal Plain region is particularly vulnerable to drought given the regional importance of agriculture.

Historical and Cultural Resources

- Flooding poses the most significant climate risk to historical and cultural resources because it is difficult to physically move these resources.
- 27 of the 158 sites on the National Register of Historic Places are in the 100-year floodplain.
- Archival records stored in government buildings are often impacted by flooding.

Natural Environmental Systems

- Conservation areas and natural and working lands can provide resilience to natural hazards, often buffering communities from disaster impacts.
- Wetlands, agriculture, and forests are key resources in the region to aid in resilience and should be given protection from development.
- Six species listed as endangered, threatened, or of special concern are found in **all five** counties and may be vulnerable to climate impacts that permanently change their habitat, such as higher temperatures.

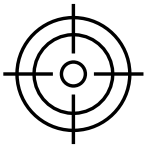
Public Health

- Physical and mental health can be directly impacted by natural hazards, particularly hurricanes, tropical storms, flooding, and extreme heat.
- Edgecombe, Halifax, and Northampton counties have the highest percentage of adults that report fair or poor physical or mental health.
- Elderly persons and persons with disability are more vulnerable to natural hazards.
- Natural hazards can impact drinking water quality and supply, directly affecting public health.
- Heat-related illnesses are common during extreme heat events and are the result of the body's decreased ability to cool itself.

Social Vulnerability

- Social vulnerabilities are the individual characteristics that make it harder for a person to withstand and quickly recover from natural hazards and other stresses.
- Edgecombe and Halifax counties have high overall social vulnerability and may be affected by natural hazards more than other parts of the region.
- The region is considered highly vulnerable because of household compostition and disability, meaning there are high proportations of elderly, youth, single-parent households, and residents living with a disability.
- Northampton County has the highest percentage (27%) of elderly persons who are more likely to experience harm from natural hazards.

Hot Spots

	• Census Tract 209 southeast of Princeville in Edgecombe County, Tracts 9301 and 9304 around Weldon and south of Roanoke Rapids near the Halifax Regional Medical Center in Halifax County, Tract 104 around the western portion of Rocky Mount in Nash County, and Tract 7 in the eastern part of the City of Wilson in Wilson County are climate hazard hot spots. These locations are within proximity to the 100-year floodplain, have a greater number of high heat days, have more impervious surface area, and have a greater number of mobile homes and nursing homes compared to other areas in the region.

1.3 Next Steps

Now that this Vulnerability Assessment has provided an analysis of the potential impacts of climate change in the Upper Coastal Plain region, the region is ready to prioritize efforts to build resilience. Using this document and stakeholder input, the project team will identify five to 10 regional-scale solutions and develop an implementation pathway for each strategy. The pathways will provide clarity of purpose, identify aligned funding opportunities, and outline a direct path for implementation. The Climate Resilience Projects for the Upper Coastal Plain Region can be found here **(link).**

2.0 North Carolina Office of Recovery and Resiliency (NCORR) Overview

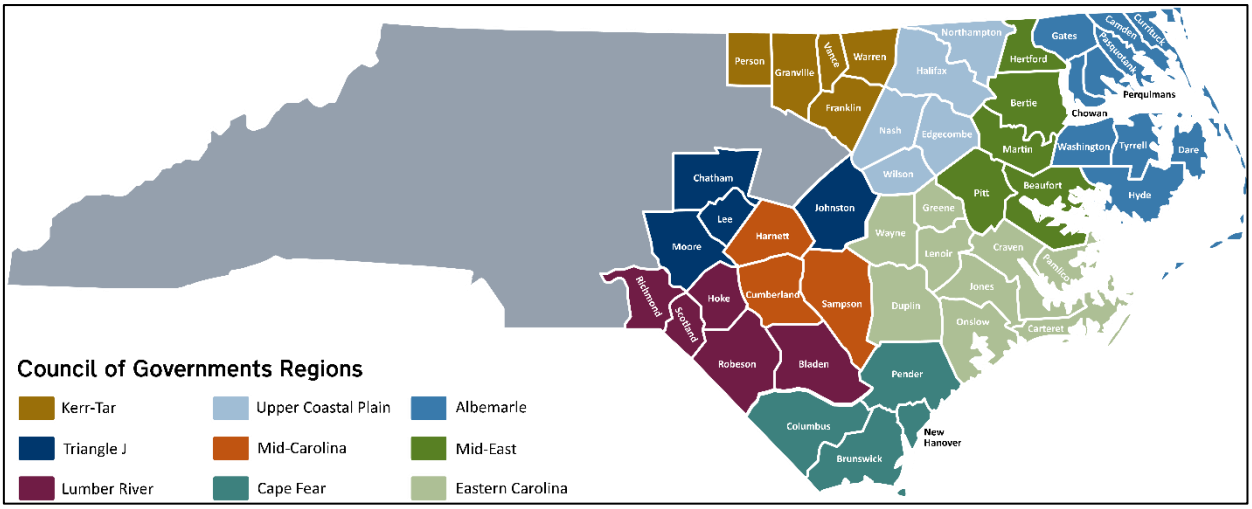
2.1 About NCORR

In the wake of Hurricane Florence in 2018, the State of North Carolina established the Office of Recovery and Resiliency (NCORR) to lead the state's efforts in rebuilding smarter and stronger. At that time, eastern North Carolina communities were still recovering from Hurricane Matthew in 2016. NCORR manages a billion dollars in U.S. Department of Housing and Urban Development (HUD) funding in two grant types, Community Development Block Grant – Disaster Recovery (CDBG-DR) funds and Community Development Block Grant – Mitigation (CDBG-MIT) funds, aimed at making North Carolina communities safer and more resilient to future storms. Additional funding is provided through the State Disaster Recovery Acts of 2017 and 2018, the Storm Recovery Act of 2019, and the Economic Development Administration Disaster Supplemental Funds. NCORR manages programs statewide that include homeowner recovery, infrastructure, affordable housing, resilience, and strategic buyouts. To learn more about NCORR programs, visit the ReBuild.NC.gov website. NCORR is a division of the Department of Public Safety.

2.2 About RISE

Developed in partnership with the North Carolina Rural Center, NCORR's Regions Innovating for Strong Economies and Environment (RISE) program supports resilience in North Carolina. **Figure**

Figure 3 - North Carolina Council of Governments (COG) Regions



3 - North Carolina Council of Governments (COG) Regions depicts the nine regions participating in the RISE program, and all are grouped by their designated Council of Government's coverage area.

The RISE program aims to support resilience primarily in the storm-impacted regions of North Carolina by:

- Facilitating the Regional Resilience Portfolio Program, which provides coaching and technical assistance to regional partners in the eastern half of the state to build multi-county vulnerability assessments
- Identifying priority actions to reduce risk and enhance resilience in their region
- Developing paths to project implementation
- Developing the North Carolina Resilient Communities Guide, a statewide resource that will provide tools, guidance, and opportunities for building community resilience
- Hosting the Homegrown Leaders program, a NC Rural Center leadership training workshop, which operates in the eastern half of the state and emphasizes resilience as a tool for community economic development.

RISE is funded by the U.S. Economic Development Administration and the U.S. Department of Housing and Urban Development's Community Development Block Grant – Mitigation funds, with in-kind support from NCORR and the North Carolina Rural Center. In addition, the Duke Energy Foundation committed $600,000 in grant funding to support the Regional Resilience Portfolio Program.

2.3 Regional Resilience Portfolio Program

The Regional Resilience Portfolio Program for the Upper Coastal Plain region is a collaboration between NCORR, the North Carolina Rural Center, the Council of Government, Kleinfelder, Inc., and the five participating counties. The project team, consisting of the previously identified organizations, established a Stakeholder Partnership made up of representatives who live and/or work in the Upper Coastal Plain region. The stakeholders are local county and municipal government officials, economic development planners, emergency managers, and community organizers and activists. The project team conducted monthly stakeholder meetings beginning January 2022 that continued through November 2022. Two virtual open house sessions occurred in April 2022 that were open to both stakeholders and the public. Initial meetings focused on

regional resiliency and natural and non-natural hazards. There are two main deliverables for each region participating in the RISE Regional Resilience Portfolio Program:

- A vulnerability assessment that can be a standalone document but is also appropriate for integration into regional and local plans, grant applications, public presentations, educational opportunities, and other planning tools; and,
- A project portfolio of 5-10 projects identified through community input and expert consultation. This is a separate document that outlines funding opportunities and paths to project implementation.

The following Upper Coastal Plain region vulnerability assessment, which covers Edgecombe, Halifax, Nash, Northampton, and Wilson counties, is the first of two main deliverables. The contents of this vulnerability assessment incorporate stakeholder (and members of the public) feedback as well as information gathered from existing literature such as regional hazard mitigation plans, the *North Carolina Climate Risk Assessment and Resilience Plan*, the *North Carolina Climate Science report,* and numerous other sources. The vulnerability assessment (this document) identifies and evaluates vulnerabilities that will inform the second deliverable, the Project Portfolio (a forthcoming, separate document).

3.0 Introduction

Natural hazards are a natural occurrence and unavoidable. Storms, floods, drought, wildfire, and hurricanes are all types of events that have the potential to impact or cause harm to humans and things we care about. A changing climate will likely mean that these events will become stronger and more frequent. The unfortunate reality is that natural hazards do not impact all communities equally. Some people may be at a higher risk of being impacted by hazards based on where they live and other factors such as physical health or income level.

The primary intention of this vulnerability assessment is to identify how climate hazards impact specific community sectors and which locations in the Upper Coastal Plain region are most vulnerable to their potential devastating effects. The assessment focuses on people, infrastructure, and assets. In addition to natural hazards that are made worse by climate change, this report includes discussions about non-climate related hazards and how they contribute to regional vulnerability.

3.1 Vulnerability Assessment Organization

The main components of this vulnerability assessment include an analysis of natural hazards, risk and vulnerabilities, sector impacts, and identification of opportunities and next steps for increasing resilience in the context of natural hazards and climate change.

Section one provides an executive summary of the findings from the Vulnerability Assessment.

Section two provides a brief introduction of the NCORR RISE Program and explains how the program positions communities to plan for climate change as a unified region with the same goals.

Section three provides an overview of the Upper Coastal Plain region, including demographic information such as population, income, and race. This chapter also discusses regional strengths and challenges related to climate change and regional vulnerability.

Section four identifies natural hazards that affect the region and discusses how they are expected to increase in the future due to climate change. Hazards include hurricanes and tropical storms, flooding, severe weather, extreme heat, drought, and wildfire. Flooding is the most prominent, high-impact hazard in the Upper Coastal Plain. Other high-risk hazards include severe weather, extreme heat, and drought as communities will increasingly experience compounding effects of these hazards due to climate change. Each of these hazards and vulnerabilities are explored in depth with a discussion on present-day and future risks for the region.

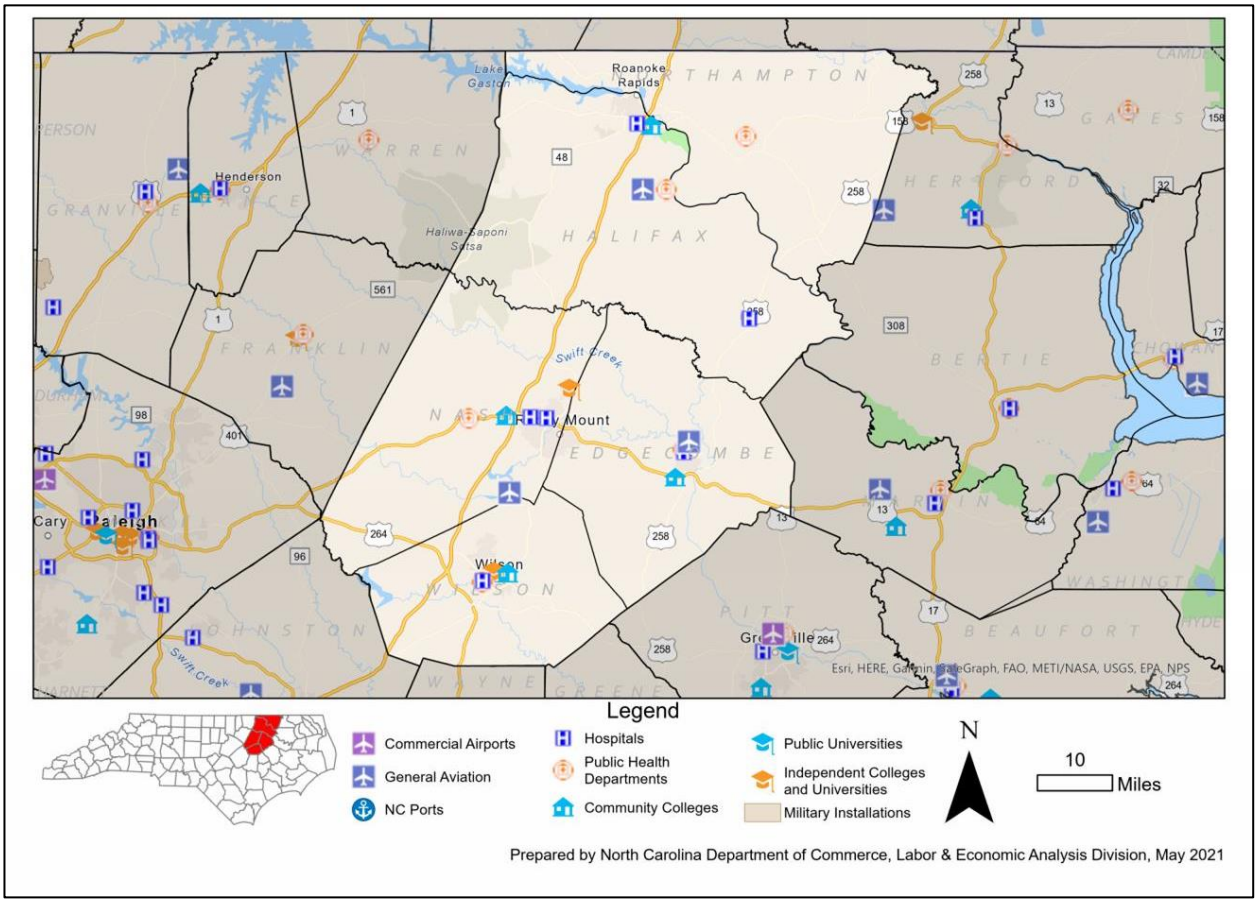
Section five discusses the impact of natural hazards on the following key sectors: housing, critical facilities, regional economy, historical and cultural resources, natural environmental systems, public health, and social vulnerabilities.

Sections six and seven identify climate vulnerability hot spots and outline next steps. Sections eight and nine include appendices, a glossary, summaries of stakeholder/open house meetings, data tables, and references.

3.2 Overview of the Upper Coastal Plain Region

The Upper Coastal Plain region is comprised of five counties: Edgecombe, Halifax, Nash, Northampton, and Wilson counties. The region is situated in northeastern North Carolina (NC) and touches the border of southern Virginia. The five-county region lies adjacent to the Piedmont region, where soft, sandy soil in the east meets hard, rocky soil in the west. To the south and west of the region lies the Raleigh-Durham metropolitan area. **Figure 4** below illustrates the Upper Coastal Plain region and its location within North Carolina.

Figure 4 - Regionwide Map



Source: North Carolina Department of Commerce, Labor & Economic Analysis Division

3.3.1 Demographics

The Upper Coastal Plain region is a mostly suburban and rural area. Major cities and towns in the region include Wilson, Rocky Mount, Tarboro, Nashville, and Roanoke Rapids. Population estimates by county for 2021 range from 17,129 (Northampton County) to 95,840 (Nash County) (U.S. Census Bureau, n.d.). Population growth rates are much less than the state average of 18.5%, with Northampton County seeing the largest change in population between 2010 and 2021 at -22.5% (U.S. Census Bureau, n.d.). **Table 1** shows population statistics by county for the region. Table 1 provides population data from 2010, population estimates as of July 1, 2021, and population change between 2010-2021. Northampton County has seen the largest decline in population over the past decade (-22.5%) and has the lowest population of all five counties. Halifax is the largest county by land area. Overall, each county in the region has seen a decline in population which presents challenges to the tax base, economy, and housing industry.

Table 1 – Population Statistics for the Upper Coastal Plain Region

County Name	County Seat	Land Area (sq. mi), 2020	Population, 2010	Population estimates, 2021	Population change (2010-2021)	River Basin
Edgecombe	Tarboro	505	56,552	48,359	-14.5%	Tar-Pamlico
Halifax	Halifax	724	54,691	48,272	-11.7%	Roanoke, Tar-Pamlico
Nash	Nashville	540	95,840	95,176	-0.7%	Tar-Pamlico, Neuse
Northampton	Easton	537	22,099	17,129	-22.5%	Chowan, Roanoke
Wilson	Wilson	368	81,234	78,369	-3.5%	Tar-Pamlico, Neuse
All Counties	n/a	2,674	310,416	287,305	n/a	Tar-Pamlico, Roanoke, Neuse, Chowan

Source: U.S. Census Bureau QuickFacts: United States (2021)

Error! Reference source not found. below provides demographic data related to housing, language, broadband, education, disability, labor force, income, and poverty. This information helps provide an overview of the region for planning purposes.

Most of the region is suburban and rural, however certain areas are experiencing modest fiscal prosperity. Portions of Nash and Wilson counties are seeing some residential growth given proximity to the Raleigh Metropolitan Statistical Area. Tarboro has experienced exponential residential growth in the past two years – over 200 single-family homes have been permitted since 2020, a significant increase since 2015 and 2016, where only one single-family home was permitted. Still, much of the region, especially unincorporated areas, struggle financially. While separate challenges can stem from population growth, an increased tax base could support the region by providing funding opportunities to implement resilience projects.

Table 2 - Demographic Information for the Upper Coastal Plain Region

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Population (April 2020 Census)	48,900	48,622	94,970	17,471	78,784
Population per square mile (April 2020 Census)	96.7	67.2	175.7	32.6	214.3
Housing units (July 2021)	23,126	24,796	43,454	10,600	36,634
Median value of owner-occupied housing units (2017-2021)	$92,900	$89,600	$141,900	$87,400	$130,000
Language other than English spoken at home	5.4%	3.4%	7%	2.5%	11.3%
Households with a broadband Internet subscription	70%	62.4%	82%	58.6%	78.1%
High school graduate or higher	84.6%	79.9%	87.4%	80.9%	82.2%
With a disability, under age 65 years	12%	13.8%	11.2%	11.8%	10.8%
In civilian labor force (total, age 16 years+)	55.5%	49.5%	60.1%	48.6%	59.2%

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Median household income (in 2021 dollars), 2017-2021	$41,974	$37,832	$52,837	$39,764	$47,348
Persons in poverty, percent	22.4%	27.3%	14.8%	23.6%	18.8%
Total employer establishments, 2020	709	938	2,041	258	1,773

Source: U.S. Census Bureau QuickFacts: United States (2021)

Wilson County has the largest proportion of Hispanic or Latino population for the region at 11.4% and the highest percentage of the population that speaks a language other than English at home. With a larger presence of people that speak a different language, it is important that any information related to hazards, emergency preparedness, and resilience is also translated into additional languages to meet the needs of those residents. Less than 60% of households in Halifax and Northampton counties have a broadband Internet subscription, which hinders communication and often the ability to receive important information or attend online meetings. Halifax County also has the lowest median household income ($37,832), highest percentage of adults under the age of 65 living with a disability (13.8%), and the highest percentage of persons in poverty (27.3%). Lower income populations, people with disabilities, and people living in poverty are disproportionately more vulnerable to hazards and may not have the same ability and resources to prepare or respond to a disaster. Comparatively, the North Carolina state average median household income in 2020 is $56,642 and the average percent of persons in poverty is 12.9% (U.S. Census Bureau, 2022).

Edgecombe, Halifax, and Northampton counties are greater than 50% Black or African American. Of note, Halifax County has about 4% of their population that identify as American Indian. The Haliwa-Saponi Tribe, whose ancestral lands are traditionally known as "The Meadows," is a State-recognized tribe and third-largest tribe in North Carolina with over 4,000 members (Warren County, NC, 2022). Tribal homelands span along the North Carolina border and include areas in Halifax County. **Table 31** in the Appendix has additional demographic information for each county.

Housing tenure (ownership) and housing occupancy are additional components of demographic makeup and can provide useful information when analyzing the vulnerability of a region and capacity for resilience. Refer to **Table 3** below for the composition of owner-occupied and renter-occupied housing within each county based on 2021 American Community Survey 5-Year estimates.

Table 3 - Housing Tenure

Housing Tenure					
	Edgecombe	Halifax	Nash	Northampton	Wilson
Owner-occupied	61%	63%	65%	72%	59%
Renter-occupied	39%	37%	35%	28%	41%

Source: 2021 American Community Survey (ACS) 5-Year Estimates Data Profiles

Northampton County has the highest percentage of owner-occupied houses and both Edgecombe and Wilson counties have more renter-occupied houses. Housing occupancy status (renting vs. homeowner) can influence the maintenance of a structure. Renting tenants are often more transient than homeowners and are less likely to provide regular maintenance to the home. Likewise, landlords may be less likely to provide updates or fix issues with a rental unit. Over time, deferred maintenance can increase the vulnerability of a building and lead to structural integrity and safety issues.

Similarly, occupied housing is more likely to receive regular maintenance and improvements than vacant homes. Units left vacant can also pose problems to local communities and require attention. Refer to **Table 4** below for the composition of occupied and vacant homes within each county based on 2021 American Community Survey 5-Year estimates.

Table 4 - Housing Occupancy

Housing Occupancy					
	Edgecombe	Halifax	Nash	Northampton	Wilson
Total Housing Units	23,293	24,859	43,117	10,690	36,195
Occupied housing units	19,259	20,049	37,477	7,397	31,980
Vacant housing units	4,034	4,810	5,640	3,293	4,215
Percent vacant	17%	19%	13%	31%	12%

Source: 2021 American Community Survey (ACS) 5-Year Estimates Data Profiles

Northampton County has the highest percentage of vacant housing at close to 31%. Vacant houses are more likely to be dilapidated and can take away from usable housing stock in the county. Hazards may also cause further damage to these buildings and make them unsafe to surrounding residents.

3.3.2 Regional Strengths

The Upper Coastal Plain Region has many strengths and advantages to combat climate hazards. During stakeholder meetings and open houses held between January and June, stakeholders provided their local knowledge about the region.

3.3.2.1 Natural Environment

Dominated by wetlands, sandy soils, and mostly flat elevation, the Upper Coastal Plain region is home to many unique natural resources. Characterized by water bodies and large open tracts of undeveloped land, the natural resources within the region provide a multitude of ecosystem services that are distinctly advantageous to the Upper Coastal Plain. Two major rivers, the Neuse and Tar, cut through the region and provide sanctuary for wildlife and drinking water sources. These river systems and their associated floodplains and wetlands provide natural flood control, reduce overall storm damage, improve water quality, and create recreational opportunities. In the northern portion of the region, Lake Gaston serves as a source of drinking water and recreation,

providing additional opportunities for swimming, fishing, and refuge from potentially extreme temperatures that occur during hot summer months. The undeveloped, forested lands within the Upper Coastal Plain add to the overall resiliency of the region by acting as carbon sinks, reducing outdoor air pollution, and providing economic and recreational opportunities (Southern Group of State Foresters).

3.3.2.2 Transportation Network

The region has a comprehensive network of roads and other modes of transportation to support evacuation routes during emergency events. There are several major roadways within the region:

- Interstate 95 (I -95) serves as the primary artery running north/south.
- US Highway 64, which is currently in the process of being upgraded to an interstate highway system (I-87), provides an east/west route.
- Several other limited access highways and throughfares such as I-795 in Wilson County.
- US Highways 158, 258, 264, and 301.

The City of Wilson, with a population around 49,000, replaced its fixed bus system with on demand minivans in September 2020. Previously, the bus routes ran once an hour and did not cover the entire city, causing accessibility issues. The new model covers 100% of the city and provides more flexibility for residents that may rely on alternative transportation. Each ride costs $1.50 to go anywhere within city limits and the service currently runs about 3,700 trips a week (Canal, 2022). This model has contributed to the resilience of Wilson residents as they have greater ability to take care of their health needs, get to school, and remain employed.

The Amtrak passenger rail service also provides an alternative means of transportation and evacuation. Regional rail stations are in Wilson and Rocky Mount. In addition, improvements in transportation are underway in the region, the most notable of which include transforming US 64 to I-87 and US 264 to I-587. Both transportation improvements will provide additional evacuation options and new economic development opportunities.

3.3.2.3 Educational Access

Access to educational institutions is an advantage in the region where there are eight institutions of higher learning:

- Wilson Community College (Wilson)
- Barton College (Wilson)
- North Carolina Wesleyan University (Rocky Mount)
- Edgecombe Community College (Tarboro and Rocky Mount)
- Nash Community College (Rocky Mount)
- Halifax Community College (Weldon and Scotland Neck)

These institutions help residents advance their education and improve employment opportunities and career growth.

3.3.3 Regional Challenges

Non-climate related issues impede the region's ability to create, enhance, and sustain its climate resilience-building efforts. Stakeholders provided feedback about challenges they see in the region and this information provides a more personalized, local viewpoint. To corroborate stakeholder input, the project team reviewed planning documents, regional data, and maps to gain a holistic understanding of the challenges.

3.3.3.1 Labor and Workforce

There is a lack of skilled and available personnel within local governments to manage daily operations. Many public sector employees "wear several hats," which makes it difficult to implement climate resiliency measures. Competing priorities can also limit efforts to advance resilience, particularly when there are more immediate issues to address like sewer, water, and public safety. Additional staffing and continuing education is needed to support efforts related to comprehensive planning, grant writing and funding strategies, and emergency planning.

Similarly, unemployment is extremely high throughout the region with rates well above the state average. Rates are highest in Edgecombe and Halifax counties (**Table 5**). Unemployment often negatively affects the disposable income that families have, meaning people purchase less goods and services, which can lead to unemployment for other workers in a cascading effect on the economy of a region. These cumulative economic strains affect resiliency planning efforts because families must first meet their basic needs before shifting focus to extraneous issues like climate hazards.

Table 5 – Unemployment, Income, and Poverty

County	Unemployment Rate (2022)	Median Household Income (2017-2021)	Persons in Poverty (2021)
Edgecombe	7.4%	$41,974	22.4%
Halifax	5.8%	$37,832	27.3%
Nash	5.0%	$52,837	14.8%
Northampton	4.4%	$39,764	23.6%
Wilson	5.4%	$47,348	18.8%
Regional Average	**5.6%**	**$43,951**	**21.4%**
State Average	**4.1%**	**$60,516**	**13.4%**

Source: U.S. Census Bureau QuickFacts: United States (2021), Neighborhood Information | Homefacts

3.3.3.2 Stormwater Management

Local governments have recognized the need for stormwater management structures and controls; however efforts are often limited by jurisdictional boundaries. For example, the efforts of one jurisdiction to clean debris from waterways is diminished if the upstream and downstream jurisdictions don't do the same – flooding will still occur in the jurisdiction that has not cleaned debris from the waterway. Regional communication and collaboration regarding stormwater management are an absolute necessity between all branches of government (local, county, and state) and divisions (e.g., planning, public works, engineering) to ensure solutions truly enhance resiliency across the region and can be effectively implemented. Additionally, Hazard Mitigation Plans and Hurricane Matthew Resilient Redevelopment Plans have identified specific locations in need of upgrading undersized culverts which have contributed to flooding.

3.3.3.3 Broadband

Broadband and wireless communication services continue to be a critical challenge throughout the Upper Coastal Plain region. Many areas do not have reliable access to wireless or internet communications. A study from Carolina Demography shows that Northampton County ranks as one of the lowest counties in the state for access to broadband at 51.8%. While major highway corridors like I-95 and larger municipalities such as Rocky Mount, Wilson, Roanoke Rapids, and Nashville have reliable wireless service, there are at least 14,000 homes that do not have internet (Upper Coastal Plain Council of Governments, 2021). The wireless communication industry is reluctant to invest in the region due to land use restrictions and physical features such as tree canopies that block and shield wireless signals. However, the Upper Coastal Plain Comprehensive Economic Development Strategy 2023-2027 proposes strategies to address broadband infrastructure throughout the region and the Upper Coastal Plain Broadband Task Force is also working to increase broadband equity.

3.3.3.4 Housing Affordability and Quality

Housing affordability and availability are significant stressors for the region. Many individuals are still displaced from Hurricanes Matthew and Florence; their homes were either destroyed or are unable to be renovated for occupancy. Many of the damaged homes were uninsured, denied claims payments, or are awaiting outstanding appropriations. Delays in rebuilding and resulting displacement are constant physical reminders of the life-changing experiences that people living in the Upper Coastal Plain region have been through and continue to deal with.

Aging and abandoned houses scattered across the region present an additional challenge. Older homes, once mill houses and ranch-style houses, often lack modern components such as heating/cooling, adequate insulation, updated plumbing (e.g., existing lead or clay pipes), and intact roofing. Repair and maintenance of older homes can put an economic strain on its inhabitants because repairs are often more costly in older homes than in modern ones. Reliable, constant electricity is also a challenge for many, as power goes out “literally every time it rains” (as stated by residents). Electric bills during the summer months can be more than the monthly rent, given the lack of efficient HVAC units and insulation. Lack of housing choice also makes it difficult to build personal resilience to climate hazards.

Homes throughout the region rely on septic systems for waste management and private wells for potable water. These structures require periodic and sometimes costly maintenance that many

homeowners simply cannot afford. To further complicate the housing issue, many homes were abandoned after the recent hurricanes and associated flood events within the region. For example, approximately 31% of the homes Northampton County and 19% of the homes in Halifax County are classified as vacant (see **Table 4**; (U.S. Census Bureau, 2019)). Local governments lack the funding to demolish these abandoned homes, which leads to health and safety hazards. Many homes also suffer from mold growth following storms and heavy rain, which is notoriously difficult and costly to remove, adding to health and safety hazards. Together, these factors create a lack of healthy and proper housing for the community.

3.3.3.5 Emergency Shelters

Public shelters are inadequately dispersed throughout the region and are often incapable of supporting those in need due to capacity and utility constraints. To address this issue, many local religious institutions step in and offer generous support like temporary shelter and meals during and after storms. In addition, some educational institutions such as Wilson High School, Tarboro High School, and Martin Millennium Academy have served as shelters when needed. In the past, the region has been overwhelmed by evacuees from the North Carolina coast, leading to additional strains on shelter capacities. Additionally, these temporary shelters are not set up to operate long term and often rely on volunteer support. It has been noted in various Hazard Mitigation Plans and Hurricane Matthew Resilient Redevelopment Plans that existing shelters also need back up power (generator) sources, building upgrades, and overall, an increase in capacity and resources.

3.3.3.6 Mobility + Infrastructure

With a large part of the Upper Coastal Plain consisting of rural residents, public transportation is limited and often makes individual mobility difficult. Stakeholders have expressed concerns with issues getting to work and doctor's appointments if they are unable to use a car. Beyond the towns of Rocky Mount and Wilson, there are currently no public transportation services provided. Furthermore, when emergency situations do arise, it can be difficult for emergency service personnel to respond in a timely manner to vulnerable residents living in remote areas. Stakeholders have also expressed concerns about unpaved, residential roads washing out during storms, causing issues for emergency response. Information gathered from Hurricane Matthew Resilient Redevelopment Plans described the large number of infrastructural repairs and

upgrades that are needed throughout the region, such as addressing bridge and road repairs, and potentially raising of roads.

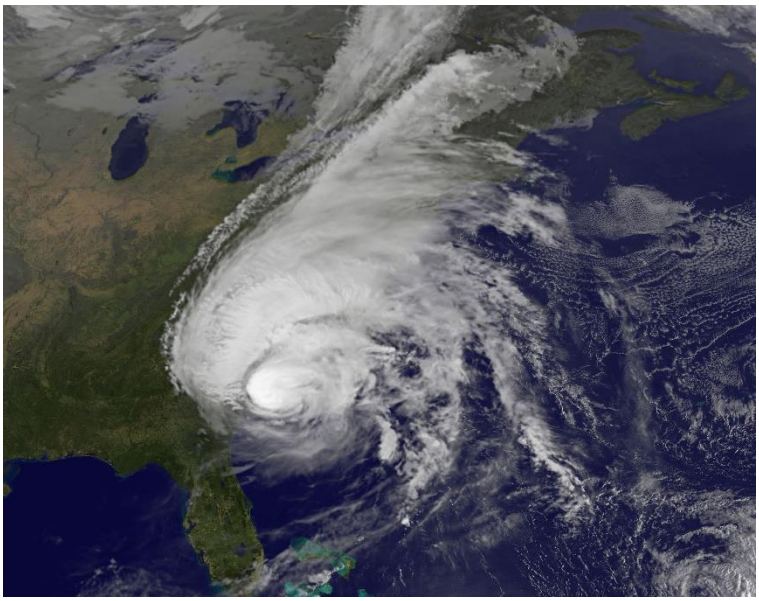
3.3.3.7 Industry

Business have been impacted from the recent COVID-19 pandemic in addition to prior economic losses from hurricanes and recessions. Commercial businesses are typically clustered or sparsely located throughout the region, making it difficult for less mobile residents to obtain goods and services. This trend is most evident within the unincorporated areas and smaller communities throughout the region. Over time, small family-owned businesses that served the community or a rural crossroads for generations have closed due to economic hardships. This can contribute to food deserts—geographic areas where urban residents live more than one mile from a supermarket and rural residents live more than ten miles from a supermarket. Food deserts tend to encompass communities with a high proportion of low-income residents who lack adequate transportation, hindering access to affordable and nutritious food.

3.3.4 Resiliency-Related Work – Needed and Underway

Hurricanes Matthew (2016) and Florence (2018) devastated the Upper Coastal Plain region. Fifteen inches of heavy rainfall from Hurricane Matthew inundated portions of Nash and Wilson counties, with all five counties in the region receiving more than 6 inches of rainfall within a 48-hour period (RebuildNC, 2017). Though it has been a few years since these significant storm events, the residents of the region continue to face daunting challenges from these storms as well as from other climate hazards, such as frequent flooding. It is likely that climate change will

Figure 5 - Hurricane Matthew (October 8, 2016)



Source: NASA/NOAA GOES Project

increase the frequency, intensity, and duration of hurricanes in the future, potentially resulting in higher wind speeds and heavier rainfall events.

Upper Coastal Plain communities have learned from past storm events in ways that will increase resilience. While efforts to build a more resilient region are underway, there is more work to be done to protect communities from both climate and non-climate hazards. The strong-willed character of the people living in this region, coupled with firsthand experience in dealing with severe flooding, have set the tone for many in the community to prepare for these hazards. Stakeholders provided insight about current and future resiliency-related efforts during stakeholder meetings and the open house.

3.3.4.1 Current Efforts

The five-county region continues to work in areas like stormwater management and emergency response to advance resilience efforts.

- Since Hurricanes Matthew and Florence, communities have become better prepared for emergency situations. For example, several municipal emergency management personnel have started distributing emergency supplies to vulnerable populations. These emergency kits include essential items such as solar battery packs to charge cell phones, lanterns, and meals. Stakeholders recognized that further improvements and expansion of these programs are needed to serve both the aging and special needs populations.
- The City of Wilson has completed stormwater improvements such as underground storage basin installations, the acquisition of flood-prone properties through buyout programs, the establishment of special flood hazard conservation areas, and the implementation of stormwater utility fees to administer maintenance efforts, all of which have cumulatively demonstrated improvements in reducing downstream flooding issues.
- The City of Wilson also has a robust broadband program that provides reliable communication during severe weather.
- Throughout the region, several community colleges have implemented green stormwater infrastructure systems such as constructed wetlands. The installations serve as best management practices and educational tools for potential replication across the region.
- In Edgecombe County, the Town of Princeville has implemented several projects since Hurricane Floyd (1999) to enhance their resiliency and adaptive capacities. A few examples of projects include approaches to re-build/invest outside of known flood-prone

areas, implementation of stormwater management procedures, health initiatives related to food access, implementation of stormwater best management practices, and addressing the levee in tandem with the US Army Corps of Engineers.

- In Rocky Mount, the town is in its final stages of writing their own climate resiliency plan.
- Nash County is updating its land development policies to help the County plan for growth in a way that accounts for climate change and natural hazards. Along with advancing land use policies, Nash County recently completed maintenance efforts to clean up several waterways including Stony Creek, where over 600 objects were removed.
- In the northern portion of the region, Halifax and Northampton counties have various ongoing efforts to improve resiliency through communication and education programs. Some of these programs include enhancing digital literacy, conducting climate justice surveys, providing healthy food access maps, starting resiliency hubs, and administrating efforts to improve broadband.
- A Better Chance, A Better Community (ABC2) is a community organization based in northeastern North Carolina focused on healthy living, civil engagement, and changing the world one community at a time. The organization recently purchased the old Dawson Elementary school building in Halifax County. It provides space for organizing community resiliency and acts as an emergency shelter when needed. ABC2 has also purchased equipment like chainsaws and generators to share amongst the community after severe weather events. Additionally, ABC2 has engaged in climate justice initiatives, digital literacy trainings, workshops, and healthy food accessibility and distribution. Local capacity building efforts such as these are important for sustained resiliency.
- Counties and municipalities in the region are addressing the development of floodplain zoning and permit programs to limit construction in areas at risk of flooding. Tarboro has updated their Unified Development Ordinance (2020), Flood Ordinance, and is currently updating their Stormwater Ordinance.

3.3.4.2 Stated Needs

Though the region has implemented many projects and improvements, there are topics that need further attention and execution according to stakeholder input.

- Existing stream maintenance and dam removal programs need improvements to be sustainable. These programs also need planning on a regional scale instead of being limited to municipal or county boundaries.

- Alternative energy sources like solar can be used for backup power generation.
- The region also needs continued broadband service enhancement.
- Nash and Wilson counties have expressed the need for execution of best management practices for stormwater infrastructure in residential areas.
- Existing shelters need enhancements and identification of locations for additional shelters will address current constraints.
- Improved communication efforts across emergency management agencies (Department of Social Services, Red Cross, Federal Emergency Management Agency, and Emergency Management Service) will make it easier for residents to prepare and respond during an event.

4.0 Natural Hazards

Based on data from regional hazard mitigation plans (AECOM, 2021), (Wood, 2020), and stakeholder feedback, the major high-risk natural hazards in the Upper Coastal Plain region are flooding, hurricanes and tropical storms, and severe weather, specifically heavy rainfall. Other high-risk natural hazards include extreme heat, drought, winter storms, and wildfire. Additional analysis by the project team using publicly available Geographic Information System (GIS) data confirms these as the top regional natural hazards. All high-risk natural hazards have widespread potential impacts and damages and can be highly threatening to people and the built environment.

This section discusses how natural hazards influenced by climate change are likely to change and affect the Upper Coastal Plain region over the next 30 – 50 years. The team that developed the vulnerability assessment analyzed the data and conclusions from the North Carolina Climate Science Report (2020) and other climate science research reports (Kunkel, et al., 2020) to provide a discussion about climate hazards pertaining to the Upper Coastal Plain region. The North Carolina Climate Science Report discusses the three regions of North Carolina:

- The Coastal Plain region, whose climate is dominated by oceanic influences and is typically more humid and experiences smaller day-to-night temperature changes than other parts of North Carolina, due to its proximity to the ocean.
- The western Mountains region, whose climate is most influenced by the elevation and topography of the Appalachian Mountains. This region is cooler due to its higher elevation.
- The Piedmont region, which lies between the Coastal Plain and Mountains, and lacks the influence of high elevation and steep topography or proximity to the ocean.

The Upper Coastal Plain is located in the Coastal Plain region, so many of the climate observations and projections stated in this report are based on the findings for North Carolina's Coastal Plain.

4.1 Flooding

Flooding is a major high-risk natural hazard for the Upper Coastal Plain region, as the region is still rebuilding and recovering after Hurricanes Matthew and Florence caused extreme widespread and damaging flooding. Inland flooding is the most common and frequent natural hazard in North Carolina, most often resulting from tropical storms. In the last 20 years, eastern North Carolina, including the Upper Coastal Plain region, has experienced three extreme flood-producing hurricanes – Floyd (1999), Matthew (2016), and Florence (2018) (Kunkel, et al., 2020). It is very likely that flooding resulting from heavy rainfall will become more frequent and severe across the Upper Coastal Plain in the next 30-50 years (Kunkel, et al., 2020).

It is a natural event for lands adjacent to rivers, streams, and shorelines to flood occasionally. In the Upper Coastal Plain region, flooding is generally the result of heavy rainfall rather than wind-driven surge or tidal influence like along the coast. Damaging floods in the region are caused by rainfall resulting from hurricanes and tropical storms, short-duration heavy rainfall from intense convection like thunderstorms, and winter coastal storms. Flooding may occur near rivers as high volumes of sustained rainfall exceed the capacity of the streams. Changes in climate conditions such as rainfall amount, in water management practices, or in land use and land cover can determine how flooding will impact communities.

Recent climate science and trend analyses indicate:

- severe thunderstorms will increase in frequency,
- winter storms will very likely produce heavier precipitation and,
- hurricane intensity and associated heavy precipitation in North Carolina will very likely increase.

Based on stakeholder input, residents are interested in collaborative, regionalized approaches to building flood resilience. Strategies may include developing and conserving more green space to slow and reduce runoff and upgrading and modernizing stormwater infrastructure to handle more frequent and intense rainfall events. The stakeholders believe these approaches will reduce the

incidence of flooding from moderate-intensity storms. The region's experience responding to and recovering from flooding is a strength; the public and emergency management staff are practiced, prepared, and well-informed about how best to improve emergency response.

4.2 Hurricanes and Tropical Storms

Hurricanes and tropical storms are some of the most damaging natural hazards influenced by climate change in the Upper Coastal Plain region and are among residents' top concerns. Heavy, sustained rainfall and high winds combine to cause property destruction, debris accumulation, and severe and widespread flooding. In some hurricanes, tornadoes may develop. Approximately 70 hurricanes and tropical storms have been tracked through the Upper Coastal Plain region since 1930 (Hurricane Information, 2022). Even tropical systems that have not directly tracked through the region have left their impacts in the form of heavy rainfall, high winds, and flooding.

Recent Hurricanes Matthew (2016) and Florence (2018) caused widespread damage across the region. Major emergencies caused by these two storms included the need for water rescues from homes threatened by water, fatalities when people attempted to navigate flooded roads, and vegetation and debris that blocked the flood flow (Neely, 2016).

Flooding during Hurricane Matthew was particularly impactful because the heavy rains occurred shortly after more moderate soaking rainfall from Tropical Storms Colin, Julia, and Hurricane Hermine. Because rain was so heavy on already-soaked ground, residents reported unexpected flooding in areas where they never experienced flooding before. Hurricane Florence devastated the area two years later with heavy rains and bands of tornadoes, in many cases undoing recovery efforts in areas which had been hit hard by Hurricane Matthew (Armstrong, 2022).

Hurricanes and tropical storms form over the ocean and make landfall at the coast, but they can affect inland areas such as the Upper Coastal Plain region. The Atlantic hurricane season runs from June to November, with the peak season from mid-August to late October. On a global scale, the intensity of the strongest hurricanes is likely to increase with warming. In addition, heavy precipitation associated with hurricanes and tropical storms will very likely increase for North Carolina over the next 30-50 years, which increases the risk of flooding (North Carolina Department of Environmental Quality, 2020).

4.3 Severe Weather

Severe weather in the Upper Coastal Plain includes several hazards such as thunderstorms, winds, lightning, and hail. Although typical severe weather systems affect small geographic areas, they can cause substantial property damage and be very dangerous.

4.3.1 Thunderstorms

Thunderstorms are a major source of heavy rain in the Upper Coastal Plain, and can include flooding, high winds, hail, lightning, and sometimes tornadoes. While individual thunderstorms are unlikely to cause flooding on the scale of a hurricane or tropical storm, thunderstorms can cause short-duration heavy rainfall which leads to flash flooding and power outages in some parts of the Upper Coastal Plain region. Stormwater regulations of 10-year storm data is now insufficient to address flash flooding. Lightning associated with thunderstorms may ignite wildfires; both lightning and heavy winds result in property damage, disruption to transportation networks, and potentially loss of life.

Severe thunderstorms are likely to occur more frequently in the Upper Coastal Plain region by over the next 30-50 years (Kunkel, et al., 2020). Thunderstorms are typically isolated, intense events, and thus cannot be explicitly simulated in large-scale climate models. However, large-scale climate models can simulate changes over time in the frequency and intensity of conditions conducive to thunderstorm formation - for example, the measures of temperature, humidity, and differences in wind speed at various heights in the atmosphere. It is also possible to study fine-scale events like thunderstorms using more detailed, localized models. While no consensus on future thunderstorm characteristics in North Carolina has been reached through such methods, studies across the US have found that conditions conducive to thunderstorm formation are likely to become more common by 2050 (Genio, Yao, & Jonas, 2007).

4.3.2 Wind

Strong winds in the Upper Coastal Plain region are associated with a range of weather patterns including thunderstorms, hurricanes and tropical cyclones, and tornadoes. When high winds occur, they can:

- damage property and vital infrastructure like powerlines,
- interrupt transportation by blocking roads,

- create dangerous driving conditions, and
- increase the potential spread of wildfire during dry weather.

At present, climate science studies do not contain sufficient evidence or consensus to make a confident conclusion on future changes in high winds or in storms caused by cyclones, which are associated with strong wind in the region. However, it is likely that convective storms will occur more frequently, and that hurricanes and other tropical cyclones will affect the region with greater intensity in the next 30 – 50 years (Kunkel, et al., 2020).

Studies of tornado formation across the US have found that, while the number of days per year on which tornadoes occur has decreased since the 1970s, tornadoes are more likely to occur in clusters (multiple tornadoes in one region and day) and that the length of the season over which tornadoes occur is increasing (Elsner, Elsner, & Jagger, 2014) (Tippett, 2014) (Kunkel, et al., 2020). While these conclusions are not specific to the Upper Coastal Plain region or even North Carolina, regional emergency managers should consider the implication that tornado destructiveness may increase in the region over the next 30 – 50 years and that tornadoes may become a plausible threat earlier in the year and continue to occur later into the year.

4.3.3 Lightning

Lightning is a dangerous severe weather hazard in the United States and is responsible for deaths, injuries, and property damage to buildings, power lines, and electrical systems each year. Lightning strikes the U.S. about 25 million times each year (NOAA, 2014). Lightning can also cause forest and brush fires.

Lightning can occur anywhere there is a thunderstorm, and it is one of the most underrated severe weather hazards – lightning strikes in the U.S. cause an average of 50 deaths per year (NOAA, 2014). While evidence of how lightning activity in the Upper Coastal Plain region will change over the next 30 – 50 years is inconclusive, scientific evidence suggests it is likely that severe thunderstorms will become more frequent in the same period.

4.3.4 Hail

Hail is an important hazard in the Upper Coastal Plain region because hailstorms can be damaging to crops. Hail can fall during thunderstorms and is formed when updrafts carry water

droplets into freezing areas of the atmosphere causing the water to turn into ice (National Weather Service, n.d.). Hail then falls back to the earth when it becomes heavy enough to overcome the force of the updraft. Hailstorms can occur in spring, summer, or fall but are more common in late spring and early summer, when many crops are at or near harvest. Crop damage ultimately causes economic loss for farmers. Hail can also cause property damage to vehicles either in use or left outdoors.

Specific scientific evidence of the future frequency of hailstorms is inconclusive in the Upper Coastal Plain region. However, general scientific conclusions suggest it is likely that thunderstorms, a leading cause of hail, will become more frequent in the Upper Coastal Plain region in the next 30-50 years (Kunkel, et al., 2020).

4.3.5 Heavy Rainfall

Heavy rainfall in the Upper Coastal Plain region can have severe consequences to residents, agriculture, and businesses, and heavy rainfall is expected to become more frequent and severe in the future. There has been an upward trend in the number of heavy rainfall events (three inches or more in a day), with the greatest number of events since 1990 occurring between 2015-2018. It is likely that precipitation will increase for North Carolina over the next 30-50 years. Scientists project that is very likely that heavy rainfall will increase, both in frequency and intensity, due to increases in atmospheric water vapor content (Kunkel, et al., 2020).

Heavy rainfall, where more than three inches of rain occur in a 24-hour period, occurs rarely, making it difficult to characterize recent trends based on observational data. In the Upper Coastal Plain, heavy rainfall events have historically occurred about one day per year. It is also difficult to make statements on likely future trends in heavy rainfall based on climate modelling studies. The heaviest rainfall events tend to be spatially isolated unless caused by a very large storm system, so weather station records of heavy rainfall amounts can be very different from station to station during the same storm. Because of this issue, the techniques used to estimate the frequency of such extreme events across stations tend to underrepresent the frequency of extreme precipitation in areas far away from stations. For example, one station may estimate 0.3 days with more than three inches of rain and a different station may estimate 0.9 days with more than three inches of rain in the Upper Coastal Plain region (Kunkel, et al., 2020).

Hurricanes Matthew (2016) and Florence (2018) delivered as much as twelve inches over four days and fifteen inches over six days in the Upper Coastal Plain region, respectively. Recent climate science and analysis of recent trends indicate it is likely that severe thunderstorms will increase in frequency, that winter storms will produce heavier precipitation, and that the intensity of strong hurricanes and the heavy precipitation from hurricanes over North Carolina is very likely to increase in the next 30-50 years. Additionally, stormwater regulations of 10-year storm data are now insufficient to address flash flooding.

4.4 Extreme Heat

Extreme heat can have significant effects on health, property, and infrastructure. Residents of mobile homes and low-income households, and individuals working outside, are especially vulnerable to extreme heat. “Heat waves” are defined as any event lasting at least three days where temperatures reach ninety degrees Fahrenheit or higher. Humidity can exacerbate the physiological response to heat waves. The National Oceanic and Atmospheric Administration (NOAA) identifies heat as the number one weather-related cause of death from a natural hazard, followed by frigid winter temperatures. The National Weather Service devised the Heat Index, often called the “feels like” temperature, to better inform the public of heat dangers. The Heat Index, shown in **Figure 6**, uses air temperature and humidity to determine the heat index or apparent temperature.

Figure 6 - Heat Index

		Relative Humidity (in percent)																				
Air Temp (in F)		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
	140	125																				
	135	120	128																			
	130	117	122	131																		
	125	111	116	123	131	141																
	120	107	111	116	123	130	139	148														
	115	103	107	111	115	120	127	135	143	151												
	110	99	102	105	108	112	117	123	130	137	143	150										
	105	95	97	100	102	105	109	113	118	123	129	135	142	149								
	100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144						
	95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136				
	90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122		
	85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108
	80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91
	75	69	69	70	71	72	72	73	74	74	74	75	75	76	76	77	77	78	78	79	79	80
	70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	70	71	71	71	71	72

In the chart, heat indices:

- highlighted in red indicate extremely dangerous conditions in which heat stroke and/or sunstroke are highly likely for people continuously exposed
- highlighted in orange are dangerous; heat exhaustion, heat cramps, sunstroke, and/or heatstroke are for those exposed to the conditions for prolonged periods or engaged in physical activity
- highlighted in yellow indicate extreme caution should be taken by all exposed for prolonged periods or engaging in physical activity
- highlighted in pale tan indicate caution should be taken with prolonged exposure and/or physical activity

Table 6 - Heat Index Health Risks

Heat Index Temperature (in F)	Description of Risks
80°-90°	Fatigue possible with prolonged exposure and/or physical activity
90°-105°	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105°-130°	Sunstroke, heat cramps, and heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
130° or higher	Heatstroke or sunstroke is highly likely with continued exposure.

Table 6 provides a detailed explanation of consequences of exposure to each heat index category.

While Upper Coastal Plain region residents consider extreme heat to be a lower-priority concern relative to other natural hazards in the region at present, climate science studies indicate extreme heat may become a dangerous threat in the region's future (Kunkel, et al., 2020). The average annual temperature in North Carolina has increased by about 1.0°F since 1895. The most recent years (2009-2018), however, represent the warmest 10-year period on record in North Carolina, averaging about 0.6°F warmer than the warmest decade in the 20th century. The most recent data indicates that 2019 was the warmest year on record for North Carolina (Kunkel, et al., 2020).

Observed and projected increases in average temperature, hot days, and warm nights suggest an increase in the frequency of dangerous heat index values and cooling demand which are a serious concern in a region already challenged by poor housing quality and where summer electric bills can cost more than rent. Current trends suggest that average temperatures will continue increasing.

Scientists project the number of very hot days will increase from the historical average of 13 days per year to 17-60 days each year by the 2050s. Similarly, the number of very warm nights may increase from an average of 6 per year to 23-55 per year by the 2050s. While the region is primarily rural and suburban, the number of warm nights may be even higher in urbanized centers that have higher impervious land cover such as Roanoke Rapids, Rocky Mount, and Wilson. Dark impervious surfaces like roads trap heat during the day and release it during the night. Areas that have less vegetative cover likes trees and green areas are not able to help cool the area down. It is very likely that the number of warm and very warm nights will continue to increase through the 2050s and beyond (Kunkel, et al., 2020).

Scientists project the average annual temperature in North Carolina will increase by 1.5°F to 3.5°F during the 2021-2050 period compared to the long-term average from 1971-2000 (Kunkel, et al., 2020). It is likely that the number of days annually where high temperatures exceed 95°F in North Carolina will increase by at least 15-20 days over the next 30-50 years (Kunkel, et al., 2020). Further, it is very likely that the summer heat index will increase in North Carolina with the number of hot and very hot days (Kunkel, et al., 2020).

4.5 Drought

The Upper Coastal Plain region is particularly vulnerable to drought given the regional importance of agriculture and prevalence of homes which rely on private wells for drinking water. Droughts are a normal occurrence in nearly all climatic regions, including areas with high and low average rainfall, and are a normal part of the climate in the Upper Coastal Plain region as well. Drought is the consequence of a natural reduction in the amount of precipitation anticipated over an extended period of time, usually a season or more in length. High temperatures, winds, and low humidity can exacerbate drought conditions. Droughts can also be exacerbated by water management regimes which extract water more rapidly than it can be replenished. Drought is a serious hazard to the Upper Coastal Plain region, which faced drought recently in 2007 – 2009 along with much of the southeast US (Kunkel, et al., 2020). The drought followed the fourth-wettest fall (2006) on record in North Carolina at the time, but a below-average rainfall spring, dry summer, and hot late summer weather placed much the Upper Coastal Plain region in “Extreme Drought” by October 2007. Private domestic wells are often the first to feel the impacts of falling groundwater levels during drought; this is a significant concern in the Upper Coastal Plain region where many residents rely on private wells for drinking water. The drought of 2007 – 2009 affected

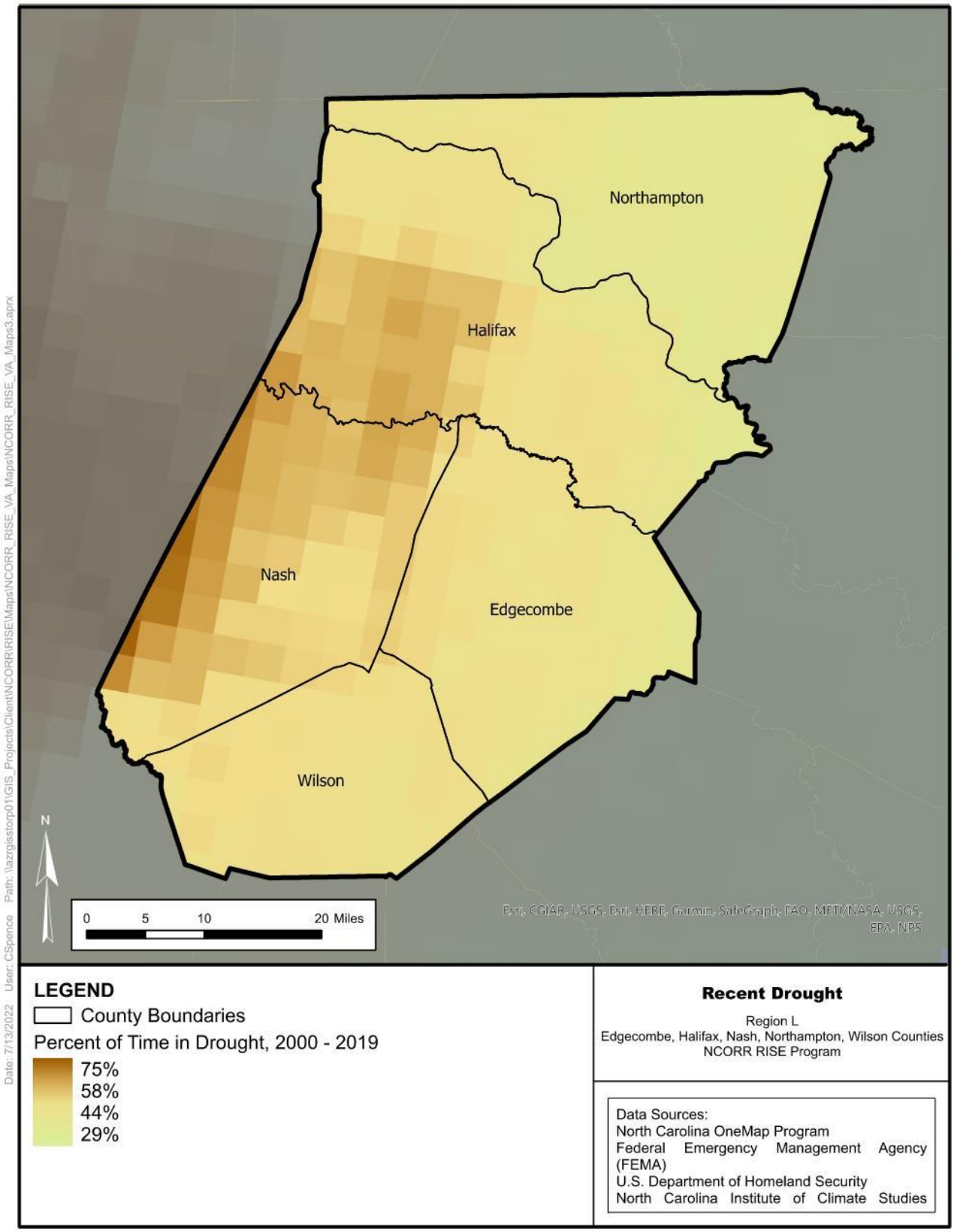
not only domestic wells, but also centralized surface water and groundwater supply systems. By December 2007, nearby Durham had just 14 days of water supply remaining in its reservoir. Under the dry conditions, wildfire activity in the region heightened. North Carolina's agriculture industry suffered an estimated $573 million loss due to the combined effects of the drought and an extreme cold spell in April 2007 (Davis, 2015).

The state and region responded to the severe impacts of the drought with a range of interventions:

- bottled water was distributed to residents whose wells had dried up,
- water conservation restrictions on public water supplies slowed the drawdown,
- the governor of North Carolina requested federal disaster aid and waved road weight restrictions for trucks carrying hay to conserve soil moisture on drought-stricken farms (2007 Drought Timeline, 2007),
- and communities collaborated to share water as needed - in the Upper Coastal Plain region, Rocky Hill extended a pipe to share its water supply with nearby Wilson.

The onset of droughts is typically slow, but over time droughts can have damaging affects to agriculture, municipal and recreational water supply and use, and wildlife. In the future, droughts are projected to occur during warmer conditions, which will cause more rapid water loss due to evaporation and transpiration through plants in the sustained absence of precipitation (Kunkel, et al., 2020). While climate model projections and recent trends provide some limited and inconclusive evidence that annual total precipitation may increase in the Upper Coastal Plain region by mid-century, additional evidence from the North Carolina Climate Science Report suggests that more precipitation will arrive as high-intensity, short-duration events where a greater volume of water will run off rather than replenish groundwater stores (Kunkel, et al., 2020). Therefore, droughts in the future will likely cause more issues than droughts in the past. **Figure 7** below depicts the percent of time the region was in drought from the years 2000-2019. Drought conditions are likely to increase in the future, and the Upper Coastal Plain region should consider revisiting lessons learned from past droughts to prepare.

Figure 7 – Regional Drought in the Upper Coastal Plain



4.6 Winter Storms

The future prevalence and impacts of winter storms, snow, and ice in the Upper Coastal Plain region are presently uncertain. Winter storms in the region are typically rainfall events, but when winter storms coincide with very low temperatures, the precipitation may fall as snow, sleet, freezing rain, or a wintry mix. These storm events can create dangerous conditions over a large area. Winter storms can have a substantial impact on communities, utilities, transportation systems, agriculture, and can result in the loss of life due to hypothermia and accidents. Residents are less concerned about this hazard and its impacts to the region, so it hasn't been a topic of focus during stakeholder meetings. One point raised at the open house was, because snow and ice storms are infrequent in the region, there is often little equipment and capacity to respond and it can impact daily life – driving on slick roads is dangerous, roofs may experience damage, and some homes may lack adequate insulation to keep cold out.

While climate science studies show it is very likely that winter storms will produce heavier precipitation in the future than they do now, the season-average winter temperatures in the Upper Coastal Plain region have been consistently higher than the long-term average since the 1990s. Projections show that winter temperatures are very likely to continue increasing through the remainder of the century, resulting in warmer winter seasons and less snowfall than today (Kunkel, et al., 2020).

Scientists hypothesize that it is likely that total snowfall will decrease along with the number of heavy snowstorms (Kunkel, et al., 2020). Very cold days may not become more common but can still happen. Given the impacts of extreme cold, winter weather, and icing in the Upper Coastal Plain region, it is important to not discount preparation for these events as part of climate resilience planning.

4.7 Wildfire

The risk of wildfire is lower in the Upper Coastal Plain region than other parts of North Carolina, but future climatic conditions may increase the frequency of conditions that are conducive to wildfire. Wildfire is any outdoor fire that is not prescribed, meaning planned and executed under controlled circumstances for a specific purpose. Fires occur naturally in forest and grassland ecosystems, but fires may also be caused by humans. Nationally, negligent human behavior such

as smoking in wooded areas and improperly extinguishing campfires has eclipsed natural causes such as lightning as the most common start of wildfires. In North Carolina, most fires are caused by debris burning. Fires are particularly dangerous in dry conditions, in conditions where fuel has built up to higher than usual levels, and when fires occur near human settlement.

Drought conditions increase the probability of wildfires by producing fuel in both urban and rural settings. During a drought, dead and dying vegetation provides a ready fuel source which can sustain and propagate burning when a fire ignites. More accumulated fuel after a long period without burning can increase the duration and destructive potential of wildfire. Wildfires are more likely to spread widely during high wind conditions, which can blow burning debris to ignite fire in new areas. As discussed above, severe droughts are likely to increase across North Carolina due to higher future temperatures, which accelerate the depletion of moisture in soil and vegetation in times without precipitation. As a result, it is likely that the frequency of climate conditions conducive to wildfires will increase in the next 30-50 years (Kunkel, et al., 2020). In the Upper Coastal Plain region, wildfires pose risks to farmers and to homes, industries, and businesses located in sparsely settled rural areas where evacuation routes may not be clear and water supplies used to fight fires are more likely to come from small wells which may not reliably supply water during drought conditions.

Local weather conditions influence the risk of wildfires, but human behavior and natural resource management strategies can mitigate the risk. Public cooperation with fire prevention measures lowers the risk of wildfire even during high-risk weather conditions. Fire ignition is more likely in areas where people camp, burn debris, and where construction is taking place. Fires are more destructive when fuel has accumulated over long periods without burns. While wildfire has been a lesser threat to the Upper Coastal Plain region in the past, the region can prepare for more conditions conducive to burning in the future through public education on responsible camping and smoking practices, fire-smart land management in agricultural areas, and developing a prescribed burning program to reduce fuel accumulation.

5.0 Upper Coastal Plain Region Sector Impacts

This chapter describes how natural hazards impact the following sectors:

- Housing
- Critical facilities
- Regional economy
- Historical and cultural resources
- Natural environmental systems
- Public health
- Social vulnerability

5.1 Housing

Figure 8 - Housing Sector Overview

- The housing stock in the Upper Coastal Plain region is particularly vulnerable because of the number of aging homes, mobile homes, and inefficient heating/cooling systems. Electric bills during the summer months are more than the monthly rent for some families.
- Mobile and manufactured homes are also vulnerable as they are less structurally capable of withstanding high winds and hurricanes.
- Over 3,000 homes across the region lie in the 100-year or 500-year floodplain, mostly in Edgecombe and Nash counties.
- The Upper Coastal Plain region is particularly vulnerable to drought given the prevalence of homes that rely on private wells for drinking water, and drought conditions are likely to increase by the 2050s.

Homes provide shelter and comfort during weather related events and are a key social determinant of health. Social determinants of health are the conditions in the environment where people live, work, etc. that affect a wide range of health, functioning, and quality-of-life outcomes and risks (US Department of Health and Human Services, n.d.). Other examples include polluted air and water, education and job opportunities, transportation, and neighborhoods. A lack of housing, poor-quality housing, or housing instability can negatively affect an individual's physical and mental health status. For example, dampness, mold, inadequate heating and cooling, or

overcrowding directly affect the wellbeing of individuals and their families. Approximately 62% of homes in the region were built more than 30 years ago and about 5% of homes are newer than 2010 (U.S. Census Bureau, 2022). Homes 30 years and older typically are more prone to experience dampness and mold issues and inadequate heating and cooling. Additionally, an analysis by the project team found that at least 3,038 residential buildings in the region are located in the 500-year floodplain and are at a greater risk of flooding. Using a variety of data sources, this section includes maps that identify which homes are most vulnerable to each hazard. To explore the impacts of natural hazards on housing further, the project team looked at present day conditions and 30-year projections of natural hazards using best available methods.

5.1.1 Housing Characteristics that Affect Vulnerability

Individual homes may be more vulnerable to the impacts of natural hazard events if they have certain characteristics. The age of a structure, housing type, housing tenure (ownership), and occupancy status may make it more susceptible to hazard impacts. Older homes or manufactured/mobile homes, for example, may be more prone to structural damages related to high wind events and hurricanes. The project team collected data from the 2020 American Community Survey 5-Year Estimates to discuss the housing vulnerability metrics presented below.

5.1.1.1 Structural Condition

The age of residential buildings can directly impact ability to withstand climate hazards. In **Table 7** below, the 2021 American Community Survey 5-year estimate data show that the following percentages of homes in each county are at least 30 years old (built prior to 1989), which can put them at higher risk of costly maintenance and repair:

Table 7 - Percent Homes Greater than 30-Years Old

County	Homes Greater than 30-Years Old (percent)
Edgecombe	63%
Halifax	66%
Nash	56%
Northampton	64%
Wilson	61%
Regional Average	**62%**

Source: 2021 American Community Survey (ACS) 5-Year Estimates Data Profiles

Table 8 further illustrates the construction dates of homes within each county of the Upper Coastal Plain region based on 2021 American Community Survey 5-Year estimates. About 5% of homes across the region are newer than 2010. Stakeholders have discussed the lack of housing availability in some areas throughout the region during meetings, saying housing is hard to find in some towns so people end up living further away from where they work. Additionally, stakeholders pointed out that housing in Scotland Neck (Halifax County) is, on average, 60 years or older, and lacks air conditioning, adequate insulation, and potentially harbors mold behind the walls.

Table 8 - Home Construction Dates

Structure Build Date					
	Edgecombe	Halifax	Nash	Northampton	Wilson
Built 2020 or later	0.0%	0.3%	0.0%	0.3%	0.1%
Built 2010 to 2019	5%	4%	6%	6%	5%
Built 2000 to 2009	13%	9%	18%	10%	16%
Built 1990 to 1999	19%	21%	20%	19%	18%
Built 1980 to 1989	11%	15%	15%	12%	15%
Built 1970 to 1979	18%	12%	15%	16%	15%
Built 1960 to 1969	9%	11%	7%	8%	9%
Built 1950 to 1959	11%	11%	8%	13%	10%
Built 1940 to 1949	4%	8%	3%	8%	5%
Built 1939 or earlier	10%	9%	8%	7%	6%

Source: 2021 American Community Survey (ACS) 5-Year Estimates Data Profiles

The build type of a structure may also influence its ability to withstand natural hazards. Site-built homes with permanent, concrete foundations are generally expected to withstand strong storms, including tornadoes and high winds. Manufactured homes are constructed in a controlled setting and delivered to a property where the house is then attached to the ground using anchors and reinforced with steel straps to ensure stability during storms (Gritton, 2019). The term "mobile home" is often used historically to refer to "trailers," which are typically smaller homes on wheels that can be moved from site to site fairly easy. Manufactured homes today are also often referred to as mobile homes because they are built off-site and transported (mobile) with wheels that are removed when the house is permanently attached to the ground (Gritton, 2019). However, standards for manufactured homes are regulated by the US Department of Housing and Urban Development with standards for high wind and such, whereas site-built homes often have multiple contractors and sub-contractors working to construct the house and may not have the same regulatory oversight for standards. Two important components of considering risk of damage during severe storms is the location of the structure and who lives there. Land within and near

floodplains is often less expensive and may be appealing to someone looking for property to place a manufactured home. Lower income people and older adults may also live in smaller structures like manufactured homes due to income constraints or mobility. Risk of negative impacts therefore depends on the standards the home was built to, whether it meets those standards, and where it is located. Manufactured/mobile homes represent approximately 21% of the different housing types in the region. Refer to **Table 9** below for housing type composition for each county within the region based on 2021 American Community Survey 5-Year estimates. Counties with larger proportions of manufactured and mobile homes, such as Northampton, Edgecombe, and Halifax, should consider ways to ensure safety and structural integrity during storms.

Table 9 - Housing Types

Housing Type					
	Edgecombe	Halifax	Nash	Northampton	Wilson
Single Unit	62%	65%	66%	70%	67%
Multiple Units	14%	11%	16%	5%	19%
Mobile Home	24%	24%	18%	25%	14%

Source: 2021 American Community Survey (ACS) 5-Year Estimates Data Profiles

5.1.2 Impacts by Hazard

5.1.2.1 Flooding

Flooding can have a major impact on housing. Homes that experience flooding must deal with expensive cleanup and repairs, including long term effects such as mildew and mold. Often, flooding can result in a complete loss of the structure and/or abandonment for families that cannot afford the cost of repairs. Floodwaters are especially problematic as they carry large loads of sediments that are deposited and left behind in the interior of homes when floodwaters recede. This results not only in damages to the housing structure itself but also to the personal items inside.

The project team used available GIS data to compare residential building first floor elevations to the 100-year and 500-year floodplain to analyze how many residential buildings are at risk of flooding. Approximately 648 residential buildings (valued at approximate $44.6 million) are estimated to have a first-floor elevation below the current 100-year water surface elevation. Approximately 3,038 residential buildings (valued at $192 million) are estimated to have a first-floor elevation below the current 500-year water surface elevation.

Looking forward, the North Carolina Floodplain Mapping Program estimates the probability of flooding in the next 30 years across the state. The Program estimated the probability of flooding for buildings outside of the current 100-year floodplain within the Upper Coastal Plain region and found 3,058 additional residential buildings, with an estimated total value of $210 million, outside of the current floodplain have a chance of flooding in the next 30 years (NC Floodplain Mapping Program, n.d.).

Table 10 presents the number of homes located within the 100-year and 500-year floodplain for each county and the total number in the Upper Coastal Plain region.

Table 10 - Number of Homes in Floodplain

County	Homes in 100-Year Floodplain	Homes in 500-Year Floodplain
Edgecombe	225	1,640
Halifax	41	254
Nash	211	544
Northampton	29	164
Wilson	142	436
Total	648	3,038

Source: NC OneMap

Manufactured/mobile homes may have higher exposure to flooding because they are often located on land in floodplains. Of particular importance, there are three manufactured/mobile home parks in Wilson and Nash counties located in the 100-year floodplain and two in Edgecombe County located in the 500-year floodplain**. Table 11** and **Table 12** detail the name and general address of these areas.

Table 11 - Mobile Home Parks Located in the 100-Year Floodplain

100-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Juanita Loop	6401 Juanita Loop, Lucama, NC 27851	Mobile Home Parks	Wilson
Shady Grove Mobile Home Park	720 Kingston Ave, Rocky Mount, NC 27803	Mobile Home Parks	Nash
Kasey Lane, Cliff Lane, Charlene Lane	Kasey Lane, Rocky Mount, NC 27801	Mobile Home Parks	Nash
E Northern Blvd, Jamie Ln, Kathryn Ln	35.93212, -77.5258	Mobile Home Parks	Edgecombe

Source: NC OneMap

Table 12 - Mobile Home Parks Located in the 500-Year Floodplain

500-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Lakeside Lane/Bertha Lane/Lyons Lane/Lone Pine Lane/Carol Lane/Young Lane/Ernest Lane Mobile Home Park	9 Lakeside Ln, Tarboro, NC 27886	Mobile Home Park	Edgecombe
Cool Spring Road/NC Hwy 97 Mobile Home Park	10344 NC-97, Rocky Mount, NC 27801	Mobile Home Park	Edgecombe

Source: NC OneMap

Figure 9 and **Figure 10** identify homes located in both the 100- and 500-year floodplain. As a proxy for the 30-year projections, the 500-year flood event map was used for this analysis. Note that one pinpoint represents one residential building. It is possible that the building may have multiple units.

Residential buildings located in the 100-year floodplain are at greater risk from flooding and are required to have flood insurance. The State of North Carolina regulates the floodplain to protect property and people and to reduce future flood losses (also called repetitive loss properties). It is important to note which residential buildings are in the floodplain to ensure residents are aware

of their increased risk and take proper precautions to mitigate damages from flooding. Residential buildings that are not in the floodplain may still experience flooding – any location that receives rainfall has the potential to flood. However, homes located closer to a body of water inherently begin with more risk than homes that are not near a body of water.

In the Upper Coastal Plain region, most homes exposed to 100-year flooding are located:

- In the area near the Tar River around Rocky Mount and the eastern part of Tarboro
- In the area near Stony Creek around Nashville
- In the area near Toisnot Swamp and Contentnea Creek
- In the area near the Roanoke River around Roanoke Rapids and Weldon

In addition to the locations above, most homes exposed to 500-year flooding are located:

- In the area near the Roanoke River around Halifax, Tillery, and Rich Square
- In the area near the Tar River between Rocky Mount and Tarboro, Princeville, and Old Sparta
- In the area near Bloomery Swamp in Wilson

Figure 9 - Homes Exposed to the 100-Year Flood Event

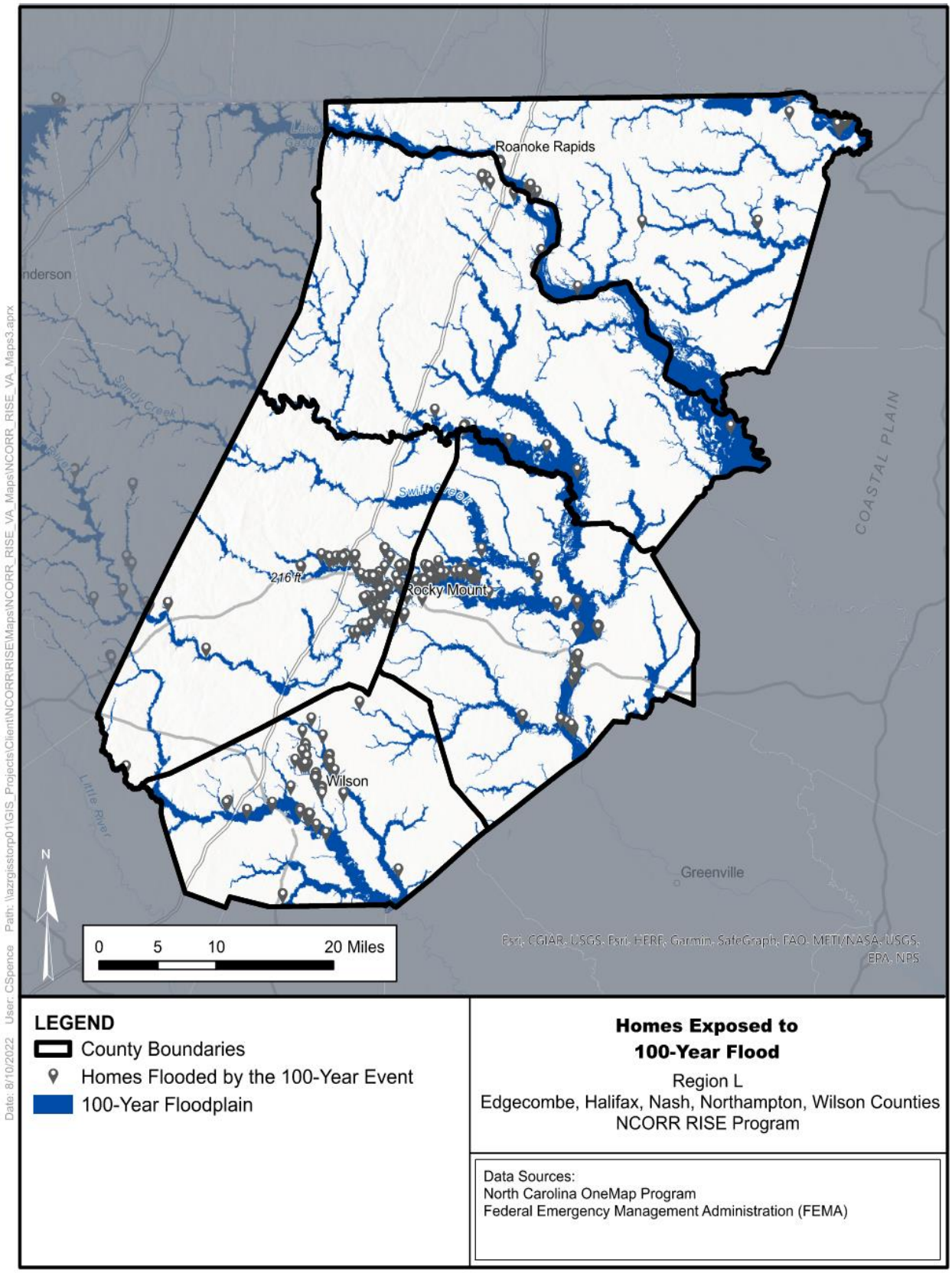
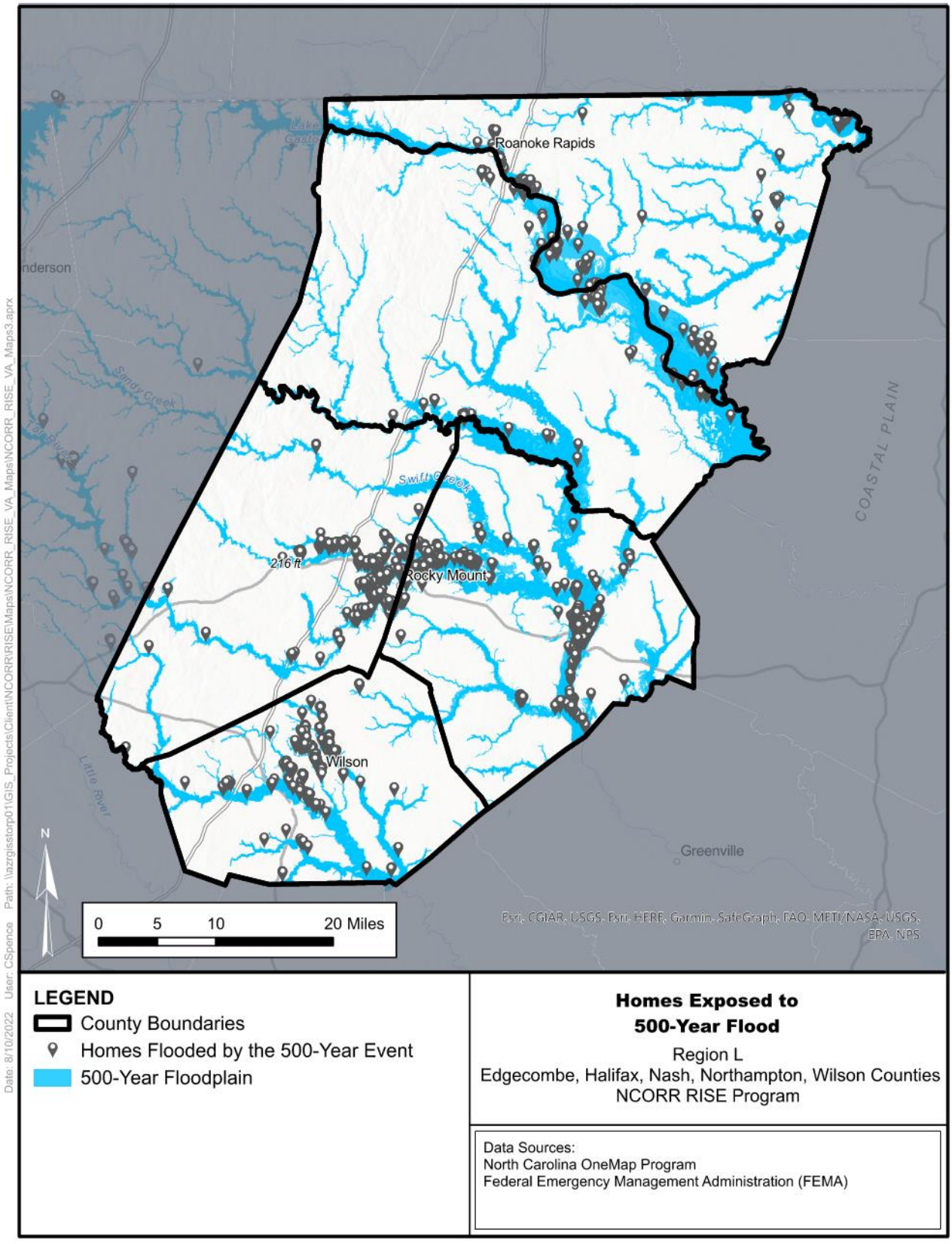


Figure 10 - Homes Exposed to the 500-Year Flood Event



5.1.1.2 Hurricanes and Tropical Storms

Hurricanes and tropical storms can have devastating impacts to homes and entire communities. Heavy rainfall from these storms can cause localized flooding and high winds can damage the exterior of homes, tear off shingles and damage roofs, cause trees to fall onto homes, break windows, and damage personal property. Between 1999 and 2018, 19 tropical storms and hurricanes caused approximately $5.7 million of property damage in Nash, Edgecombe, and Wilson counties, as reported in the National Center for Environmental Information Events Database (Wood, 2020). NOAA's Office for Coastal Management keeps records of all historical hurricane tracks, and between August 1851 and July 2021, there were 89-99 hurricanes and tropical storms that passed within 50 miles of the Upper Coastal Plain Region (NOAA Office of Coastal Management, 2022). Approximately 44,829 residential buildings worth an estimated $31.8 million in Northampton and Halifax counties are at risk of damage from 100-year hurricane winds (AECOM, 2021). That is approximately 82.3% of all residential buildings in these counties. In Nash, Edgecombe, and Wilson counties, approximately 100,174 residential buildings worth an estimated $105.4 million are also at risk of damage from 100-year hurricane winds (Wood, 2020). That is approximately 83.3% of all residential buildings in these three counties. Overall, about 83% of residential buildings in the Upper Coastal Plain region are at risk of damage from hurricane winds.

5.1.1.3 Severe Weather

Severe weather impacts to housing are similar to the impacts from flooding and hurricanes. From 2009-2020, the National Climatic Data Center has recorded 267 instances of thunderstorm wind conditions in Halifax and Northampton counties that caused approximately $1.1 million in losses to property (AECOM, 2021). Severe weather also encompasses lightning and hail, each of which cause damages to housing and property. The National Center for Environmental Information records indicate that Nash, Edgecombe, and Wilson counties have endured approximately $1.5 million in property damages caused by lightning from 1999-2018 (Wood, 2020).

Across all five counties, a total of 145,003 residential buildings are at risk of 100-year thunderstorm winds, with total estimated damages of approximately $96.5 million (AECOM, 2021) (Wood, 2020).

In future scenarios, the 2020 *North Carolina Climate Science Report* notes that "global climate models consistently project an increase in the frequency of severe thunderstorm environments in the United States in the mid- to late 21st century" (Kunkel, et al., 2020). Therefore, it is likely that the impact to housing due to wind, hail, and lightening damage will increase in the next 30-50 years.

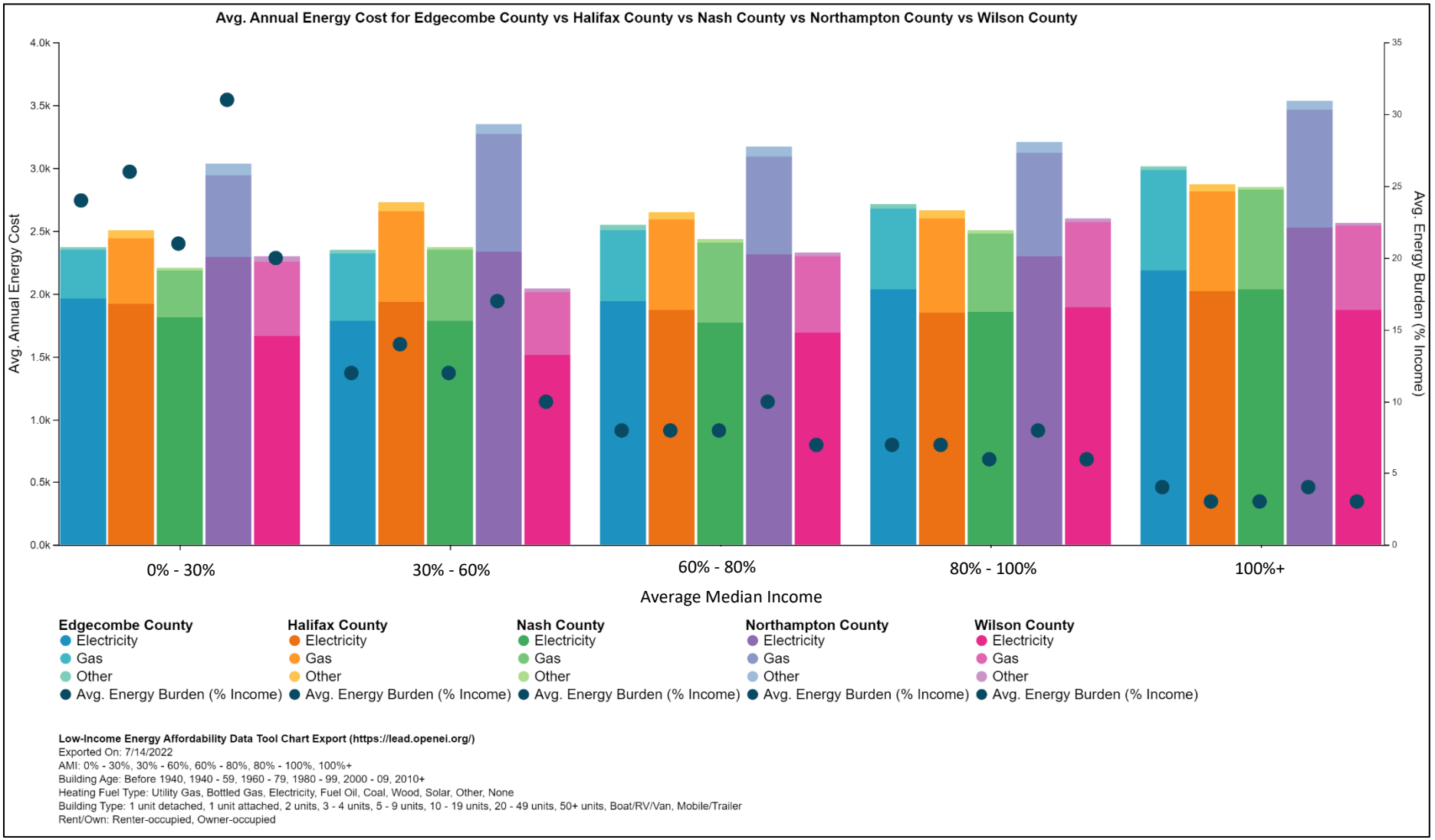
5.1.1.4 Extreme Heat

Comparatively, excessively hot temperatures can strain aging building materials in homes and residential structures. Some homes may lack central cooling units, leaving residents to rely only on fans and open windows. Where cooling units are installed, higher energy use can overburden power lines and be very cost prohibitive. Where cooling units are installed, the increased energy use can put a tax on the utility infrastructure. Manufactured/mobile homes may utilize different heating and cooling systems and may be less energy efficient than site-built homes.

Across the U.S., low-income households tend to spend a larger portion of their income on home energy costs (e.g., electricity, natural gas, and other home heating fuels) than other households (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2018). This measure is often called "energy cost burden" and can mean households may have to choose between paying energy bills and buying food or other essentials (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2018). **Figure 11** below illustrates the energy cost burden in the Upper Coastal Plain region (US Department of Energy, 2022). Area median income is the household income for the median/'middle' household in the region and is used as a benchmark to determine categories of income level. Specifically, extremely low, very low, and low-income households are critical to highlight as these are likely to experience energy cost burden. Households with an income of 80% or less than the area median income are categorized as low income; households with an income of 50% or less than the area median income are categorized as very low income; and households with an income of 30% or less than the area median income are categorized as extremely low income. In the figure, each county is compared to one another within each category of area median income – 0% - 30%, 30% - 60%, 60% - 80%, 80% - 100%, and 100% +. The dots represent the average energy burden or cost of energy that households in that county pay per year. For example, extremely low-income households in Northampton County spend 31% of their income on energy costs. In comparison, households in the 100%+ category for Northampton County spend just 4% of their income on energy costs.

Northampton County tends to have a higher energy cost burden than the other four counties in the region at each level of area median income. The average amount that extremely low-income residents in Halifax County pay per year for energy is 26% of their total income. In Edgecombe County, that number is 24%. Overall, energy cost burden impacts housing resiliency when residents are forced to choose what they can spend limited money on.

Figure 11 - Low-Income Energy Affordability Data



Source: [Low-Income Energy Affordability Data (LEAD) Tool]

5.1.1.5 Winter Storms

Winter storms can cause a variety of damage to houses. Water infrastructure is damaged when pipes freeze and burst. Accumulation of ice on trees will cause them to fall and damage roofs. Prolonged periods of low temperatures can strain old heating systems and cause electrical problems. Additional hazards result from residents using generators, propane heaters, open flame, and ovens with doors left open to heat their homes in the winter. These choices increase fire risk and air quality hazards. Stakeholders have noted that there are fewer instances of winter storms with snow and ice, but when they do occur, many towns are unprepared to respond. Ice has mostly caused leaking and subsequent roof damage.

Between 1999 and 2018, ice and winter storms caused $1.8 million in property damage in Nash, Edgecombe, and Wilson counties (Wood, 2020). An additional $620,000 in damages have resulted from ice and winter storms in Northampton and Halifax counties since 1950 (Wood, 2020).

5.1.1.6 Wildfire

Fire is a critical component of most natural environmental systems, particularly in the Coastal Plain. Fire suppression across the region and much of the state has caused forested areas to accumulate dense undergrowth, which can fuel massive wildfires.

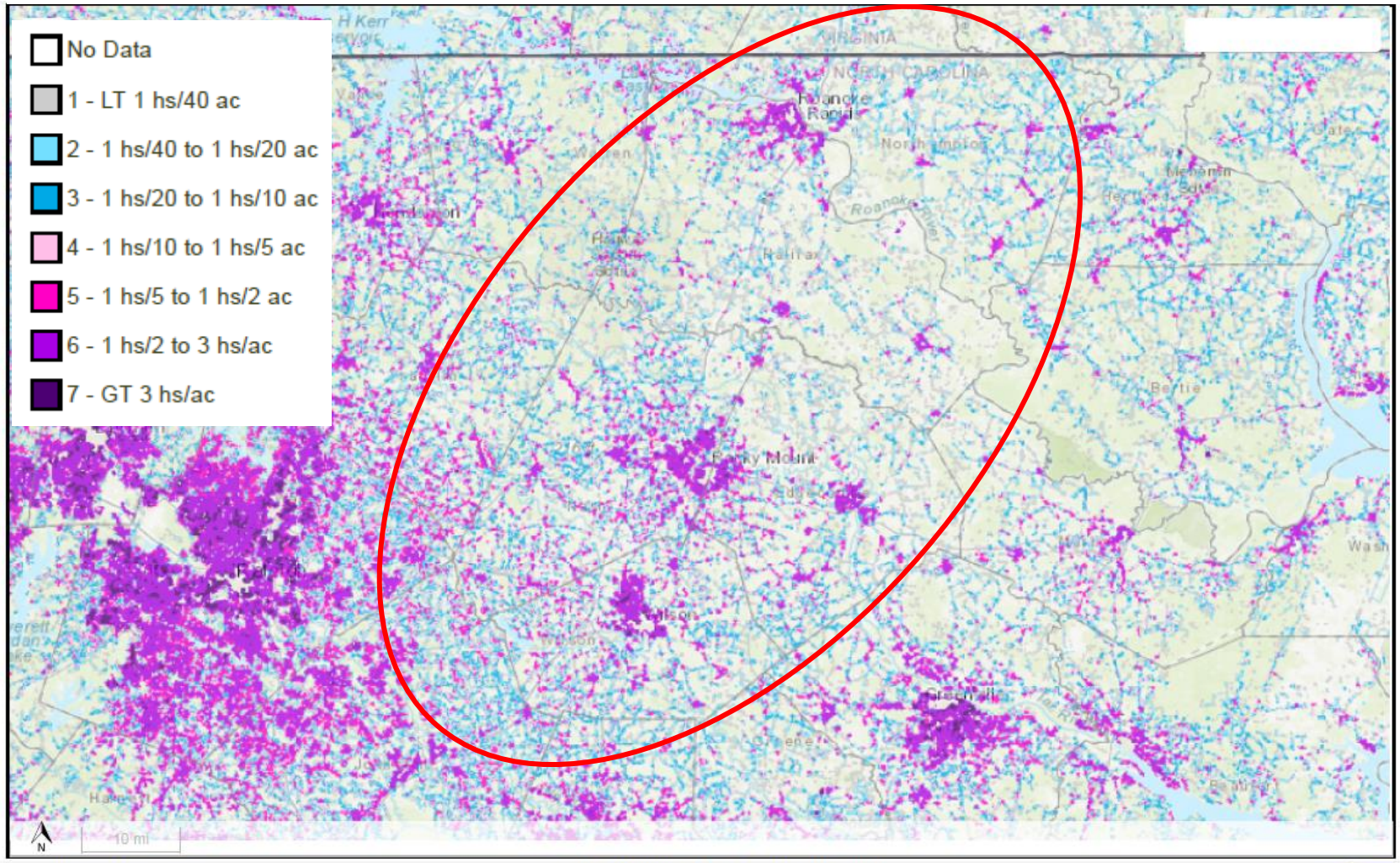
The most severe fires typically occur between February and May when dry and windy days provide the best conditions for ignition. When uncontrolled, wildfires threaten houses as embers and small flames land on roofs and grasses and ignite the house quickly.

The Southern Group of State Foresters Wildfire Risk Assessment Portal (WRAP) provides accurate and up-to-date wildfire risk information across the South. The map viewer includes data about the Wildland Urban Interface, Wildland Urban Interface Risk Index, Community Protection Zones, and Wildfire Ignition Density.

The Wildland Urban Interface (WUI) is the land that transitions between developed areas and natural wilderness. This area is important to focus on, because as more populated areas move closer towards more wild or natural areas, fire risk may increase, and homes may be more

susceptible to wildfire. The Portal's Wildland Urban Interface data reflects housing density, depicting where humans and their structures meet wildland fuels. As seen in **Figure 12**Error! Reference source not found., areas highlighted in pink and purple indicate higher numbers of houses per acre.

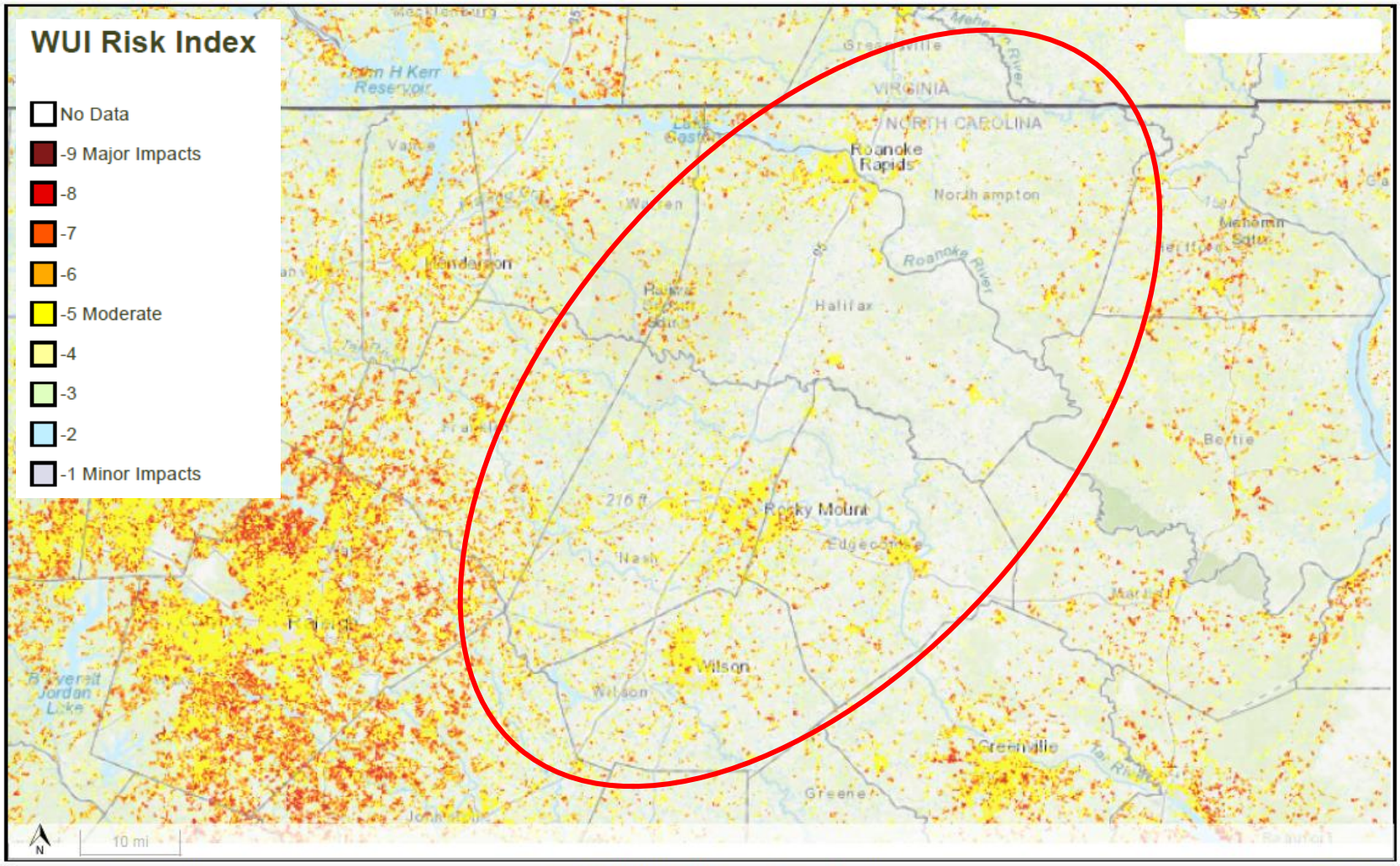
Figure 12 - Upper Coastal Plain Wildland Urban Interface (WUI)



The user assumes the entire risk related to their use of the SGSF Wildfire Risk Assessment Portal and either the published or derived products from these data. Southern Group of State Foresters is providing these data "as is" and disclaims any and all warranties, whether expressed or implied, including (without limitation) any implied warranties of merchantability or fitness for a particular purpose. In no event will Southern Group of State Foresters be liable to you or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or lost profit resulting from any use or misuse of these data.

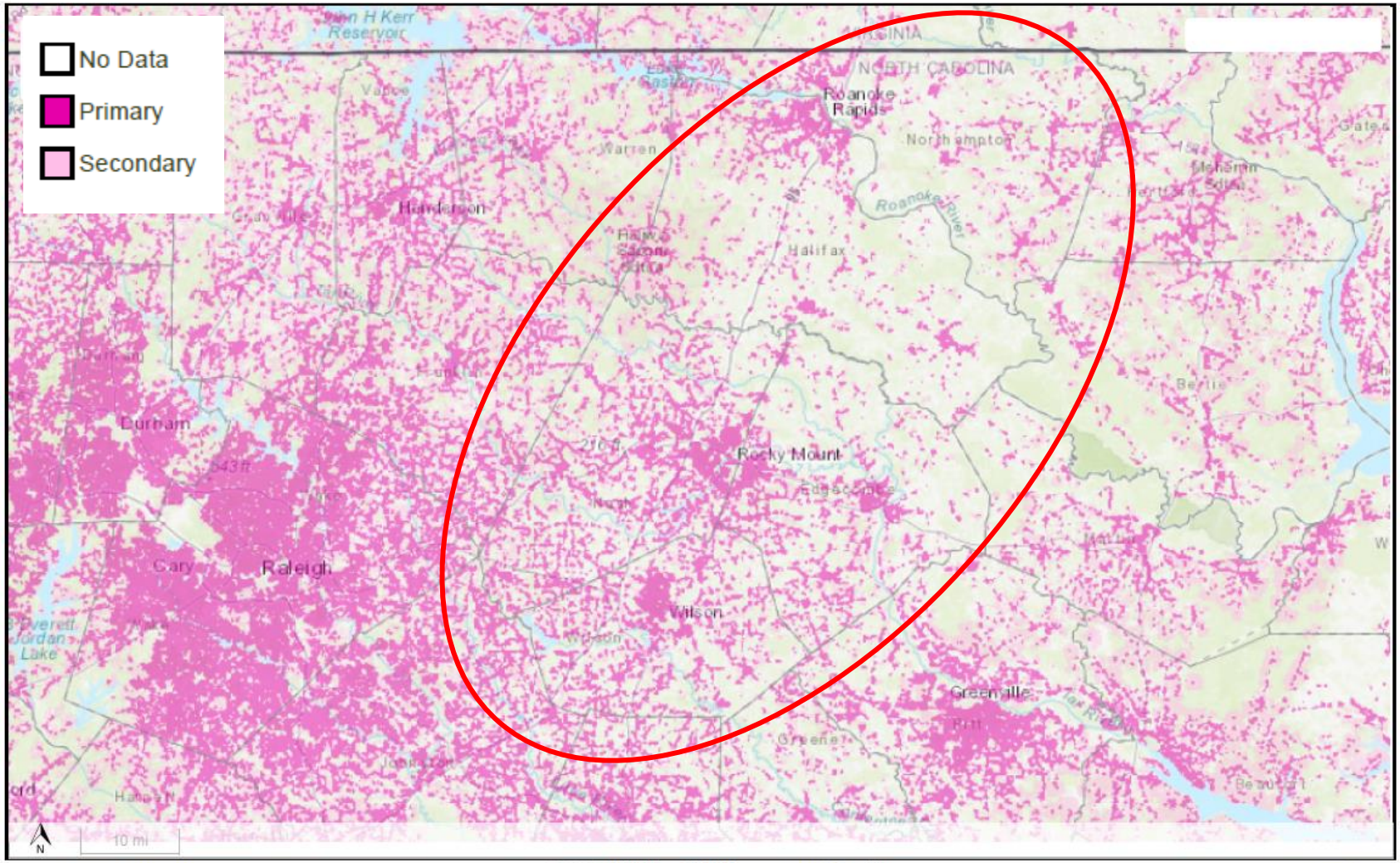
The Portal's Wildland Urban Interface Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. Data in **Figure 13** displays a gradient of major impacts in dark red to minor impacts in gray. Most of the Upper Coastal Plain region would experience minor impacts from wildfire. Those areas with moderate impacts are clustered around more urban centers where wildfire poses risk to more infrastructure.

Figure 13 - Upper Coastal Plain Wildland Urban Interface Risk Index



Community Protection Zones represent areas considered highest priority for mitigation planning activities. Wildfires that begin in this area contribute more to potential loss of community assets than other management zones (U.S. Forest Service, Pacific Southwest Region, 2016). Under most conditions, direct action to mitigate wildfires is needed in this area to prevent direct threats to life or property. In **Figure 14**, dark pink indicates primary community protection zones to focus actions to mitigate wildfire risk.

Figure 14 - Upper Coastal Plain Community Protection Zones



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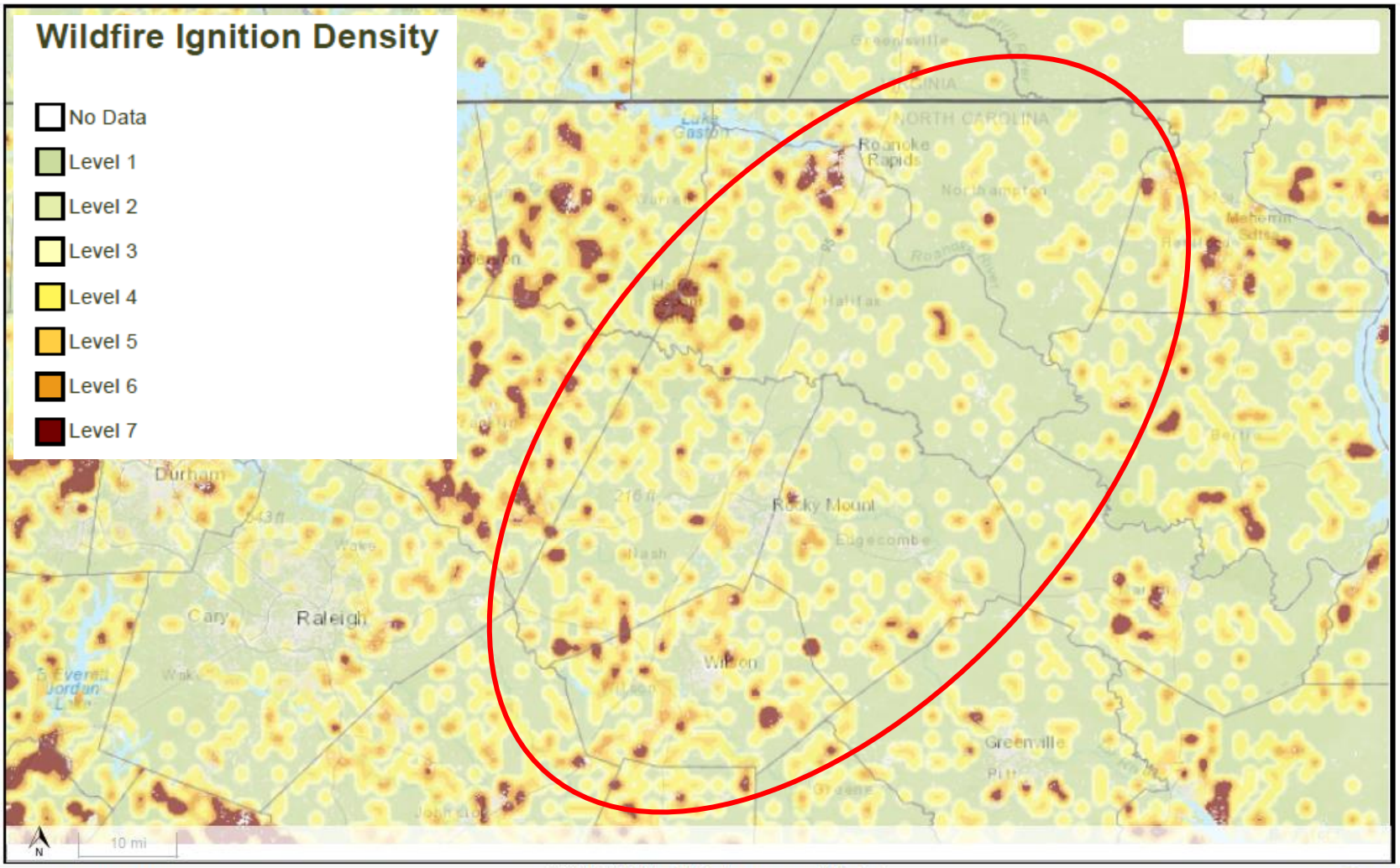
SGSF Wildfire Risk Assessment Portal
https://southernwildfirerisk.com

Wildfire ignition density is the likelihood of a wildfire igniting in an area, based on historic records. Since it is currently not possible to accurately model 30-year projections of wildfires in the region, climate scientists use wildfire ignition density as the best measurement substitute. Data in **Figure 15** on average ignition rates displays as Very Low (Level 1) in light green to Very High (Level 7) in dark red.

Figure 15 - Upper Coastal Plain Wildfire Ignition Density



Wildfire ignition density is low for much of the Upper Coastal Plain region, with isolated areas of high wildfire ignition occurrence. Some of those areas include Roanoke Rapids, Hollister, north of Rocky Mount, Saratoga, and north of Wilson. However, given the mostly very low ignition rates and low Wildland Urban Interface Risk Index score for the entire region, it is likely that wildfire presents little hazard to the housing sector.

5.2 Critical Facilities

Figure 16 - Critical Facilities Overview

- Critical facilities are susceptible to severe weather and flooding that cause business, school, and road closures; downed trees and powerlines; and structural damage.
- Many houses of worship act as last resort shelters during natural hazards and don't have the same resources as established shelters.
- There are currently four major critical facilities located in the 100-year floodplain – 1) Stoney Creek Fire & Rescue Department - Station 3 in Nash County, and 2) O.R. Pope Elementary School (used as emergency shelter), 3) Conetoe Volunteer Fire & Emergency Medical Services, and 4) Pattillo Middle School in Edgecombe County.
- There are 8 major critical facilities located in the 500-year floodplain – 5 in Edgecombe County and 3 in Halifax County.

Critical facilities consist of assets, systems, and networks, both physical and virtual, that impact security, economic security, and public health and safety. The project team collected data on critical facilities within the Upper Coastal Plain region that included critical health resources such as emergency medical services, dialysis centers, pharmacies, urgent care centers, and hospitals; critical social hubs and resources such as SNAP-authorized retailers, schools, and houses of worship; emergency response such as emergency operations centers, police and fire stations, emergency shelters, and cellular towers; group quarters and vulnerable housing such as colleges and universities, correctional institutions, nursing homes, and mobile home parks; and hazardous contamination potential such as hazardous waste sites, landfills, and power plants. **Table 13** below shows the total number of critical facilities within each category for the Upper Coastal Plain region.

There are 1,718 critical facilities in the region with the majority categorized as social hubs and resources. Examples of these include houses of worship, gas stations, Dollar General, convenience, and grocery stores. Stakeholder input has revealed that many houses of worship across the region act as last resort shelters during emergencies and often lack capacity and additional necessities to function like a real shelter. Additionally, stakeholders discussed the importance of houses of worship having emergency plans in place ahead of events in case something happens during a service, and to prepare ahead of major storm events. Social hubs and resources are critical to the integrity of the region and should be addressed in resiliency efforts.

Table 13 - Critical Facilities in the Upper Coastal Plain Five-County Region

Critical Health Resources	Social Hubs & Resources	Emergency Response	Group Quarters & Vulnerable Housing	Hazardous Contamination Potential
249	**781**	**186**	**266**	**236**

Source: NC OneMap

5.2.1 Impacts by Hazard

Natural hazard occurrences in the region can damage critical infrastructure and assets causing many indirect and direct impacts, the most severe being injury and loss of life. Buildings, utilities, and roadways are especially at risk of extensive damage. Property damage may be widespread. Power outages happen because of the increased use of air conditioning during heat waves and because of downed trees and powerlines, especially during hurricanes, high wind, and winter storm events. Loss of power can range from a mild inconvenience to a life-threatening event for those reliant on powered medical equipment and air conditioning units. During hurricanes and severe weather, transformers can explode, and exterior building features like windows can shatter. Blocked roadways and bridges can prevent access to life-saving care and delay first responders. Agricultural fields can also be significantly impacted or destroyed.

Damages to infrastructure within the Upper Coastal Plain region have secondary impacts that can be just as detrimental as the direct ones. These include mental trauma, displacement, financial losses for businesses and individuals, job losses, prolonged cleanup, and food and water supply

concerns. Socially vulnerable populations such as youth, the elderly, disabled persons, low-income persons, and mobile home occupants, among others, are at greater risk of harm from hazardous events. As such, critical facilities like senior centers, assisted care communities, healthcare facilities, mobile home parks, schools, and other facilities serving socially vulnerable populations should be prioritized in resiliency efforts.

5.2.1.1 Flooding

Flooding is one of the most frequently mentioned natural hazards in the Upper Coastal Plain region, particularly inland flooding. During stakeholder meetings and the April 2022 open house, participants regularly mentioned flooding as a main concern. All types of structures in a floodplain are at-risk of damage to varying degrees. Factors that affect the degree of damage include physical location, building methods, structure age, elevation levels, and more. The project team used available GIS data to compare the location of critical facilities to the 100-year and 500-year floodplain to analyze how many critical facilities are at risk of flooding.

The Upper Coastal Plain region is connected to surrounding areas via its transportation network. The ability to carry goods, services, and persons across land in an efficient manner is essential to sustaining the region's economy, vitality, and livelihood. Interstate 95 (I-95), the largest highway system, traverses through the region north to south, and US Highway 64 travels east to west. Additional major roadways include Interstate 795 and US routes 265, 301, 258, and 158. Railways consist of CSX Transportation, Amtrak, and North Carolina & Virginia Railroad. Regional airports are in Rocky Mount-Wilson and Halifax-Northampton. Should any of them be impacted by natural hazards, the effects would be costly and widespread. **Table 14** below shows the number of road miles at risk of flooding and becoming impassable because of 100-year flooding.

Table 14 - Road Miles Subject to Flooding

County	Number of miles of roads at risk of becoming impassable
Edgecombe	462
Halifax	438
Nash	402
Northampton	249
Wilson	408
All counties	1,959

Source: Flood Factor

"Major" critical facilities were separated from the five main categories and analyzed for risk. Major critical facilities have been defined to include emergency medical services, fire stations, police and law enforcement, emergency shelters, power plants, and wastewater treatment plants. There are currently five major critical facilities located in the 100-year floodplain – 1 in Nash County and 3 in Edgecombe County. Additionally, there are 8 major critical facilities located in the 500-year floodplain – 5 in Edgecombe County and 3 in Halifax County. **Table 15** shows the major critical facilities, including facility name and address, within the 100-year and 500-year floodplain.

Table 15 - Major Critical Facilities in the 100-Year and 500-Year Floodplain

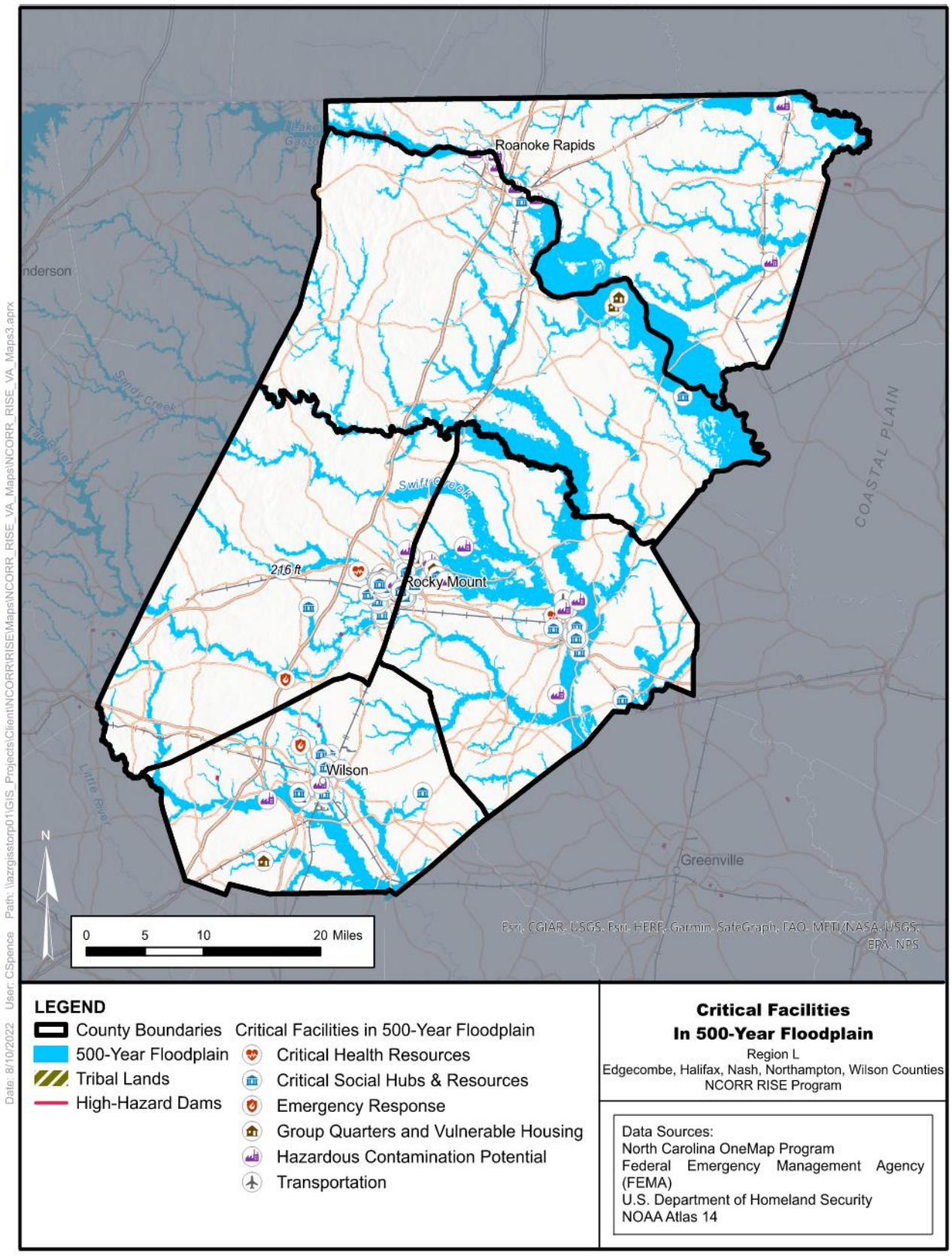
100-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Stoney Creek Fire & Rescue Department - Station 3	651 Country Club Rd, Rocky Mount, NC 27804	Emergency Medical Services	Nash
O.R. Pope Elementary School	226 Coleman Ave, Rocky Mount, NC 27801	Emergency Shelters	Edgecombe
Conetoe Volunteer Fire & Emergency Medical Services	115 S. Canal St., Conetoe NC, 27881	Emergency Medical Services	Edgecombe
Pattillo Middle School	501 East Ave, Tarboro, NC 27886	Emergency Shelters	Edgecombe
500-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Princeville Montessori School	306 Walston St, Princeville, NC 27886	Emergency Shelter	Edgecombe
Tarboro Fire Department	205 West Saint John St, Tarboro, NC 27886	Fire Stations	Edgecombe
Princeville Volunteer Fire Department	312 Mutual Blvd, Princeville, NC 27886	Fire Stations	Edgecombe
Tarboro Police Department	318 N Main St, Tarboro, NC 27886	Police & Law Enforcement	Edgecombe
Princeville Town Hall	201 S Main St, Princeville, NC 27886	Police & Law Enforcement	Edgecombe
Weldon Fire Department - Station 1 Headquarters	201 Sycamore St, Weldon, NC 27890	Fire Stations	Halifax
Weldon Water Plant	328 Mill St, Weldon, NC 27890	Wastewater Treatment Plant	Halifax
Kapstone Kraft Paper Corporation	100 Gaston Rd, Roanoke Rapids, NC 27870	Power Plant	Halifax

Source: NC OneMap, FEMA National Flood Hazard Layer Viewer

The location of these important facilities in an area with a 1% and/or 0.2% chance of flooding in any year puts them at risk of failing to operate or being damaged when a storm does occur. Many of these facilities provide emergency response and in the event of an emergency, lives and property are even more at risk if flooding impacts these locations.

Figure 17 below depicts all critical facilities – approximately 120 – that are identified within the 500-year floodplain. For future risk levels, 500-year is used as proxy for the 30-year projection. Like residential buildings located in the floodplain, it is important to identify critical facilities that have a disproportionate risk to flooding. For example, SNAP-authorized retailers are important retailers of food for low-income populations. If these facilities are impacted by flooding, or community residents can't access these places during hazard events, vulnerable populations may struggle to purchase necessities. There are 36 SNAP-authorized retailers located in the 500-year floodplain.

Figure 17 - Critical Facilities Exposed to a 500-year Flood Event



5.2.1.2 Severe Weather

Severe weather includes thunderstorms that can be accompanied by wind, lightning hail, and heavy rainfall. As mentioned in Section 5.1, severe weather impacts critical facilities similarly to houses. Stakeholders have provided information about street intersections in Nashville and Scotland Neck that fill with water any time it rains. Location of heavy rainfall also influences communities downstream, as water flows over land into streams and rivers and sometimes has a greater impact after the initial storm event.

5.2.1.3 Extreme Heat

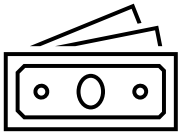
Extreme heat can cause significant damage to infrastructure. In extreme cases, in which several factors must align such as prolonged periods of very high temperatures, road surfaces can be damaged as asphalt softens and train rails can buckle due to heat-induced expansion. Powerlines may also sag. When there is a high demand on the electrical grid for cooling purposes, it can increase power line temperatures that can result in fire. One important cascading impact of extreme heat is that increased use of air conditioning systems can strain the power grid, triggering power outages which can lead to adverse health impacts. More commonly, the consequences of extreme heat lead to heat-related illnesses and agricultural losses.

5.2.1.4 Wildfire

Wildfire is a naturally occurring event, but it can be attributed to negligent human actions. Wildfires can quickly spread and destroy critical facilities. Extreme temperatures and drought can also increase wildfire risk. Most of the critical facilities in Upper Coastal Plain region have a low probability of being affected by wildfire.

5.3 Regional Economy

Figure 18 - Regional Economy Overview



- Flooding from hurricanes and severe weather is the most significant hazard to the regional economy. Relatedly, residents report frequent power outages when it rains, which affects operations for businesses.
- Disruption to the supply chain, logisitics, and transportation routes caused by hazards like flooding, hurricanes, and severe weather can affect the manufacturing industry and regional economy.
- The Upper Coastal Plain region is particularly vulnerable to drought given the regional importance of agriculture.

Climate change is likely to pose impacts to industries in the region. Heavy rainfall during hurricanes and thunderstorms will likely cause flooding on roads, preventing employees and customers from accessing a business. Droughts will make water more expensive, which will affect the cost of raw materials and production (Cho, 2019). Supply chain and logistics can be affected by severe weather, hurricanes, and other hazards happening in different locations. The result is delays and increased timelines. Water damage to building infrastructure can also cause businesses to close for a period, affecting profit and job stability for employees. Heavy rain, flooding, and extreme temperatures will likely cause school closures, disrupting teaching and learning. Each industry in the Upper Coastal Plain region has felt the impacts of climate change in some way already and will need to prepare and become resilient starting now. The following section outlines the top industries and largest employers in the region and vulnerabilities that affect the regional economy.

As the region changes throughout the years, so do industries and employment opportunities. In 1990, Information, Manufacturing, and Educational Services industries ranked #1 for the Upper Coastal Plain region based on quarterly tax and wage reports and range of number of employees per company (NC Department of Commerce, 2022). In 2021, Finance and Industry Retail Trade, Health Care and Social Assistance, Transportation and Warehouse, and Manufacturing industries are ranked #1 for the five-county region (NC Department of Commerce, 2022).

The Manufacturing industry employs an average of 19,663 people at 259 establishments across the region. Retail Trade accounts for 1,107 establishments with average employment of 14,660, and Health Care and Social Assistance employs an average of 14,651 people at 696 establishments across the region. **Table 32** in the **Appendix** displays the number of establishments and average employment for industries across all five counties (Edgecombe, Halifax, Nash, Northampton, and Wilson) for 2021.

Across the Upper Coastal Plain region, the agricultural industry is vulnerable to natural hazards that can cause crop and livestock losses. For example, during the open house in April 2022, one participant discussed how frequent rainfall caused watermelons to grow larger than sellable size, meaning it was not profitable to harvest them. The farmer simply left them in the fields to decompose. Other comments during the open house about weather hazards affecting crops included mentions of a change in weather patterns and the unpredictability of rain and drought. **Table 16** presents data about farm operations across the region and what percent of acreage has crop insurance if weather hazards impact production. Less than half of the total crop acreage in Halifax and Nash counties have crop insurance, putting farmers at risk of negative economic impact if a hazard causes crops to be unharvested.

Table 16 - Agricultural Sector

County	Number of Farms	Acreage in Farms	Proportion of Total County Land Acres in Farms	Top Crop	Total Acreage with Crop Insurance	Estimated Market Value of Land & Buildings
Edgecombe	249	148,917	46.0%	Grains, oilseeds, dry beans, dry peas	89,517 (60%)	$454M
Halifax	336	209,073	45%	Cotton and cottonseed	98,663 (47%)	$536M
Nash	425	129,478	37%	Vegetables, melons, potatoes, sweet potatoes	63,414 (49%)	$599M
Northampton	272	170,170	48%	Cotton and cottonseed	94,534 (56%)	$476M
Wilson	276	122,946	52%	Vegetables, melons, potatoes, sweet potatoes	79,223 (64.4%)	$465M

Source: USDA 2017 Census of Agriculture

5.3.1 Impacts by Hazard

5.3.1.1 Flooding

Flooding poses a significant risk to the regional economy of the Upper Coastal Plain region and can cause serious financial losses. The First Street Foundation Flood Model is a tool created by the First Street Foundation and displays data about specific properties' current and future risk of flooding, flood history, and how flood risk is changing over time. A property's Flood Factor is a comprehensive risk assessment including thirty-year risk of flooding from heavy rainfall,

overflowing rivers and streams, high tides, and storm surge (Flood Factor FAQ, n.d.). Using the Flood Factor tool to quantify flood risks for the commercial sector, the project team determined that approximately 13% of commercial properties are at risk of flooding in the region. Currently, Flood Factor does not provide mapping, so these commercial property locations are unknown. **Table 17** below shows the total number of businesses at risk of flooding over the next 30 years.

Table 17 - Flood Risk to Commercial Properties

County	Number of Commercial Properties at Risk of Flooding	Total Number of Commercial Properties
Edgecombe	139	843
Halifax	183	1,394
Nash	367	2,269
Northampton	46	695
Wilson	204	2,132
Regional Total	939	7,333
Total Percent at Risk	**13%**	

Source: Flood Factor - County

5.3.1.2 Extreme Heat, Drought, and Wildfire

Severe weather within the Upper Coastal Plain region can impact the regional economy to varying degrees. Property damage may be widespread. Power outages from downed trees and powerlines can occur during hurricanes, high wind, and storms. Both property damage and power outages can harm businesses and individuals, leading to financial losses and unemployment. For example, power outages can cause a loss of refrigeration at homes and grocery stores, resulting in food spoiling. There may be prolonged periods of rebuilding communities and the economy, further putting a strain on this sector. During extreme heat events, the increased use of air conditioning can strain the power grid and result in outages. Customers may opt to stay indoors in cooler temperatures instead of supporting local businesses. Outdoor workers may suffer heat-related illnesses and business operations may slow down, as people opt to heed extreme heat warnings. Droughts and wildfire impact the economy by reducing tourism and recreational opportunities.

When these hazards damage economic assets, the secondary impacts can be just as detrimental as the direct ones. Mental trauma, long term psychological impact, displacement, prolonged cleanup, financial losses, and food and water supply concerns can stress people as well as the local economy. For example, if a business is destroyed from a flood or hurricane event, the business owner may experience financial losses and their employees may lose their jobs.

The Upper Coastal Plain has already felt some of these direct economic impacts following Hurricanes Matthew and Florence, in addition to periods of drought and seasonally heavy storms. Secondary impacts such as the COVID-19 pandemic and domestic crises also strain economic development, and when compounded with natural hazards, can significantly impact the region.

5.4 Historical and Cultural Resources

Figure 19 - Historical and Cultural Resources Overview

- Flooding poses the most significant climate risk to historical and cultural resources because it is difficult to physically move these resources.
- 27 of the 158 sites on the National Register of Historic Places are in the 100-year floodplain.
- Archival records stored in government buildings are often impacted by flooding.

The identity of the Upper Coastal Plain region can be defined by its historical and cultural heritage. The region is rich in cultural resources such as historic and archeological sites, museums with artifact collections, historic districts, and archival records. These types of resources are unique and irreplaceable assets that are equally vulnerable to natural hazards. Awareness of the need to preserve and protect these resources is ever increasing.

In the Upper Coastal Plain region, there are 158 sites on the National Register of Historic Places (National Register). Established by the 1966 National Historic Preservation Act, the National Register is the nation's official list of historic places worthy of preservation for their significance in

American history, architecture, archaeology, and culture (Resources, 2022). The list includes districts, sites, buildings, structures, and objects of historical significance.

Additionally, in the Upper Coastal Plain region, there are 7,837 sites on the "Study List" evaluated by the North Carolina Historic Preservation Office (NCHPO) for inclusion in the National Register. The Study List screens out properties that are not eligible for the National Register, but nonetheless, identifies properties and districts that have potential significance and could be eligible for the National Register in the future. The Study List is also intended to help stimulate preservation at the local level.

5.4.1 Impacts by Hazard

5.4.1.1 Flooding

The phrase "water-where-it-doesn't-belong" collectively represents the biggest threat to cultural and historical resources (North Carolina Department of Environmental Quality, 2020). Floods caused by hurricanes and tropical storms, heavy rainfall, and other weather events pose the greatest risk to the sector. Cultural resources in fixed locations are inherently sensitive to flooding and it is difficult to reduce the exposure of a site to flooding. Increased or more frequent flooding may inundate and potentially destroy more cultural resources.

The project team used available GIS data to compare Study List and National Register sites to the 100-year floodplain to analyze how many cultural resources are at risk of flooding. The results are summarized in **Table 18** below. Sites are identified as in or within 500 feet of the 100-year FEMA floodplains.

Table 18 - Historical and Cultural Sites within the 100-Year Floodplain

County	National Register Sites within the 100-Year Floodplain	Study List Sites within the 100-Year Floodplain	Study List Sites within 500 ft Proximity to the 100-Year Floodplain
Edgecombe	11	112	4
Halifax	5	29	1
Nash	5	42	1
Northampton	0	15	0
Wilson	6	25	0
Regional Totals	**27**	**223**	**6**

Source: National Register of Historic Places

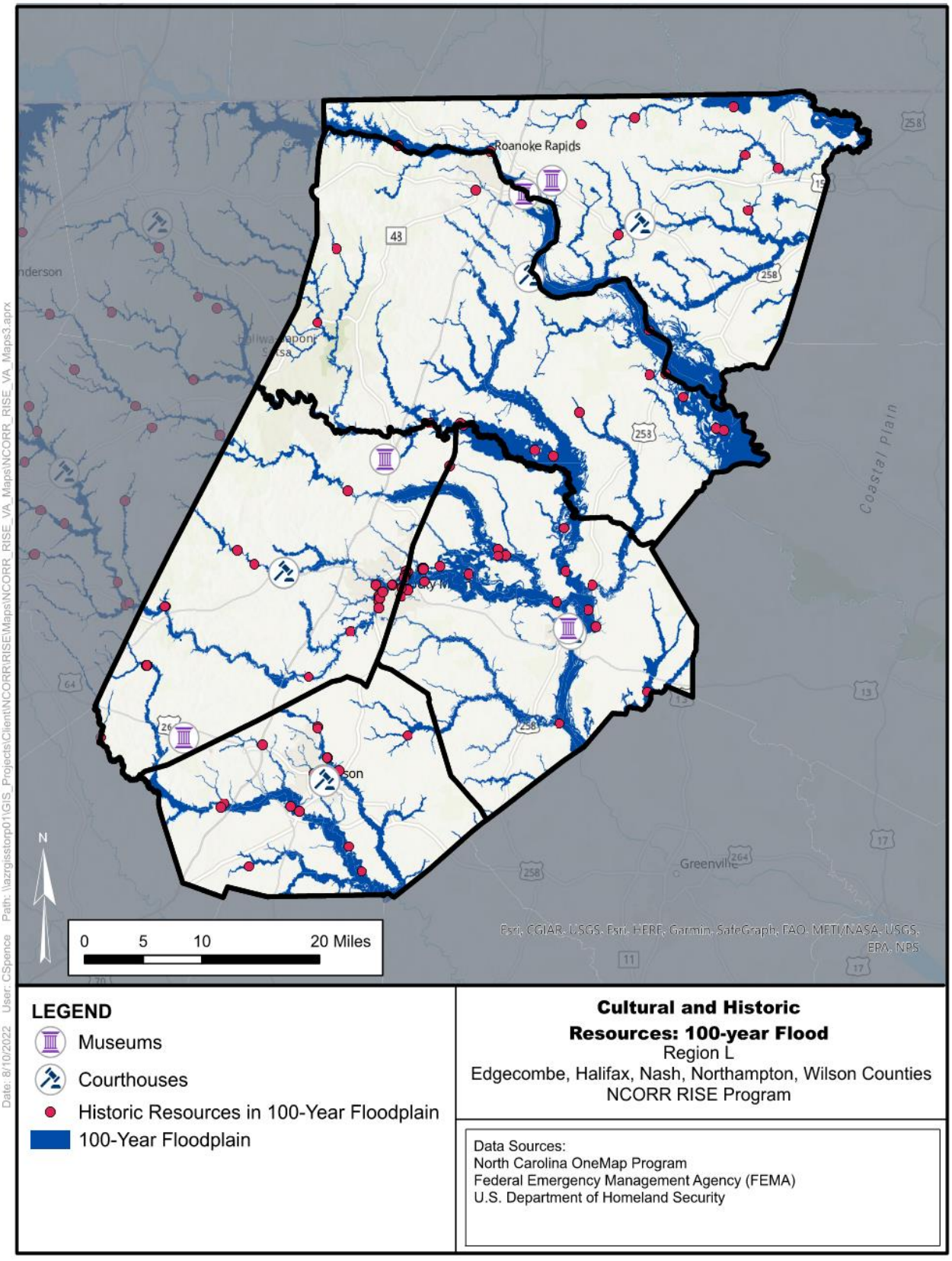
Of the 158 sites on the National Register in the Upper Coastal Plain region, 27 are in the 100-year FEMA floodway and/or floodplains – approximately 17%. Note that Edgecombe County has the highest percentage of its National Register sites in the 100-year floodplain. An inventory of all National Register sites in the Upper Coastal Plain region can be found in **Table 38** in the **Appendix**.

In Edgecombe County, notable National Register Sites located within the 100-year floodplain include: 1) Booker T. Washington Community Center, 2) Dr. A.B. Nobles House and McKendree Church, 3) Lincoln Park Historic District (Rocky Mount), and 4) Tarboro Historic District. In Halifax County, the Tillery Resettlement District and Weldon Historic District are both within the floodplain. Caromount Mills, Nashville Historic District, and West Haven Historic District in Nash County are within the floodplain. The Squire Academic Center and Severn Historic District in Northampton County are within the floodplain. And in Wilson County, the Black Creek Rural Historic District and Upper Town Creek Rural Historic District are also located within the 100-year floodplain. These locations are important to the heritage and cultural identity of communities throughout the region, and damage from flooding may cause irreparable losses.

Figure 20 below shows the locations of museums, county courthouses, and locations of Study List and National Register sites within the 100-year floodplain. There are no museums or county

courthouses that lie within or near the 100- and 500-year floodplains. There are approximately 256 historical and cultural resources within or near the 100- and 500-year floodplains.

Figure 20 - Cultural and Historic Resources in the 100-Year Floodplain



5.5 Natural Environmental Systems

Figure 21 - Natural Environmental Systems Overview

- Conservation areas and natural and working lands can provide resilience to natural hazards, often buffering communities from disaster impacts.
- Wetlands, agriculture, and forests are key resources in the region to aid in resilience and should be given protection from development.
- Six species listed as endangered, threatened, or of special concern are found in all five counties and may be vulnerable to climate impacts that permanently change their habitat, such as higher temperatures.

Natural environmental systems are also at risk of severe and long-term impacts from climate change. Natural environmental systems, or ecosystems, are defined as a community of organisms living in a particular environment and the physical elements in which they interact. An ecosystem can be as small as a field or as large as the ocean. Ecosystems create habitat that allow plants and animals to flourish. These plants, animals, and their ecosystem rely on a particular set of climatic conditions. With natural hazards and climate change, those climatic conditions are changing, and the rate of change is too fast for many species to adapt. Ecosystems sustain human societies by providing agricultural, environmental, cultural, recreational, and aesthetic resources. Ecosystem services, defined as the direct and indirect contributions of ecosystems to human wellbeing and survival, include crops, livestock, fish, wood, clean water, energy, oxygen, and wildlife. Without natural environmental systems, human life could not exist.

5.5.1 Upper Coastal Plain Ecosystems and Ecosystem Services

The Upper Coastal Plain region is home to unique ecosystems that include rivers, streams, wetlands, managed forests, and working lands. These ecosystems consist of pine forests, oak forests, mixed pine/hardwood forests, wet pine savannahs, floodplain forests, wetlands, and riverine systems. Ecosystem services are the economic, social, and environmental benefits that ecosystems provide to human society. Wetlands and other aquatic habitats buffer hurricane and severe weather impacts by providing water storage and flood control. Wetlands also improve water quality by filtering pollutants and nutrients from water supplies, provide fish and wildlife

WHAT ARE 'NATURAL AND WORKING LANDS'?

Natural and working lands are made up of forests, farmland, and wetlands and are managed for natural purposes, to support food and fiber production, and for human communities. Examples include public and private forests, cropland, pastureland, grassland, wetlands, salt marsh, recreational areas, and 'development lands,' which refer to natural and managed lands within urban and rural communities (NC Department of Environmental Quality, 2020). North Carolina consists of 31.1 million acres of land area and forests make up about 14 million acres and agriculture makes up another 6.9 million acres (NC Department of Environmental Quality, 2020).

habitat, and hold water during droughts. Managed forests supply lumber, reduce inland flooding, and provide recreational opportunities. Working lands or agricultural lands are the farms that produce food, feed communities, and drive regional economies. Each ecosystem benefits and contributes to climate resilience. Decisions made in planning and development occasionally fail to consider connections throughout the surrounding environment and can impact the provision of ecosystem services. It is important to recognize the value of each ecosystem and preserve and conserve these lands for future generations.

5.5.2 Importance of Natural and Working Lands

Natural and working lands reduce disaster-related impacts to communities. Forests and wetlands slow water flow, reduce downstream flooding, contain contaminated floodwaters, and filter pollutants. Having these natural areas intact within the floodplain, rather than developed land and populated areas, reduces the risk to people and property. Additionally, these natural and working lands accumulate and store carbon, preventing it from escaping from tree biomass and soils, which mitigates greenhouse gas emissions. Once these lands are disturbed or developed, this stored carbon is released into the atmosphere where it contributes to harmful impacts of climate change. 27.4 million acres of North Carolina are natural and working lands, which covers 88% of the total land area in the state. These areas are slowly declining as forests and farms are converted to developed land (Katie Warnell, n.d.). Most natural and working lands are privately owned and are important to the state's economy, collectively producing more than 20% of the total economy (Warnell, Jaffe, & Olander, n.d.).

In the Upper Coastal Plain region, wetlands, agriculture, and forests are key resources that can aid in resilience to climate hazards. The collaboration amongst agencies to produce the *North Carolina Natural and Working Lands Action Plan* is important for stakeholders in the region to use when considering ways to address resilience. The Plan provides recommendations for the best opportunities to pursue actions.

5.5.3 At-risk Species

The North Carolina Natural Heritage Program gathers and shares information about rare species and natural communities across the state. This information can help the region identify plants, animals, and ecosystems that are unique to the Upper Coastal Plain region and may be impacted by natural hazards and climate change. The Natural Heritage Program found that, in the Upper Coastal Plain region, there are six species that are endangered, threatened, or of special concern. Each species, shown in **Table 19,** is found in all five counties.

DEFINITIONS

Endangered – any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy, or any species of animal determined to be endangered pursuant to the Endangered Species Act.

Threatened – any native or once-native species of wild animal likely to become endangered within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the Endangered Species Act.

Special Concern – any species of wild animal native or once native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring

Source: (North Carolina Natural Heritage Program, 2018).

Climate change and natural hazards threaten the vulnerability of species by altering habitats to the extent that breeding patterns change, habitat becomes no longer suitable, competition from other species pushes natives out, and ecosystems overall are altered. For example, drought can lower water levels in streams and rivers where freshwater bivalves live, and extreme heat can increase water temperatures to a point that kills crustaceans and bivalves. Severe weather and hurricanes that hit the Upper Coastal Plain region can knock down trees that provide habitat for birds. It is important to consider vulnerabilities of wildlife and natural ecosystems for the roles they play, often in the background of our daily lives.

Table 19 - Species of Interest

Common Name	Taxonomic Group	NC Status
Atlantic Pigtoe	Freshwater Bivalve	Endangered
Red-cockaded Woodpecker	Bird	Endangered
North Carolina Spiny Crayfish	Crustacean	Special Concern
Roanoke Slabshell	Freshwater Bivalve	Special Concern
Eastern Lampmussel	Freshwater Bivalve	Threatened
Triangle Floater	Freshwater Bivalve	Threatened

Source: NC Natural Heritage Program Online Data Search

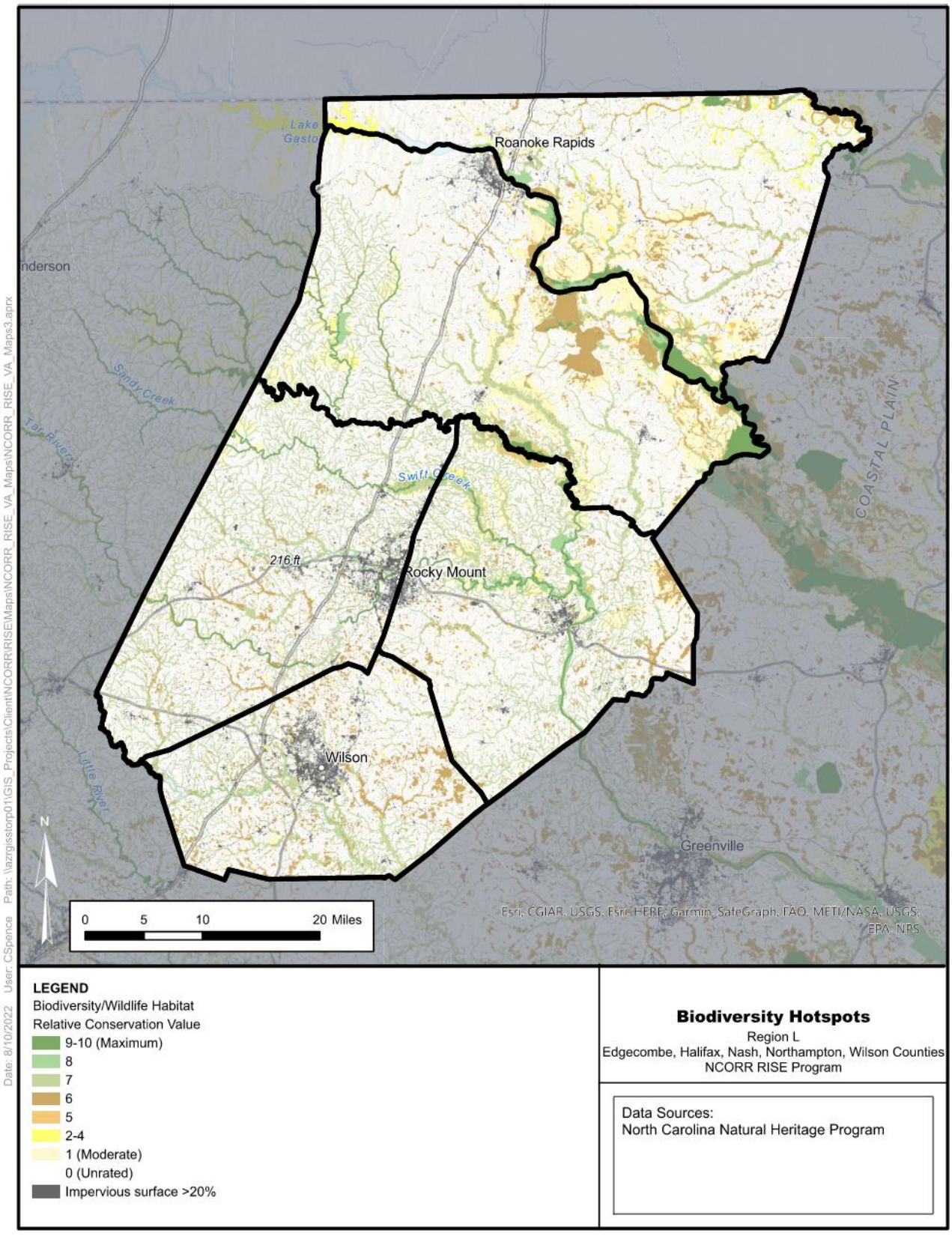
Biodiversity in the Upper Coastal Plain Region

A variety of flora and fauna are located throughout the Upper Coastal Plain. The North Carolina Natural Heritage Program created the Biodiversity and Wildlife Habitat Assessment to identify, evaluate, and prioritize areas that are important for maintaining healthy and sustainable ecosystems (North Carolina Natural Heritage Program, 2021). This analysis helps visualize important areas that can provide ecosystem services and resilience to natural hazards but may also be vulnerable to impacts of climate change and land development. **Figure 22** below depicts the ranking of areas pertaining to conservation values that focus on 1) the biodiversity of aquatic and terrestrial species and communities, 2) large-scale landscapes, including core wildlife habitats and habitat connectors, and 3) lands important to ecosystem processes like riparian buffers and wetlands.

These data identify areas and conservation values of significant natural resources throughout the state and have been applied by a variety of stakeholders (such as local governments, state agencies, regional councils of governments, private sector, etc.) to support planning and decision-making for land use, conservation, mitigation, and transportation projects (North Carolina Natural Heritage Program, 2021).

Data inputs for this assessment include natural heritage natural areas, rare species occurrences, core wildlife habitats and their connections, important aquatic resources, wetlands, and watershed priorities. Combined, areas receive a rating from 1 to 10, where areas rated 5-10 have significant importance to conservation efforts.

Figure 22 - Priority Biodiversity Locations in the Upper Coastal Plain Region



In the Upper Coastal Plain region, areas with a relative conservation value between 8-10 are most often located adjacent to bodies of water – particularly around notable rivers like the Roanoke and Tar Rivers, Fishing Creek between the towns of Enfield and Whitakers, and along Swift Creek between Battleboro and Whitakers. Greener areas have a greater conservation value compared to areas with impervious surfaces – such as towns, buildings, and roads.

Natural and Managed Areas in the Upper Coastal Plain

Many of the natural and managed areas in the region, as depicted in **Figure 23** below, are on private land and are not open to the public. Natural and managed areas are important to identify because they provide ecosystem services and protection for flora and fauna that depend on that habitat. Additionally, natural and managed areas play a role in climate resilience through supporting wildlife, retaining floodwaters, providing habitat, and contributing to biodiversity all around.

Knowing where there are areas that are home to important species will help prioritize voluntary conservation activities for landowners, land managers, local planners, and funding agencies (Wojcik, 2018). Conservation easements are tools that land managers and conservationists can encourage as they prohibit the development, farming, timbering, and mining on the land – but still allow for passive and low-impact recreation

NATURAL AREAS

Natural areas are land or water important for conservation of the natural biodiversity of North Carolina. They contain known locations of rare animal or plant species, rare or high-quality occurrences of natural communities, and/or are sites for important animal assemblages (groups).

Source: (Wojcik, 2018)

MANAGED AREAS

Managed areas are a collection of properties and easements where natural resource conservation is one of the primary management goals or are of conservation interest.

Source: (North Carolina Department of Environmental Quality, Stewardship Program, n.d.)

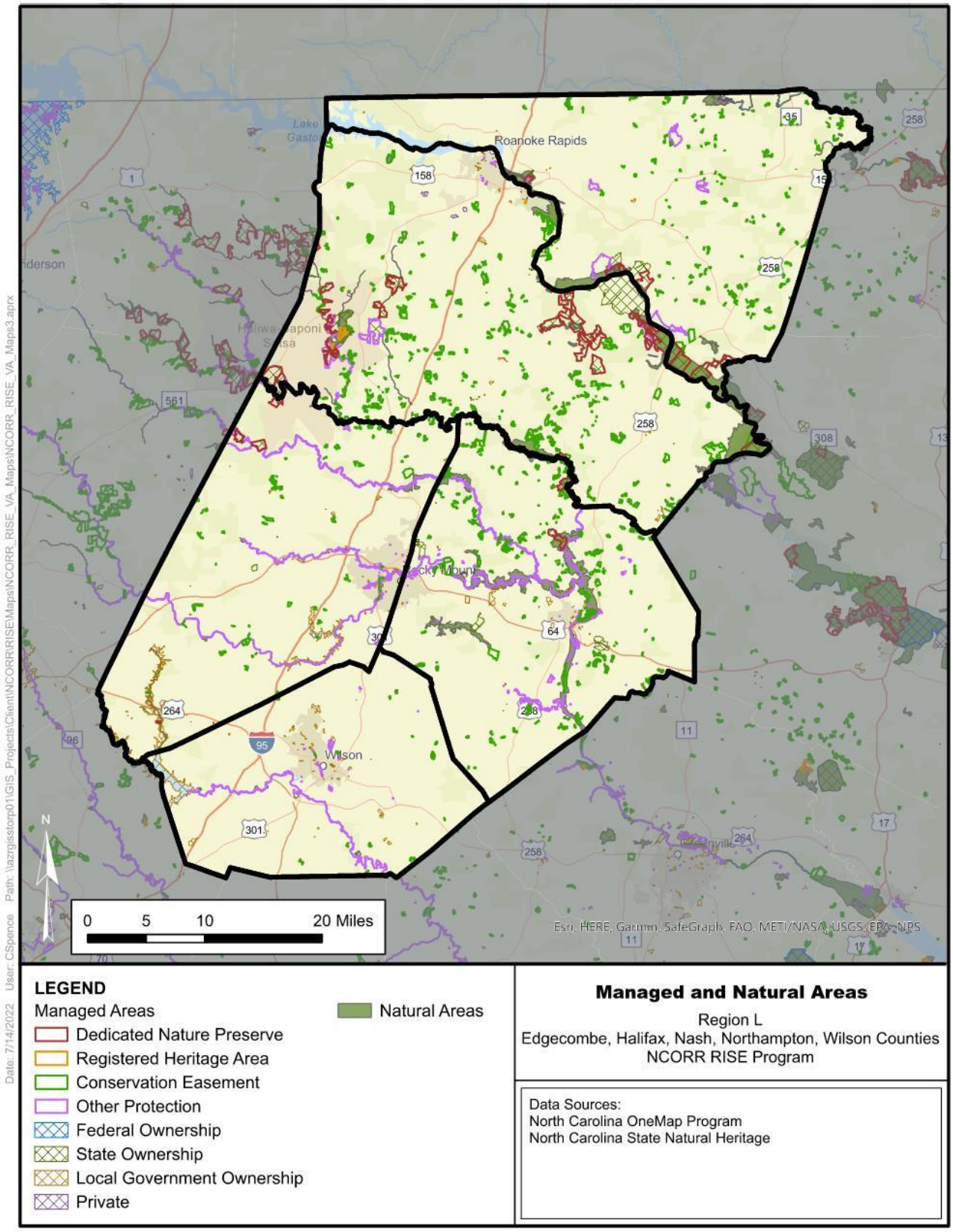
activities like hunting, fishing, and educational uses (North Carolina Department of Environmental Quality, Stewardship Program, n.d.) In the Upper Coastal Plain region, areas south of the Roanoke River near Tillery, Pea Hill, and Highway 561 are dedicated nature preserves, under state ownership, and have patches with very high conservation priority ratings. Additionally, our team has learned through stakeholder input that this area has experienced flooding during and after major storms. By ensuring these natural areas are under protection and cannot be developed will reduce the risk that people will be subjected to flooding, and that the land can perform its natural function to slow and hold floodwater. Similarly, in Edgecombe County there is habitat rated high on the conservation priority rating around the Tar River that, if conserved, may also help alleviate flooding to nearby communities like Princeville, Tarboro, Shiloh Mills, and others.

CONSERVATION EASEMENT

A voluntary legal agreement designed to ensure the long-term viability and protection of the natural resources within a surveyed and recorded boundary. The easement planning process establishes allowances and restrictions that are beneficial to the landowner, the easement holder, and the environment.

Source: (North Carolina Department of Environmental Quality, Stewardship Program, n.d.)

Figure 23 - Managed and Natural Areas



5.5.4 Impacts by Hazard

5.5.4.1 Severe Weather

Heavy rainfall can damage river systems by causing excessive flooding, increasing water volumes and velocities, resulting in increased erosion, and scouring. The number one pollutant in North Carolina's waterways is sedimentation, which is usually caused by heavy precipitation events.

High winds damage trees and forested areas. Wind intensity and frequency are key factors that affect forest dynamics and diversity. Wind damage can create gaps in forest canopy, allowing the newly opened space to be invaded by exotic species or the recruitment of shade-intolerant plants, thereby altering the native ecosystem.

5.5.4.2 Extreme Heat

Extreme heat impacts water resources and terrestrial species. Extreme heat increases water temperatures, which decreases dissolved oxygen, which directly impacts aquatic species. Low dissolved oxygen levels cause stress to aquatic species that can interfere with feeding and reproduction. When dissolved oxygen levels drop too low, fish and other aquatic species can die. Similarly, algal blooms can occur which can harm aquatic species and contaminate drinking water. Terrestrial species can also be affected by increasing temperatures. Studies have concluded that warmer daytime and nighttime temperatures affect animal breeding behavior, gender, parasites, and food availability.

Similarly, warmer winters are expected to benefit the expansion of invasive exotic species that change native landscapes. Cogon grass (*Imperata cylindrica*), Chinese tallowtree (*Triadica sebifera*), and fire ants (*Solenopsis invicta*) are just a few examples of invasive exotic species that are anticipated to spread across North Carolina due to warmer winter weather. Similarly, studies have shown that climate change has contributed to the expanded range and prevalence of ticks. Warming temperatures in the next 30-50 years could extend the period that ticks are active during the year and increase the time people could be exposed to disease (EPA, 2021).

5.5.4.3 Drought and Wildfire

Droughts can cause water shortages and create an increased risk of wildfire. The hazard can reduce the availability of suitable habitat for wetland and aquatic species and can cause mortality for species that are unable to migrate to areas with water sources. Drought intolerant flora are also affected during periods without rain.

Fire is important to many natural ecosystems in the coastal plain, as it constitutes change and allows for regeneration. However, it can threaten conservation and working lands if it is not managed. Climate change is projected to increase fire severity and frequency, and a change to frequency could negatively impact how certain ecosystems function.

5.5.4.4 Impacts of Non-Climate Stressors

Land use change, typically driven by population increases and development, directly affects all natural ecosystems in the Upper Coastal Plain. Hydrological changes resulting from changes to flood control, groundwater depletion and water withdrawal, damming of rivers and streams, and water pollution are the greatest threats to the water resources through the state. Impacts to riparian zones, vegetated areas next to water bodies, damage the health of riverine systems and create issues for bank stabilization and the filtration of pollutants and nutrients. Invasive exotic species alter species and community composition, outcompete native species, affect biodiversity, and disrupt ecological interactions and processes.

Natural environmental systems provide many benefits for us, from necessities like food and drinking water, to aesthetics and inspiration. It is important to examine the natural processes that environmental systems inherently do that will contribute to climate resilience, and to conserve, restore, and protect these systems into the future.

5.6 Public Health

Figure 24 - Public Health Overview

- Physical and mental health can be directly impacted by natural hazards, particularly hurricanes, flooding, and extreme heat.
- Edgecombe, Halifax and Northampton counties have the highest percentage of adults that report fair or poor physical or mental health.
- Elderly persons and persons with disability are more vulnerable to natural hazards.
- Natural hazards can impact drinking water quality and supply, directly affecting public health.
- Heat-related illnesses are common during extreme heat events and are the result of the body's decreased ability to cool itself.

Climate change and public health are directly related, and it is likely that impacts to public health will become more pronounced as climate conditions continue to change. The risks to health include heat related illness, respiratory illness, water borne diseases, injury and mortality from extreme weather, vector borne diseases, malnutrition and food borne diseases, and mental health issues (World Health Organization, 2021). As climatic conditions change, their impacts on public health will become more pronounced. Scientists evaluate physical and mental health alongside environmental metrics such as heat-related issues, drinking water quality, agriculture, and waste sites.

Knowledge of health statistics for the regional population, for example, may help county officials and other advocates plan for future changes. Locations of hazardous waste sites can be included in emergency operations and response plans to prevent potential leakage and spreading contamination.

Furthermore, any irregularities to metrics of public health can be a sign of worsening climate conditions. For example, as the number of very hot days increases, there will be an uptick in the number of heat-related illnesses, and, during drought events, communities may experience water supply shortages and increasingly poor water quality.

The following section discusses health related vulnerabilities in the Upper Coastal Plain region and current conditions in relation to each of the health metrics listed above. These can then be tracked for change over time and help to inform resiliency efforts.

5.6.1 Physical Health Conditions

Physical health is important for quality of life and individuals that have poor physical health are more vulnerable to the negative effects of climate change. The project team collected data from the Centers for Disease Control and Prevention (CDC) National Environmental Public Health Tracking Network to provide a high-level summary of public physical health by county based on data from the CDC Behavioral Risk Factor Surveillance System, the Census 2010 population, and American Community Survey estimates. **Table 20** below shows that an average of 26% of adults in the Upper Coastal Plain region self-reported to have poor or fair health – much higher than the North Carolina average of 18% (University of Wisconsin Population Health Institute, 2022).

Table 20 – Poor or Fair Health

County	Percent of Adults with Poor or Fair Health (2019)
Edgecombe	28%
Halifax	28%
Nash	22%
Northampton	27%
Wilson	25%
Regional Average	**26%**
North Carolina Average	**18%**

Source: County Health Rankings & Roadmaps – Poor or Fair Health

Physical health is important for quality of life. Since individuals that have poor physical health are more vulnerable to the negative effects from climate change, it is important to focus on current

physical health to bolster the population's ability to withstand additional environmental stress. Investments in public health can include improving accessibility to medical facilities, introduce/improve disease prevention information campaigns, eliminate food deserts through increased access to affordable nutritious food, and encourage exercise through improvements to public parks and trails.

5.6.2 Mental Health Conditions

Mental health, which is also important for quality of life, can be exacerbated by extreme weather events that lead to traumatic experiences. In addition, individuals struggling with poor mental health are more vulnerable to risk behaviors, such as binge drinking, smoking, little physical activity, and sleeping less than seven hours (Health Risk Behaviors Measure Definitions, 2021). Extended periods of risk behavior can lead to increased vulnerability. According to County Health Rankings & Roadmaps data, the regional average number of days per year that adults in the Upper Coastal Plain self-reported that their physical health was not good is 4.6 days – about 1 full day more than the North Carolina average of 3.7 days (University of Wisconsin Population Health Institute, 2022). Comparatively, the regional average number of days per year that adults self-reported that their mental health was not good is 5 days – again, higher than the North Carolina average of 4.4 days per year (University of Wisconsin Population Health Institute, 2022). **Table 21** below shows the average number of physically and mentally unhealthy days per year in each region. Halifax County has the highest number days adults indicate that they experience physically and mentally unhealthy days.

Table 21 – Average Number of Physically and Mentally Unhealthy Days

County	Average # of Physically Unhealthy Days	Average # of Mentally Unhealthy Days
Edgecombe	4.8	5.1
Halifax	5.0	5.2
Nash	4.2	4.7
Northampton	4.7	5.0
Wilson	4.5	4.9
Regional Average	**4.6**	**5.0**
North Carolina Average	**3.7**	**4.4**

Source: County Health Rankings & Roadmaps – Physically and Mentally Unhealthy Days

Any region-scale mental health initiatives targeted at alleviating climate-driven impacts should therefore begin in Halifax, Edgecombe, and Northampton counties, as these have the highest percentage of adults with less than good mental health.

5.6.3 Heat-Related Illness

Extreme heat is a major cause of death and is often known as the 'silent killer' because it doesn't cause environmental damage like other weather hazards and lacks sufficient data and monitoring (Jacks, 2014). Heat-related illnesses are common during extreme heat events and are the result of the body's decreased ability to cool itself. Symptoms of heat-related illness include heavy sweating, cool skin, weakness, possible throbbing headaches, muscle cramps, and more (Jacks, 2014). North Carolinians and those living in the Upper Coastal Plain are familiar with hot and humid months, particularly in the summer. However, prolonged periods of extreme heat and high nighttime temperatures pose hazard to health and particularly vulnerable populations. Extreme

heat events occur when the air temperature and/or heat index is greater than 95F. Heat waves and high nighttime temperatures are likely to increase over the next 30 years.

Rising temperatures also contribute to air quality. Hotter temperatures and poor air quality have disproportionate impacts on maternal and infant mortality, young children, and older adults. Individuals living below the poverty line often lack access to adequate home cooling. Older adults are at risk of social isolation and typically live on fixed/limited incomes, which limits their ability to afford rising energy costs associated with home cooling. Laborers working outside are also vulnerable to heat related-illness due to exposure. Individuals with respiratory illnesses such as asthma or chronic obstructive pulmonary disease are particularly vulnerable to extreme heat due to worsening air quality conditions. Athletes and laborers working outside are also highly susceptible to heat related illness. Impaired air quality from wildfire smoke, pollen, and ozone may also contribute to increased emergency department visits for individuals with asthma, cardiovascular disease, and diabetes within the Upper Coastal Plain region. Approximately 3,099 emergency department visits for heat-related illness were observed for North Carolina in 2020. About 47% of the total emergency department visits across North Carolina were seen in the hospitals in the Coastal region, which includes Edgecombe, Halifax, Nash, Northampton, and Wilson counties (North Carolina Department of Health and Human Services, 2020).

While the National Oceanic and Atmospheric Administration and National Weather Service provide forecasts for prolonged periods of high temperatures, most of the Upper Coastal Plain region lacks unified heat warnings for residents. Additional efforts could be made across local health departments, emergency management, and local governments to coordinate responses before and during a heat wave to ensure vulnerable populations are aware of available resources and actions to take to protect their health.

5.6.4 Impaired Waters

Access to clean water is an essential component of public health that can be impacted by climate change. In 1970, the United States Congress passed the Clean Water Act with the goals of protecting waters from pollution, improving water quality, and maintaining clean, healthy waters. Section 303(d) of the Clean Water Act established the impaired waters list which is a requirement for all states to evaluate and identify impaired and threatened waterways (e.g., stream/river segments, lakes) based on certain water quality indicators.

Knowing the location of impaired waters and the cause of impairment is important in building regional resiliency because these water bodies may affect public and environmental health if they are flooded over a larger area. A waterway's water quality is evaluated based on its designated use, such as drinking water supply, recreation, or shell-fish propagation. There are two kinds of pollution that contaminate and degrade water quality, causing "impairment." Point source pollution has a specific location, such as discharges from industrial and municipal facilities, while non-point source pollution is discharged across a wide area, such as sedimentation from construction sites, leaking septic tanks, street runoff, and agricultural runoff.

Current (2022) GIS data for impaired waters are not publicly available for download (the latest GIS data for impaired waters was published in 2014). However, the North Carolina Department of Environmental Quality (NCDEQ) maintains an online mapping system that depicts current impaired waters. Please follow this link to view the latest maps from 2020 IR 2020 Dashboard (arcgis.com).

Based on the online mapping system, some segments of Butterwood Creek, Beech Swamp, Fishing Creek, Bear Branch, Town Creek, Stony Creek, Turkey Creek, Contentnea Creek, Little Contentnea Creek, Hendricks Creek, Ballahack Creek, Conetoe Creek, and the Tar River are listed as Category 5 for impairment, many of which exceed the maximum standard for dissolved oxygen, benthic organisms, chlorophyll-a, and zinc. Impaired streams designated as Category 5 require participation in a Total Maximum Daily Load program, which establishes the maximum amount of a pollutant (i.e., bacteria, nutrients, metals) the waterbody can receive daily and still meet water quality standards.

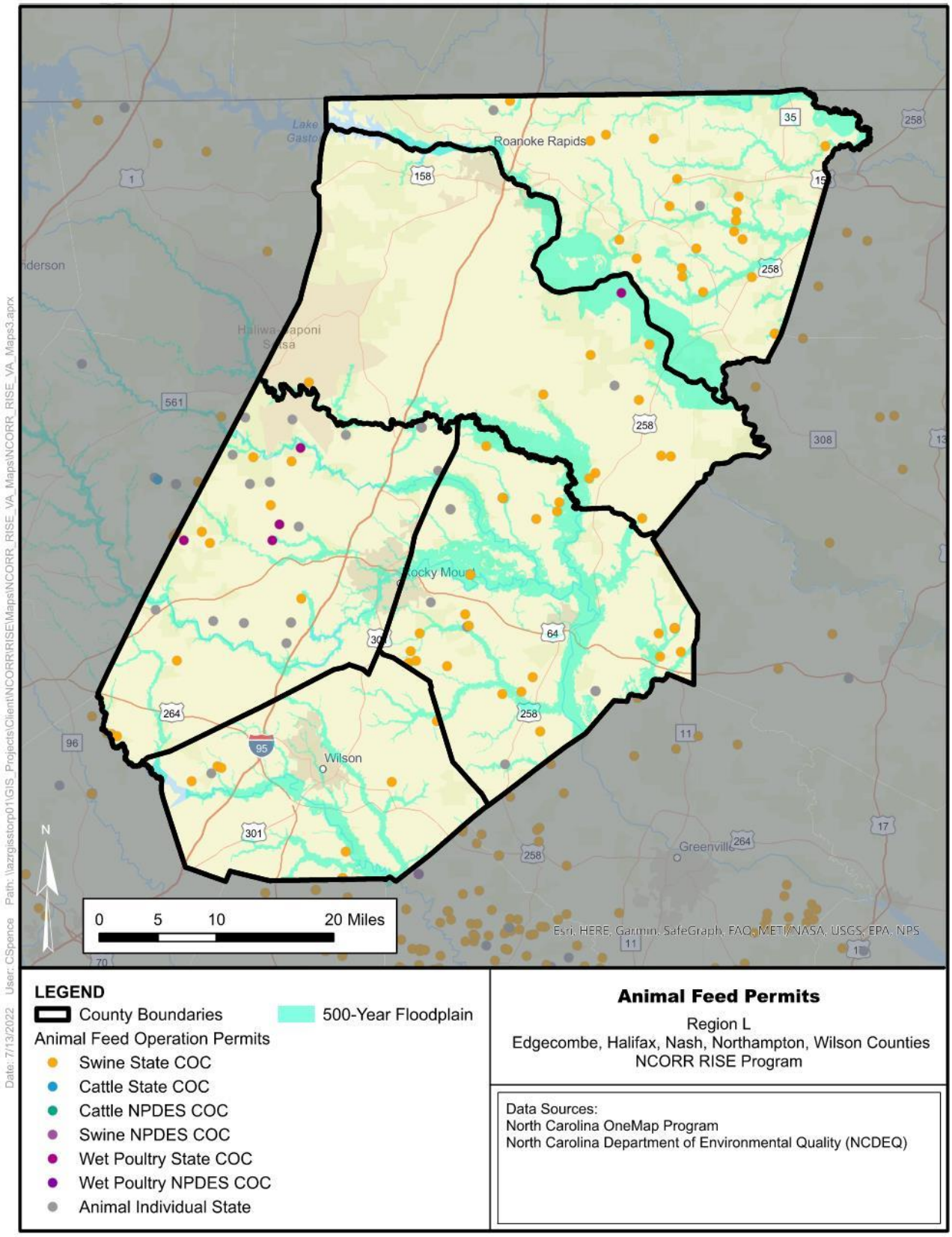
Statewide, the number of impaired waters is growing, having increased by a third between 2017 and 2019 (Sorg, 2019). Increases in air and water temperature have a direct effect on the chemistry and biology of water resources. As regional temperatures continue to rise, so too will the number of impaired waters, thus directly affecting the health, safety, and wellbeing of its users, whether it is for drinking, recreation, fisheries or shellfish.

5.6.5 Animal Feed Operation Sites

Animal feed operations and agriculture throughout the region can contribute to poor water quality when rain carries fertilizer and animal waste to waterways. Hurricanes and heavy rains create more surface water runoff and flooding, moving pollutants from fertilizer and animal waste to waterways faster and in higher quantities. As climate change makes these hurricanes and heavy rains stronger, polluted waterways will continue to grow in toxicity. Analyzing the vulnerability of agricultural sites is important in building regional resilience because flooding may cause public health problems and environmental contamination. Animal feed operation sites are regulated through the NC Department of Environmental Quality and include swine farms, wet poultry, and cattle. In the Upper Coastal Plain region there are approximately 110 animal feed operation sites, and the majority are swine. **Figure 25** below depicts the locations of animal feed operations in relation to the 500-year floodplain.

Flooding from hurricanes and heavy rainfall directly threaten hog farms and poultry operations in the Upper Coastal Plain region and across eastern North Carolina. The North Carolina Department of Agriculture reported that across the state, an estimated 2,800 hogs died during Hurricane Matthew in 2016 and roughly 5,500 hogs and 3.4 million chickens died during Hurricane Florence (Oglesby, 2021). Hog lagoons are contained areas where waste is collected, and most often sprayed back onto fields as a fertilizer. When these lagoons are flooded, the animal waste mixes with floodwaters and poses a serious threat to water quality and public health. Additionally, rising floodwaters can trap livestock and cause death, also contributing to a public health risk as the animals decompose. Adding to the public health risk, farmers experience an economic loss when the livestock is impacted. Animal feed operations located in the 100-year and 500-year floodplains are particularly vulnerable to flooding and following major damage from Hurricane Floyd in 1999, the North Carolina Floodplain Buyout Program has incorporated purchasing swine productions located in the 100-year floodplain (Oglesby, 2021).

Figure 25 - Animal Feed Operation Permits



5.6.6 Contaminated Waste Sites

As climate change increases the frequency and intensity of heavy rain and storm events, waste sites located throughout the Upper Coastal Plain region may contaminate nearby resources, particularly drinking water. Similarly, wildfires can damage site remedies and lead to the release of contaminants. Waste sites are a component of many landscapes and are necessary to deal with human consumption.

The contamination of brownfields often makes it difficult to redevelop the land due to regulations about safety. Brownfields are common across North Carolina and can be remediated for certain future uses. However, those sites located in proximity to waterways can have negative impacts on water quality when contaminants from the site enter the water through surface runoff or underground leaching.

BROWNFIELDS

Brownfields are lands previously developed for commercial or industrial purposes that have been compromised by something harmful, typically pollutants or chemicals (Hazardous Waste Experts, 2014).

There are approximately 29 sites within the region that have started the process of enrolling in the NCDEQ Brownfields Program, which helps property owners to come to an agreement with NCDEQ on the activities needed to make the site suitable for reuse, in addition to cleaning up the site to meet regulatory standards. Each county in the region has at least one recorded brownfield site. Tarboro is currently funded by a $300,000 EPA Brownfields grant. There is one brownfield site in southern Halifax County within the 100-year floodplain. Due to its proximity to the floodplain, it is at higher risk of contaminant release during storm events. None of the sites are within areas at high risk of wildfire.

Weather hazards like flooding and hurricanes may also cause hazardous waste sites to contaminate surrounding resources. The Resource Conservation and Recovery Act, commonly known as RCRA, is the federal law that regulates the management of such wastes. NCDEQ manages hazardous waste at the state level and maps the locations of sites.

HAZARDOUS WASTE

A hazardous waste is waste that has properties that make it dangerous or capable of having a harmful effect on human health or the environment, such as motor oil, car batteries, industrial chemicals, explosives, etc. (EPA Hazardous Waste, 2021)

There are approximately 98 sites within the region regulated by the Resource Conservation and Recovery Act. All counties have at least one hazardous waste site, and Wilson has the most sites. There are multiple Resource Conservation and Recovery Act sites throughout the region located within the 100-year floodplain. There is one site in Enfield (Halifax County), two sites west of Rocky Mount (Nash), one site north and one site south of Rocky Mount (Edgecombe) and two sites south of Wilson (Wilson) located in the 100-year floodplain. Due to their proximity to the floodplain, they are at higher risk of contaminant release during storm events. None of the sites are within areas at high risk of wildfire.

Other toxic waste dump sites are managed by the EPA through the Comprehensive Environmental Response, Compensation and Liability Act, informally known as Superfund. There are no Superfund sites within the Upper Coastal Plain region.

COAL ASH

Coal ash is the byproduct of burning coal in coal-fired power plants, and without proper management, can pollute waterways, groundwater, drinking water, and the air (EPA, 2022).

Storage sites containing coal ash and other industrial process byproducts are at risk for flooding from heavy rains and hurricanes, causing spills that contaminate waterways and nearby communities. Northwest Halifax County and northeast Northampton County each have a permitted industrial waste landfill. Neither are located within the 100-year floodplain or are in an area at high risk of wildfire.

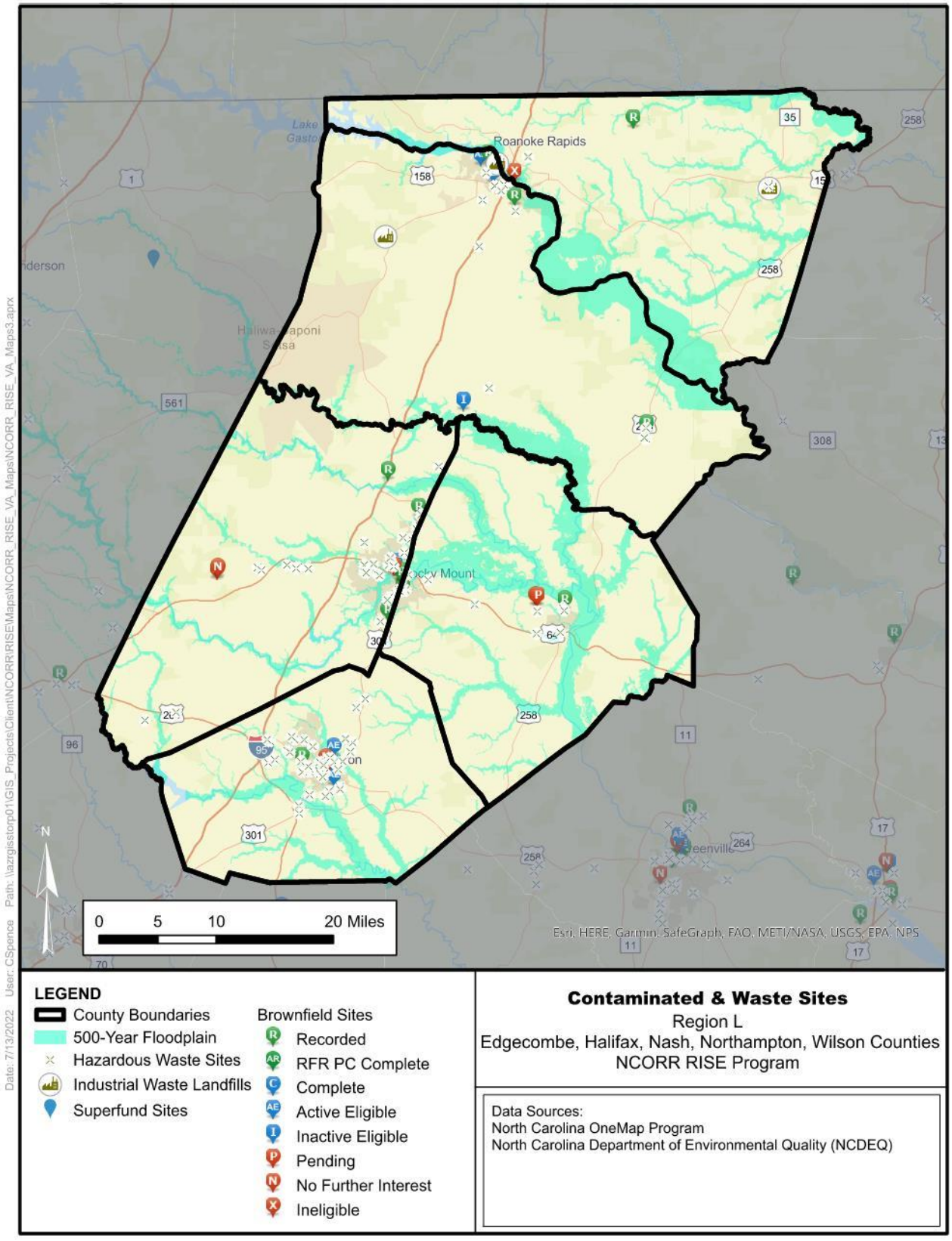
Contaminated waste sites and other drivers of pollution can be environmental justice concerns as the sites have historically been more commonly located in communities of color. Studies have shown that in the United States, 79% of municipal solid waste incinerators are in environmental justice communities, and the majority of landfills and burn facilities are located near these communities as well (Yang, 2021). Environmental justice communities are those where there is 1) disproportionate exposure to environmental hazards and 2) increased vulnerability to those hazards (Foresight Design Initiative, 2017). Communities of color bear a disproportionate risk when flooding impacts waste sites, including hog lagoons. In eastern North Carolina following Hurricanes Matthew and Florence, major flooding caused widespread issues as lagoons meant to hold hog waste mixed with floodwater and traveled across the land.

When preparing for climate change, it will be important for the region to account for impacts from weather hazards to contaminated waste sites. There are currently six waste facilities located within the 100-year floodplain – 2 in Wilson County and 4 in Nash County. There is one additional site located in the 500-year floodplain in Wilson County. These sites are considered waste sites due to the chemicals used and stored on site. **Table 22** displays the name and address of these facilities. **Figure 26** below shows contaminated waste sites including hazardous waste, industrial waste landfills, Superfund sites, and brownfield sites throughout the Upper Coastal Plain region.

Table 22 - Waste Sites in the 100-Year and 500-Year Floodplain

100-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Exclusive Cleaners & Laundry	725 Goldsboro St S, Wilson, NC 27893	Laundromat	Wilson
City of Wilson Garage	1800 Herring Ave E, Wilson, NC 27893	Auto	Wilson
CVS Pharmacy #7330	2605 Sunset Ave, Rocky Mount, NC 27804	Pharmacy	Nash
Clean-Clean Dry Cleaners	2408 Sunset Ave, Rocky Mount, NC 27804	Laundromat	Nash
Prestige Cleaners	620 E Thomas St, Rocky Mount, NC 27801	Laundromat	Nash
Telepathic Graphics	1131 Atlantic Ave, Rocky Mount, NC 27801	Commercial Printer	Nash
500-Year Floodplain			
Name	**Address**	**Facility Type**	**County**
Sandoz Novartis, Inc.	4700 Sandoz Dr, Wilson, NC 27893	Pharmaceutical	Wilson

Figure 26 - Contaminated Waste Sites in Relation to 500-Year Floodplain



5.6.7 Well Water

Private wells are a main source of drinking water for many homes across the Upper Coastal Plain region, particularly in rural communities that are not connected to municipal water. However, these wells are vulnerable to climate change, particularly droughts and flooding. Wells collect groundwater for drinking and other purposes and can vary in depth. Flooding from heavy storms and hurricanes can result in increased pollution and surface runoff, which can inundate wells and cause contamination. Often this contamination is a result of bacteria and nitrates that can cause short-term illnesses and be dangerous to vulnerable populations like children, pregnant women, elderly, or immunocompromised individuals. Common contaminants detected in private well water in North Carolina include arsenic, cadmium, lead, and manganese (UNC Superfund Research Program, n.d.).

Conversely, droughts result in less water entering the ground because rainfall is not replenishing underground aquifers. During this time, aquifers can become depleted when more water is pumped out for consumption than can be replenished by rain or other water sources (Uhlman, n.d.). Depleting groundwater can affect agriculture and strain other water sources.

5.7 Social Vulnerability

Figure 27 - Social Vulnerability Overview

- Social vulnerabilities are the individual characteristics that make it harder for a person to withstand and quickly recover from natural hazards and other stresses.
- Edgecombe and Halifax counties have high overall social vulnerability and may be affected by natural hazards more than other parts of the region.
- The region is considered highly vulnerable because of household compostition and disability, meaning there are high proportations of elderly, youth, single-parent households, and residents living with a disability.
- Northampton County has the highest percentage (27%) of elderly persons who are more likely to experience harm from natural hazards.

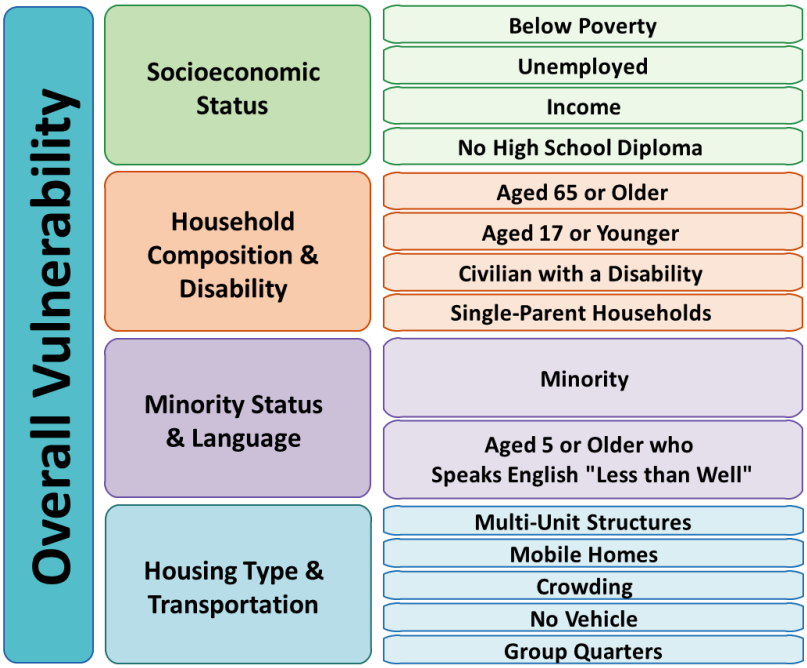
Social vulnerability is directly linked to regional resilience. Socially vulnerable populations such as youth, elderly, disabled individuals, low-income households, and mobile home occupants, among others, are at greater risk of harm from hazardous events than individuals who do not fall into those groups. For example, individuals without personal transportation may have difficulty evacuating before a hurricane arrives. Similarly, those with a limited income or who are unemployed may have difficulty rebuilding or repairing homes and businesses after a natural disaster. It is therefore imperative to understand the vulnerabilities of the region to develop targeted action plans and emergency preparedness that help those most in need. High social vulnerability can indicate challenges in a community's ability to respond to hazardous events. Social vulnerability refers to the potential negative effects to communities caused by external stresses on human health. Communities can use social vulnerability information to prioritize preparedness actions, allocate emergency resources, and plan for recovery.

SOCIAL VULNERABILITY

Social vulnerability refers to the potential negative effects to communities caused by external stresses on human health.

Social vulnerability is described at the census tract level because this smaller scale provides a better understanding of communities that may be vulnerable, rather than across a county. The more social factors – like percentage below poverty, percentage aged 65 or older, percentage minority, and percentage mobile homes, for example – that are present within a certain area, the higher vulnerability that area is likely to be due to the compounding factors.

Figure 28 - CDC Social Vulnerability Index



Source: CDC SVI Documentation 2018

The Upper Coastal Plain region exhibits moderate to high levels of social vulnerability, with Edgecombe, Halifax and central Wilson counties reporting higher levels of social vulnerability amongst census tracts.

5.7.1 Background

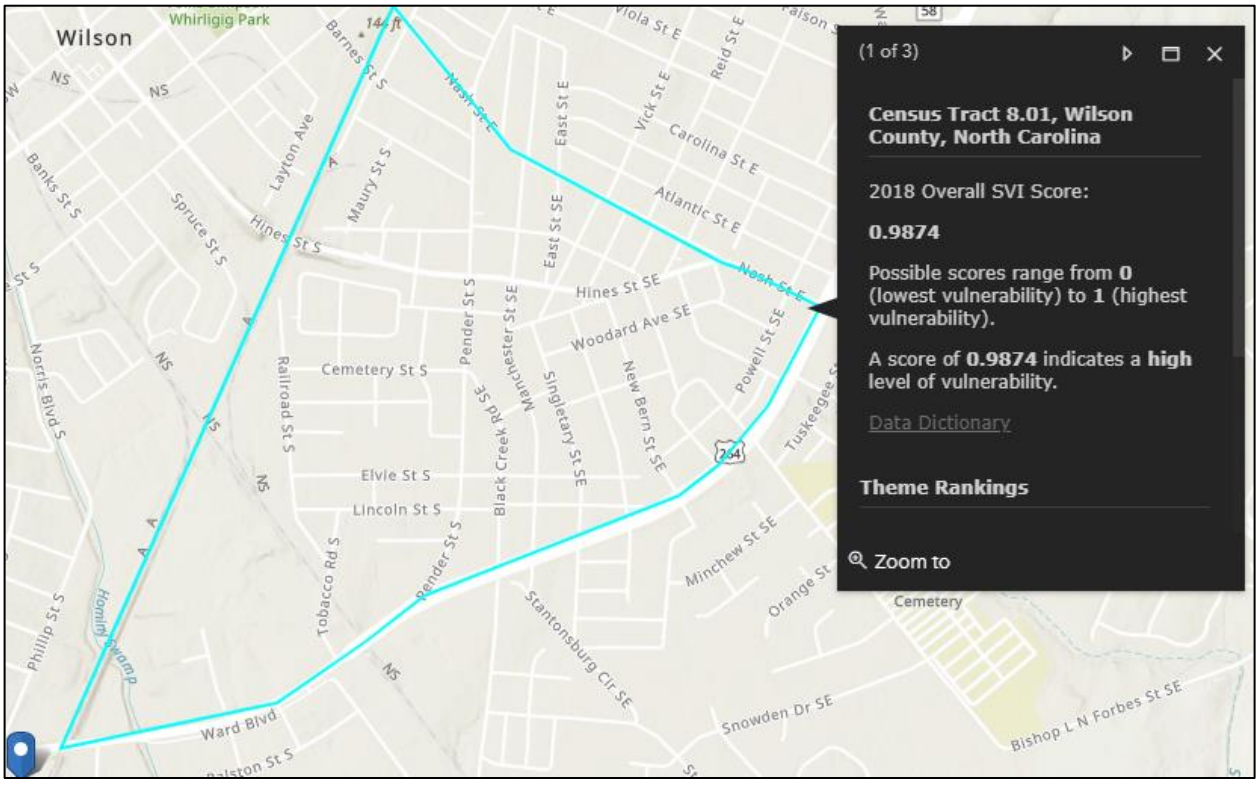
The Center for Disease Control and Prevention Social Vulnerability Index (CDC SVI or simply SVI, hereafter) was created to help public health officials and emergency response planners identify and map the communities that will most likely need support before, during, and after a hazardous event (Centers for Disease Control / Agency for Toxic Substances and Disease Registry, 2022). The SVI ranks each census tract on 15 social factors, and groups them into four themes listed below. **Figure 28** details the structure of the SVI.

1) Socioeconomic Status
2) Household Composition and Disability
3) Minority Status and Language
4) Housing Type and Transportation

The CDC uses the US Census and the American Community Survey 5-year data to assign each census tract a ranking for each of the four themes as well as an overall ranking. These percentile rankings (or scores) are between zero and 100, with zero being lowest vulnerability and 100 being highest vulnerability. The social vulnerability indicators for a specific census tract are compared against other census tracts in North Carolina (as opposed to the entire country) to produce the final rankings.

A percentile score of 0 – 25 is considered a low vulnerability score, 26 – 50 is considered low to moderate, 51 – 75 is considered moderate to high, and 76 – 100 is considered a high vulnerability score. **Figure 29 - Census Tract 8.01, Wilson County** encompasses an area in the southeastern part of the City of Wilson between Nash St. E., Ward Blvd/US-264 Alt E., and Wilson railroad. This tract has a socioeconomic status ranking of 99.91, which means that it is more vulnerable than 99.91% of all other census tracts in North Carolina because of the percentage of its population below poverty, unemployed, low-income, and with no high school diploma. The analysis below discusses which of these variables is driving the result so that the region can understand how best to prepare its residents for the impacts of disasters.

Figure 29 - Census Tract 8.01, Wilson County



5.7.2 Overall Social Vulnerability

In addition to the four vulnerability themes discussed above, the CDC SVI also provides an overall vulnerability score for each census tract. The overall score is a composite of all the vulnerability themes. The average overall vulnerability score for Edgecombe and Halifax counties are within the high range, while Nash, Northampton, and Wilson counties have moderate to high vulnerability scores. **Table 23** shows these results.

Table 23 - Overall Vulnerability

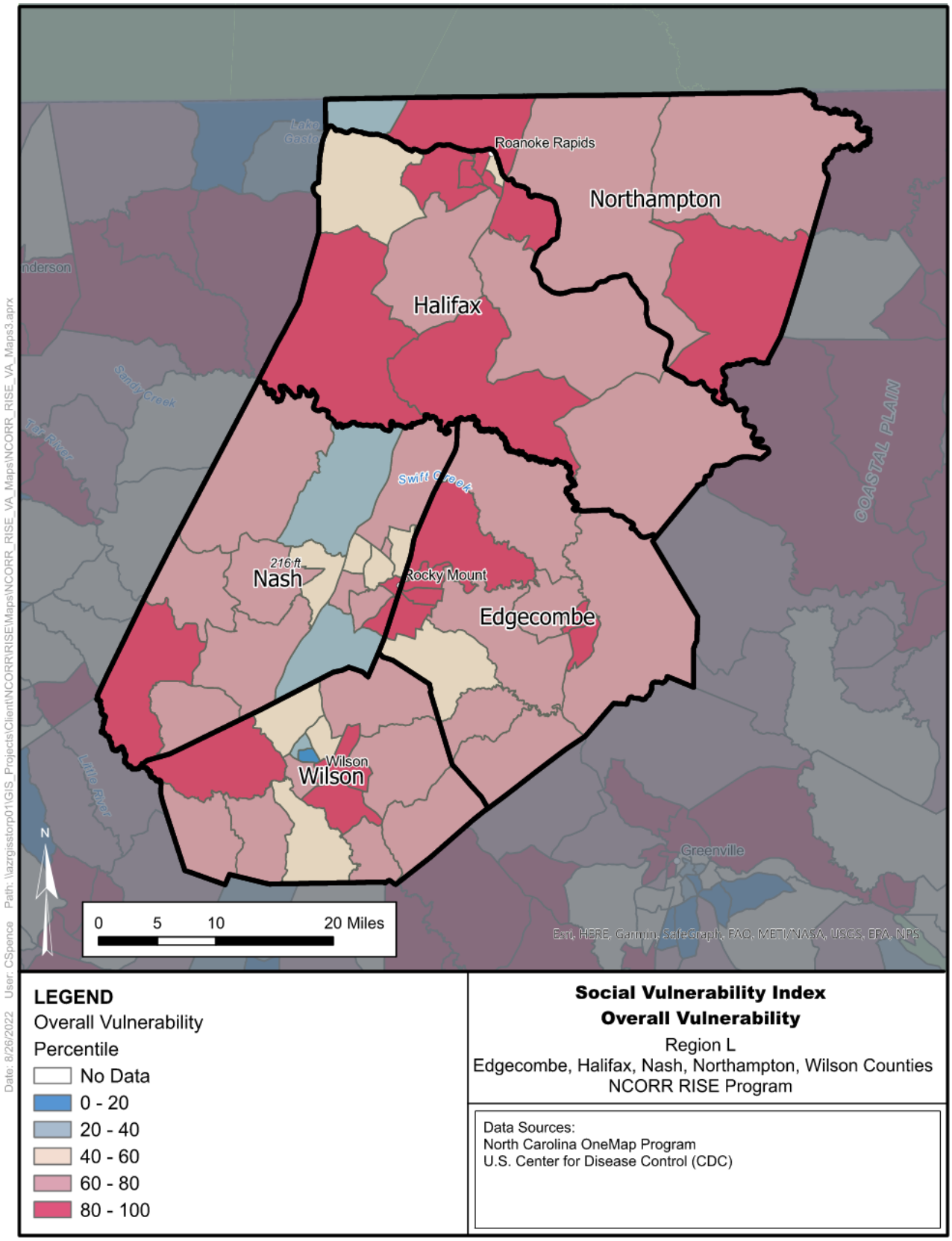
Overall Vulnerability		
County	**Percentile Score**	**Vulnerability Description**
Edgecombe	77th percentile	High
Halifax	78th percentile	High
Nash	66th percentile	Moderate to High
Northampton	72nd percentile	Moderate to High
Wilson	72nd percentile	Moderate to High
Region Overall	73rd percentile	Moderate to High

Source: The Social Vulnerability Index (SVI)

Edgecombe and Halifax counties have more census tracts with high vulnerability across the measured variables, but less often are the most vulnerable areas located in those counties. A few tracts within central Wilson County consistently have the highest vulnerability but are surrounded by areas of lower vulnerability which result in moderate vulnerability scores for the County.

Figure 30 below shows the overall vulnerability scores for census tracts within the region represented by color. The overall vulnerability scores within the Upper Coastal Plain region range from the 11th to the 100th percentile.

Figure 30 - Overall Social Vulnerability for the Upper Coastal Plain Region



5.7.3 Socioeconomic Status

The overall socioeconomic score for the Upper Coastal Plain region is moderate to high. The average socioeconomic score for Edgecombe and Halifax counties is within the high range, while Nash, Northampton, and Wilson counties have a moderate to high socioeconomic vulnerability score. The socioeconomic theme combines data on persons below poverty, unemployed (individuals aged 16 years or older), per capita income, and no high school diploma (persons aged 25 years or older). **Table 24** depicts these results.

Table 24 – Socioeconomic Status

Socioeconomic Status		
County	**Percentile Score**	**Vulnerability Description**
Edgecombe	78th percentile	High
Halifax	80th percentile	High
Nash	54th percentile	Moderate to High
Northampton	73rd percentile	Moderate to High
Wilson	72nd percentile	Moderate to High
Region Overall	71st percentile	Moderate to High

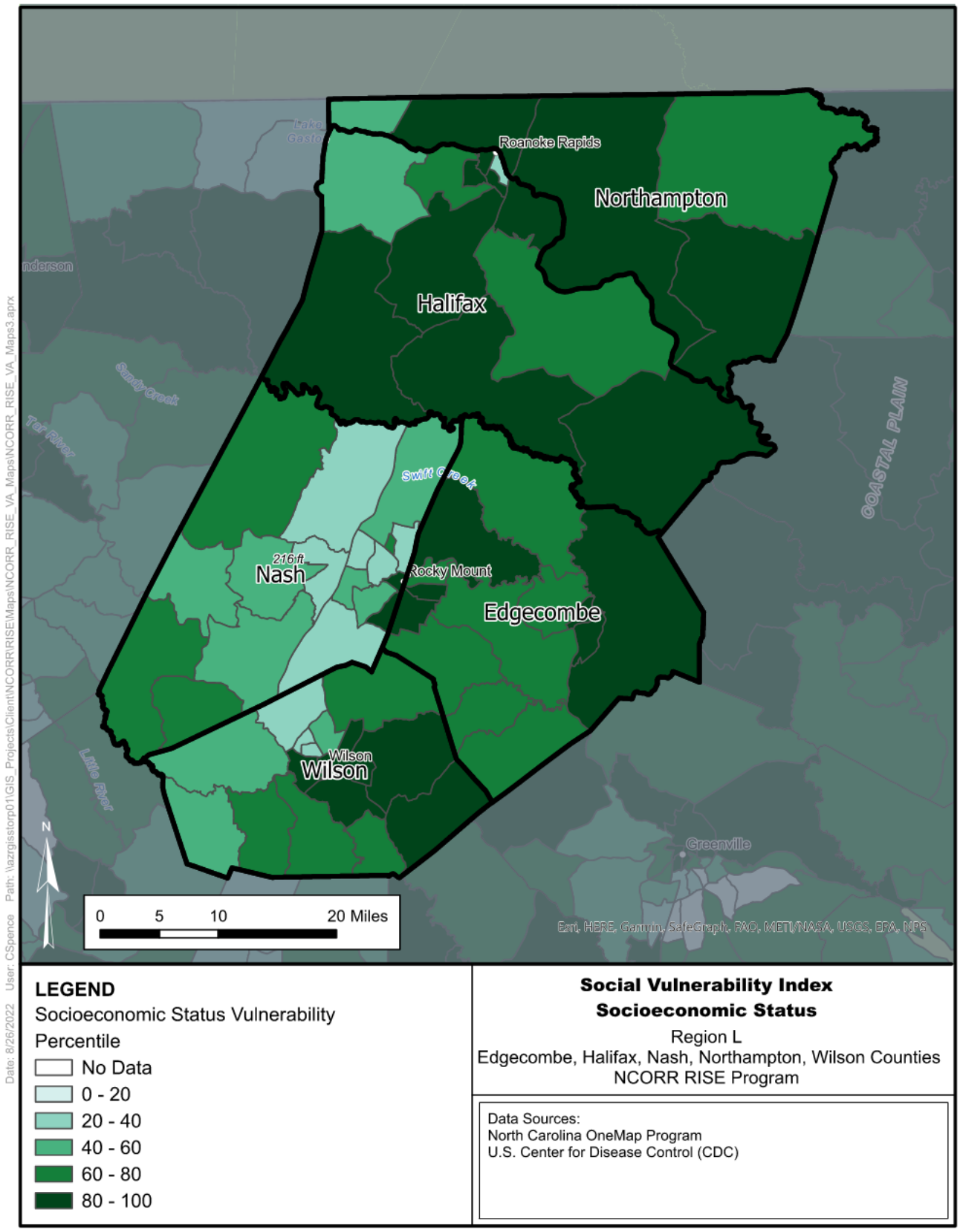
Source: The Social Vulnerability Index (SVI)

The three census tracts with the highest socioeconomic vulnerability are in central Wilson County and represent a 1.9-square mile area in and around the City of Wilson. All three tracts rank in the 90th percentile for populations living in poverty, unemployed, low income and without a high school diploma. Approximately 60% of the people living in and around Wilson are in poverty, based on the 2018 ACS data. Elsewhere in Wilson County, socioeconomic vulnerability is lower and falls in the moderate ranges. Conversely, Halifax and Edgecombe counties have higher composite socioeconomic vulnerability scores driven by more tracts with high vulnerability but less instances of very high vulnerability (such as around Wilson). Half of the census tracts in Edgecombe County

and 83% of census tracts in Halifax County have a high socioeconomic vulnerability score, leading to overall high vulnerability scores. High vulnerability tracts in Edgecombe and Halifax counties exhibit high scores in poverty, unemployment, and lack of high school diploma.

Figure 31 below shows the socioeconomic vulnerability scores for all census tracts within the region represented by color. The darker color indicates higher vulnerability. Relative socioeconomic vulnerability among all tracts ranges from the 21st to 100th percentile.

Figure 31 – Social Vulnerability Index - Socioeconomic Status for the Upper Coastal Plain Region



5.7.4 Household Composition and Disability

The overall household composition and disability score for the Upper Coastal Plain region is high. The average household composition and disability score for Nash and Wilson counties is moderate to high, while Edgecombe, Halifax and Northampton have a high vulnerability score. The household composition and disability theme reviews persons aged 65 or older, persons aged 17 or younger, persons with disability, and single parent households with children under 18 years old. **Table 25** depicts the results.

Table 25 – Household Composition and Disability

Household Composition and Disability		
County	**Percentile Score**	**Vulnerability Description**
Edgecombe	79th percentile	High
Halifax	83rd percentile	High
Nash	74th percentile	Moderate to High
Northampton	80th percentile	High
Wilson	71st percentile	Moderate to High
Region Overall	77th percentile	High

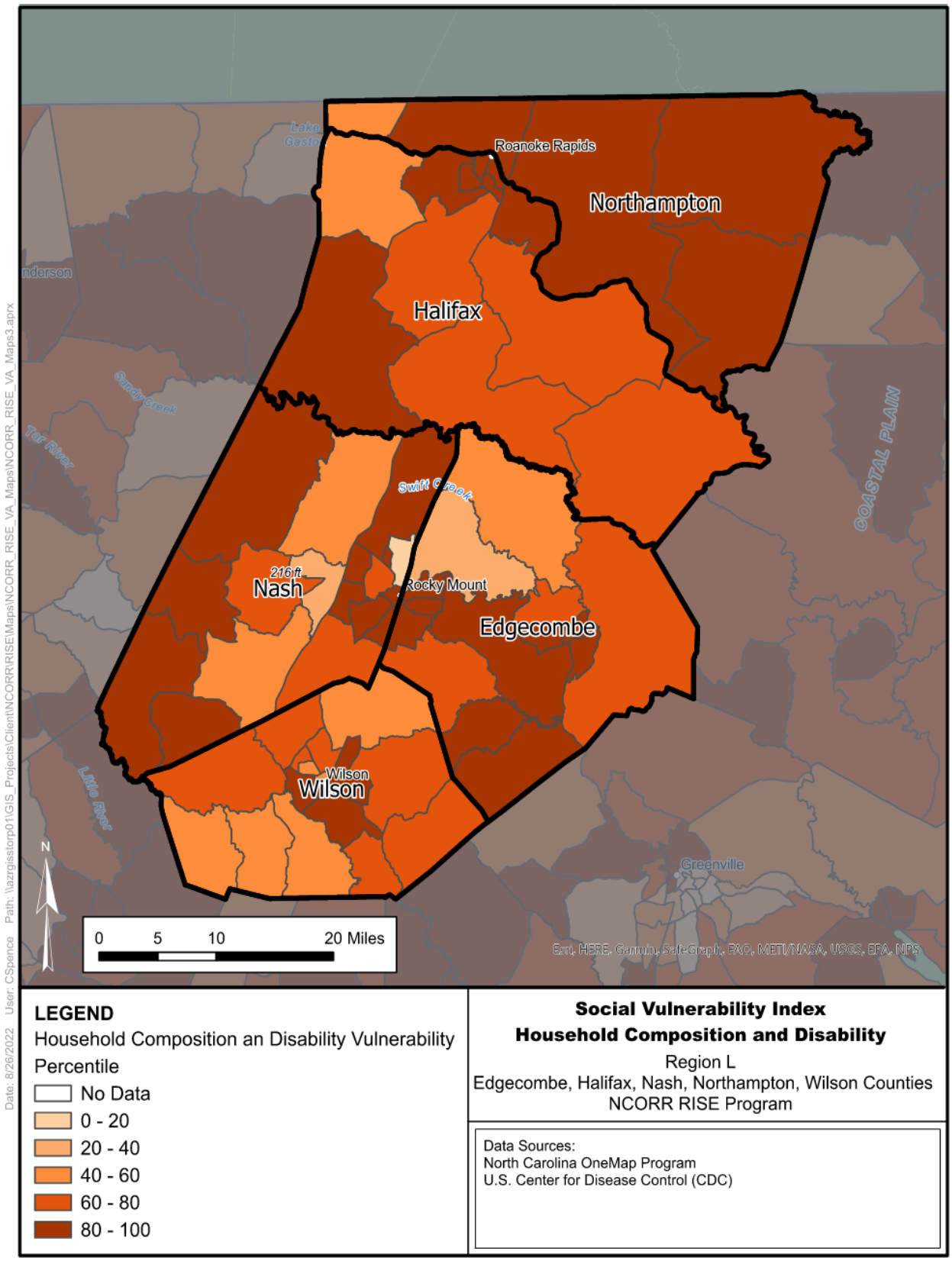
Source: The Social Vulnerability Index (SVI)

The three census tracts with the highest household composition and disability vulnerability scores are in Edgecombe, Wilson, and Halifax counties. All three tracts are in the 90th percentile for single parent households, with **Figure 29 - Census Tract 8.01, Wilson County** also ranking in the 90th percentile for percent of people with disabilities. Sixty-seven percent of census tracts in Halifax County have high household composition and disability vulnerability, with multiple tracts in the 90th percentile for population age 17-years or under, those with disabilities, or single parent households. Northampton County overall has a high vulnerability score with 60% of the census

tracts in the 90th percentile for people aged 65-years and older and one tract also in the 90th percentile for those with disabilities.

Figure 32 below shows the household composition and disability vulnerability scores for census tracts within the region represented by color. The darker color indicates higher vulnerability. The household composition and disability vulnerability scores for the region range from the 19th to the 100th percentile.

Figure 32 - Social Vulnerability Index - Household Composition and Disability for the Upper Coastal Plain Region



5.7.5 Minority Status and Language

The overall minority status and language score for the Upper Coastal Plain is also moderate to high. The minority status and language theme of the social vulnerability index captures the share of minorities (all persons except white, non-Hispanic) and people five years or older who speak English "less than well." **Table 26** shows these results.

Table 26 – Minority Status and Language Vulnerability

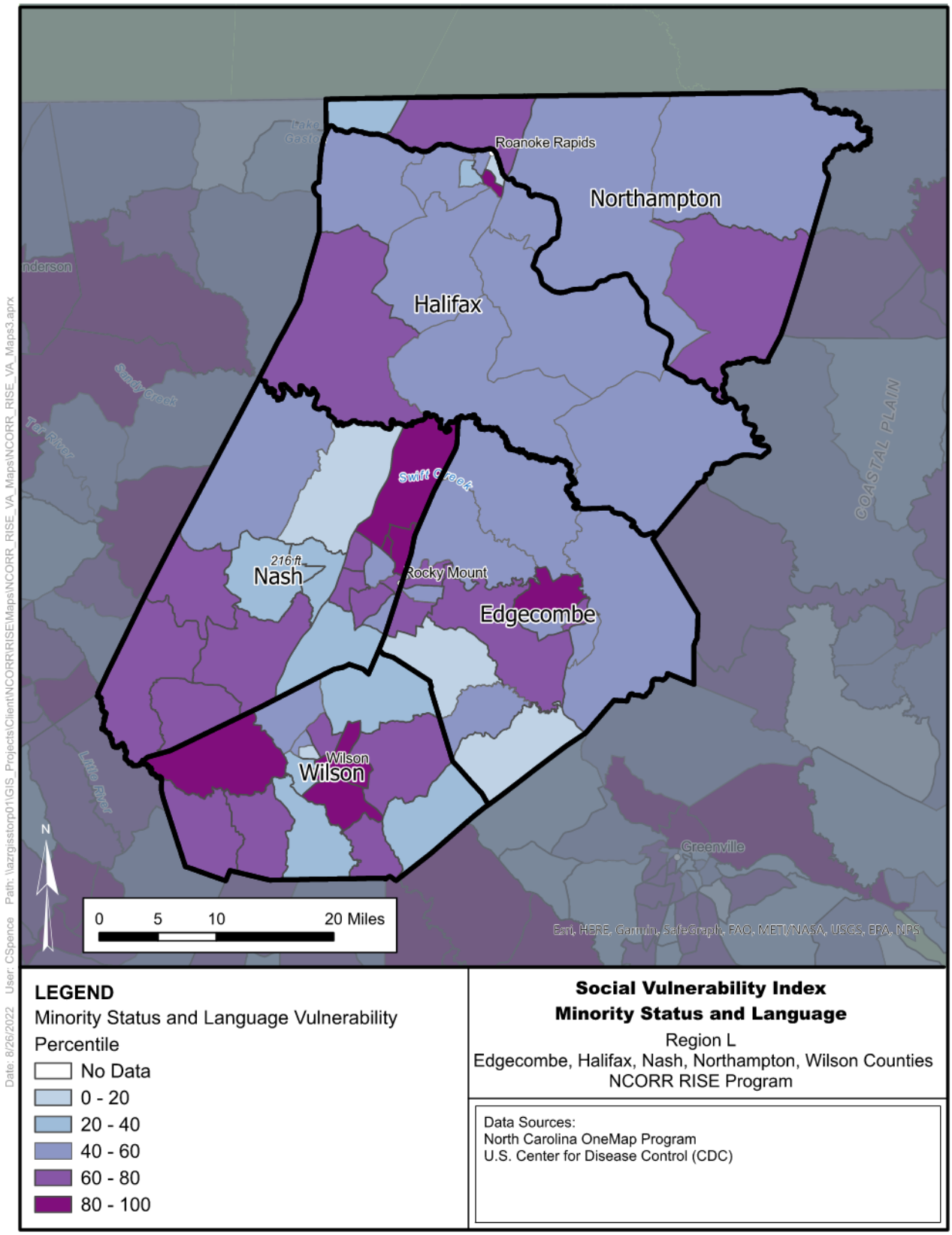
Minority Status and Language		
County	**Percentile Score**	**Vulnerability Description**
Edgecombe	55th percentile	Moderate to High
Halifax	51st percentile	Moderate to High
Nash	59th percentile	Moderate to High
Northampton	56th percentile	Moderate to High
Wilson	66th percentile	Moderate to High
Region Overall	57th percentile	Moderate to High

Source: The Social Vulnerability Index (SVI)

The three census tracts in the region with the highest minority status and language vulnerability are all in and around the City of Wilson in Wilson County. Each tract has a minority population of 89% or more (all three rank within the 90th percentile in the State) and **Figure 38 - Census Tract 2, Wilson County** ranks in the 90th percentile for those who speak English less than well.

Figure 33 below shows the minority status and language vulnerability scores for census tracts within the region represented by color. The minority status and language vulnerability scores within the region range from the 9th to 98th percentile.

Figure 33 - Social Vulnerability Index - Minority Status and Language for the Upper Coastal Plain Region



5.7.6 Housing Type and Transportation

The overall housing type and transportation score for the Upper Coastal Plain region is moderate to high. The housing type and transportation theme of the social vulnerability index examines the prevalence of multiple unit housing (housing in structures with 10 or more units), mobile homes, crowded housing (more people than rooms at the household level), households without a vehicle, and persons living in institutionalized group quarters. **Table 27** contains these results.

Table 27 – Housing Type and Transportation Vulnerability

Housing Type and Transportation		
County	**Percentile Score**	**Vulnerability Description**
Edgecombe	66th percentile	Moderate to High
Halifax	65th percentile	Moderate to High
Nash	65th percentile	Moderate to High
Northampton	58th percentile	Moderate to High
Wilson	61st percentile	Moderate to High
Region Overall	63rd percentile	Moderate to High

Source: The Social Vulnerability Index (SVI)

The three census tracts with the highest housing type and transportation vulnerability scores are in Wilson, Edgecombe, and Nash counties. **Figure 29 - Census Tract 8.01, Wilson County** has the highest vulnerability score and ranks in the 90th percentile for percent of households without access to a vehicle and percent of population living in institutionalized group quarters.

Figure 34 - Census Tract 1, Wilson County

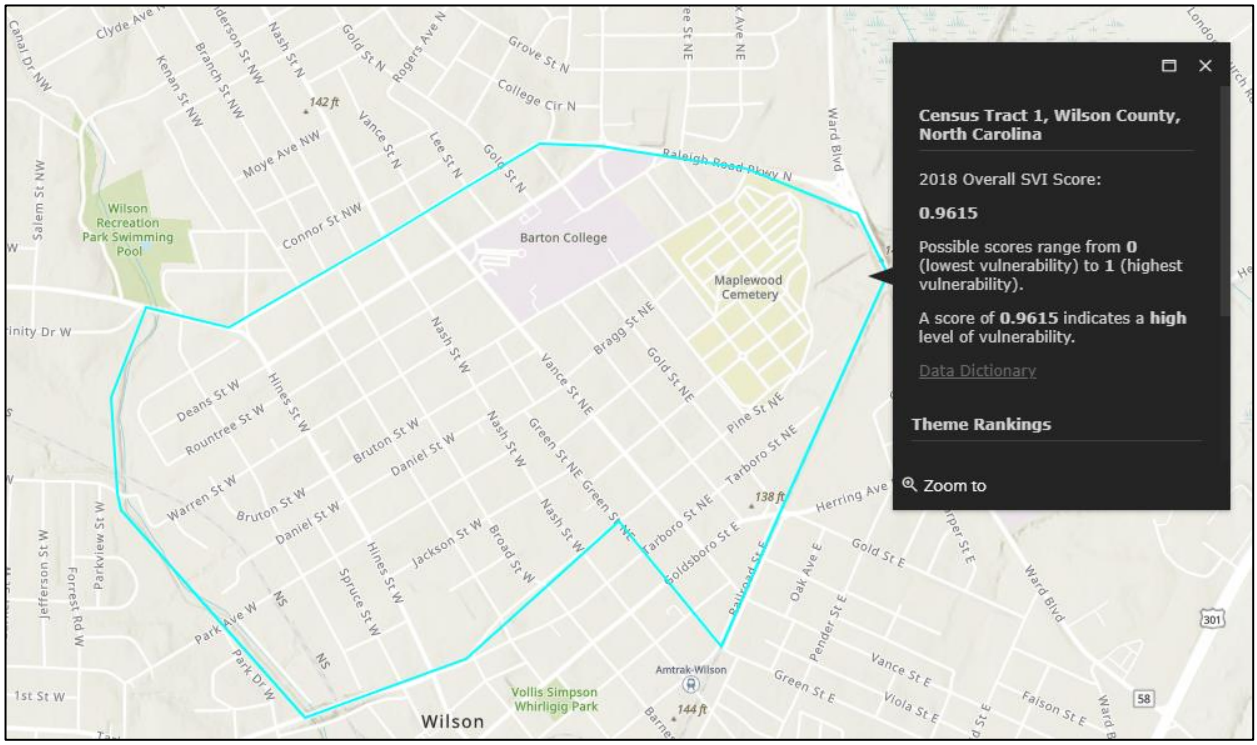
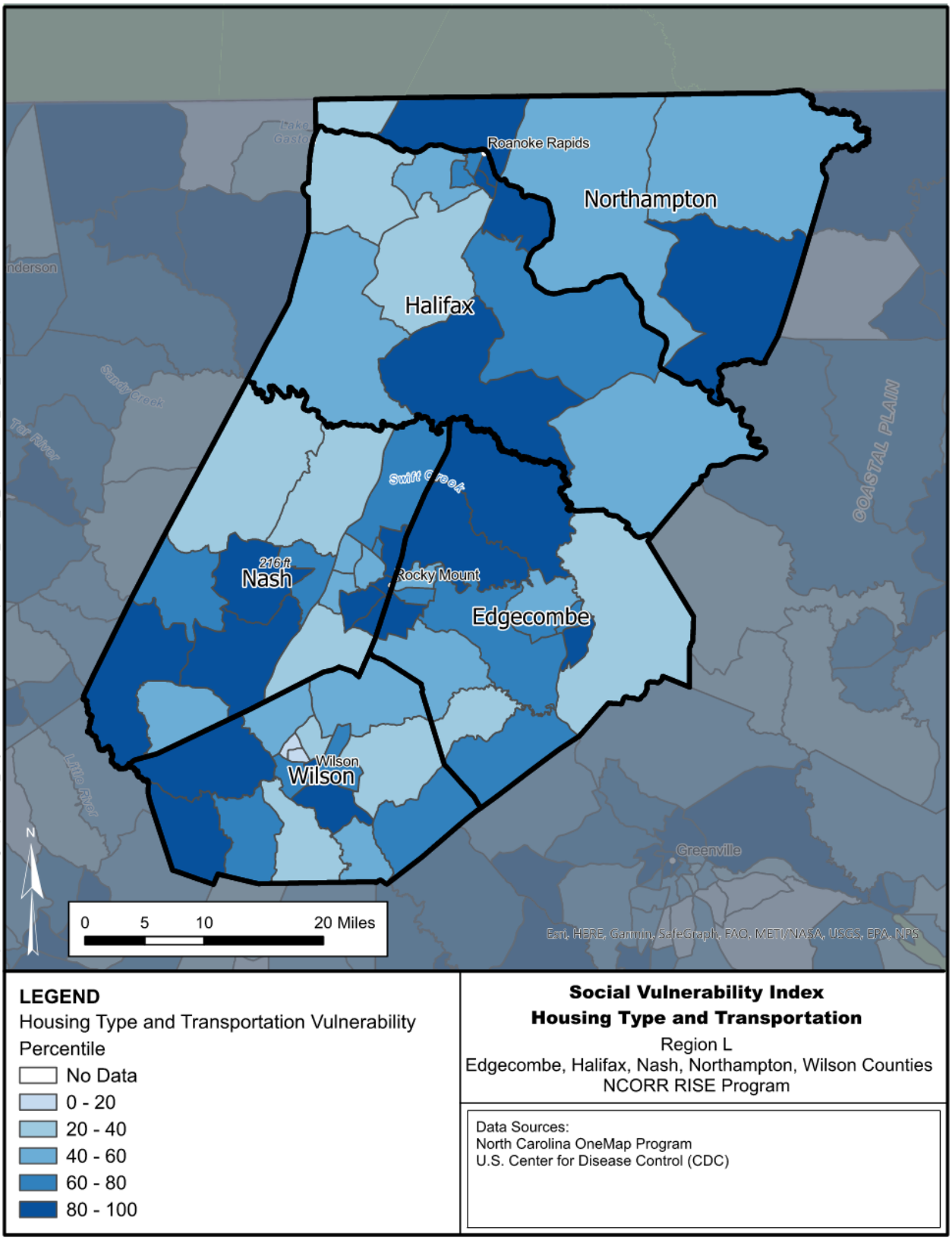


Figure 39 - Census Tract 202, Edgecombe County, just south of Rocky Mount, is in the 90th percentile for crowded housing and households without access to a vehicle. **Figure 40 - Census Tract 111.02, Nash County** is in the 90th percentile of those living in institutionalized group quarters. Halifax County also has a 'moderate to high' housing type and transportation vulnerability score, with 50% of its census tracts ranking in the 'high' vulnerability range. Three census tracts, making up most of the western half of Halifax County, are in the 90th percentile for mobile homes. Four different tracts in central Halifax County are in the 90th percentile for households without access to a vehicle.

Figure 35 below shows the housing type and transportation vulnerability scores for census tracts within the region represented by color. The housing type and transportation vulnerability scores within the Upper Coastal Plain region range from the 3rd to the 99th percentile.

Figure 35 - Social Vulnerability Index - Housing Type and Transportation for the Upper Coastal Plain Region



6.0 Regional Climate Vulnerability Hot Spots

The project team identified locations where multiple natural hazards intersect with communities of high vulnerability. These locations are within proximity to the 100-year floodplain, have a greater number of high heat days, have more impervious surface area, and have a greater number of mobile homes and nursing homes. Areas with a large amount of impervious surface—e.g., concrete and asphalt—correspond to areas with increased surface heat, otherwise known as heat islands. Mobile home parks and nursing homes are noted as additional locations of vulnerable communities. As seen in **Figure 36** and **Figure 37**, the following census tracts are highly exposed to flooding and heat with higher numbers of mobile homes and nursing homes compared to other areas:

- **Census Tract 209**, southeast of Princeville in Edgecombe County
- **Census Tract 9301**, around Weldon, South Weldon, and Days Crossroads in Halifax County
- **Census Tract 9304**, from Roanoke Ave to E 10th St, to I-95, to Chockoyotte Creek in Halifax County
- **Census Tract 104** in Rocky Mount from NW/SW Main St to the Tar River to the ABA Railroad in Nash County
- **Census Tract 7** from US 264 E to Landfill Road, to NC Hwy 42 E to US 301 N to Van Slyke Rd. east of Wilson

Table *28* further details the analysis.

Table 28 – Hot Spot Analysis Results

Location	Census Tract	County	Social Vulnerability Score	# of Nursing Homes	# of Mobile Home Parks	# of Days over 90°F
Southeast Roanoke Rapids	9304	Halifax	0.968	1	2	53-60
Weldon	9301	Northampton	0.9454	1	2	61-65
Rocky Mount	104	Nash	0.9648	0	0	61-65
Southeast Princeville	209	Edgecombe	0.9574	0	1	61-65
East Wilson	7	Wilson	0.9778	1	4	53-60

Source: Kleinfelder

See **Appendix** section 8.3 Highly Vulnerable Census Tracts for maps of these and other highly vulnerable locations.

Figure 36 – Climate Vulnerability Hotspots

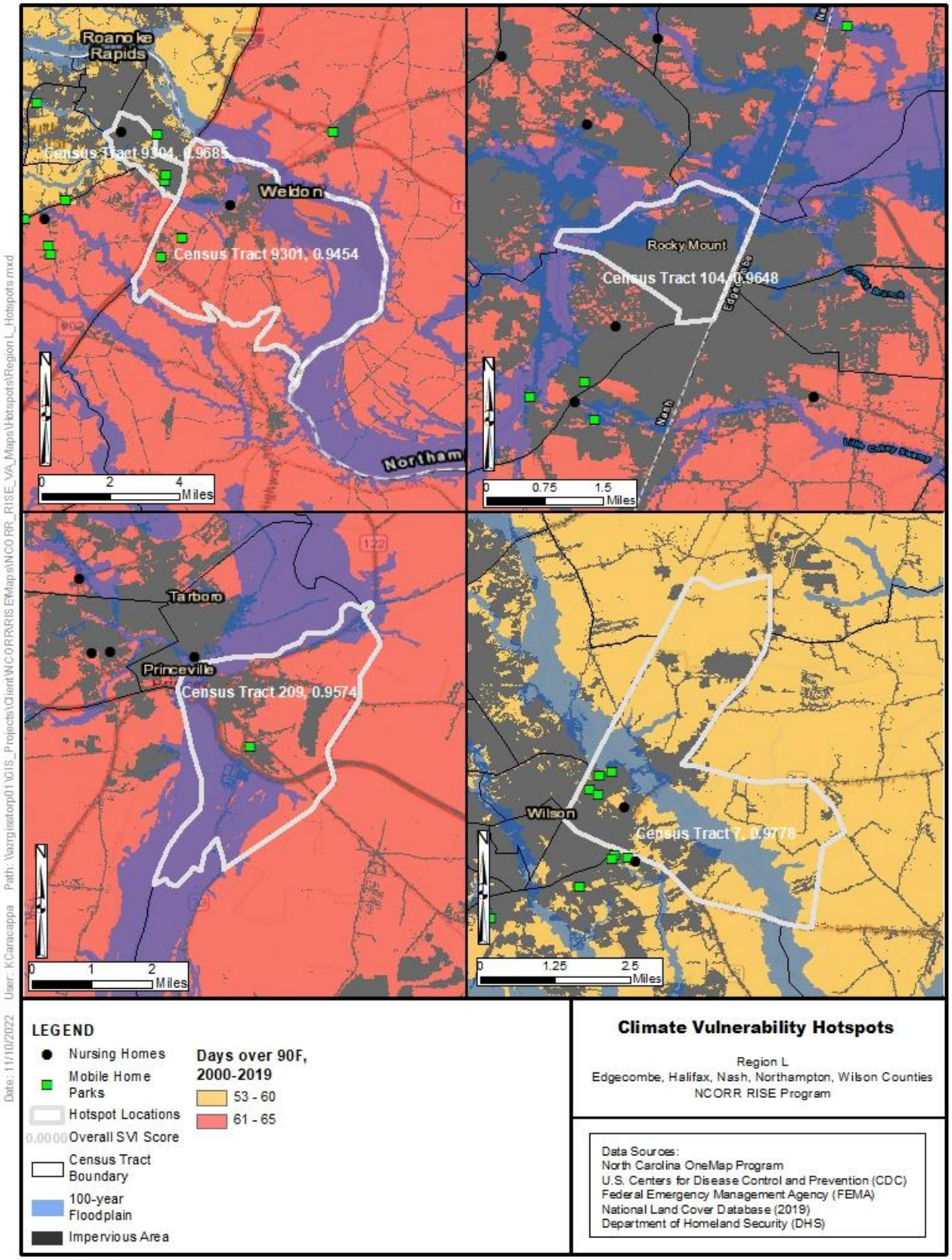
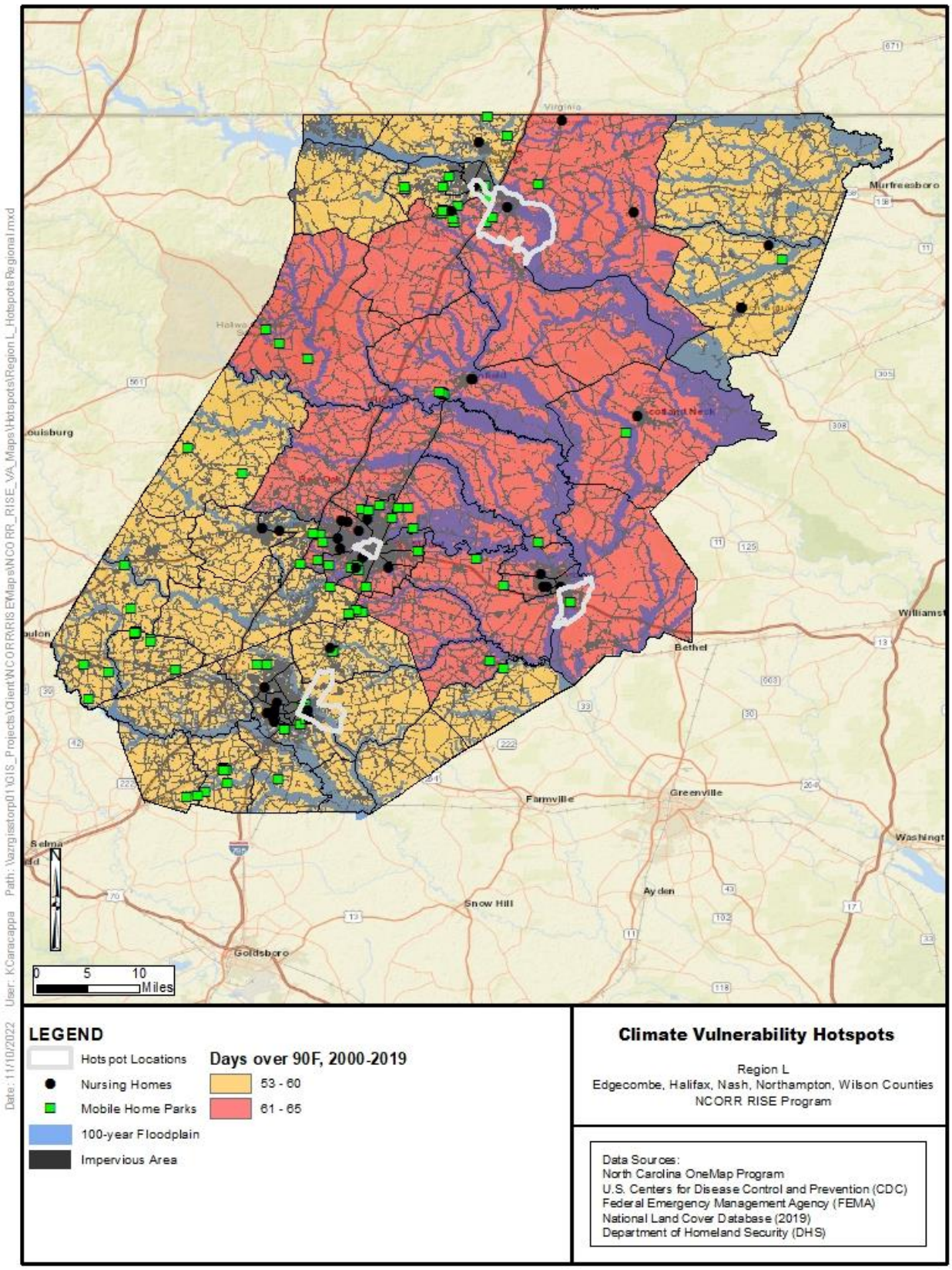


Figure 37 – Climate Vulnerability Hot Spots in the Upper Coastal Plain Region



Additionally, **Table 29** details specific census tracts across the region with overall vulnerability scores greater than 0.9, indicating very high social vulnerability. Wilson County has the greatest number of tracts with high vulnerability and all of these locations should receive focus when planning for hazard resilience.

Table 29 - Census Tracts with Overall Vulnerability Greater Than 0.9

County	Census Tract	Overall Vulnerability Score
Edgecombe	Census Tract 209	0.9574
Edgecombe	Census Tract 202	0.9741
Halifax	Census Tract 9309	0.9255
Halifax	Census Tract 9301	0.9454
Halifax	Census Tract 9304	0.9685
Nash	Census Tract 102	0.9199
Nash	Census Tract 104	0.9648
Wilson	Census Tract 1	0.9435
Wilson	Census Tract 3	0.9727
Wilson	Census Tract 7	0.9778
Wilson	Census Tract 8	0.9847
Wilson	Census Tract 8	0.9894
Wilson	Census Tract 2	0.9958

7.0 Conclusion

The Upper Coastal Plain region faces a variety of vulnerabilities to natural hazards and climate change. The most significant vulnerabilities in this region are tied to flooding, hurricanes, and tropical storms, although other risks like heat waves are still significant. These hazards are all likely to increase in frequency and intensity over the next 30-50 years.

This Vulnerability Assessment revealed that the region contains a high number of aging homes at risk of weather-related impacts, and that there are concerning number of homes, critical facilities and historic sites at risk of flooding. Aging homes likely have a less efficient heating and cooling system and are more susceptible to structural damage from weather events. Additionally, there are over 3,000 homes currently located within the 100-year and 500-year floodplains that are at risk of damage from hurricanes and other heavy precipitation events. Similarly, there are over 1,700 critical facilities in the region, such as emergency medical services, SNAP-authorized retailers, places of worship, nursing homes, police and fire departments, and convenience stores. There are currently five major critical facilities located in the 100-year floodplain—one in Nash County and four in Edgecombe County. Additionally, 8 major critical facilities across Edgecombe and Halifax counties, most of which are meant to provide services during severe weather, are located in the 500-year floodplain and are at greater risk of flooding during a storm. There are also 27 historical and cultural sites listed on the National Register of Historic Places that are in the 100-year floodplain. As flooding is already a concern for the Upper Coastal Plain region, and increased frequency and intensity of flooding is likely in the next 30-50 years, regional adaptation efforts should focus on protecting public infrastructure from flooding and on development standards that will improve housing resilience. Stakeholders are interested in collaborative regionalized approaches to building flood resilience and targeted improvements for stormwater management.

Flooding also poses risk to the regional economy. The manufacturing industry, the largest employer in the region, heavily relies on transportation. With major intrastate and interstate transportation routes crisscrossing the Upper Coastal Plain, there are approximately 1,900 miles of roads at risk of becoming impassable due to 100-year flooding. Disruption to supply chain, logistics, and transportation routes caused by hazards like flooding, hurricanes, and severe weather can affect the regional economy for long periods of time. Another prominent industry in the region is health care and social assistance. Employees and others that depend on these

facilities may be particularly vulnerable to natural hazards. Stakeholders have provided first-hand knowledge of experiences related to being unable to access medical facilities or reach patients due to flooded roads. Additionally, the agriculture industry is highly susceptible to flooding, drought, and extreme heat. Drought conditions are likely to increase in the future and instability of seasonal weather patterns will make it difficult for farmland to be productive.

In addition to structures and economies, climate impacts will also affect individuals and families in North Carolina's Upper Coastal Plain. Social vulnerabilities are the individual characteristics that make it harder for a person to withstand and quickly recover from natural hazards and other stresses. Edgecombe and Halifax counties have high overall social vulnerability due in part to the number of people living in poverty, those living with a disability, and lack of reliable broadband internet. Northampton County has a high percentage (27%) of elderly persons who are more at risk from natural hazards. It may be harder for these populations to prepare ahead of natural hazard events, evacuate when needed, and recover after events. Physical and mental health can also be directly impacted by natural hazards, particularly flooding, hurricanes, and extreme heat. These hazards can impact drinking water quality and supply as well, potentially posing a threat to public health.

In all, there are climate hazard hot spots throughout the region that are disproportionately more vulnerable. Census tract 209 southeast of Princeville in Edgecombe County, tracts 9301 and 9304 around Weldon and south of Roanoke Rapids near the Halifax Regional Medical Center in Halifax County, tract 104 around the western portion of Rocky Mount in Nash County, and tract 7 in the eastern part of the City of Wilson in Wilson County are climate hazard hot spots. These locations are within proximity to the 100-year floodplain, have a greater number of high heat days, have more impervious surface area, and have a greater number of mobile homes and nursing homes. The combination of hazards and high social vulnerability make these important communities in which to focus resilience efforts.

7.1 Next Steps

By participating in the RISE program, the Upper Coastal Plain region demonstrates its commitment to increasing resilience against natural hazard events. This vulnerability assessment incorporates research gathered from planning documents and evidence-based reports and localized knowledge obtained from a series of stakeholder meetings and open houses. It is the foundation for the next phase of the RISE program: the project portfolio. The Upper Coastal Plain's

project portfolio is intended to be a collection of five to 10 regional resiliency projects designed to address the vulnerabilities identified in this document. Project selection will be based on public input collected through stakeholder meetings and open houses, as well as a standardized method that assesses and prioritizes projects for inclusion in the Resilience Project Portfolio. Each project will be published with an implementation pathway that provides clarity of purpose, identifies aligned funding opportunities, and outlines a direct path for implementation.

Below is a list of potential projects that have been discussed for inclusion in the project portfolio.

Table 30 - Resilience Projects Under Consideration

Projects Under Consideration	Description
Housing needs assessment	Determine what housing stock can remain viable and serve this purpose and which households are eligible for energy efficiency assistance.
Emergency shelter feasibility analysis	Determine the feasibility of identifying a large (400+ person) regional shelter facility that can be utilized during disaster and emergency events.
Transfer switches for emergency shelters	Define the process for procuring and installing transfer switches for backup generator power at designated emergency shelters.
Improve roadway accessibility to critical infrastructure	Determine best practical engineering solutions to address roadway flooding that is restricting access to critical infrastructure.
Heat response plan	Create a template defining response and procedure for emergency managers and other relevant officials when a heat wave is forecasted.
Comprehensive plan and zoning ordinance updates to include climate change	Conduct an audit of all comprehensive plans in the five-county region for reference to climate change, consider creating a template document for a climate change element that can be integrated into existing/future comprehensive plans, and consider reviewing and amending zoning ordinances to align with comprehensive plan objectives related to climate change.
Inform elected officials about resilient decision-making	Present information about data and findings from the Vulnerability Assessment to city and county elected officials to clearly articulate climate hazards and vulnerabilities in each county, with the goal of increasing resilient decision-making.

Projects Under Consideration	Description
Floodplain and open space planning	Create a plan to remove properties from the floodplain and flooded areas and establish these as open spaces while also providing residents additional opportunities to remain within their community. Examples include: • Inventory existing lots and structures within flood hazard areas to establish baseline data regarding current state of development within flood hazard areas • Seek funding sources to buy out repetitive loss properties • Establish partnerships between agencies to assist in voluntary buyouts and relocations • Identify parcels (from acquisitions/buyouts) and determine best and appropriate uses for open space
Environmental health assessment	Evaluate factors related to climate equity and public health
Stormwater management analysis and planning	Consider the development and adoption of a stormwater management plan that can include: • Modeling and assessment of flooding potential along streams based upon new developments that occur upstream • Establishing stormwater utility funds in jurisdictions throughout the region to pay for stormwater management projects • Encourage low impact development (LID) techniques in urbanized areas at the lot and subdivision level to reduce stormwater runoff and flooding • Identify locations for detention facilities and best management practices to mitigate peak flow and runoff in needed locations
Community emergency preparedness plan	With many channels of information related to ways to prepare yourself and home for natural hazard events, this project can create a plan to: • Identify relevant and trusted channels of communication • Explore utilizing early flooding notification tools • Explore ways to encourage residents to enroll in local emergency warning systems • Create preparedness programs targeted towards vulnerable populations (including

Projects Under Consideration	Description
	LEP, Latine, seniors, low-income, disabled, mobile home communities) • Partner with volunteer groups or other organizations to create preparedness survival kits
Food network and agriculture resilience plan	Build upon opportunities and recommendations from the Upper Coastal Plain Health Food Access Mapping assessment by: • Identifying strategies to build redundancy into food systems to mitigate supply disruptions • Identifying agricultural assets in the five-county region that are vulnerable to climate hazards • Supporting the development of local food distribution centers, small community gardens, and/or pop-up farmers markets • Aligning efforts with Tri-COG Food Ecosystem Economic Development Strategy (Tri-COG FEEDS)
Critical facilities assessment	An assessment of critical facilities can: • Build upon existing data from the Vulnerability Assessment and other sources to determine which critical facilities may need possible improvements to reduce exposure to hazards • Create a plan to secure and maintain supplemental equipment necessary for operations during hazards • Determine options for relocating or flood proofing critical facilities in/near the floodplain • Provide strategies for actions to address improvements
Waterway clearing and maintenance	Create a program to ensure that waterways stay clear of debris so they can effectively move water during storm events. The project can: • Establish and maintain a coordinated program to identify locations of debris and create a process for debris removal • Identify partnerships at the local, state, and federal level to clear and snag stormwater conveyances

Projects Under Consideration	Description
	• Identify sustained funding opportunities for continued maintenance of waterways
Regional flood analysis	A flood analysis can: • Build upon the Vulnerability Assessment's identification of flooding impact to sectors across the region • Analyze flood risk across the five-county region using current data and future projections • Identify additional hot spots along roads and at critical locations that experience repetitive flooding • Procure and place flood sensors and gauges at needed locations to provide real-time data • Install signage at hot spots warning about flooding
Transportation and mobility analysis	The Upper Coastal Plain region has areas outside of cities and towns that lack transportation options, including residents that lack the use of a car. This analysis can: • Analyze current public transportation options for each municipality and county in the region • Survey residents about their individual mobility needs • Identify established emergency evacuation routes and examine usability
Local resiliency hubs	Identify strategies to replicate the resiliency hub model throughout the five-county region to build local capacity.
Regional culvert analysis and improvements	A regional culvert analysis can: • Build upon existing data to identify aging and undersized stormwater infrastructure across the five-county region • Create a plan to upgrade and retrofit undersized culverts where needed • Create a plan to build new culverts where needed • Clean and remove debris from culverts where identified

7.2 Considerations for Developing the Resilience Portfolio

The Resilience Project Portfolio will be published in late 2022 and consist of five to 10 projects identified through stakeholder collaboration and planning document review. Based on this vulnerability assessment, the project team recommends the following considerations when identifying projects for the portfolio:

- Consider reviewing local and county planning documents and update ordinances according to the most current climate science projections for flooding and other natural hazards.
- Plan for sustainable growth in towns that are projected to grow and determine strategies to attract growth in towns that are declining in population.
- Identify emergency shelter locations and coordinate efforts across the region with responsible parties to ensure these facilities are equipped with everything needed before emergency events.
- Recognize and support the efforts of communities that are building capacity and resiliency. These efforts are important and display the determination of residents in the Upper Coastal Plain region.
- Consider green infrastructure and natural solutions when planning for stormwater control and other infrastructure projects.

8.0 Appendices

8.1 Glossary

Key definitions provided by FEMA (unless otherwise stated) used throughout the vulnerability assessment include:

Assets are determined by the community and include but are not limited to people; structures; systems; natural, historic, and cultural resources; and/or activities that have value to the community.

Disaster is an occurrence of a natural catastrophe, technological accident, or human-caused event that has resulted in severe property damage, deaths, and/o multiple injuries. It is important to note that the term 'natural disaster' is not entirely accurate because it ignores the role that humans have in the disaster – a hazard only becomes a disaster once it affects society or a community.

Exposure is the people, property, systems, or functions that could be lost to a hazard. Exposure includes what lies in the area the hazard could affect.

Natural hazards are a source of harm or difficulty created by a meteorological, environmental, or geological event. Natural hazards, such as flooding and earthquakes, impact the built environment, including dams and levees. [Note that natural hazards and climate hazards may be used interchangeably in the vulnerability assessment.]

Resilience is the capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption (United States Global Change Research Program, 2021).

Risk for the purpose of hazard mitigation planning is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources.

Social vulnerability is understood as the potential for loss within an individual or social group, recognizing that some characteristics influence an individual's or group's ability to prepare, respond, cope, or recover from an event. These characteristics can overlap within populations to create heightened vulnerability, which may be compounded by infrastructure deficiencies within communities and historic or existing discriminatory government policies.

Vulnerability is a description of which assets, including structures, systems, populations, and other assets as defined by the community, within locations identified to be hazard-prone, are at risk from the effects of the identified hazard(s).

8.2 Open House Summary

Summary of Upper Coastal Plain Region Open Houses – April 14th, 2022

Attendance at the morning session (11:00 am – 12:30 pm) totaled approximately 15 participants in addition to the six Core planning team members. The evening session (5:30 pm – 7:00 pm) had approximately 16 participants in addition to the six Core planning team members. At both sessions, the first question discussed was, "What is a weather hazard that impacts you and your family?" The second question discussed was, "How do you see your community being impacted by weather hazards and where are they happening?" The following document summarizes key themes and important points of information gained directly from participants at both Open House sessions.

Sheltering & Response

- Residents are unaware of the nearest shelter location to their home
- Halifax County doesn't have shelters
- Quality of service in Red Cross shelters is lacking compared to larger cities. Red Cross also doesn't respond to more rural areas, making it hard to travel to a designated Red Cross shelter
- Shelters are mostly schools, and churches serve as last resort shelters, which lack size, capacity, and additional necessities to function like a real shelter.
- The region lacks shelters specifically for extreme heat
- Elderly folks lack ability to get to schools designated as shelters
- Coastal areas occasionally evacuate to the region and will also need room in shelters
- Need to check with family and friends first before evacuating or going to a shelter
- Englewood Baptist church in Nash County has a large facility and operates as a shelter with HVAC system
- In Wilson, schools with non-air-conditioned gyms are the only option for shelters
- Greater Joy North church serves as a last resort shelter for emergencies but when Smith Church Road floods, only some people from one side of the road can reach the church shelter
- Response teams need to start traveling to the other ends of the county (Halifax)

Drought

- Crop yield varies when there is a drought and too much water

- Heavy rainfall results in produce that is unable to sell – watermelons were too big to sell at market
- Agricultural production schedule is more varied – dates to plant, harvest, etc. will change
- Impact on residents that rely on well water
- Impact on water table and recreational opportunities in water bodies that may experience increased bacteria levels/toxicity
- Drought and rising temperatures affect community garden yields and local food supply
- Drought and rising temperatures can affect the food supply chain and lead to higher food costs, food scarcity
    - After Hurricane Florence (2018), produce and dairy sections of Food Lion were empty for a week because the Benson distribution facility flooded
- Food production is also dependent on fertilizers coming from other countries, need to focus on building more local connections and small-scale infrastructure to meet our own needs

<u>Heat</u>

- Hotter temperatures make weatherization of buildings and homes important
- Heat strains air conditioning units and causes utility bills to increase monthly payments, costing $500 and even more in the summer
- Dawson Resiliency Hub plans to assist with financial support for heating and air conditioning bills
- Currently few if any energy efficient standards being followed for low-income housing
- More AC utilization contributes to climate change
- Seniors and others in rural areas don't always have air conditioning units, can be hard to raise and open windows, concern with safety, minimal fans available
- Mill houses (Roanoke Rapids) haven't had improvements since construction and the top story gets hot without AC
- Heat makes it harder to work outside that it used to be
- Crop reductions are a result of hotter temperatures
- Loss of pollinators (bees) due to heat
- Transformers blow during hotter temperatures, affecting supply of electricity
- Hot days cause power outage issues in Roanoke Rapids regularly – Hodgestown and Hightown area off highway from Pine Street area of Roanoke Rapids has transformers blow during heat

- Parks and green shady space can be improved to provide refuge during extreme heat events
- Increase shade, build splash pads, consider orientation of buildings in relation to sun
- Edgecombe Community College needs to replace AC units
- AC is seen as an economic issue

Electricity & Broadband

- When power goes out, also lose water because well system takes electricity to pump
- Power outages affect people who use medical devices (oxygen, sleep machines)
- 14,000 homes in the COG region don't have internet available and many are in cellphone dead zones – there are maps detailing lack of coverage available
- Power outages used to be less frequent than they are today
- Broadband is not enough, especially when it's necessary to function for jobs
- Internet service is disrupted when it rains

Communication efforts

- "I hope I would get an alert about a weather event"
- Communication about emergencies and emergency preparedness can always be improved, especially as new people move to the region
- Those who don't speak English as a first language might not know where to go or where to look for information
- Even in winter months, large number of folks don't understand the importance of leaving your water dripping to prevent pipes from freezing
- Need for information about extreme cold weather as well
- Don't seem to have an evacuation plan for Halifax County
- Immediately around college campuses (UNC Greensboro, UNC Chapel Hill) there are emergency alerts sent via phone
- Download phone apps to get alerts about events but major reliance on TV or radio broadcast to receive information
- There aren't major TV networks with forecasts that cover the region, making it difficult to know when storms are coming

Preparedness

- People stay at home if they can during events, which could lead to problems when things turn bad
- Preparedness lessens impacts

- We face problems by working together
- Construction in Nashville is using more durable materials – steel roofs to prevent hail damage, more insulation for energy efficiency, natural yard plantings
- Manual can openers and grills are examples of small preparedness efforts that are inexpensive
- Fill up water jugs, bathtubs before storm events
- Create a 72-hour preparedness kit with simple things like charcoal, can opener, gas grill to have on hand
- Churches need to have an emergency plan for when storms hit to be prepared if it happens during a service
- Tillery Volunteer Fire department is trying to collect information on elderly in the community (names, location, next of kin, medical needs)
- Conflict of not being able to force evacuation and make people leave homes but emergency response won't be able to come back and get you
- Fire departments need to know where to place generators – they need to know whether a household has an individual that needs oxygen
- Wilson needs a registry of folks with special needs for emergency events
- First instinct during an emergency event is to check floodgates in the area in if those are flooded, they know they are next
- Nash county had no deaths during Hurricane Floyd but some in Hurricane Matthew, relating back to the need for preparedness and addressing complacency when evacuating/preparing

<u>Building & Infrastructure</u>

- Life of critical infrastructure is reduced with each weather event – streets, storm sewers, buildings, sanitary sewers, water towers, etc.
- Need to rethink default assumptions about building, parking lots, roads, landscaping so we cause fewer impacts
- Consider net zero buildings with solar and electric car charging
- More impervious surfaces cause problems and planning regulations can help solve this
- Lack of political will to limit development in floodplains
- Efforts to move buildings and other structures out of floodplains and parks

- We must increase our capital improvement plan in Nashville to a more aggressive schedule. Streets and storm sewers aren't lasting as long and we're constantly fighting sanitary overflows.
- UNC Greensboro campus is growing, and it doesn't seem like they have a plan to manage drainage
- Flooding on secondary roads because they aren't well maintained
- Drainage ditches overflow
- During Hurricane Matthew, Princeville elementary school completely flooded and didn't know where to put the students
- During Hurricane Matthew, the whole corridor along Roanoke Creek was devastated

Tornadoes & Wind

- More frequent tornado warnings – it's upsetting to children and challenging to deal with senior parents that require medical devices
- We have high winds that have destroyed outdoor furniture
- Few basements in the region you could go during tornado or storm
- Wind and tornadoes take down tall pine trees, and when the soil is saturated, trees can fall
- Flat areas and neighborhoods without trees might be more susceptible to wind damage
- Tornado in 1984 in Wayne County went down Hwy 117 and leveled tops of pine trees, blew off roofs on west side of highway and destroyed business on east side of highway
- Hail damage causing insurance claims for roofs and cars
- Students were kept late at school one time because a tornado came through as school was being dismissed
- Wind damage has been an issue

Snow & Ice

- Snow and ice shut down our area, and since it's only a couple times a year, we have very little equipment to respond
- Ice impacts daily life, makes it hard to drive, cases roof damage and leaking

Rain & Flooding

- Flooding concerns
- Ditches overflowing into yards and yards flooding
- Yards flood along Hwy 158 between Weldon and Garysburg after you cross over the river – about half a mile from the Roanoke River

- In Garysburg going north on 301, yards are lower than the road, causing water to drain into yards
- Drainage problems in town cause flooding and prevent travel; trash and garbage from drains become unsanitary
- Water sewage and drainage problems in Scotland Neck
- Secondary roads flood in Scotland Neck and leave people stranded
- Mill Creek floods people in Tillery
- Roanoke River is only 3 miles away from houses and Mill Creek is less than half a mile from one house, so flooding comes from all sides; one time the whole road flooded, and the lights were out for 4 days
- Major flooding on 561 going towards Tillery hits houses and homes
- Water washed out 903 at the Halifax-Martin line, which makes it hard to commute to work
- Hwy 125 between Hogwood and Oak City is flood prone and flooded during Floyd and Matthew
- Sheetz parking lot in Nashville has been a place where people have needed rescuing twice in three years because of flooding
- We have bought flood insurance on a house we own in Durham, which isn't in a floodplain, but the street one block over has flooded so we want to be prepared
- Heavy rain causes driveways to wash away and need repair, driving in and out is hard
- Flooding in Tarboro is a big issue, whether it's from hurricanes or heavy storms. One road we take to get to our homes in our neighborhood floods and prevents access, limiting us getting around. Flooding also washes out bridges and roads
- Tarboro campus of Edgecombe Community College has parts that are in the floodplain/watershed areas. There are experts looking at flood maps. They must provide a permanent easement in one area, and we can't use it for development.
- Residents in a SFHA in Edgecombe County have experienced 2-3 feet of water in their homes – particularly from Hurricane Floyd, which caused residents to be out of their home from 1999-2001
- Low elevations and flat lands contribute to standing water, and lower areas become lakes
- Rainfall and flooding have increased over the years
- In Roanoke Rapids, an area right outside the local hospital floods so much that cars have been stranded in the parking lot

- Princeville and Edgecombe County have constant flooding during hurricanes and heavy storms
- Low-income residents live near Vine Street area are affected by flooding on Smith Church Road
- In Rocky Mount, Lucas Circle, Fountain Street, and Hillsdale Drive are closed due to flooding
- In Rocky Mount, Springfield Road and Leggett Road are the location of an excavation site being used to manage some of the flooding, where water is redirected to that site through machines and pumps
- Unpaved driveways and roads flood and make travel difficult – emergency vehicles get stuck and can't respond (Gaston)
- In Gaston, Old Emporia Road becomes impassible
- Vidant North Hospital has experienced flooding
- Logging in Warren and surrounding counties contributes to erosion during heavy rains
- I-95, US 64, and US 264 have all flooded in the past, along with local roads
- The I-95/US 64 interchange near Rocky Mount flooded during Hurricane Floyd
- Nash UNC Healthcare becomes an island and is difficult to access during major storms
- Flooding occurs down the hill in Nashville, affecting businesses
- Stoney Creek is difficult to access during rain events
- Hubbard Elementary has ponding during rain events
- Meals on Wheels can't deliver to seniors that need food during heavy rain events
- Hurricane Matthew caused new areas to flood which didn't during Floyd, demonstrating changes in the watershed in terms of development/impervious surfaces, etc.
- An arts center at Sunset Park in Nash County flooded during Hurricane Floyd but did not flood during Matthew
- Mobile home park (Meadowbrook) off of 4th Ave behind Walmart in Roanoke Rapids flooded during Hurricane Matthew
- Major flooding along 561, mainly on the east side, which is where black farms from the Tillery Settlement owned land
- Wilson County flood maps accurately capture flooding
- Secondary roads

<u>Housing</u>

- Subsidized housing in Roanoke Rapids and Halifax County means folks feel impacts from weather hazards more
- Homes are not up to public health standards – landlords bleach units to remove mold and mildew and don't handle problems professionally, causing insecurity for tenets
- Potential for project on renters and rights, enforcement, building inspections/inspectors
- Housing in Scotland Neck averages 60 years or older, lacking AC and adequate insulation, potential for mold behind walls, etc.
- Residents of mobile home parks and low-income communities may be on fixed income and utility bills and rent are sources of issue
- Housing is hard to find in some towns so folks live far away from where they work and might have to commute

Impacts

- Events like job fairs and church are canceled because of weather hazards
- Climate change contributes to changes in species composition; stressed trees become more susceptible to infestations
- Some people have noticed that the weather has changed from one extreme to the other – warmer winters and less snow than years prior
- These days there are fewer weather occurrences that feel average and often feel more extreme – lacking the middle ground balance that's needed
- In some weather hazards, senior residents needing home delivered meals don't get served
- Nash and Wilson counties are experiencing bedroom community growth from Raleigh, so subdivisions are being built on old tobacco farms
- Colonial Pipeline shutdown contributed to fuel shortages, and some couldn't get to work
- Transportation is interrupted during weather hazards

Natural

- Nature's Best Hope (Doug Tallamy) encourages people to switch from yards to neighborhood wildlife corridors
- Working Landscapes started working with more organizations in the community during COVID
- There has been a change in fire ants
- As development continues and rains are more frequent, there is a greater need to incorporate drainage into natural green spaces

- As more people move into the wildland-urban interface/woods, there seem to be more fire incidents
- Can use flood spaces as areas for assets like greenways, parks, and recreation fields

Community

- People want to be useful, want to help one another, especially with acute problems.
- It feels like even though we know specific places flood, our community leaders don't seem to have a plan in place to deal with it
- These events are traumatizing and can impact children when you are trying to provide them normality
- You can't have everything located in the most populous city (Roanoke Rapids); you have to have a car to get where you need to go
- Our counties need a better plan, and we deserve to have adequate services when we are paying taxes too
- The southeastern part of Halifax County is always neglected. What opportunities are available for us and what can we have available for our community?
- The Tillery Resettlement in the 1930s forced Black farmers to buy land in the floodplain and this is still the result today

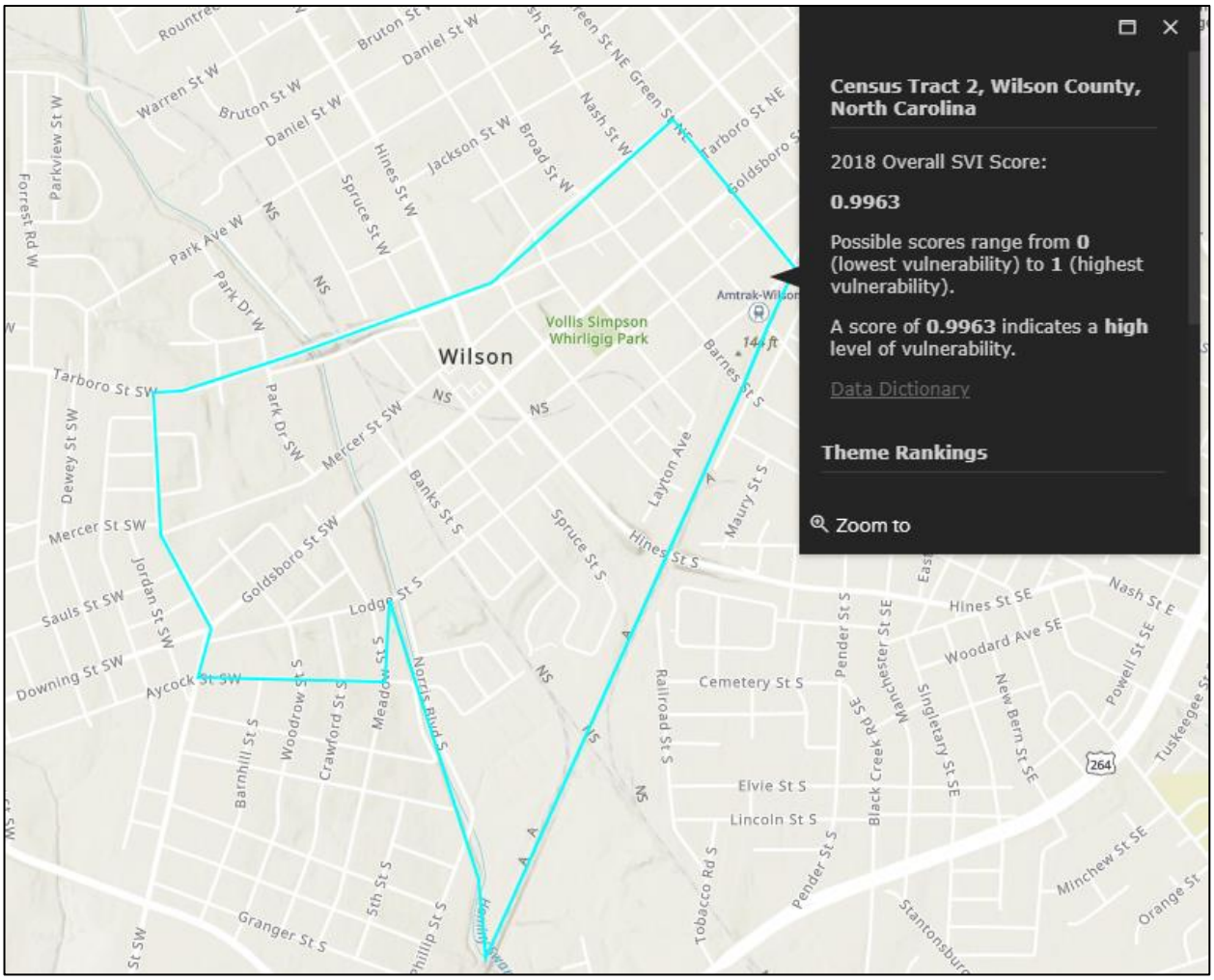
Buyouts

- Industry and residential have been impacted economically from buyouts
- Buyout program has helped reduce repetitive losses and rooftop rescues like during Hurricane Floyd

8.3 Highly Vulnerable Census Tracts

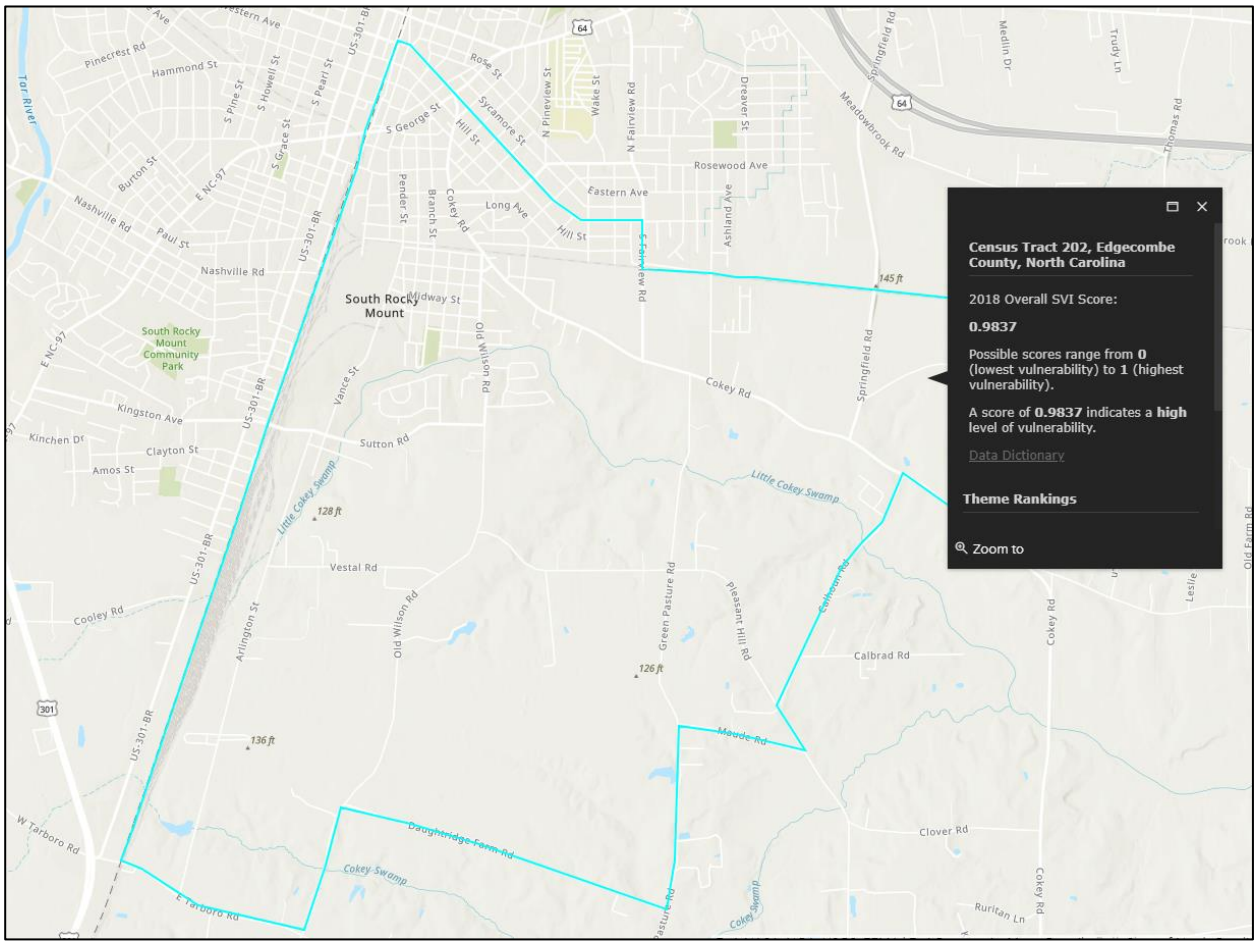
The following figures are census tract locations according to the CDC SVI mapping tool.

Figure 38 - Census Tract 2, Wilson County



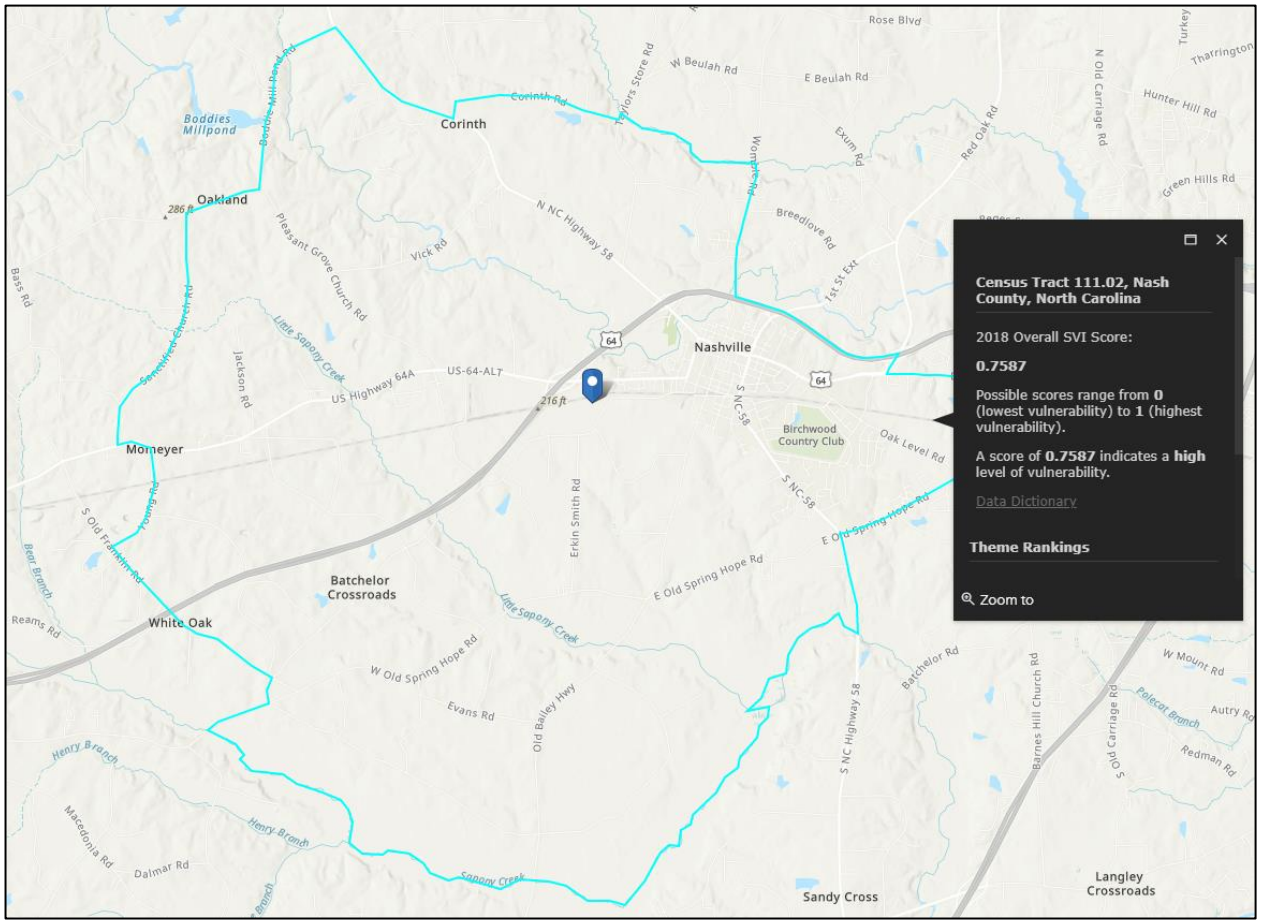
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 39 - Census Tract 202, Edgecombe County



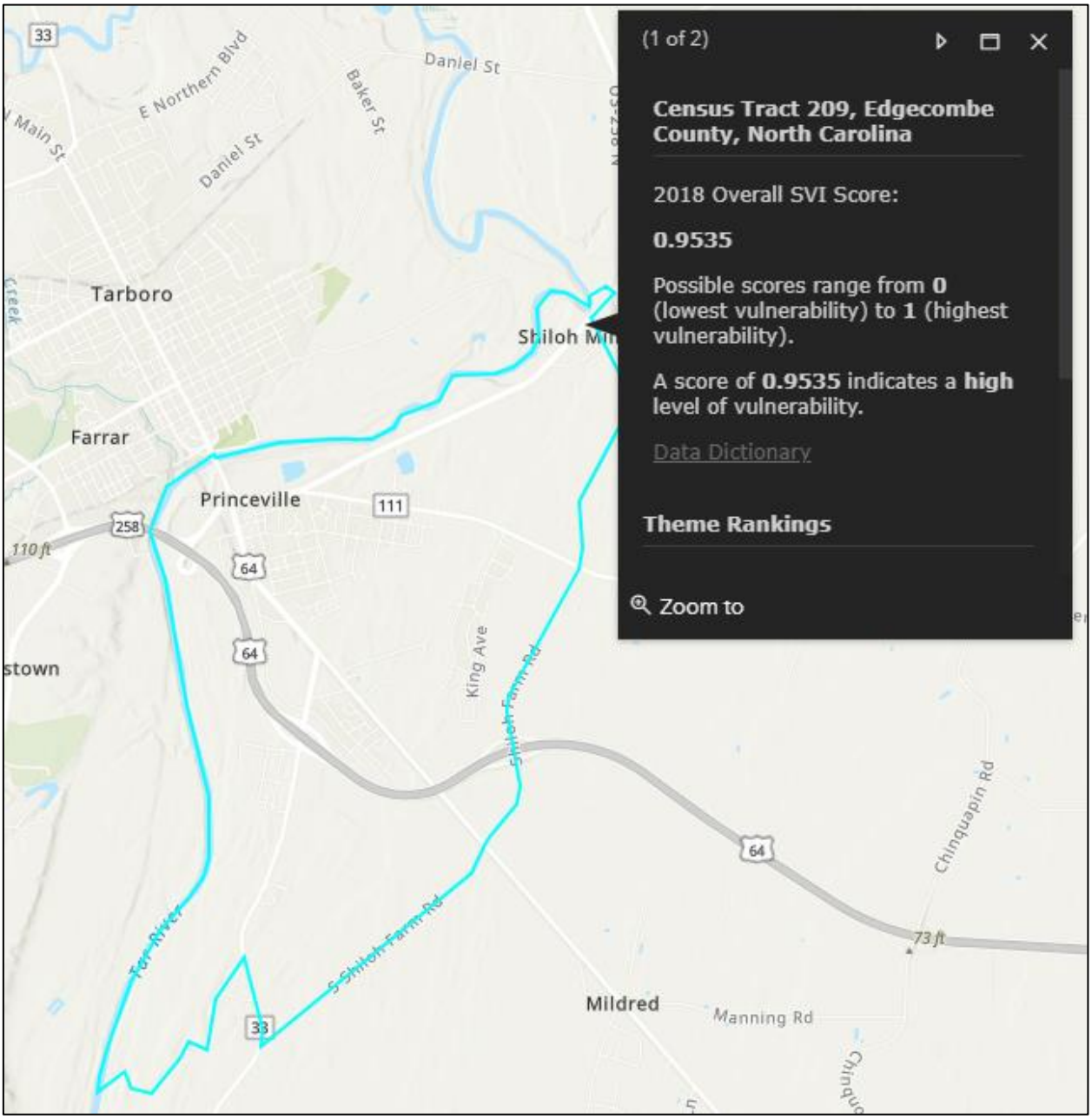
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 40 - Census Tract 111.02, Nash County



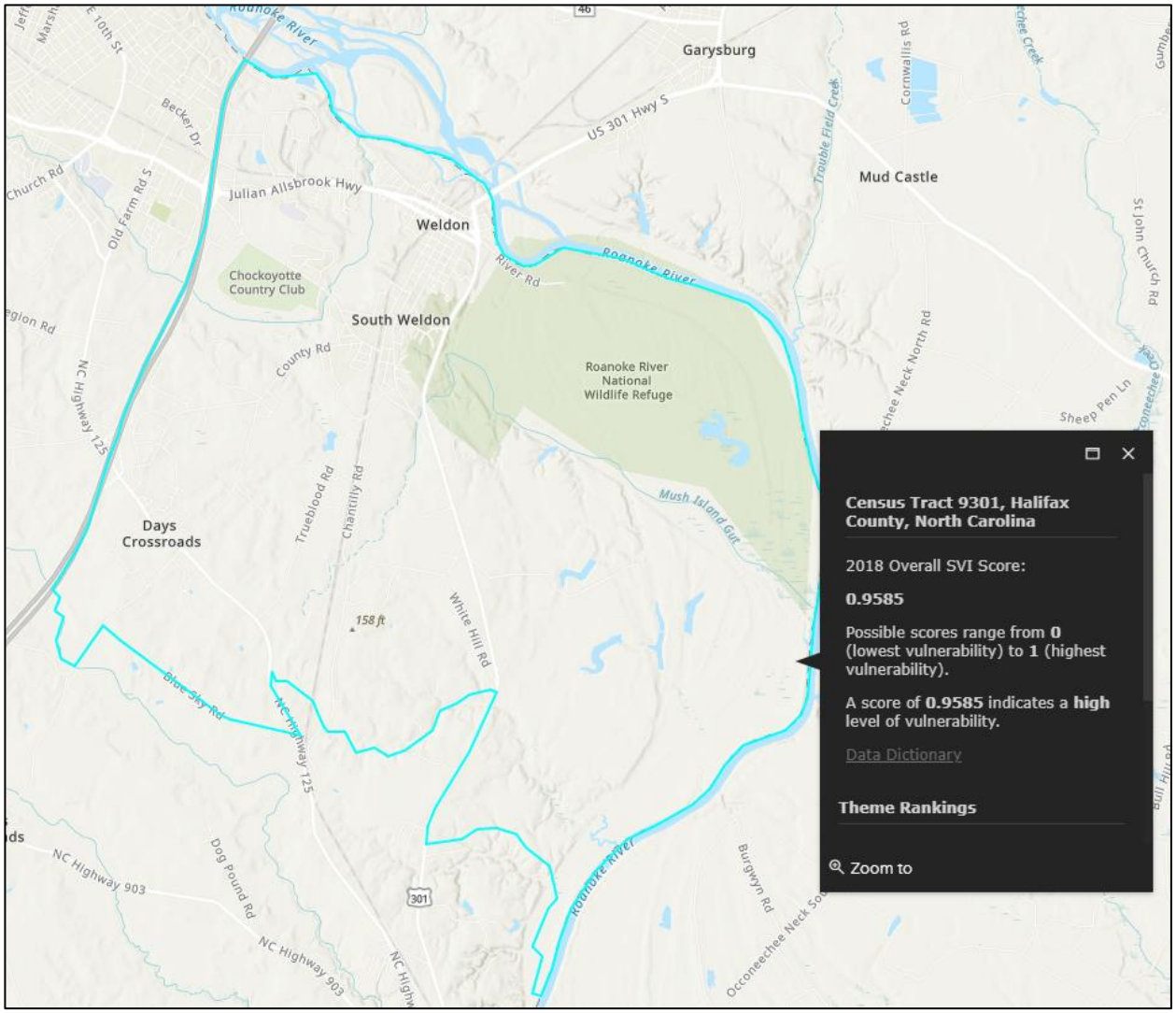
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 41 - Census Tract 209, Edgecombe County



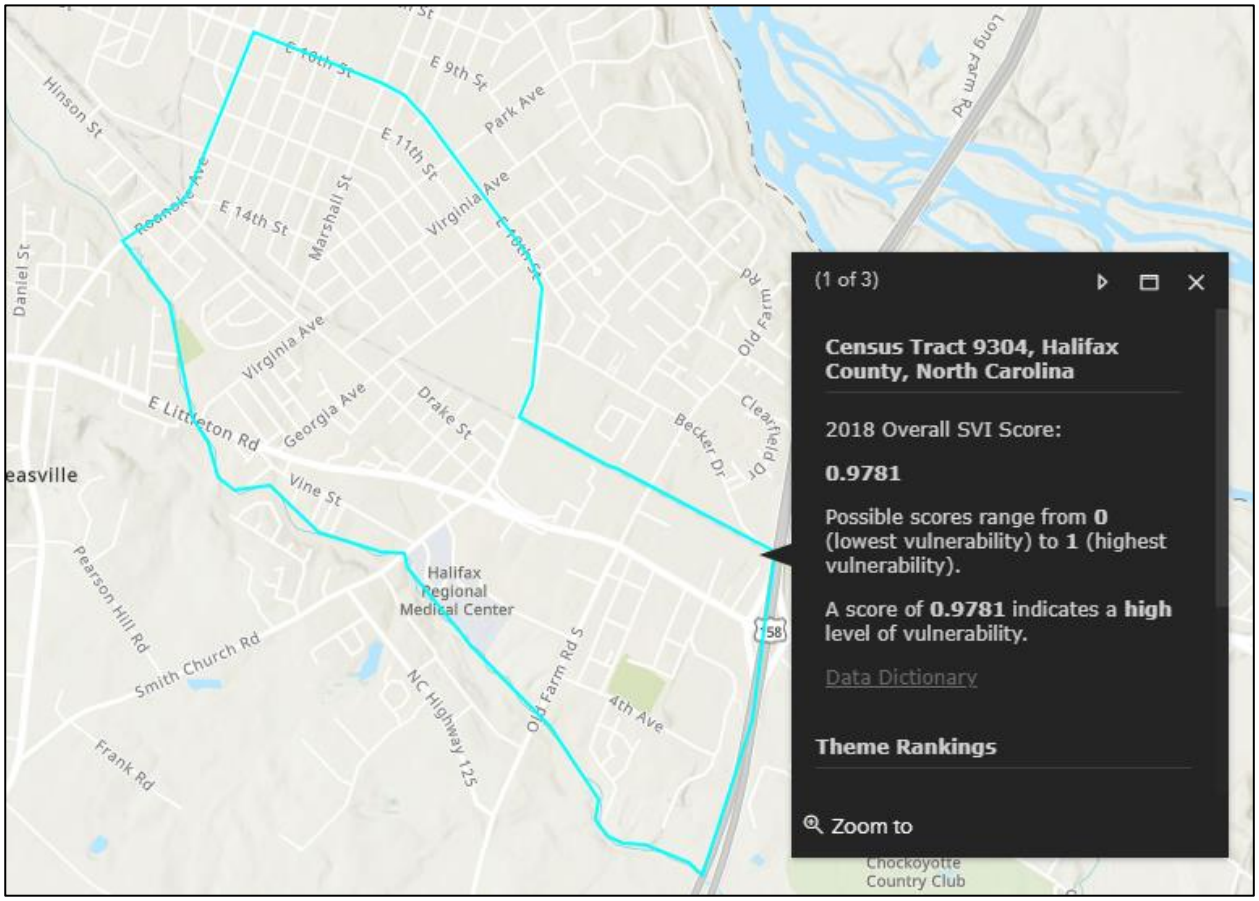
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 42 - Census Tract 9301, Halifax County



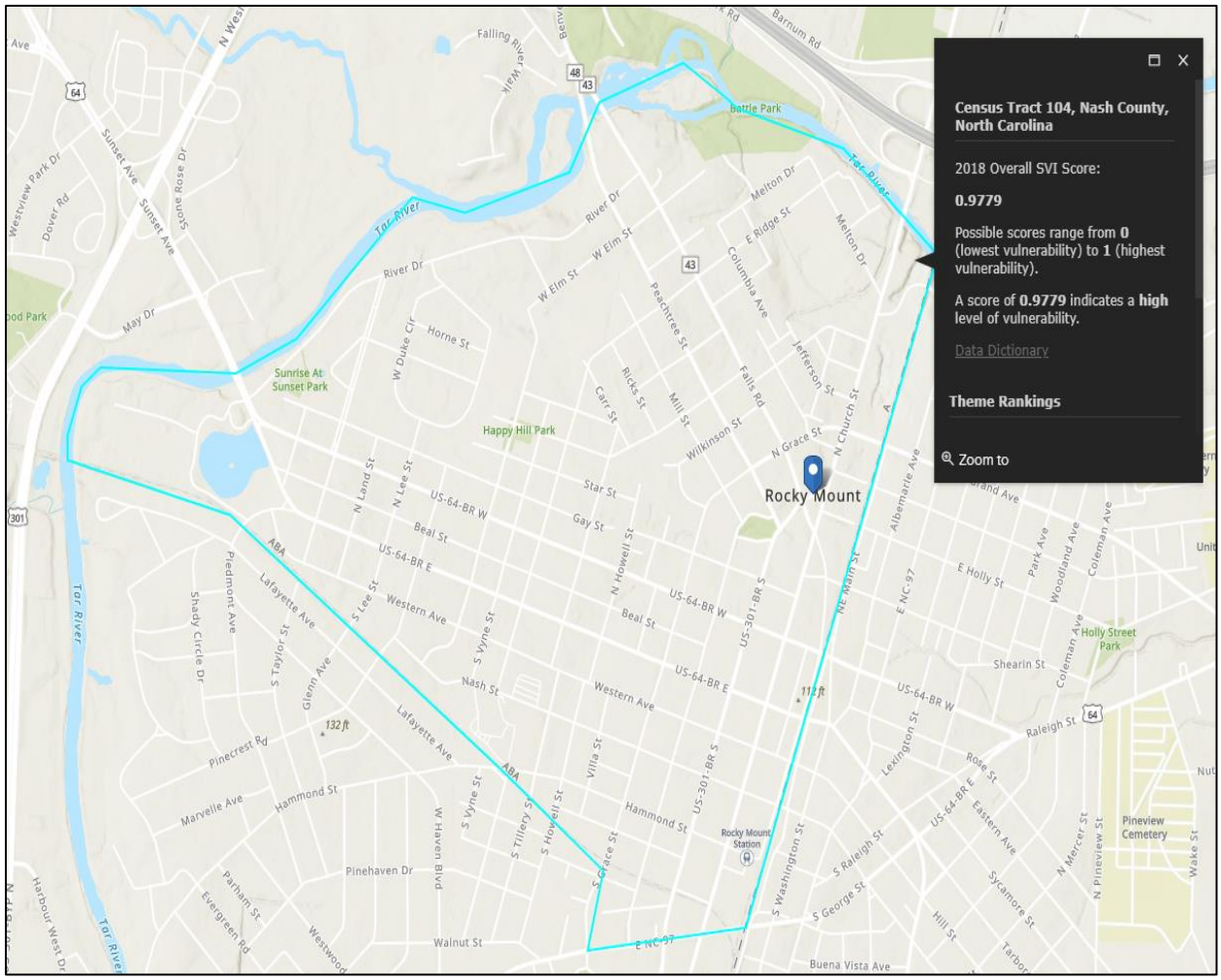
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 43 - Census Tract 9304, Halifax County



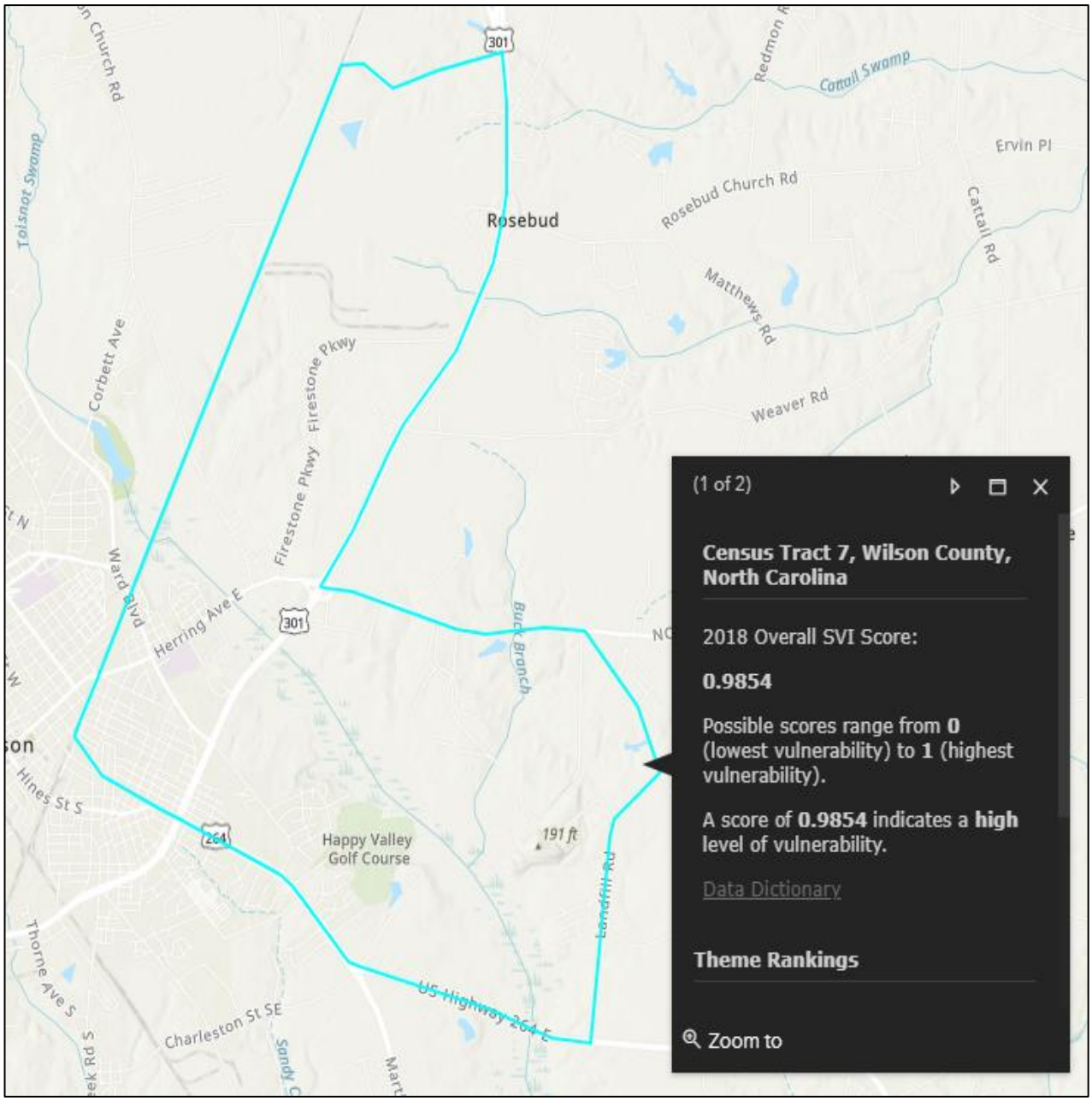
Source: [CDC Social Vulnerability Index Interactive Map]

Figure 44 - Census Tract 104, Nash County



Source: [CDC Social Vulnerability Index Interactive Map]

Figure 45 - Census Tract 7, Wilson County



Source: [CDC Social Vulnerability Index Interactive Map]

8.4 Tables

Table 31 provides data on demographics for each county in the region.

Table 31 - Regional Demographics

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Population					
Population Estimates, July 1, 2021, (V2021)	48,359	48,272	95,176	17,129	78,369
Population estimates base, April 1, 2020, (V2021)	48,900	48,622	94,970	17,471	78,784
Population, percent change - April 1, 2020 (estimates base) to July 1, 2021, (V2021)	-1.1%	-0.7%	0.2%	-2.0%	-0.5%
Population, Census, April 1, 2020	48,900	48,622	94,970	17,471	78,784
Population, Census, April 1, 2010	56,552	54,691	95,840	22,099	81,234
Age and Sex					
Persons under 5 years, percent	5.7%	5.5%	5.6%	4.7%	5.9%
Persons under 18 years, percent	22.6%	21.4%	21.9%	17.6%	22.9%
Persons 65 years and over, percent	21.1%	21.9%	19.1%	28.3%	19%
Female persons, percent	53.6%	51.8%	51.8%	51%	52.3%
Race and Hispanic Origin					
White alone, percent	39.6%	39.8%	53.5%	40.5%	55.4%

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Black or African American alone, percent	57.5%	53.4%	42.1%	56.7%	40.5%
American Indian and Alaska Native alone, percent	0.8%	4.3%	1.2%	0.7%	0.8%
Asian alone, percent	0.4%	0.9%	1.2%	0.4%	1.2%
Native Hawaiian and Other Pacific Islander alone, percent	0.2%	0.1%	0.1%	Z	0.2%
Two or More Races, percent	1.5%	1.6%	2.0%	1.7%	2.0%
Hispanic or Latino, percent	5.6%	3.4%	7.8%	2.6%	11.4%
White alone, not Hispanic or Latino, percent	35.6%	37.8%	47.5%	39.0%	46.0%
Veterans and Foreign Born					
Veterans, 2017-2021	2,906	2,372	6,603	1,109	4,433
Foreign born persons, percent, 2017-2021	2.8%	2.1%	4.3%	1.9%	6.1%
Housing					
Housing units, July 1, 2021, (V2021)	23,126	24,796	43,454	10,600	36,634
Owner-occupied housing unit rate, 2017-2021	61.4%	62.9%	64.5%	72.3%	58.5%
Median value of owner-occupied housing units, 2017-2021	$92,900	$89,600	$141,900	$87,400	$130,000

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Median selected monthly owner costs - with a mortgage, 2017-2021	$1,124	$1,136	$1,225	$1,150	$1,195
Median selected monthly owner costs - without a mortgage, 2017-2021	$464	$432	$451	$418	$442
Median gross rent, 2017-2021	$717	$706	$838	$730	$806
Building permits by county, 2021	145	59	495	32	343
Families & Living Arrangements					
Households, 2017-2021	19,259	20,049	37,477	7,397	31,980
Persons per household, 2017-2021	2.54	2.41	2.48	2.33	2.42
Living in same house 1 year ago, percent of persons age 1 year+, 2017-2021	92.8%	91.7%	89.1%	90.6%	88.8%
Language other than English spoken at home, percent of persons age 5 years+, 2017-2021	5.4%	3.4%	7.0%	2.5%	11.3%
Computer & Internet Use					
Households with a computer, percent, 2017-2021	81.4%	82.5%	89.2%	79.8%	83.1%
Households with a broadband Internet subscription, percent, 2017-2021	70.0%	62.4%	82.0%	58.6%	78.1%

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Education					
High school graduate or higher, percent of persons age 25 years+, 2017-2021	84.6%	79.9%	87.4%	80.9%	82.2%
Bachelor's degree or higher, percent of persons age 25 years+, 2017-2021	17.4%	14.8%	21.8%	16.7%	19.7%
Health					
With a disability, under age 65 years, percent, 2017-2021	12.0%	13.8%	11.2%	11.8%	10.8%
Persons without health insurance, under age 65 years, percent	11.4%	14.0%	13.3%	11.5%	15.1%
Economy					
In civilian labor force, total, percent of population age 16 years+, 2017-2021	55.5%	49.5%	60.1%	48.6%	59.2%
In civilian labor force, female, percent of population age 16 years+, 2017-2021	54.2%	45.1%	56.3%	50.2%	56.6%
Total accommodation and food services sales, 2017 ($1,000)	45,787	D	194,324	D	D
Total health care and social assistance receipts/revenue, 2017 ($1,000)	231,934	222,933	515,341	31,858	414,417
Total transportation and warehousing receipts/revenue, 2017 ($1,000)	26,905	18,337	140,321	22,036	103,477

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
Total retail sales, 2017 ($1,000)	329,923	627,778	1,309,270	130,281	1,017,730
Total retail sales per capita, 2017	$6,249	$12,230	$13,914	$6,547	$12,496
Transportation					
Mean travel time to work (minutes), workers age 16 years+, 2017-2021	22.8	23.6	23.4	28.1	22.2
Income & Poverty					
Median household income (in 2021 dollars), 2017-2021	$41,974	$37,832	$52,837	$39,764	$47,348
Per capita income in past 12 months (in 2021 dollars), 2017-2021	$23,048	$22,573	$29,082	$25,240	$26,186
Persons in poverty, percent	22.4%	27.3%	14.8%	23.6%	18.8%
Businesses					
Total employer establishments, 2020	709	938	2,041	258	1,773
Total employment, 2020	11,227	12,161	38,468	4,382	32,464
Total annual payroll, 2020 ($1,000)	400,599	432,008	1,522,249	172,636	1,384,130
Total employment, percent change, 2019-2020	-3.0%	-7.2%	1.9%	-3.7%	2.4%
Total non-employer establishments, 2019	2,613	2,704	6,210	898	4,916

Fact	Edgecombe County	Halifax County	Nash County	Northampton County	Wilson County
All employer firms, Reference year 2017	556	723	1,623	185	1,529
Men-owned employer firms, Reference year 2017	283	427	902	82	859
Women-owned employer firms, Reference year 2017	113	129	268	S	280
Minority-owned employer firms, Reference year 2017	107	92	S	S	223
Nonminority-owned employer firms, Reference year 2017	343	506	1,191	137	1,061
Veteran-owned employer firms, Reference year 2017	S	S	S	24	117
Nonveteran-owned employer firms, Reference year 2017	376	518	1,094	117	1,139
Geography					
Population per square mile, 2020	96.7	67.2	175.7	32.6	214.3
Population per square mile, 2010	111.9	75.5	177.3	41.2	220.6
Land area in square miles, 2020	505.44	723.74	540.44	536.7	367.57
Land area in square miles, 2010	505.34	724.09	540.41	536.59	368.17

Source: U.S. Census Bureau, QuickFacts (2021)

The North Carolina Department of Commerce, Labor & Economic Analysis Division (LEAD) provides data and statistical information for the state. For the Upper Coastal Plain region, **Table 32** displays the number of establishments and average employment for industries across all five counties for 2021 (Edgecombe, Halifax, Nash, Northampton, and Wilson). An industry is a group of establishments that produce similar products or provide similar services and are grouped according to the North American Industry Classification System (NAICS).

Table 32 - Employment distribution by industry

Industry	# of Establishments	Average Employment
Manufacturing	259	19,663
Retail Trade	1,107	14,660
Health Care and Social Assistance	696	14,651
Accommodation and Food Services	547	9,401
Public Administration	131	8,209
Educational Services	120	6,346
Construction	599	6,191
Wholesale Trade	320	5,069
Administrative Support, Waste Management, Remediation Services	399	4,939
Finance and Insurance	332	3,663
Transportation and Warehousing	211	2,824
Professional, Scientific, and Technical Services	442	2,480
Other Services	593	2,328

Industry	# of Establishments	Average Employment
Management of Companies and Enterprises	31	943
Real Estate and Rental and Leasing	242	832
Information	54	588
Agriculture, Forestry, Fishing and Hunting	97	507
Arts, Entertainment, and Recreation	41	407
Utilities	14	206

Source: Quarterly Census of Employment and Wages (QCEW), Annual 2021 Sector

Table 33 through **Table 37** below display a ranked list of top employers for each county in the region, providing further description of which companies have the most employees and what industry the companies are grouped into. The North Carolina Department of Commerce LEAD provides data and the following tables present annual statistics from 2021.

Table 33 - Largest Employers in Edgecombe County (2021)

Edgecombe County			
Rank	**Company Name**	**Industry**	**Employment Range**
1	QVC Rocky Mount Inc*	Retail Trade	1000+
2	City of Rocky Mount	Public Administration	500-999
3	Edgecombe Tarboro Board of Education	Educational Services	500-999
4	Sara Lee Frozen Bakery LLC	Manufacturing	500-999
5	Edgecombe County	Public Administration	500-999
6	ECU Health (formerly Vidant Medical Center)	Health Care and Social Assistance	250-499
7	Air System Components Inc	Manufacturing	250-499
8	ABB Inc	Manufacturing	250-499
9	Keihin Us Mfg LLC	Manufacturing	250-499
10	Edgecombe Community College	Educational Services	250-499

**QVC Distribution Center - Rocky Mount sustained major damage to over 70% of the facility from a fire in December 2021. As of June 2022, it will close and cease all operations in Rocky Mount, laying off more than 1,900 employees.*

Table 34 - Largest Employers in Halifax County (2021)

Halifax County			
Rank	**Company Name**	**Industry**	**Employment Range**
1	ECU Health (formerly Vidant Medical Center)	Health Care and Social Assistance	500-999
2	Resers Fine Foods Inc	Manufacturing	500-999
3	County of Halifax	Public Administration	500-999
4	Halifax County Schools	Educational Services	250-499
5	Westrock Services LLC	Manufacturing	250-499
6	Education	Educational Services	250-499
7	Dept of Public Safety	Public Administration	250-499
8	Rural Health Group Inc	Health Care and Social Assistance	250-499
9	Wal-Mart Associates Inc.	Retail Trade	250-499
10	PCB Piezotronics of North Carolina	Manufacturing	250-499

Table 35 - Largest Employers in Nash County (2021)

Nash County			
Rank	**Company Name**	**Industry**	**Employment Range**
1	Hospira Inc	Manufacturing	1000+
2	Nash County Public Schools	Educational Services	1000+
3	Nash General Hospital	Health Care and Social Assistance	1000+
4	Consolidated Diesel Co	Manufacturing	1000+
5	County of Nash	Public Administration	500-999
6	Wal-Mart Associates Inc.	Retail Trade	500-999
7	Mclane Mid-Atlantic Inc	Wholesale Trade	500-999
8	NC Department of Transportation	Public Administration	250-499
9	Boddie Noell Enterprises Inc	Accommodation and Food Services	250-499
10	PNC Bank NA	Finance and Insurance	250-499

Table 36 - Largest Employers in Northampton County (2021)

Northampton County			
Rank	**Company Name**	**Industry**	**Employment Range**
1	Lowes Home Centers Inc	Transportation and Warehousing	500-999
2	Meherrin Agricultural & Chem Co Inc	Wholesale Trade	500-999
3	Northampton County	Public Administration	250-499
4	Northampton County Schools	Educational Services	250-499
5	Kipp ENC Public Schools	Educational Services	250-499
6	Enviva Management Company LLC	Wholesale Trade	100-249
7	Fx Gear	Manufacturing	100-249
8	West Fraser Inc	Manufacturing	100-249
9	Insource Performance Solutions, LLC	Administrative/Support/Waste Management/Remediation	50-99
10	Smithfield Foods Inc	Agriculture, Forestry, Fishing and Hunting	50-99

Table 37 - Largest Employers in Wilson County (2021)

Wilson County			
Rank	**Company Name**	**Industry**	**Employment Range**
1	BB&T	Finance and Insurance	1000+
2	Bridgestone Americas Tire Operation	Manufacturing	1000+
3	Wilson County Schools	Educational Services	1000+
4	Kidde Aerospace/ Fenway Safety System	Manufacturing	1000+
5	S T Wooten Corporation	Construction	500-999
6	City of Wilson	Public Administration	500-999
7	County of Wilson	Public Administration	500-999
8	Rutherford Regional Health System	Health Care and Social Assistance	500-999
9	Smithfield Foods Inc	Manufacturing	500-999
10	Kelly Services Inc	Administrative/Support/Waste Management/Remediation	500-999

Table 38 identifies historic and cultural sites that are in or adjacent to floodplains and floodways. "In FEMA Floodplain" refers to the 100-year FEMA floodplain. Properties in bold are on the National Register of Historic Places.

Table 38 - National Register of Historic Places at Risk of Flooding

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
Edgecombe County			
ED0442	Atlantic Coast Line Railroad Bridge		In FEMA Floodplain
ED----	House (Gone)	1-story side gable frame house w/ rear ell (appears to be a second house)	In FEMA Floodplain
ED0327	Abram's Barbecue (Gone)	frame building	In FEMA Floodplain
ED1362	Apartment House (Gone)		In FEMA Floodplain
ED1544	Baker Funeral Home		In FEMA Floodplain
ED0326	Barber Shop	brick	In FEMA Floodplain
ED0463	Batts Chapel Baptist Church		In FEMA Floodplain
ED0464	**Batts House and Outbuildings**	**1880 2-story frame farmhouse; outbuildings**	**~ 500' from floodplain**
ED0614	**Booker T. Washington Community Center**		**In FEMA Floodplain**
ED1632	Bridge Grocery and Grill	1-story commercial building w/ brick veneer and asphalt shingle, side gable.	In FEMA Floodplain
ED1614	Bryan School (Gone?)	1923 2-room Rosenwald School	In FEMA Floodplain
ED1596	Charles and Nanie R. Woods House James & Mildred Davis	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0620	Cherry House	1-story frame dwelling w/ side gable and weatherboard siding.	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
ED1566	Clifton and Christine F. McCullum House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1276	Commercial Building	c. 1915, 1940 1-story parapet roof standard commercial form building	In FEMA Floodplain
ED1650	Commercial Building	c. 1954 1-story side gable concrete block building w/ small shed roof & monitor roof	In FEMA Floodplain
ED1651	Commercial Building	c. 1950 remnants of concrete block structure & side gable concrete block warehouse	In FEMA Floodplain
ED1652	Commercial Building	c. 1964 1-story flat roof building clad w/ brick	In FEMA Floodplain
ED1571	Consolee & Sarah L. Caufield House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0007	**Cotton Press**	**1840 22-foot cotton press**	**~550' from floodplain**
ED1563	Daniel and Sarah W. McAllister House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0009	**Dr. A.B. Nobles House and McKendree Church**	**1875 Gothic Revival brick cottage, gable front frame church**	**In FEMA Floodplain**
ED1633	Duplex	1-story frame residence w/ asphalt shingle hip roof and brick veneer. Central breezeway divides duplex units.	In FEMA Floodplain
ED0029	**Eastern Star Baptist Church (Gone)**	**1870s Carpenter Gothic frame church**	**In FEMA Floodplain**
ED0071	Edgecombe Bonded Warehouse		In FEMA Floodplain
ED0325	Edgecombe Bonded Warehouse	brick	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
ED0070	Edgecombe Bonded Warehouse (Gone)	c. 1937 1-story frame, tin-covered warehouse w/ shed roof on one side	In FEMA Floodplain
ED1525	Edgecombe Co. Welfare Building (Gone)	brick	In FEMA Floodplain
ED1562	Elias Robinson House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0075	F. S. Royster Guano Company (Gone)	1890	In FEMA Floodplain
ED0694	Fishing Creek Stream Gauging Station		In FEMA Floodplain
ED1391	Harrison's Grocery		In FEMA Floodplain
ED1347	House	concrete	In FEMA Floodplain
ED1351	House	bungalow	In FEMA Floodplain
ED1352	House	frame house	In FEMA Floodplain
ED1355	House	Ranch	In FEMA Floodplain
ED1388	House	frame house	In FEMA Floodplain
ED1389	House	frame house	In FEMA Floodplain
ED1390	House	frame house	In FEMA Floodplain
ED1392	House	frame house	In FEMA Floodplain
ED1393	House	brick	In FEMA Floodplain
ED1394	House	frame house	In FEMA Floodplain
ED1396	House	frame house	In FEMA Floodplain
ED1397	House	frame house	In FEMA Floodplain
ED1400	House	frame house	In FEMA Floodplain
ED1401	House	frame house	In FEMA Floodplain
ED1634	House	c. 1950s-1960s 1-story side gable residence w/ asbestos shingles and full-width shed-roof porch	In FEMA Floodplain
ED1635	House	1-story frame residence w/ hip roof. Appears to have been moved to current site.	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
ED1636	House	c. 1955-60 1-story frame Ranch w/ asphalt shingle hip roof and 6/6 adhs windows	In FEMA Floodplain
ED1637	House	1-story frame front gable residence w/ projecting partial-width gable porch and 1/1 adhs windows	In FEMA Floodplain
ED1638	House	c. 1960-70, 1-story Ranch w/ ashpalt shingle roof and side gable addition	In FEMA Floodplain
ED1655	House	c. 1930 1-story side gable house	In FEMA Floodplain
ED0239	House (Gone)	1923 frame	In FEMA Floodplain
ED0271	House (Gone)	frame house	In FEMA Floodplain
ED1346	House (Gone)	ranch	In FEMA Floodplain
ED1348	House (Gone)	frame house	In FEMA Floodplain
ED1349	House (Gone)	bungalow	In FEMA Floodplain
ED1350	House (Gone)		In FEMA Floodplain
ED1353	House (Gone)	frame house	In FEMA Floodplain
ED1354	House (Gone)	frame house	In FEMA Floodplain
ED1356	House (Gone)	frame house	In FEMA Floodplain
ED1357	House (Gone)	frame house	In FEMA Floodplain
ED1358	House (Gone)		In FEMA Floodplain
ED1359	House (Gone)	frame house	In FEMA Floodplain
ED1360	House (Gone)		In FEMA Floodplain
ED1361	House (Gone)	ranch	In FEMA Floodplain
ED1395	House (Gone)	frame house	In FEMA Floodplain
ED1398	House (Gone)	frame house	In FEMA Floodplain
ED1399	House (Gone)	brick	In FEMA Floodplain
ED0619	J & J Quik Mart	c. 1955 1-story hip roof Craftsman commercial bldg w/ porte cochere and	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
		tapered columns on brick pedestals	
ED1564	J. Lawrence and Katie Armstrong House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1573	James and Maggie L. Pender House James H. Lewis	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1559	James E. and Letha B. Davis House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0847	Jenkins House	frame house	In FEMA Floodplain
ED0894	Johnson Store (Gone)	frame building	In FEMA Floodplain
ED1555	**Lincoln Park Historic District**	**1948-1953 Minimal Traditional residential district**	**In FEMA Floodplain**
ED0453	**Lone Pine**	**Mid-19th c. Greek Revival 2-story frame house; outbuildings**	**In FEMA Floodplain**
ED1594	Lonnie and Nina Davis House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1569	Lonnie T. and Bettie W. Foster House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1599	Lossie M. Hines House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0461	Mabrey Bridge		In FEMA Floodplain
ED1565	Mary Dortch House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1567	Mary Ricks House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
ED1312	Merriemeade	1927 brick 2-story hip roof frame Georgian Revival w/ Flemis	In FEMA Floodplain
ED1598	Morris B. and Dorothy Fletcher House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1595	Moses & Irene Brown House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0010	**Old Town Plantation**	**mid-18th C. Georgian gambrel roof frame house**	**In FEMA Floodplain**
ED0433	Orren Williams House (Gone)	frame house	In FEMA Floodplain
ED1570	Oscar G. House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1020	Patrick McDowell House	frame house	In FEMA Floodplain
ED1626	Pittman Grove School (Gone)	1925 2-room Rosenwald School	In FEMA Floodplain
ED1065	Princeville Baptismal Site	1890-1950 baptismal site	In FEMA Floodplain
ED1039	**Princeville School (Princeville Town Hall)**	**1930s 1-story hip roof, 3-teacher plan African American frame school**	**~200' from floodplain**
ED1041	**Quigless Clinic**	**1946 African American 2-story brick medical clinic**	**~25' from floodplain**
ED1597	Rebecca Corbett House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED0055	Saint Paul AME Zion Church (Gone)	Late Gothic Revival church w/ central tower & triangular-arched windows	In FEMA Floodplain
ED0426	Shiloh Cemetery	1760-1886 cemetery	In FEMA Floodplain
ED0200	St. Stephens Church	Gothic Revival church	In FEMA Floodplain
ED0659	Swift Creek Bridge		In FEMA Floodplain
ED0017	**Tarboro Historic District**	**18th-20th c. residential and commercial**	**In FEMA Floodplain**

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
ED1167	Tarboro Historic District Boundary Expansion (Bridge No. 24) (Gone)	1931 10-span 500-foot Beaux Arts-inspired reinforced concrete tee beam (DOT 320024)	In FEMA Floodplain
ED0297	Tarboro Primitive Baptist Church Cemetery		In FEMA Floodplain
ED0296	Tobacco Prize House (Gone)	Early 20th C. 1-story parapet roof frame, metal-sheathed warehouse	In FEMA Floodplain
ED0420	Victory Warehouse #2	1923	In FEMA Floodplain
ED1656	Warehouse	c. 1960 1-story front gable concrete block building	In FEMA Floodplain
ED1560	Welton A. and Emma L. McMillan House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1593	Wesley and Lizzie Williams House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1666	Whitakers Historic District		In FEMA Floodplain
ED1034	Whitehurst House (Gone)	frame house	In FEMA Floodplain
ED1561	William C. Hines House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1572	Willie F. and Essie Weaver House	1948 1-story side gable frame Minimal Traditional house	In FEMA Floodplain
ED1019	Wimberly Tenant House	frame house	In FEMA Floodplain
Halifax County			
HX0250	Atlantic Coast Line Pumping Station		In FEMA Floodplain
HX0425	B.F. Tillery House		In FEMA Floodplain
HX1760	Bridge	1966 bridge	In FEMA Floodplain
HX1761	Cemetery	1926 cemetery	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
z-2303CR	Chockoyotte Aqueduct		In FEMA Floodplain
HX0515	Conoconnara Plantation	1826-1865 Plantation house	In FEMA Floodplain
HX0359	First Quankey Creek Bridge		In FEMA Floodplain
HX0909	(former) J. S. Turner & Sons Lumber Company		In FEMA Floodplain
HX0914	(former) Weldon Corn Mill	1892 3-story brick mill	In FEMA Floodplain
HX0021	**Halifax County Home (former)**	**1923 brick-2-story county home**	**In FEMA Floodplain**
HX0006	**Halifax Historic District**	**18th-19th C river town, state museum site**	**In FEMA Floodplain**
HX0518	Light Neck School		In FEMA Floodplain
HX0493	Looking Glass Run Bridge	c. 1915 steel stringer/multi-beam (DOT 410189)	In FEMA Floodplain
HX1426	Mildred Woods Butts Log House	1-story side gable frame house w/ exterior chimney	In FEMA Floodplain
HX0524	Norfleet Store (Gone?)		In FEMA Floodplain
HX0009	**Roanoke Canal**	**1819-1904 canal around rapids of the Roanoke**	**In FEMA Floodplain**
HX1559	Roanoke Rapids Power Company Plant Complex (Virginia Electric)	c. 1919-1935 1-story flat roof brick buildings	In FEMA Floodplain
HX1559	Roanoke Rapids Power Company Plant Complex (Virginia Electric Power Co.)	c. 1919-1935 1-story flat roof brick buildings	In FEMA Floodplain
HX0545	Roanoke River Railroad Bridge (Gone)		In FEMA Floodplain
HX0337	Roanoke River Railroad Bridges		In FEMA Floodplain
HX0525	Saint Stephen Baptist Church		In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
HX0027	Thorne Mill	c. 1900 grist mill	In FEMA Floodplain
HX0541	Tillery Resettlement District		In FEMA Floodplain
HX1401	**Weldon Historic District**	**19th -20th c. railroad town**	**In FEMA Floodplain**
HX0412	Whitaker Log Barn		In FEMA Floodplain
HX0012	**White Rock Plantation**	**Late 18th c. Georgian frame house**	**In FEMA Floodplain**
HX0043	Wollett Tenant House (Gone?)		In FEMA Floodplain
HX0229	Zora Ashley "Dawsey" Hardee Farm	Cotton, tobacco, and peanut farm w/ c. 1900 I-house, tobacco	In FEMA Floodplain
Nash County			
NS1173	Atlantic Coast Line Pumping Station		In FEMA Floodplain
NS0003	Bellamy's Mill	1859 stone grist mill	In FEMA Floodplain
NS0895	Boddie's Mill	Grist mill	In FEMA Floodplain
NS1560	Bridge	1959 prestressed concrete channel beam (DOT 630143): 1 of 2 examples of BMD-13	In FEMA Floodplain
NS----	Bridge	1925 reinforced concrete tee beam (DOT 630032)	In FEMA Floodplain
NS1172	Bridge #33 (Cockrell's Bridge)		In FEMA Floodplain
NS0948	Bulluck Farm		In FEMA Floodplain
NS1553	**Caromount Mills**	**1930s-1960s 1- and 2-story brick, concrete & steel manufactured**	**In FEMA Floodplain**
NS1544	Commercial Building	c. 1949 long rectangular 1-story building w/ flat roof and monitor roof sections	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
NS1545	Commercial Building	c. 1959 1-story low-pitch gable roof brick-clad commercial building	In FEMA Floodplain
NS1546	Commercial Building	c. 1965 1-story flat roof commercial building	In FEMA Floodplain
NS1547	Commercial Building	c. 1965 2-story flat roof brick & metal building	In FEMA Floodplain
NS1206	Davenport Mill Dam		In FEMA Floodplain
NS0508	**Dr. Franklin Hart Farm (Hidden Path)**	**c. 1780; 1845; 1912 2-story frame house and farm**	**In FEMA Floodplain**
NS0904	Falls Bridge	1937 reinforced concrete tee beam (DOT 630038)	In FEMA Floodplain
NS0830	Frank Wilkinson House		In FEMA Floodplain
NS0829	H. Alex Easley House		In FEMA Floodplain
NS1069	Houses		In FEMA Floodplain
NS1046	Houses		In FEMA Floodplain
NS1072	Houses		In FEMA Floodplain
NS0824	John G. Smith House		In FEMA Floodplain
NS0010	Machaven	1908 Southern Colonial 2-story brick house	In FEMA Floodplain
NS0825	Macon Comer House		In FEMA Floodplain
NS1183	Municipal Power Plant (The Power Plant)	1924 2-story brick Georgian Revival-style plant with 19465-story addition	In FEMA Floodplain
NS0205	Murray's Mill	Early 19th C. and later frame grist mill	In FEMA Floodplain
NS0206	Murray's Mill Bridge		In FEMA Floodplain
NS0936	**Nashville Historic District**	**1890-1930 commercial and residential**	**In FEMA Floodplain**
NS1073	R. James Thornton House		In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
NS0946	Ricks-Boseman Farm		In FEMA Floodplain
NS0838	Rocky Mount Arts and Crafts Center	1907 3-story 57-foot-wide water tower	In FEMA Floodplain
NS0008	Rocky Mount Mills	1870, 1890s 3-story brick textile mill complex	In FEMA Floodplain
NS0704	**Rocky Mount Mills Village Historic District**	**19th- early 20th c. textile mill village**	**In FEMA Floodplain**
NS1182	Rocky Mount Waterworks		In FEMA Floodplain
NS0481	Swift Creek Bridge (Bridge #4)		In FEMA Floodplain
ED0618	Tar River Railroad Bridge		In FEMA Floodplain
NS0009	Taylor's Mill	1850s frame grist mill (gone?) and pond	In FEMA Floodplain
NS0853	Thomas Simthson House		In FEMA Floodplain
NS0317	Truss Bridge #27	1921 rivet-connected Camelback thru truss (DOT 630271)	In FEMA Floodplain
NS0316	Webb's Mill	1907 3-story frame grist mill on 18th century mill site	In FEMA Floodplain
NS0840	**West Haven Historic District**	**1928-1952 residential area**	**In FEMA Floodplain**
NS1074	Wildwood Park		In FEMA Floodplain
NS0852	Z.B. Bullock Rock House		In FEMA Floodplain
Northampton County			
NP0013	Boon's Mill Battleground and Dam	c. 1863 Concrete	In FEMA Floodplain
HX1567	Bridge No. 158-30-30		In FEMA Floodplain
NP0519	Bridge No. 77	1932 timber stringer/multi-beam (DOT 650077)	In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
NP0231	Charlie Henry Pate Farm	c. 1897 Period Cottage Timber Frame	In FEMA Floodplain
NP0213	Conwell's Mill Pond	c. 1950	In FEMA Floodplain
NP0314	DeBerry's (DeBary) Mill (Gone)	1940 1-story front gable weatherboarded mill on concrete piers over a spillway	In FEMA Floodplain
NP0850	Doolittle Mill Pond Dam	c. 1930	In FEMA Floodplain
NP0068	House	c. 1830 19th-20th C. trad/vern 2-story	In FEMA Floodplain
NP0193	Jeremiah Brown Farm		In FEMA Floodplain
NP0237	Jordan's Mill	c. 1800 Federal Weatherboard: Beaded 1-story	In FEMA Floodplain
NP0439	Seaboard Air Line Railway Bridge	c. 1905 Warren truss multi-span	In FEMA Floodplain
NP0657	Severn Historic District		In FEMA Floodplain
NP1134	Squire Elementary School	1956-1957, 1960s, c. 1975, 1999 1-story flat roof L-shaped	In FEMA Floodplain
NP0208	US 258 Bridge (Replaced)	Truss bridge, gone by at least 1993	In FEMA Floodplain
Wilson County			
WL0714	**Black Creek Rural Historic District**	**18th-20th c. farming community**	**In FEMA Floodplain**
WL1449	Bloomery Iron Co. Furnace (Gone)		In FEMA Floodplain
WL2116	Bridge	1920 reinforced concrete thru girder (DOT 970105): oldest example of type in state	In FEMA Floodplain
WL1965	Bridge #118		In FEMA Floodplain

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
WL1462	Bridge #29 (Black Creek Bridge)		In FEMA Floodplain
WL1718	Bridge #33 (Barefoot's Bridge)		In FEMA Floodplain
WL0696	**Edmundson-Woodard House**	**1830 2-story frame Federal style house**	**In FEMA Floodplain**
WL0705	Evansdale Rural Historic District	3 discontinuous parts / E. Barnes house. gone, heavy development on north	In FEMA Floodplain
WL0706	Evansdale Rural Historic District	c. 1840 Greek Revival 2-story frame house	**In FEMA Floodplain**
WL2094	House		In FEMA Floodplain
WL1917	House		In FEMA Floodplain
WL2092	House (Gone)		In FEMA Floodplain
WL2093	House (Gone)		In FEMA Floodplain
WL2074	Houses		In FEMA Floodplain
WL2090	Houses (Gone)		In FEMA Floodplain
WL2088	Houses (Gone)		In FEMA Floodplain
WL1958	London's Church	c. 1895 frame African American church	In FEMA Floodplain
WL0686	Olzie Whitehead Williams House	1860 Italianate 1-story frame house	In FEMA Floodplain
WL1955	Recreation Park Bathhouse & Pool		In FEMA Floodplain
WL1638	Taylor's Mill Complex	Grist mill gone? House, cotton gins remain	In FEMA Floodplain
WL0709	**Upper Town Creek Rural Historic District**	**Four c. 1820-1920 farms**	**In FEMA Floodplain**
WL0692	**W.H. Applewhite House**	**1840s, 1870s 2-story frame farmhouse, outbuildings**	**In FEMA Floodplain**
WL0687	**Ward-Applewhite-Thompson House**	**1859 Greek Revival 2-story frame house**	**In FEMA Floodplain**

SITE ID	SITE NAME	DESCRIPTION	PROXIMITY TO FLOODPLAIN
WL1661	Wiggins Mill		In FEMA Floodplain
WL0700	**Woodward Family Rural Historic District**	**Four 19th c. Woodard family farms**	**In FEMA Floodplain**

Source: National Register of Historic Places

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