CLIMATE RESILIENCE PROJECTS

for the

Lumber River Region

December 2022

NC RURAL CENTER

Lumber River Council of Governments

NCORR
NORTH CAROLINA OFFICE OF RECOVERY AND RESILIENCY

KLEINFELDER

RISE
Regions Innovating for Strong Economies and Environment

EQUAL HOUSING OPPORTUNITY

Multiethnic History of the Lumber River Region

The Lumber River region has a rich cultural heritage encompassing multiple ethnicities and histories. Whether providing sustenance or supporting industry, the Lumber River has for centuries served as a lifeline to the area and as such, attracted the diverse population of today. The river continues to be a source of support to its surrounding communities and the people that call the region home.

Land Acknowledgement

We wish to acknowledge and honor the Indigenous communities native to this region and recognize that this project portfolio covers communities and structures that are built on Indigenous homelands and resources. We recognize the Cheraw, Lumbee, Skaruhreh/Tuscarora, and Waccamaw Siouan 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.

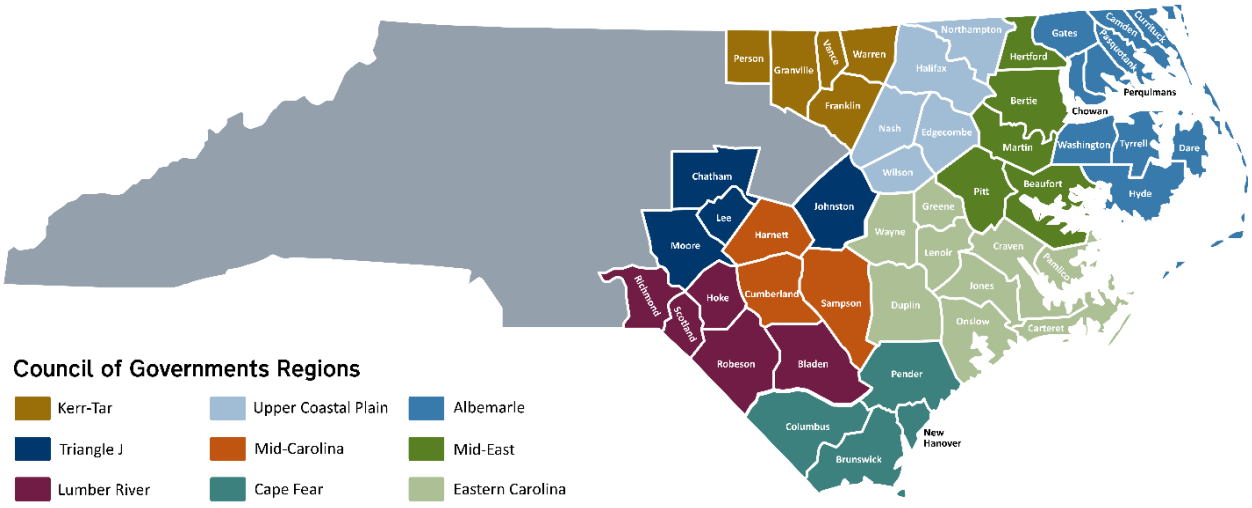
About NCORR

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, which had impacted the State in 2016. NCORR manages nearly 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) and Community Development Block Grant – Mitigation (CDBG-MIT). These are aimed at making North Carolina communities safer and more resilient from future storms. Additional funding is provided through the State Disaster Recovery Acts of 2017 and 2018, the Storm Recovery Act of 2019 and 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 ReBuild.NC.Gov. NCORR is a division of the Department of Public Safety.

About RISE

Developed in partnership with the North Carolina Rural Center, NCORR's Regions Innovating for Strong Economies and Environment (RISE) program builds resilience in North Carolina by:

- Facilitating the Regional Resilience Portfolio Program. This Program provides facilitation and technical assistance to regional partners in the eastern half of the state. Together, staff and regional partners develop comprehensive multi-county climate vulnerability assessments, identify priority actions to reduce risk and enhance resilience in the region, and develop paths to project implementation.
- Developing the North Carolina Resilient Communities Guide, a statewide resource that provides tools, guidance, and opportunities for building community resilience.
- Hosting the Homegrown Leaders program, a North Carolina Rural Center leadership training workshop, with an emphasis on resilience as a tool for community economic development.



The RISE Regional Resilience Portfolio Program covers nine areas, which align with the North Carolina Council of Government regions (see above). This portfolio of projects is the second and final deliverable of the Regional Resilience Portfolio Program for the Lumber River Region. The first was a comprehensive climate hazard vulnerability study.

RISE is funded by the U.S. Economic Development Administration and the U.S. Department of Housing and Ubran Development's Community Development Block Grant-Mitigation funds, with in-kind support from NCORR and the NC Rural Center. In addition, the Duke Energy Foundation

committed $600,000 in grant funding to support the implementation of projects identified in the Regional Resilience Portfolio Program.

LRCOG

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Dedicated to Regional Excellence

December 22, 2022

Dear Residents of the Lumber River Region:

The Lumber River region, encompassing Bladen, Hoke, Richmond, Robeson and Scotland counties, is evolving to meet the needs of its residents, employees and visitors. Natural hazards challenge and impact this evolution, straining the region's social, environmental and economic systems and infrastructure. Residents and local partners have been working diligently through collective action and proactive planning efforts to produce this document, which identifies specific projects that will reduce the impacts of hurricanes and other high wind events, heavy precipitation, extreme heat and drought exacerbated by climate change.

The actions proposed in this portfolio address the major concerns identified in the Lumber River region's Vulnerability Assessment. The portfolio provides an in-depth overview and implementation pathway for each proposed project. Each project represents the needs identified through numerous meetings and input from residents, elected officials and local leaders with assistance from the North Carolina Office of Recovery and Resiliency, the North Carolina Rural Center, Kleinfelder, and the Lumber River Council of Governments.

As you read the following pages, think about how, if implemented, these projects will improve the quality of life in our communities and better prepare us for the immediate and long-term future.

Sincerely,

David Richardson, JD/MBA
Executive Director

/dr

Member Governments

BLADEN COUNTY
Bladenboro • Clarkton • Dublin
East Arcadia • Elizabethtown
Tar Heel • White Lake

HOKE COUNTY
Raeford

RICHMOND COUNTY
Dobbins Heights • Ellerbe • Hamlet
Hoffman • Norman
Rockingham

SCOTLAND COUNTY
Gibson • Laurinburg • Wagram

ROBESON COUNTY
Fairmont • Lumber Bridge • Lumberton
Marietta • Maxton • McDonald
Orrum • Parkton • Pembroke
Proctorville • Red Springs • Rennert
Rowland • St. Pauls

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Introduction

Purpose of Project Portfolio

The RISE Regional Resilience Portfolio Program provides technical assistance to help communities collectively reduce risk from climate hazards and increase resilience across the region. The two main deliverables for each region participating in the RISE Regional Resilience Portfolio program include:

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

The Project Portfolio was developed with input from the Lumber River region's stakeholder group, the public, and technical experts. The Stakeholder Partnership is comprised of representatives who live and/or work in the Lumber River region and are local county and municipal government officials, economic development planners, emergency managers, and community organizers and activists. The Project Portfolio lays the foundation for implementing the priority projects identified by these groups. The document includes detailed descriptions, likely funding sources, potential costs, collaboration opportunities, project "champions" who can carry out the project, and other steps to implementation.

Portfolio Development Process

The Regional Resilience Portfolio Program for the Lumber River 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, worked with stakeholders to brainstorm project ideas that evolved into a working list of potential projects (see **Appendix A. Initial Working List of Projects**). They also identified and added other projects described in Hazard Mitigation Plans and Resilience Plans and recommended potential projects that would fit the resilience needs of the region per the analysis and findings of the Lumber River Vulnerability Assessment. The project team collected stakeholder and resident feedback on the working list through multiple stakeholder meetings and two in-person open house sessions.

Once the working list of projects was approved by stakeholders, the project team employed a project prioritization tool, or a 'Resilience Scorecard' (refer to **Appendix B. Resilience Scorecard** for more details), designed by Kleinfelder to rank projects in an unbiased, objective, and consistent fashion. Fifteen projects, based on stakeholder preferences, went through the prioritization tool. The project team used input from the Stakeholder Partnership and the public to select the seven projects included in this document.

About the Lumber River Region

The Lumber River region is situated in southeastern North Carolina and touches the border of South Carolina. Characterized by wetlands and mostly rural areas, the natural resources within the region, like the Lumber River and large tracts of undeveloped forested land, provide opportunities for residents. Five counties make up the Lumber River region – Bladen, Hoke, Richmond, Robeson, and Scotland – and the area is multicultural and diverse. The Lumbee Tribe is a state-recognized Native American tribe, with ancestral lands across Hoke, Robeson, and Scotland counties. 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 do not 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.

Summary of the Vulnerability Assessment

Over the next 30 years, the Lumber River region must adapt to changing climate conditions. In the Lumber River, climate scientists project that heavy rainfall and flooding will increase, severe weather will intensify, the number of very hot days and nights will increase, and drought and wildfire may become more common. The regional will also continue to face other hazards, such as high winds. 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 Lumber River region.

The Lumber River region has many strengths in addressing climate hazards now and in the future. Those strengths include natural resources and ecosystems that manage flood waters, allow for an agricultural economy, and provide other benefits. Strong community organizations have also put forward efforts to increase personal resilience and recover after major storm events.

Hurricanes Matthew (2016) and Florence (2018) significantly damaged the Lumber River region and much of eastern North Carolina. As much as 16 inches of heavy rainfall inundated portions of Robeson and Bladen counties, with all five counties in the region receiving more than 6 inches of rainfall within a 48-hour period (ReBuildNC, 2017). In Robeson County, Lumberton received 12.53 inches of rain and exceeded a rainfall record of 7.62-inches set during Hurricane Floyd in 1999 (ReBuildNC, 2017). All of the counties in the region were declared disaster and following the declaration, North Carolina Emergency Management created Hurricane Matthew Resilient Redevelopment Plans for each of the counties in the Lumber River region. These plans evolved with public input and support and identified proposed projects and actions to address a variety of needs following the hurricane. However, many of the previously identified projects have not been funded in the five years following publication of the plans in 2017. Additional projects from the Bladen-Columbus-Robeson Hazard Mitigation Plan (2020), Pee Dee Lumber Hazard Mitigation Plan (2018), and Cumberland-Hoke Regional Hazard Mitigation Plan (2020) have not yet been implemented, likely due to lack of funding and capacity. The RISE Program Project Portfolio aims to identify projects with local community support and further define pathways for implementation to provided benefits to communities across the region and increase resilience to climate hazards.

Based on research from scientific reports, regional planning documents, and localized knowledge obtained from the stakeholder partnership group, the most prominent, highest-impact climate hazards in the Lumber River region today are flooding, severe weather, specifically heavy rainfall and winds, and hurricanes. Extreme heat, drought, and wildfire are project to occur more frequently by the 2050s and beyond. The 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 below.

- **Flooding** is the most prominent natural hazard that impacts the region and occurs due to heavy rainfall associated with storms.
- It causes widespread damage to residential and commercial property and infrastructure.
- Flooding is very likely to increase over the next 30-50 years.

- **Severe weather** includes thunderstorms, rain, wind, lightning, and hail.
- These events can cause substantial property damage and create dangerous conditions for residents.
- The frequency and intensity of severe weather and storms are likely to increase over the next 30-50 years.

- **Hurricanes and tropical storms** are the most damaging type of natural hazard.
- Heavy, sustained rainfall and high winds cause property destruction, debris accumulation, and severe, widespread flooding.
- Hurricanes and tropical storms are very likely to increase in frequency and intensity over the next 30-50 years.

- **Extreme heat** and heat waves impact health and can cause heat exhaustion, heat stroke, and death. It also raises energy costs for households.
- High temperatures and warm nights pose threats to vulnerable populations like seniors and those working outdoors.
- The number and severity of heat waves and high nighttime temperatures are likely to increase through the 2050s and beyond.

- **Droughts** can impact agriculture, wildlife, and water supply.
- Extreme heat can exacerbate drought conditions and impact the agriculture in the region.
- The region has previously experienced long periods of drought, and drought conditions are likely to increase in the next 30-50 years.

- **Wildfire** poses relatively low risk to most of the region, with increased risk located around urban centers and isolated areas of high wildfire ignition occurrence.
- Wildfires can impact water quality and water supply and pose a threat to public health.
- Wildfire is likely to become a more severe threat in the next 30–50 years.

In addition to describing the region's climate hazards and their present-day and future risks, the vulnerability assessment explains how these hazards impact major sectors including:

- Housing
- Critical Facilities
- Regional Economy
- Historical and Cultural Resources
- Natural Environmental Systems
- Public Health
- Social Vulnerability

Summary points for sector of concern are shown below.

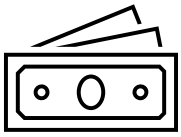
Housing

	• Older homes may have deferred maintenance or inefficient heating or cooling systems that put residents more at risk of impact from natural hazards. More than 58% of homes in the region were built more than 30 years ago. Hoke County has the most homes (16%) built within the past decade, and Scotland County has the most homes (69%) built prior to 1989. • Mobile homes may be more prone to structural damages related to high wind events and hurricanes. Robeson County (36%) and Bladen County (33%) have the greatest proportion of mobile/manufactured homes in the region. • Bladen County has the highest percentage of vacant housing units (26%). • Approximately 843 residential buildings (valued at approximately $73.1 million) have a first-floor elevation below the current 100-year floodplain. Approximately 2,804 residential buildings (valued at $324 million) have a first-floor elevation below the current 500-year floodplain.

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.
- There are 1,811 critical facilities in the region, the majority of which are classified as social hubs.
- Seventy-five critical facilities are within the 100-year floodplain (58 in Robeson County) and 90 critical facilities are within the 500-year floodplain.
- There are currently twelve major critical facilities located in the 100-year floodplain – two in Bladen County, nine in Robeson County, and one in Scotland County.
- There are 3 major critical facilities located in the 500-year floodplain – all in Robeson County.
- 325 critical facilities are at high risk of wildfire.

Regional Economy



- Flooding from hurricanes and severe weather is the most significant hazard to the regional manufacturing economy.
- 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.
- Agriculture is prominent in the region, with 611,753 acres in agricultural production. However, only 43% of farmland acres have crop insurance.
- Flooding, extreme heat, erosion and drought all pose a significant risk to agriculture.
- Eighteen percent of commercial properties are at risk of flooding in the region, with the largest proportion in Robeson County.

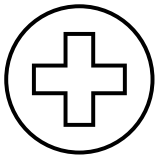
Historical and Cultural Resources

- Flooding poses the most significant climate risk to historical and cultural resources because it is difficult to physically move these resources.
- 23 of the 78 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.
- Bladen County has the largest number of sites in the 100-year floodplain, and the Robeson County Courthouse is very close to the 100-year floodplain.

Natural Environmental Systems

- The Lumber River is a federally designated National Wild and Scenic River.
- Wetlands, agriculture, and forests are key resources in the region to aid in resilience and should be given protection from development.
- Fifteen 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.
- Bladen County has 24,254 acres of pocosin wetlands that are unique to the region and important for carbon storage, and many areas high in conservation value that are lacking management and protection.

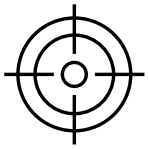
Public Health

	• Natural hazards, particularly hurricanes, flooding, and extreme heat, have negative impact on physical and mental health • Robeson, Scotland and Richmond counties have the highest percentage of adults that report fair or poor physical or mental health. • An average of 27% of residents reported poor physical health and 18% reported poor 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 characteristics of groups or individuals that make it harder for a person to withstand and quickly recover from natural hazards and other stresses. These include everything from age and family structure to housing and ability to speak English. • Bladen, Robeson and Scotland counties have the highest overall social vulnerability but all five counties have an overall high social vulnerability score. • The region is considered highly socially vulnerable because of high proportions of elderly, youth, single-parent households, and residents living with a disability. It is important to reduce vulnerabilities that specifically affect these populatoins • Bladen County has the highest percentage (24%) of elderly persons who are more likely to experience harm from natural hazards. • Census Tract 9706, east of Rockingham in Richmond County, has the highest overall social vulnerability score for the state of North Carolina.

Hot Spots

	• Climate hazard hot spots in the region include an area east of Rockingham, Red Springs and several neighborhoods in Lumberton, and an area north of Laurinburg. • 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.

	• The specific Census tracts captured as hot spots include Census Tract 9706 east of Rockingham in Richmond County, tract 9603 around Red Springs, tracts 9608.01, 9608.02, 9609, 9610, 9611, 9612, 9613.02 around Lumberton, and tract 102 north of Laurinburg. For more detail, please see the Vulnerability Assessment.

Lumber River Priority Projects

Using the Lumber River Vulnerability Assessment, along with stakeholder input and consultation, the project team identified the following priority regional-scale projects that address climate change for inclusion in this Project Portfolio. Each project includes a clear plan towards its implementation with potential funding sources and other resources.

Project A. Stormwater Infrastructure and Drainage Assessment

Project Overview

Flooding is a major stressor for communities across the Lumber River region. Pluvial flooding, which is flooding caused by stormwater runoff during heavy rainfall events, impacts roadway access, individual homes and businesses, agriculture, and emergency response. This type of flooding is not captured by FEMA's Flood Insurance Rate Maps, which regulate the 100-year floodplain. The Flood Insurance Rate Maps portray flooding from natural water bodies like rivers and streams.

As much of the region is low-lying with sandy soil and a shallow groundwater table, stormwater has historically been managed by cutting ditches to drain wetlands and create agricultural land. When communities were established throughout the region, the specific location of infrastructure like concrete pipes and culverts was not always accurately captured. With a combination of ditches and unmapped pipes, it is difficult for municipalities to determine how stormwater runoff is conveyed. While it has been noted in Hazard Mitigation Plans, Hurricane Matthew Resilient Redevelopment Plans, and other local planning documents that stormwater infrastructure upgrades are needed in some parts of the region, it is difficult to develop solutions without first understanding the location, flow direction, and connectivity of existing systems.

This project would create a comprehensive map of stormwater and drainage infrastructure for areas in the region that want this data and do not currently have it. This information will support the development of infrastructure to manage current and future stormwater flows and reduce flooding. Utilizing Geographic Information Systems (GIS) software, this project would map existing ditches, canals, drainage easements, pipes, culverts, and other stormwater conveyance systems, including flow direction and connectivity, within the region.

An important component to regional efforts to address stormwater issues is creating a rural stormwater working group. This group should be composed of stormwater managers from all county and municipality levels, soil and water conservation staff, and any others who have technical experience or daily jobs that want to be a part of the group. The working group can oversee the stormwater and drainage system mapping effort, identify problematic areas that require further study, and share resources amongst jurisdictions.

Following recent hurricanes, planning efforts have identified multiple locations in need of addressing stormwater issues. The sheer volume of water that inundated the region from Hurricane Matthew caused stormwater system failures, as the water exceeded existing capacity. Stakeholders repeatedly discussed the need to better understand how water flows through and drains their communities. This project would examine those components and provide physical information that can then be used for additional funding opportunities to improve stormwater conveyance and alleviate flooding. Knowledge of the location of stormwater pipes, culverts, and drainage ditches is not comprehensively documented throughout the region. Some Drainage Districts that put drainage infrastructure in place have dissolved or become defunct.

The assessment is a critical first step as comprehensive mapping of existing stormwater infrastructure would lay the foundation for modeling stormwater capacity and assessing whether existing systems are appropriately sized to handle significant rainfall events (see Project B – Stormwater Infrastructure Hydrologic and Hydraulic Modeling). A GIS database of regional stormwater infrastructure will improve the ability to assess areas with flooding concerns. Conducting this mapping assessment at a regional scale, beyond one jurisdiction, will help provide information to municipalities that may not have the staff or budget to compete the assessment. It will also save municipalities from having to expend dollars to do the assessment themselves. The rural stormwater working group can lead efforts to raise the visibility of stormwater needs throughout the region to state leaders and officials in positions to support funding those needs.

The results of this project will likely benefit counties, local municipalities, and unincorporated areas across the five-county region that do not have their stormwater and drainage infrastructure mapped. Many local governments in the region are low-staffed and may not have stormwater engineers or resources to pursue funding for a baseline mapping project. Smaller local governments will be better positioned to pursue projects that address stormwater issues, such as

upgrades to capacity or replacing system components. Ultimately, a reduction in stormwater flooding benefits public safety, health, and environmental quality.

Connection to Other Projects, Programs, and Plans

To address the challenges associated with unmapped drinking water and wastewater infrastructure, the Lumber River Council of Governments is digitizing data and coordinating with public works directors to also create maps that will be housed in an online portal. The portal may be a convenient location to house any maps created by this project.

Following severe flooding from Hurricane Matthew in 2016 and Hurricane Florence in 2018, the Town of Pembroke and UNC Pembroke received a Golden LEAF grant for $140,000 and hired a consulting firm to complete a Hydrological Study (2019) to analyze the stormwater conveyance infrastructure on a macro level and provide recommendations for improvements. Short-term and long-term recommendations were designed for a 25-year storm. The final model recommended 29 construction projects totaling about $6M in construction costs and recommended establishing and maintaining a stormwater utility within the Public Works Department (MacConnell & Associates, P.C., 2019). The Town of Pembroke has found this report useful in catalyzing needed investments, and staff recommend that other small towns in the region consider pursuing a similar study.

Currituck County in northeastern North Carolina has invested in mapping drainage across the county, which includes mainland and coastal outer banks areas. The mainland landscape is similar to areas in the Lumber River region with miles of ditches and shallow groundwater tables. The County formed stormwater districts based on political boundaries about 20 years ago, which taxes properties to pay for stormwater management projects. Recognizing challenges in understanding the drainage and flow throughout the districts, an effort by staff at the Currituck County Soil and Water Conservation District gave names to all ditches that drained more than 2 properties and mapped these ditches using GIS. Data is maintained on the county GIS platform. The Clean Water Management Trust Fund provided some grant funding for the naming and mapping efforts.

The Town of Newport and the Eastern Carolina Council (ECC) received an EPA Clean Water Act Section 205(j) grant in 2016 to create a digital map of the town's stormwater system (NC DEQ). Approximately $17,000 in 205(j) funding facilitated creating a digital map of the town's stormwater

system by reviewing existing maps and aerial images and collecting additional field data with GPS. Similar stormwater mapping projects in Siler City (2018), Bridgeton (2018), White Lake (2018), among others ranged in cost from approximately $7,000 to $40,000 (NC DEQ).

Implementation

Implementation Steps

The following steps may assist the lead implementers in getting started.

Step 1 – Gauge interest with local government

- Reach out to local governments to determine interest in mapping infrastructure and/or participating in rural stormwater working group.
- Establish a meeting schedule and agendas for the working group.
- Determine interest in mapping stormwater drainage and infrastructure.

Step 2 – Scope mapping needs

- Outline the need for mapping drainage and stormwater conveyances with GIS and other field methods versus digitizing or compiling data that are already available.
- Determine location(s) where mapping is most needed.
- Scope total cost of the project to map stormwater infrastructure and drainage in jurisdictions that want to participate.

Step 3 – Identify and obtain funding for project

Step 4 – Complete mapping

- After data collection, determine an online location where data will be publicly available
- Develop a protocol to update data and map as needed

Step 5 – Conduct outreach on the utility of the data

- Determine how the data are used, who uses it, and what additional data might be needed

Barriers to Implementation

It may be a challenge to recruit local governments that are interested and able to participate. Stormwater is not a straightforward topic, and mapping alone might not spark interest. Hearing testimonial from Pembroke or communities outside the region that have done this mapping might be helpful. There may be capacity or other barriers as well. Local staff in the region play many roles and may not have any extra bandwidth. On the other hand, if there is widespread interest, there may be challenges with determining the location(s) to receive mapping. As stated

previously, the Town of Pembroke and UNC-Pembroke have already completed a similar study. Mapping drainage infrastructure may add significant cost to the project, as most parts of the region are served by open drainage rather than hard infrastructure like pipes. There may be other jurisdictions that have better data regarding stormwater drainage and infrastructure, however it is more likely that many jurisdictions want this information. The geographic area of the project will need to be determined based on need or prioritized in some way.

Needed Resources

- **Lead implementers:** TBD, could be a state entity, the COG, or local government
- **Confirmed partners:** TBD
- **Recommended partners:** Local governments like Robeson County, City of Lumberton, Town of Red Springs, Town of Parkton, NC Foundation for Soil & Water Conservation, USDA Natural Resources Conservation Service, Soil and Water Conservation Districts, North Carolina State University Stormwater Engineering Group, Lumber River Council of Governments, NC Department of Transportation.

The major resources needed for this project include participation from one or more interested jurisdictions and funding to contract the mapping effort. The Pembroke study was completed for $140,000, but just included the one municipality and only stormwater infrastructure, not open drainage. Staff trained in GIS and staff knowledgeable about stormwater conveyance will be helpful. Potential partners will likely include local governments in the five-county region that have documented issues with stormwater and flooding and any existing local Drainage Districts and Soil and Water Conservation Districts, as these organizations are likely already engaged in efforts related to stormwater. The Natural Resources Conservation Service (NRCS) works with rural and agricultural communities and have detailed information and maps of watersheds and waterways as they related to soil surveys. NRCS offices are staffed by federal and local personnel that report to county commissioners or district elected officials. NC Department of Transportation may be interested in participating in this project because of related work on hydraulics and stormwater conveyance around roadways.

Funding Opportunities

The **EPA Clean Water Act Section 205(j) Grant** funding is a good match for funding the mapping component of the proposed project. DEQ Division of Water Resources administers this program. Similar projects have been funding through this grant within the past 5 years. A limitation,

however, is that only Councils of Governments are eligible to receive funds. The Lumber River Council of Governments would need to apply on behalf of the stormwater working group or jurisdiction(s) that are implementing the project.

The **Golden LEAF Flood Mitigation Program** awards funds to units of local government for public infrastructure projects for flood mitigation. Up to $250,000 may be awarded per project. Funds may only be awarded to units of local government. Local governments from all 100 counties are eligible. For purposes of this program, units of local governments include counties and cities and their boards, agencies, commissions, authorities, and institutions. The program funds engineering related to infrastructure for flood management, so it is possible that mapping stormwater and drainage infrastructure could be eligible.

The **FEMA BRIC** program is also likely an applicable funding source for the assessment step of the project, as BRIC funds projects with multiple phases, such as assessments, engineering studies, benefit cost analysis, project scoping, etc.

The NC DEQ Division of Water Infrastructure created the Local Assistance for Stormwater Infrastructure Investments (LASII) program with a one-time federal infusion of approximately $82 million from the American Rescue Plan Act funding. Grants were available to local governments for projects to improve or create infrastructure for controlling stormwater quantity and quality. Construction grants and planning grants were available – stormwater construction grants were limited to $5 million per applicant per grant cycle and stormwater planning grants were limited to $400,000 per applicant per grant cycle. Applications for Fall 2022 funding round were due September 30, 2022. *It is not yet known* whether the program will re-open for new applications in Spring 2023, in which case this project would be a strong match. Spring 2023 applications would be due May 1, 2023.

Table 1 - Funding Opportunities for Stormwater Infrastructure and Drainage Assessment

Fund	Project A Alignment	Source	Amount	Type	Timing
Golden LEAF Flood Mitigation Program	Step 4 – Step 5, maybe Step 6	NC Emergency Management, administered by Golden LEAF Foundation	$250,000 cap	Competitive grant	No specified deadline, applications accepted and reviewed by staff on rolling basis
EPA Clean Water Act Section 205(j) Grant Program	Step 4 – Step 5, maybe Step 6	EPA – administered by NC Dept. of Environmental Quality	$150,000 total	Competitive grant	Annual, RFP released in summer, project notification in fall
FEMA Building Resilient Infrastructure in Communities (BRIC)	Step 4 – Step 5, maybe Step 6	FEMA; NC Emergency Management Hazard Mitigation Division	$2.295 billion to be distributed for FY22; See NC DPS website for more information	Grant	Annual, Notice of Funding Opportunity is typically posted in the summer by NCEM and communities (sub-applicants) must submit a Letter of Interest by October.

Fund	Project A Alignment	Source	Amount	Type	Timing
Local Assistance for Stormwater Infrastructure Investments (LASII)	Step 4 – Step 5	NC DEQ	$500,000 cap for collaborative effort with other local government units	Competitive grant	May 1, 2023

Project B. Stormwater Infrastructure Hydrology and Hydraulic Modeling

Project Overview

As described in Project A, flooding from stormwater runoff is a consistent natural hazard that affects many communities across the Lumber River region. Most stormwater infrastructure in the region consists of a complex network of canals and ditches rather than concrete pipes and culverts. **The proposed project would conduct hydrologic and hydraulic (H&H) modeling for select stormwater systems within the region.** H&H models help describe the volume, speed, depth, and elevation of stormwater runoff. Modeling problematic areas within the region is an interim step between mapping infrastructure and drainage (Project A) and proposing shovel-ready projects for implementation.

The results of the H&H modeling provide an understanding of water moves through particular land areas and drainage systems. H&H models help evaluate capacity and sizing of existing drainage systems and stormwater infrastructure. These models allow engineers to identify projects that will alleviate flooding. For example, volume and rate can be used to determine the needed size for stormwater ponds to temporarily store water and alleviate flooding during flash events. Velocity and depth calculations can be used to size culverts at roads that are overtopped. Models can also help illustrate potential upstream and downstream impacts of projects and evaluate land-based stormwater solutions like land conservation, nature-based solutions, and floodplain easements. Communities that have stormwater and drainage infrastructure mapped and modeled are in a good position to implement effective projects that reduce flooding from rainfall. They are also in a good position to apply for grant funds.

There are a few advantages of pursuing this project at a regional scale. Ensuring hydrological models are consistent across the region, regardless of jurisdictional boundaries, will support strong connections between local projects and among other agencies that might pursue stormwater projects. Modeling will advance the region towards a watershed-based approach to flooding by standardizing data. Additionally, bundling modeling projects for procurement will help municipal agencies that may lack bandwidth or budget to pursue such a project on their own. It will also save municipalities from having to expend dollars to do the assessment themselves. The regional approach may also raise the visibility of stormwater needs throughout the region to state leaders and officials in positions to support funding those needs.

As in-depth modeling is expensive and time-consuming, the lead implementers and partners will need to determine which location(s) to focus resources. Some communities have identified the need for specific capital stormwater improvements, which would be supported by H&H modeling. The Bladen County Hurricane Matthew Resilient Redevelopment Plan identified a project that would perform an H&H study to determine capacity needed for effective stormwater drainage design in White Lake, Bladenboro, and Elizabethtown, with upgrades to stormwater drainage systems to accommodate existing and future development. Additional communities are likely interested in this project, as this project was discussed frequently in stakeholder meetings and public workshops. Hazard Mitigation Plans for the region - Bladen-Columbus-Robeson Hazard Mitigation Plan (2020), Pee Dee Lumber Hazard Mitigation Plan (2018), and Cumberland-Hoke Regional Hazard Mitigation Plan (2020) – and Hurricane Matthew Resilient Redevelopment Plans (2017) identify and describe the need for improvements to local stormwater management infrastructure, which requires H&H modeling.

Additional efforts are ongoing at the State level to better understand stormwater and flooding across watersheds. The forthcoming NC Flood Resilience Blueprint will serve as a guiding source for communities to improve flood resiliency and may provide additional hydrologic and hydraulic modeling.

Implementation

Implementation Steps

This project closely resembles the implementation steps in Project A, and if both projects are advanced together or in succession, some steps may be combined between the two efforts.

Step 1 – Gauge local government interest

- Reach out to local governments to determine interest in participating in the modeling effort
- Establish a meeting schedule and agendas for the working group
- Determine interest in H&H modeling

Step 2 – Scope project direction

- Outline the need H&H modeling and level of detail needed
- Determine location(s) to receive modeling efforts
- Scope total cost of modeling for jurisdictions that want to participate

Step 3 – Identify and obtain funding for project

Step 4 – Complete modeling

- After data collection, determine an online location where data will be publicly available
- Develop a protocol to update modeling as needed

Step 5 – Recommendations and next steps

- Project team will provide recommendations for stormwater projects and next steps following the results of the modeling.

Step 6 – Conduct outreach on the utility of the models, as appropriate

- Determine how the modeling is used, who uses it, and what additional data might be needed

Barriers to Implementation

Like Project A, a challenge to forming the stormwater working group may be unwillingness or inability for relevant personnel to participate, due to capacity or other barriers. Additionally, there may be challenges with determining the location(s) to complete H&H modeling. The geographic area of the project will need to be determined based on need or prioritized in some way.

Needed Resources

- **Lead implementers:** TBD, but a state agency, the COG or a strong local government partner with regional relationships are all possibilities
- **Confirmed partners:** TBD
- **Recommended partners:** Bladen County, White Lake, Bladenboro, Elizabethtown, City of Lumberton, Raeford, Maxton, Laurinburg, Fairmont, Red Springs, St. Paul's, NC Foundation for Soil & Water Conservation, USDA Natural Resources Conservation Service, Soil and Water Conservation Districts, North Carolina State University Stormwater Engineering Group, Lumber River Council of Governments, local governments in the region, NC Department of Transportation.

The major resources needed for this project are participation from one or more interested jurisdictions and funding or personnel to conduct the H&H modeling effort. The role of lead implementer(s) could be state, COG, or local government. A stormwater engineering consulting firm will likely need to be hired to complete the project. Potential partners will likely include local governments in the five-county region that have documented issues with stormwater and flooding and have a stated need for modeling. From Hurricane Matthew Resilient Redevelopment Plans, some local municipalities that have identified this need include:

- Bladen County – White Lake, Bladenboro, Elizabethtown

- Robeson County – City of Lumberton, Tanglewood Community, Town of Parkton, Town of Red Springs, Town of St. Paul's
- Hoke County – Raeford

Additionally, existing local Drainage Districts and Soil and Water Conservation Districts may be partners in this project, as these organizations are likely already engaged in efforts related to stormwater. The Natural Resources Conservation Service (NRCS) works with rural and agricultural communities and have detailed information and maps of watersheds and waterways as they related to soil surveys. NRCS offices are staffed by federal and local personnel that report to county commissioners or district elected officials. NC Department of Transportation may be interested in participating in this project because of related work on hydraulics and stormwater conveyance around roadways.

Funding Opportunities

The cost of this project will vary depending on the spatial extent of modeling. The Town of Pembroke's H&H study cost approximately $140,000 in 2019, as a point of reference. The Golden LEAF Foundation Flood Mitigation Program is likely the best match for funding this project. Funds may only be awarded to units of local government, including counties and cities and their boards, agencies, commissions, authorities, and institutions.

The EPA Clean Water Act Section 205(j) Grant funding, administered by DEQ, might be a good match for the proposed H&H project. Similar projects have been funded through this grant within the past 5 years. A limitation, however, is that only Councils of Governments are eligible to receive funds. The Lumber River Council of Governments would need to apply on behalf of the stormwater working group or jurisdiction(s) that are implementing the project.

The FEMA BRIC program, administered by NCEM, might also fund the modeling project, as BRIC funds projects with multiple phases, such as assessments, engineering studies, benefit cost analysis, project scoping, etc.

The NC DEQ Division of Water Infrastructure created the Local Assistance for Stormwater Infrastructure Investments (LASII) program with a one-time federal infusion of approximately $82 million from the American Rescue Plan Act funding. Grants were available to local governments for projects to improve or create infrastructure for controlling stormwater quantity and quality.

Construction grants and planning grants were available – stormwater construction grants were limited to $5 million per applicant per grant cycle and stormwater planning grants were limited to $400,000 per applicant per grant cycle. Applications for Fall 2022 funding round were due September 30, 2022. *It is not yet known* whether the program will re-open for new applications in Spring 2023, in which case this project would be a strong match. Spring 2023 applications would be due May 1, 2023.

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Table 2 - Funding Opportunities for Stormwater Infrastructure Hydrology & Hydraulic Modeling

Fund	Project B Alignment	Source	Amount	Type	Timing
Golden LEAF Flood Mitigation Program	Step 4 - Step 5	NC Emergency Management, administered by Golden LEAF Foundation	$250,000 cap	Competitive grant	No specified deadline, applications accepted and reviewed by staff on rolling basis
EPA Clean Water Act Section 205(j) Grant Program	Step 4 - Step 5	EPA – administered by NC Dept. of Environmental Quality	$150,000 total	Competitive grant	Annual - RFP released in summer, project notification in fall
FEMA Building Resilient Infrastructure in Communities (BRIC)	Step 4 - Step 5	FEMA; NC Emergency Management Hazard Mitigation Division	$2.295 billion to be distributed for FY22; See NC DPS website for more information	Grant	Annual; applications FY22 round were due in December 2022. The Notice of Funding Opportunity is typically posted in the summer and Communities

Fund	Project B Alignment	Source	Amount	Type	Timing
					(sub-applicants) must submit a Letter of Interest by October.
Local Assistance for Stormwater Infrastructure Investments (LASII)	Step 4 - Step 5	NC DEQ	$500,000 cap for collaborative effort with other local government units	Competitive grant	May 1, 2023

Project C. Housing Needs Assessment for Older Adults

Project Overview

Older adults are the heart of many communities in the Lumber River region. However, older adults often are more vulnerable to natural hazards because of limited mobility, fixed incomes, and reliance on electricity for medical needs. About 17 percent of people living in the Lumber River region are over the age of 65, with the highest share of older adults in Bladen County. Older adults may live alone and be unable to evacuate safely during an emergency if they cannot easily enter and exit their homes. They may also have limited means to rehab or maintain their homes. Many housing structures throughout the Lumber River region have been significantly impacted by hurricane damage, including roof damage from high winds, flooding that causes mold and mildew, and structural damage from falling debris and heavy rain.

The housing stock across the five-county region is also aging. Approximately 60 percent of homes were built more than 30 years ago, and only 2 percent were built after 2014. Older homes are often less energy efficient and may need more repairs. Deferred maintenance can compound and cause homes to be more likely to sustain damage during natural hazards.

Following Hurricanes Matthew (2016) and Florence (2018), the State of North Carolina has made more funding available for home repairs. However, energy efficiency, weatherization, home repair, and rehabilitation programs are delivered and administered separately by multiple organizations (NC Department of Environmental Quality - State Energy Office, n.d.). Each program has varying eligibility criteria and program offerings, varying in age limit, income, and homeownership requirements. Some programs support basic emergency repairs, while others assist in building accommodations for mobility issues, like wheelchair ramps. The Low-Income Energy Assistance Program (LIHEAP) is a federally-funded program that provides a one-time payment to help adults over the age of 60 or disabled persons receiving services through the NC Division of Aging and Adult Services pay heating bills. The Weatherization Assistance Program (WAP) provides grant funding to help low-income, elderly, and other vulnerable groups weatherize their homes (e.g., install heating and air units, upgrade insulation, address plumbing, etc.).

The project would conduct a baseline assessment of the housing needs of older adults and the resources currently available. This assessment can focus on where older adults live in more detail, and how well their housing serves their needs, from accessibility to disaster safety.

The assessment can also document gaps and needs in the existing programs that fund repairs and weatherization. Better understanding and documenting data regarding housing needs of older adults in the region can potentially expand the number of older adults served by programs, otherwise enabling healthier and more resilient living conditions for these residents. Key research questions might include:

- What type of housing do older adults in the region live in? (Tenure, type, age, etc.)
- What are the vulnerabilities of these types of housing to climate resilience? How do these vulnerabilities affect seniors in particular? What vulnerabilities to seniors face in general with housing in the region?
- How are government and nonprofit programs, law and policy, and market dynamics addressing these climate and housing vulnerabilities? Are there instances where they are making vulnerabilities worse?
- What solutions might be put forward to address these vulnerabilities?

A secondary component to the project, if wanted and supported by local agencies, would establish a working group of local and state agency representatives that have existing programs that assist with home repairs and weatherization upgrades to coordinate program requirements and serve low-income and older adult populations in the Lumber River region. The working group will be positioned to document gaps and needs in programs, while strengthening relationships needed to accurately refer residents to available resources. This project will provide clarity and shared understanding of programs available to older adults and vulnerable populations living in the Lumber River region who can benefit from home maintenance and upgrades. It will also increase alignment with existing grant programs to help prioritize applications.

Connection to Other Projects, Programs, and Plans

Richmond County has identified the need to develop a long-term strategy to address the community's housing needs, specifically analyzing unmet needs of older residents (NDCPS, 2017). Scotland County has also identified a similar project to prepare the housing sector to meet the needs of an aging population through increasing training for contractors to perform accessibility modifications and other policies that may improve the quality of life for older adults (NCDPS, 2017). The Lumber River Council of Governments' Area Agency on Aging (AAA) responds to the needs of Americans 60 and over in every local community and provides assistance to help older adults "age in place" in their homes and communities. The AAA facilitates

applications for rehabilitation projects, such as installing wheelchair ramps, minor repairs (e.g., shower grab bars, handicap toilets, steps, etc.), and new windows.

In 2019, the State of Connecticut developed a Task Force on Housing and Supports for Vulnerable Populations with the mission of enhancing coordination across agencies to ensure that the state 1) evaluates vulnerability and prioritizes resources consistently, 2) coordinates effectively to serve shared clients, and 3) implements best practices reliably to meet the housing needs of residents. The group is administered within the Office of the Governor to emphasize the centrality of its work and improve coordination across state agencies and nonprofit partners. This structure could be replicated at a wider level in North Carolina beyond the Lumber River region.

There are state and federal programs for resilient housing development and upgrades:

- Through the Federal Inflation Reduction Act passed and signed in August 2022, there will be funding available for 'Affordable Housing Resilience and Efficiency Investments.' "The loans and grants must fund projects that address affordable housing and climate change issues. For example, it provides funding, which shall remain available through FY2028, for projects that improve energy or water efficiency […] or projects that address climate resilience. It also provides funding, which shall remain available through FY2028, for energy and water benchmarking of eligible property along with associated data analysis and evaluation at the property. Eligible property includes low-income housing or housing for the elderly or disabled."
- The NC Department of Commerce administers Rural Transformation Grants for "local government activities that support the development of new affordable housing and improvements to existing affordable housing, including permanent supportive housing. Housing may be single-family or multifamily. All activities must provide or improve housing for low-income households and communities."

Implementation

Implementation Steps

The following steps may assist the lead implementers in getting started.

Step 1 – Further gauge interest with local agencies

- Lead implementer can identify all departments and agencies that 1) administer programs for home repair, improvement, and weatherization and 2) provide services

that focus on older adults and vulnerable populations (e.g., low-income, persons with disability, etc.)

- Lead implementer can gauge interest from relevant agencies in forming a working group and participating in the assessment

Step 2 – Conduct baseline assessment of the housing needs of older adults and the resources currently available

- Working group will advise a baseline assessment, conducted or contracted by lead implementer, to document gaps and needs in the existing programs that fund repairs and weatherization
- The assessment will provide recommendations for next steps to improve the efficacy of existing programs in serving communities

Step 3 – Continue working group meetings

- Lead implementer will establish a meeting schedule and agenda for the working group

Barriers to Implementation

This project is proposed at a high level by the RISE Project Team with input from COG staff. The need to address the housing needs of older adults is well documented, but it's possible that agencies that are supporting senior housing needs may have particular objectives that aren't named here. Or, their understanding of needs and relationships with other agencies are sufficient. In this case, the project and/or lead implementer should examine whether the scope can be adapted to serve agencies more effectively. For example, documenting the condition of senior housing in the region may support advocacy efforts to increase funding, if that's a need. Another challenge for the proposed project may be related to staff capacity to participate in the working group. Funding for the project will likely need to include allocation for staff time for the lead implementer and potentially other partners. Additionally, there may be challenges associated with conducting the baseline housing needs assessment, such as collecting accurate and recent data.

Needed Resources

- **Lead implementers:** Lumber River Council of Governments – Area Agency on Aging.
- **Confirmed partners:** Community Partners Across the South.
- **Recommended partners:** State Energy Office, Department of Health and Human Services – Aging and Adult Services, NC Housing Finance Agency, NC Housing Coalition, Action Pathways, local non-profits that aid in home repairs, Tribal governments, public health research programs.

To implement this project, a wide representation of organizations and agencies will need to dedicate staff time to the working group. However, the dedication of resources will be dependent on the scope and focus of the working group and will be determined once the group is formed. For the baseline assessment of housing needs, data from the most current American Community Survey or Census will need to be collected. There may also be a need for collecting additional data in-person within communities or through surveys to fill in any gaps.

Funding Opportunities

This project may both have a low cost and also be difficult to fund, given that most housing funding is for capital projects. For this reason, the project might be a good fit for the Duke Energy Accelerator Grant, which could cover up to $65,000. It may also be suitable for a low-cost partnership between local governments, the Lumber River COG, and an academic institution. Additional funding opportunities may be available within academic institutions to lead this work.

Table 3 - Funding Opportunities for Housing Needs Assessment for Older Adults

Fund	Project C Alignment	Source	Amount	Type	Timing
Duke Energy Accelerator Grant	Step 1 – Step 3	Duke Energy	Estimated $65,000 max award	Grant	More information available early 2023

Project D. Community-Government Resilience Collaboration Centers

Project Overview

Community-based organizations play an integral part in supporting residents throughout the Lumber River region. Nonprofits and other non-government organizations have supported the region's residents in recovering from Hurricanes Matthew and Florence. Many groups are still helping storm survivors with recovery needs. These groups may be grassroots; they may be faith-based. In addition to deep community connections and trust, as independent organizations, they may have more flexibility to respond to needs in real time. Following recent hurricanes, multiple community groups were established to support recovery efforts in the region. Some of these organizations include the North Carolina Disaster Survival and Resiliency School, Resilient Bladen, Robeson County Disaster Recovery Group, Community Organized Relief Effort, among others.

Resilience collaboration centers could provide a number of different services. They could provide critical services during times of emergency, such as electricity, heating/cooling, food, tools, and information from trusted community leaders. Other services during non-emergencies may include access to WiFi and computers, basic health and medical supplies, and educational training opportunities. The government partner may provide training, supplies, connections to government programs, or even facility upgrades that help the site become more weatherproof. The center could be a conduit for essential information, especially in emergency. The government partner might expand the offerings of programming related to public health, economic stability, housing counseling, youth programs, all of which help build day-to-day resilience in a community. In this way, the resilience collaboration center should serve community resilience in times of emergency as well as day-to-day. While the resilience collaboration center is not an emergency shelter, it should be a facility that people already turn to when they have questions or needs. Examples could include community-based organizations, houses of worship, public community centers, public senior centers, or others. The community facility may be government-owned or not.

The center should elevate decision-making by and expressed desires of a community. This is particularly important in historically underserved communities, where community organizations have stepped in to play significant roles and build trust. The community facility that hosts the center is an organization or entity that already exists and is enmeshed in the community. Through the collaboration, the government partner is provided the opportunity to respond to the resilience

needs of community members as they are expressed by leaders, workers, and members of the community.

In other parts of the United States and in some international contexts, the community-government resilience collaboration center is called a "resilience hub." In Eastern North Carolina, the North Carolina Climate Justice Collective has been working for over a decade to develop a different model of resilience hub, now called a "resilience organizing hub." Their work focuses on climate justice and environmental justice jointly. Resilience organizing hubs are led by committed community leaders and organizers without government support. The RISE project team recognizes the critical services that resilience organizing hubs provide to North Carolinians. The model community-government resilience collaboration center proposed here is different in that it involves a government partner. However, the term "resilience hub" was used during the planning process extensively before the RISE project team understood the nuances of the different definitions. Therefore, careful conversations are needed to ensure that the collaboration centers do not co-opt nor replicate the work of resilience organizing hubs. *Resilience organizing hubs* would be welcome to participate in the collaboration center effort if they wanted to.

The proposed project would 1) examine the interest for developing one or more community-government resilience collaboration centers in the region, through discussions with grassroots leaders and local emergency management and then 2) conduct a feasibility study for starting and operating a center in the Lumber River region, looking at relevant examples in and outside of North Carolina.

The final product for this project would be a feasibility assessment and, if warranted, a proposal for establishing one or more resilience collaboration centers in the region. If the project generates interest in creating centers and supporting their ongoing programming, a proposal for implementation and grant funding would be a natural next step to come out of the project as well.

The Urban Sustainability Directors Network (USDN), using the terminology "resilience hub" to describe a community-government resilience collaboration center, provides many resources and examples of centers across the United States and even beyond. Their resources, such as the Guide to Developing Resilience Hubs (their terminology), offer tested solutions and models for resilience collaboration centers.

Implementation

Implementation Steps

The following steps may assist the lead implementers in getting started.

Step 1 – Gauge interest

- Lead implementer may identify relevant personnel and conduct one-on-one engagement with local community groups and local emergency management or other local government departments to determine interest for establishing a community-government resilience collaboration center.
- Lead implementer may establish a steering committee of interested parties to work through the feasibility study.

Step 2 – Conduct feasibility study

- Steering committee will analyze community support and interest in the resilience collaboration center model, and interest and willingness of potential government partners. These are two essential elements, without which the project should not proceed to step 3.
- Steering committee will review guidance documents and examples of resilience collaboration centers to determine whether there are other critical elements of feasibility to be assessed and included.
- Steering committee will provide recommendations for implementation based on findings from feasibility study.

If feasibility study warrants a proposal:

Step 3 – Use guidance document to create resilience collaboration center proposal.

- The proposal should include the following elements[1]
    - Process for developing a formal team and project goal
    - Method to select a service area and site, if not already identified through the feasibility assessment
    - Potential resilience solutions that will be considered

Step 4 – Use proposal to apply for and secure funding for implementation

- The resulting proposal can be submitted for funding that will aid in establishing a formal resilience hub within the region.

[1] Adapted from USDN's Guide to Developing Resilience Hubs

- Once secured, this funding would cover solutions implementation (operations, programming, facility upgrades, etc.)

Barriers to Implementation

The most critical element for implementation of this project is interest and support from local partners including both community-based organizations and local government. Without that support or interest, the project should not move forward. In some instances, there may be support but little bandwidth to follow through, especially in grassroots and smaller organizations where volunteers play a significant role. In that case, an outside entity with greater staff capacity might step in to play a role.

Needed Resources

- **Lead implementers:** TBD
- **Confirmed partners:** Community Partners Across the South, Robeson County Disaster Recovery Group, Community Organized Relief Effort (CORE).
- **Recommended partners:** UNC Pembroke, NC Climate Justice Collective, North Carolina Disaster Survival and Resiliency School, Baptists on a Mission, Resilient Bladen, Robeson County Church and Community Center, Methodist Men, Lutheran Services, NC Inclusive Disaster Recovery Network, local and tribal governments.

The lead implementer(s) will need to understand the landscape of existing community organizations across the five-county region. They should also have experience with local government. It would be great for an actual local government to play the role of lead implementer, since the effort will take local government resources and participation, or a nonprofit organization that has experience working with government. However, a regional or state organization from inside or outside government could also play this role, as long as they have some trusted relationships in the region among government and nonprofit organizations.

Funding Opportunities

Because this project does not have strong mainstream grant funding options, it might be a good match for the more flexible Duke Energy Accelerator Grant. This grant could cover the cost of the feasibility assessment and the proposal development.

In the past, the Southeast Sustainability Directors Network (SSDN) has offered funding programs that might support this project. It is not known whether these grants or similar other grants would be offered in the future. Most recently, the SSDN Community Collaboration Catalyst Micro-Grant program “provide[d] funding to local governments to overcome barriers to systemic inequities alongside dedicated community partner organizations…The program supports community leadership in local government sustainability and/or resilience projects and allows local government and frontline community partnerships to create new solutions for that will spur continued community collaboration.” The proposed project would be a strong fit for implementing a resilience collaboration center, but again, it is not known whether this funding will be offered again.

Table 4 - Funding Opportunities for Community-Government Resilience Collaboration Sites

Fund	Project D Alignment	Source	Amount	Type	Timing
Duke Energy Accelerator Grant	All Steps	Duke Energy	Estimated $65,000 max award	Grant	More information available early 2023
Community Collaboration Catalyst MicroGrant	All steps	Southeast Sustainability Directors Network, The Kresge Foundation	Varies	Grant	Not available at this time.

Project E. Wetland Restoration for Flood Mitigation

Project Overview

Wetlands give a distinct character to the Lumber River region. Low elevation and flat land create perfect conditions to areas to hold water, either permanently or seasonally. Wetlands are the connecting point between dry land and bodies of water and provide many natural benefits that are important to ecosystems and our communities. Wetlands hold, clean and filter water for drinking, fishing, swimming, and boating; they help regulate stream flow and recharge groundwater; provide habitat for aquatic species and protect lake shorelines from erosion; and most importantly, wetlands protect communities from flooding (Carolina Wetlands Association, n.d.). During heavy rainfall events, wetlands within the floodplain store water that overflows riverbanks and surface water that has collected, and slowly releases the water once flood waters have receded, effectively slowing the rate and severity of downstream flooding (Vermont Agency of Natural Resources - Watershed Management Division, n.d.).

Other valuable ecosystem services that wetland provide include carbon sequestration, water quality improvement, and cultural and aesthetic values (Kurki-Fox, Branan, & Burchell, 2022). Recent estimates indicate that North Carolina has approximate 4 million acres of wetlands remaining, covering about 12% of the state (US Fish and Wildlife Service, 2020). However, development and land disturbance often impact the important wetland functions. Draining and filling of wetlands for agriculture and development removes vegetation that holds soil in place and increases sedimentation, reducing the functionality and health of wetlands.

The proposed project will identify a suitable location or locations within the five-county Lumber River region and conduct restoration and rehabilitation efforts to wetland areas to reduce flooding risk and benefit local communities. The project will also capture lessons learned and the value of wetland restoration for flood mitigation to encourage other similar projects across the region.

Restoring wetland function can significantly reduce flooding impacts to homes, roads, critical infrastructure and lessen overall property damage. Wetland restoration can also support natural ecosystems and other ongoing conservation practices in the region.

There are many wetland restoration efforts across North Carolina. One example of a restoration project that includes flood mitigation considerations is located on private land along the Roanoke River in Halifax County. This restoration project was designed to hold flood water on site and to cope with dam water releases upstream, in addition to achieving conservation and water quality objectives. Partners on this project included the private landowner, USDA's Natural Resources Conservation Service, Coastal Federation, and a restoration firm. Note that the proposed wetland restoration for flood mitigation project(s) in the Lumber River region do not need to be at a large scale to be successful in demonstrating this technique.

Implementation

Implementation Steps

Step 1 – Identify goals and objectives

Step 2 – Site selection

- Lead implementer will identify a site(s) suitable for restoration that meets pre-determined criteria
- Lead implementer will coordinate with any federal, state, and local regulatory agencies to secure authorization

Step 3 – Site assessment

- Project team will conduct existing conditions assessment and collect data to evaluate: stream and vegetation condition, stream geomorphology, hydrologic characterization, soil classification, vegetation community, endangered and threatened species, cultural resources, utilities and site access, etc.

Step 4 – Community engagement

- Project team will engage community members throughout project implementation in various ways

Step 5 – Conceptual plans, including for documenting the project's process and outcomes for flood risk reduction.

Step 6 – Engineering plans

Step 7 – Project build and implementation

Step 8 – Long-term stewardship after completion; Recreation and economic benefit

- Restoration project will create recreation and economic benefit to community

Step 9 – Monitoring and evaluation

- Conduct periodic monitoring and evaluation to determine success of restoration. Following completed restoration, there will be a period of time ranging from less than

five years to more than a decade for ecosystem processes to be fully restored. Plantings need time to grow and become established, and continued maintenance and monitoring will take place to evaluate the restoration efforts.

Barriers to Implementation

One potential challenge is selecting a suitable site within the Lumber River region that meets criteria for restoration and rehabilitation. There are probably many locations that could benefit from restoration efforts, however the lead implementer and project team must first study and evaluate sites before the project can be implemented. Additionally, jurisdictional boundaries may pose a challenge as different agencies or private landowners may need to collaborate or there could even be challenges with conflicting program requirements or regulations.

Needed Resources

- **Lead implementer:** Carolina Wetlands Association
- **Confirmed partners:** TBD
- **Recommended partners:** Local or tribal governments, Lumber Riverkeeper, Natural Resource Conservation Service (NRCS), NC Foundation for Soil and Water Conservation, environmental nonprofits, NC Department of Environmental Quality, NC Department of Natural and Cultural Resources.

To achieve this project, key resources will include a willing landowner, most likely a unit of government although there may be interested partners in the private sector or among individual landowners as well. The lead implementer will need to secure permission from the landowner to undertake restoration efforts. Additional data will be collected and analyzed through the project as per the scope of work. Funding is needed for the restoration work as well as for documenting the process and monitoring the outcomes.

Funding Opportunities

National Fish and Wildlife Federation Five Star and Urban Waters Restoration Grant Program funds “on-the-ground wetland, riparian, in-stream and/or coastal habitat restoration, meaningful education and training activities,…and measurable ecological, educational and community benefits.” Projects must engage a diversity of community partners. This would be a good funding source for lead implementer(s) to target for implementation, education and outreach, and ongoing

monitoring. Further research is needed on whether this grant supports design and engineering phases.

The North Carolina Environmental Enhancement Grant has funded projects like “wetland restoration, land acquisition, storm-water remediation, stream stabilization, and buffer installations.” This source is only available to non-profit organizations, including academic institutions and government entities.

The NC Land and Water Fund Restoration Program “funds projects that restore the natural hydrology, stream channel, floodplain and/or riparian habitat to provide ecological uplift and the long-term stability of natural resources, including stream restoration, enhancement, or stabilization, wetland restoration, creation, or enhancement, and other projects.” Requirements state that applicants must be a “state agency; local government unit; or a nonprofit corporation whose primary purpose is the conservation, preservation, and/or restoration of our State’s cultural, environmental, and natural resources.” This fund would be a good match for restoration implementation or planning.

The Water Resources Development Grant administered by NC DEQ funds “seven types of projects: general navigation, recreational navigation, water management, stream restoration, and water-based recreation. Applicants must be a local government entity such as a municipality, county, Council of Government, etc; however, an NGO can serve as a Primary Contact and help administer the grant on behalf of the applicant.”

The U.S. Department of Agriculture (USDA) offers wetland restoration easements through its Wetland Reserve Easement Program. This program funds restoration of land degraded due to agriculture and owned by private landowners or tribal entities. There are income restrictions for land held by individuals. Under this Program is the Wetland Reserve Enhancement Partnership, which explicitly provides a role for nonprofits and state or local government to participate through cost-share or in-kind support. These programs would be a good fit for a project that takes place on privately owned land or tribal land. Further research is needed to determine if the tribal land must be held by a federally recognized tribe for this grant.

Table 5 - Funding Opportunities for Wetland Restoration Pilot Project

Fund	Project E Alignment	Source	Amount	Type	Timing
National Fish and Wildlife Federation Five Star and Urban Waters Restoration	Steps 4 - 8	National Fish and Wildlife Foundation, US EPA, US FWS	$1.6 million in grants nationwide	Matching grant	Proposals due January 31, 2023
NC Environmental Enhancement Grant	Steps 4 - 8	NC Department of Justice / NC Attorney General	$500,000 total amount awarded	Reimbursement grant	Proposals due May 26, 2022
NC Land and Water Fund Restoration Program	Steps 4 - 8	NC Department of Natural and Cultural Resources	-	Competitive grant	Annual grant cycle deadline is February 15th, award decisions made in Fall
Water Resources Development Grant Program	Steps 4 - 8	NC DEQ	$200,000 max request	50% cost-share funding	2 grant application cycles per fiscal year for State and Local projects – Fall 2022 application cycle ends December 30, Spring application cycle begins January 1 and ends June 30, 2023
Wetland Reserve Easements	Steps 4 - 8	USDA NRCS	Cost share up to 100%; percentage depends on easement length	Easement	-

Project F. Stream Gauge Installation

Project Overview

Flooding and flash flooding during extreme weather can result in rapidly rising water levels over short periods of time. Real-time data is critical to issuing emergency alerts, deploying emergency resources, and preventing loss of life. These data are also extremely helpful in developing and validating flood models that help communities with effective long-term planning. North Carolina benefits from an integrated, publicly accessible system of stream gauges, known as FIMAN (Flood Inundation and Mapping Network), managed by the Division of Emergency Management. Local stakeholders and other planning efforts have reiterated the need for additional stream gauges and rain gauges to better inform flood alert systems and data modeling ahead of storm events.

A more cohesive network of stream gauges in upstream and downstream locations provides more accurate modeling and predictions for emergency management personnel to manage risk and communicate warnings in a timely manner. For example, Bladen County only has three stream gauges, and during Hurricane Matthew, county officials were unable to accurately predict water levels before the hurricane or understand the volume of water being released from upstream waterways within the county (NCDPS, 2017).

The proposed project will procure and install stream gauges for identified locations in the five-county region. Where possible, coupling the installation of rain gauges with stream gauges should be considered, as rain gauges provide additional data on precipitation totals and drought. There are approximately twenty-four existing stream gauges in the Lumber River five-county region as of November 2022. Hurricane Matthew Resilient Redevelopment Plans for Bladen, Hoke, and Robeson County have identified at least eleven additional locations in need of stream gauges to monitor water levels and water flow from high rainfall events or dam releases.

In addition to increasing public safety, stream and rain gauge data assists scientists with long-term assessment, modeling, and planning. Measurements taken during storm events add to the record and can be used in modeling future events, ones that will likely be more intense due to climate change. For example, this project would provide supplemental information to **Project B. Stormwater Infrastructure Hydrology and Hydraulic Modeling**. Rain gauge data also

contributes important measurements for drought monitoring, which is a more difficult climate hazard to predict. Precipitation, or lack thereof, is a variable observed and used to describe drought conditions.

Sites identified for gauge installation in the Bladen County, Hoke County, and Robeson County Hurricane Matthew Resilient Redevelopment Plans include:

Bladen County

- South River (Hwy 210 near Ennis Bridge Rd. and County Line)

Hoke County

- Southeast Hoke/Cumberland County border
- Little Raft Swamp in southern portion of county west of Hwy 211
- Rockfish Creek at Phillip Church Road
- Puppy Creek at Plan Road
- Confluence of Big Middle Swamp and Raft Swamp

Robeson County

- Ashpole Swamp
- Bear Swamp
- Big Marsh Swamp
- Jacob Swamp
- Raft Swamp

NCEM also has a working list of locations that have been identified as needing gauge data, but local officials are often the best help in determining where to put gauges. Additional sites may be added as determined by local and tribal governments and emergency managers, particularly for Richmond and Scotland Counties.

Connection to Other Projects, Programs, and Plans

Over 550 gauges across North Carolina provide real-time data on stream elevation, rainfall and weather parameters to NCEM and FIMAN. Many of these gauges are managed by NCEM, some are operated by local government agencies and private organizations, and others from the US Geological Survey are included in the network as well (North Carolina Emergency Management, 2015). Local governments can procure and install gauges themselves, and data can still be integrated into the FIMAN network.

As of this report, NCEM is working to upgrade approximately 30 gauges and install an additional 70 gauges across the state. Other organizations are interested in supporting stream gauges as well. For example, the Southeast Coastal Ocean Observing Regional Association (SECOORA), is working with communities to install low-cost water level sensors across the region as part of the larger Southeast Water Level Network. SECOORA has provided funding to North Carolina Sea Grant to support the placement of three sensors in coastal regions of the state in 2023. Haywood County has received grant funding to purchase stream gauges for their county. Pender County has also procured and installed a flood gauge for approximately $20,000 in the Black River in 2018. Communities can also be involved in the NCEM Adopt a Gauge program, where local leaders and residents monitor gauges and provide additional local information to NCEM.

Implementation

Description of Implementation

The following steps may assist the lead implementer(s) in getting started.

Step 1 – Identify a lead implementer

- If the lead implementer is not an organization that directly installs or funds installation of gauges, then the following proposed steps will help this organization look at possible locations and purchase or funding options.
- If the lead implementer is an organization that installs gauges, such as NCEM, that organization is likely to have its own protocol for determining high priority sites.

Step 2 – Identify highest priority locations

- Seek local government and other subject matter expert input on highest priority sites for gauge installation, particularly for Scotland and Richmond Counties, where proposed locations were not included in Hurricane Matthew Resilient Redevelopment Plans.

Step 3 – Cross-check with NCEM list

- Compare identified sites with NCEM's list of priority sites and installation plans/timeline.

Step 4 – Identify funding streams

- Identify potential funding streams for installing gauges and determine the relevant ownership structure and maintenance responsibilities
- Match funding streams and purchase options with highest priority gauges

Step 5 – Install gauges

- Take next steps to support installation of gauges, which may include working with NCEM and USGS, working with local governments on including gauges in their budget, or developing other funding possibilities.

Barriers to Implementation

One challenge to implementing this project may be prioritizing locations that need gauges. The lead implementer(s) and other project partners will need to work together and use objective criteria to equitably fund gauge installation, such as locations that are underrepresented in the FIMAN network or those that have been identified in previous plans and still have not received funding for installation. Additionally, if a local county purchases and installs a gauge, they are then required to continue operation and maintenance of the gauge; NCEM does not typically take over maintenance of locally installed gauges. This may pose a challenge for local counties with limited staff and resources. Similarly, gauges require resources for operation and staff to miantain, which may add to the funding cost.

Needed Resources

- **Lead implementers:** TBD
- **Confirmed interest partners:** Lumber Riverkeeper
- **Recommended partners:** North Carolina Emergency Management (NCEM), US Geological Survey, Local and Tribal governments, County Emergency Management staff, Cape Fear Riverkeeper

The role of lead implementer(s) is well suited for a local government or NC Emergency Management, although other organizations could also contribute. Local knowledge of locations that have flooded previously and ones that do not currently have gauges installed will be important to implementation. Coordinate points will be useful for specifying locations for installation. Data from NCEM's FIMAN network and NCEM's working list will need to be cross-checked with local officials.

Funding Opportunities

The cost of stream gauges varies, with some 'low cost' gauges available to communities. In 2017, a USGS gauge was $32,500 to install and $18,850 for annual operation and maintenance. In Georgia, a gauge cost about $22,500 for installation, with about $13,600 for annual operation and

maintenance. On average, it takes three to four months for NCEM to purchase, install, and link a gauge into FIMAN.

There are a few funding sources that support stream gauge installation. The USGS and its partner organizations are a major source of stream gauge data in the United States. According to USGS, its Groundwater and Streamflow Information Program (GWSIP) "primarily funds the USGS national streamflow and groundwater networks, and increasingly funds integrated data collection, including precipitation, temperature, and other parameters to increase the understanding of the hydrologic cycle." The USGS Cooperative Matching Funds support projects with state, tribal and local partners related to information on water resources management, including GWSIP.

Hazard mitigation programs also support acquisition of stream gauges. For example, FEMA's Hazard Mitigation Grant Program (HMGP), as administered by NCEM, are typically eligible. More research is needed to determine if other FEMA funding might be applied to stream gauges, such as Emergency Management Performance Grants (EMPGs), which are administered by NCEM.

The NC Emergency Management Disaster Relief and Mitigation Grant specifically names stream gauges and flood warning systems as eligible expenses, but it is not known if this grant will re-open.

Additionally, the Duke Energy Foundation grant of $65,000 may be a good fit for this project.

Table 6 - Funding Opportunities for Stream Gauge Installation

Fund	Project F Alignment	Source	Amount	Type	Timing
USGS Cooperative Matching Funds – Groundwater and Streamflow Information Program	Step 5	USGS	2021 budget request for total of $58 million	Matching	Not available at this time.
Hazard Mitigation Grant Program	Step 5	FEMA, administered by NCEM	Varies, dependent on disaster declaration	Grant	Varies, dependent on disaster declaration

Project G. Lumber River 'Resilient Routes': Flood-Resilient Roadway Accessibility for Secondary Roads

Program Overview

Roadway flooding can restrict access to facilities that are critical to counties, towns, and cities, impede emergency responders from assisting those in need, and can isolate residents during large storm events. Some roads throughout the Lumber River region suffer frequent flooding even during smaller rainfall events. For example, Bladen County has experienced flooding impacts to several locations on a more frequent, 2-3 times per year cycle. Regional Hazard Mitigation Plans and Hurricane Matthew Resilient Redevelopment Plans have identified challenges in the ability to maintain roadway and emergency vehicle accessibility following rainfall flood events.

The North Carolina Department of Transportation (NCDOT) is committed to building resilience into the state's transportation network. Planning and design are also currently underway to widen and raise I-95, including the bridge over the Lumber River in Robeson County, with construction beginning in 2023. A vulnerability assessment of the US-74 corridor, through Lumberton, identified potential flooding risks for disadvantaged populations. Decreased accessibility to sustenance facilities like gas stations, emergency care, shops, and emergency shelters exists during flooding events.

NCDOT is also interested in better understanding the needs of secondary roads in the region, and this information will help the agency partner with local and tribal governments on roadway projects, particularly for opportunities that can be funded through the Bipartisan Infrastructure Law (BIL). NCDOT Hydraulics and Structural Teams are charged first-and-foremost with ensuring bridge structures and roadways can withstand flooding and safely return to service following a flood event. However, this mission is also served by avoiding impacts to roadways and other transportation infrastructure in the first place.

The proposed project includes creating a prioritized list of regionally significant roadways that are vulnerable to flooding. In addition, interested local governments, with support from state entities, may package, co-develop, and apply for funding for priority locations that flooded in previous storms (e.g., Hurricanes Matthew, Florence, etc.). Funding

opportunities include IIJA programs like RAISE Discretionary Grants and PROTECT Formula Grants.

Improvements to low-lying and at-risk roadways will improve emergency management response time and evacuation options that can reduce the possibility of loss of life. Flooding during heavy rainfall events can result in rapidly rising water levels over short periods of time. This project can reduce the risk of vulnerable populations becoming disconnected from essential services (e.g., access to hospitals, pharmacies, food supply, etc.) for extended periods of time. Those likely to benefit most from the identified project are residents living in areas of the Lumber River region that are geographically disconnected to resources and critical facilities. Many of the previously identified low-lying roadways lack adequate stormwater drainage infrastructure and have not been high-priority projects when funding has been available. The resilience of local road networks connecting residents to emergency services, shelters, schools, hospitals, grocery stores, and gas stations needs to be evaluated and addressed. In addition to mitigating public safety hazards, this project ma0y contribute to economic stimulus by improving the mobility of commerce, goods and services throughout the region.

The Vulnerability Assessment and Hurricane Matthew Resilient Redevelopment Plans have identified many locations throughout the five-county region that should receive attention to mitigate flooding:

Bladen County

- 23 locations, all on 2-lane roads, that have been damaged and need structural improvements
- Actions can include roadway/bridge elevations, culvert upsizes, etc.

Hoke County

- 22 roads across the county were washed out and/or blocked by debris during Hurricane Matthew
- Numerous private roads were in such poor conditions that emergency workers couldn't reach residents in need of rescue
- FEMA funded debris removal, emergency measures, and repairs to 13 routes damaged by Hurricane Matthew; FHWA funded repairs to 8 FHWA routes (primarily pipe damage and slope failure)
- 3 locations identified for bridge repair/protection

- 4 locations identified for road repair/protection

Richmond County

- Parts of Biltmore Drive, Long Drive, and Steele Street were blocked by floodwaters immediately following Hurricane Matthew
- Sinkholes caused Branch Road, Northside Drive, 5th Street, and South Long Drive Road to close
- Repairs to South Long Drive Road took six months before reopening to regular traffic

Robeson County

- 66 structures identified by NCDOT as closed or washed-out during Hurricane Matthew
- 2400' of roadway along Bonnie Road and 1000' of roadway along Union Chapel in Pembroke need improvements following Hurricane Matthew

Scotland County

- 5 roads were blocked by debris and flooding in Laurinburg during Hurricane Matthew
- US-74 closure resulted in traffic diversion through Scotland County and increased congestion on many roads

Other communities throughout North Carolina have received funding to study roadway resilience, setting the stage for capital improvements. In June 2022, Pender County was awarded $200,000 from NCEM Transportation Infrastructure Resiliency Fund to complete a Resiliency Analysis of the NC-210 corridor to identify deficiencies in the hurricane evacuation route and provide actionable recommendations for improved resiliency. In July 2022, the Town of Leland, North Carolina was awarded a $950,000 grant through the same Transportation Infrastructure Resiliency Fund to identify critical routes within and surrounding the town's limits. During Hurricane Florence, critical evacuation routes within the town were impacted by flooding. The Leland Resilient Routes Project analyzed routes to determine their resiliency to flooding and storm surge and identified potential solutions. Similarly, in western North Carolina, the Fixing Low Water Bridges for Emergency, Transportation, Technology, Equity and Resilience is working with six counties to replace twenty-eight low water bridges to enhance their access for emergency vehicles, school buses, and agricultural vehicles. A total of $10.7 million was awarded through the USDOT RAISE Grant to complete these replacements.

Implementation

Implementation Steps

After lead implementers are selected and additional funding is secured, the following steps may assist the lead implementers in getting started.

Step 1 – Identify existing and planned projects.

- Collate all projects relevant to flood impacts on roads into a list using existing documents, such as:
  - Hurricane Matthew Resilient Redevelopment Plans (Bladen, Hoke, Richmond, Robeson, Scotland Counties)
  - Bladen-Columbus-Robeson Hazard Mitigation Plan (2020).
  - Pee Dee Lumber Hazard Mitigation Plan (2018).
  - Cumberland-Hoke Regional Hazard Mitigation Plan (2020).
  - Additional local, county, NCDOT or other documents.
- Work with NCDOT and other partners to identify projects that have not been addressed.

Step 2 – Define a prioritization process

- Determine an appropriate method and criteria for prioritizing identified projects.

Step 3 – Scope and align projects with funding. At minimum:

- Aim to define a specific scope of work for a minimum of five high priority project(s).
- Collect due diligence data for one high priority project location to include at a minimum available state and county documentation, and existing conditions survey data.

Step 4 – Engineering design

- Procure and perform engineering design of selected project.

Step 5 – Project implementation

- Secure relevant permits, procurement, and construction of selected project.

Barriers to Implementation

One challenge to implementation is prioritizing projects to receive funding. There should be collaboration amongst implementers and partners to ensure criteria for prioritization is equitable and acknowledges previous efforts to date. Specifically, secondary and smaller roads that serve vulnerable census tracts should be prioritized highly. One way to overcome this barrier is to align locations based on urgency of need and service to disadvantaged communities, which is a top priority for the BIL and will make project proposals more competitive.

Needed resources

- **Lead implementers:** TBD
- **Confirmed partners:** TBD
- **Recommended partners:** NC Department of Transportation – Division 6 and Division 8, Local and Tribal governments, NC Emergency Management, Lumber River COG, Lumber River RPO

The role of lead implementer(s) is likely best suited for local government or NC Department of Transportation. Personnel beyond the lead implementer(s) are necessary to carry out the steps of this project. Engagement from the NC Department of Transportation, Division 6 and Division 8, will be critical to the success of this project, as many locations have already been identified by NCDOT. Additionally, NC Emergency Management can coordinate with NCDOT to facilitate resilient roads projects. The Lumber River Rural Planning Organization and local knowledge from county emergency managers and other local officials can aid in identifying areas of need and defining the prioritization process. County GIS data, NCDOT hydrological data, and FEMA floodplain data will be important data needs for this project as well.

Funding Opportunities

The Infrastructure Investment and Jobs Act (IIJA) has historic levels of new and supplementary funding for transportation-related resiliency projects. In particular, the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) and Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) program's formula funding and competitive grants will be major opportunities for counties and municipalities to bundle multiple capital and resiliency planning projects together. Additional federal programs, such as the FEMA's Building Resilient Infrastructure and Communities (BRIC), Rural Surface Transportation Grants, and Safe Streets and Roads could potentially fund such projects.

The identified project may be an appropriate match for the $65,000 Duke Energy Accelerator Grant. Funding may be best fit for Step 1 – Step 3, to identify and prioritize projects.

Table 7 - Funding Opportunities for Lumber River 'Resilient Routes'

Title	Project G Alignment	Source	Amount	Type	Timing
RAISE Local and Regional Project Assistance	All steps	US DOT	$7.5 billion in additional funding over five years	Grant	FY23 deadline is February 28, 2023
PROTECT	All steps	FWHA; NCDOT	Estimated $194 million over 5 years for North Carolina	Competitive grant	Not available at this time.
Rural Surface Transportation Grant Program	Step 5	US DOT	$2 billion (nationwide total for FY22-FY26)	Grant	FY23 deadline was May 23, 2022
FEMA Building Resilient Infrastructure in Communities (BRIC)	Step 4 – Step 5	FEMA; NC Emergency Management Hazard Mitigation Division	$2.295 billion to be distributed for FY22; See NC DPS website for more information	Grant	Annual; applications FY22 round were due in December 2022. The Notice of Funding Opportunity is typically posted in the summer and Communities (sub-applicants)

Title	Project G Alignment	Source	Amount	Type	Timing
					must submit a Letter of Interest by October.

Appendix A. Initial Working List of Projects

The following table describes additional projects identified through stakeholder meetings, public input, and document review. Based on combination of scores from the **Appendix B. Resilience Scorecard**, level of stakeholder support, and technical feasibility, these projects are not included in the final Project Portfolio at this time. However, they may contain strong ideas that just need further refinement.

Projects Under Consideration	Description
Stormwater system assessment	Conduct a comprehensive assessment of stormwater systems in all five counties and develop an immediate implementation plan for correcting deficiencies in existing networks.
Water infrastructure assessment	Assess the need for increased water infrastructure capacity and identify actions to increase or maintain that capacity as needed.
Hydrology and hydraulic modeling for stormwater drainage	Perform H&H study in all five counties to determine capacity needed for effective stormwater drainage design.
Housing strategy for older adults	• Prepare the housing sector to meet the needs of a growing population through identifying and implementing housing and community changes that would improve the quality of life for older residents in the region. • Conduct a county-wide or regional needs assessment to understand what existing housing stock can remain and serve this purpose, which structures need improvements, and which structures should be demolished and returned to open space or less critical uses.
Energy burden and home weatherization analysis	Analyze existing programs related to weatherization and energy costs for low-income households and their reach in the Lumber River region and recommend strategies to increase uptake.
Community-based resilience programs	Identify needs and provide support for local capacity-building programs.

Projects Under Consideration	Description
Stream gauge installation	Install new stream gauges at pre-identified sites across the five-county region to assist with more accurate predictions of water levels and early flood warning.
Stream restoration	• Develop a methodology for identifying stream restoration projects that have a high probability of mitigating local flooding. Analyze the network of local and state partners that may want to participate.
Open space conservation	• Stream restoration along a tributary where an outcome would include flood reduction downstream. • Wetland conservation or buyout project, based on properties that could hold flood water. Publicly owned land highly preferred • Develop a methodology for identifying parcels (public or private ownership) that have a strong possibility, if conserved, returned to wetlands, or allowed to flood (water farming), of holding floodwater and reducing downstream flooding. • Build on existing outreach efforts to make private landowners aware of opportunities to do flood mitigation-relevant conservation on their land
Flood risk mapping and analysis	Update flood profiles and mapping in areas of frequent and nuisance flooding across the five-county region to better understand overall risk of future events.
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 LEP, Latine, seniors, low-

Projects Under Consideration	Description
	income, disabled, mobile home communities) • Conduct public education about wildfire risk in the Lumber River region, including mitigation strategies homeowners and property owners can take to avoid damage
Zoning gap analysis	Conduct a gap analysis of current zoning policies and update zoning codes to reflect best practices.
Parking lot assessment and resurfacing	Perform an assessment of county parking lots and prioritize resurfacing with pervious materials to restore functionality of infrastructure and create positive environmental outcomes.
Public infrastructure inventory	Maintain a county-wide infrastructure vulnerability assessment program to identify priority needs infrastructure and structures.
Microgrid power systems	Building upon efforts by the State Energy Office and Smart Electric Power Alliance, pilot a project to build a microgrid system in a pre-identified location based on findings from the State Energy Office feasibility study.

Appendix B. Resilience Scorecard

The Resilience Scorecard contains a detailed set of criteria that was informed by a variety of sources, including FEMA's STAPLEE criteria for hazard mitigation project prioritization, Rocky Mount's Resilience Scorecard, and the project team's expertise on the subject matter. The Resilience Scorecard was approved by NCORR staff and Upper Coastal Plain stakeholders. The Resilience Scorecard ranks projects across three categories—Effectiveness, Implementation, and Benefits. There are five questions per category, for a total of fifteen questions on the Resilience Scorecard.

- The Effectiveness category considers a strategy's ability to withstand shocks and stressors, whether it will provide long-term benefits, and its ability to be replicated or expanded.
- The Implementation category considers the feasibility of strategy implementation, alignment with other planning initiatives, and potential obstacles.
- The Benefits category assesses the strategies' ability to provide overall benefits to the region, including quality of life for residents, environmental quality and protection, and economic growth.

The projects were scored using a point scale from -1, 0, 1 where:

- -1 = the strategy opposes the criteria (i.e., costs outweigh benefits, the strategy contradicts existing plans or policies, there is public or political opposition, etc.)
- 0 = the criteria are not relevant to the strategy, or the pros and cons of the strategy are balanced.
- 1 = the strategy meets or provides benefits within the criteria.

The project team provided a rationale for scoring of each criterion. Each project can generate an overall score between -15 and 15. Projects that scored between 10 to 15 are considered high priority strategies, those with scores between 5 to 9 are medium priority, and those with scores of less than 5 are low priority.

References

Carolina Wetlands Association. (n.d.). *Wetlands 101*. Retrieved from Carolina Wetlands Association: http://carolinawetlands.org/index.php/other-resources/wetlands-101/

Kurki-Fox, J., Branan, R., & Burchell, M. (2022, March 14). *The Status and Trends of Wetland Loss and Legal Protection in North Carolina*. Retrieved from NC State Extension Publications: https://content.ces.ncsu.edu/the-status-and-trends-of-wetland-loss-and-legal-protection-in-north-carolina#:~:text=Importance%20of%20Wetlands&text=Other%20wetland%20types%20are%20found,and%20Wildlife%20Service%2C%202020).

MacConnell & Associates, P.C. (2019). *Town of Pembroke, North Carolina and University of North Carolina - Pembroke Hydrologic Study.* Retrieved from https://73714d74-c64d-4050-8b76-7967984d1a42.filesusr.com/ugd/fb351c_2d0b21d60b394f138c310ca134139571.pdf

National Weather Service. (n.d.). *Turn Around Don't Drown*. Retrieved from https://www.weather.gov/tsa/hydro_tadd

NC Department of Environmental Quality - State Energy Office. (n.d.). *Energy Efficiency and Weatherization Programs*. Retrieved from https://deq.nc.gov/energy-climate/state-energy-office/weatherization-assistance-program/energy-efficiency-and-weatherization-programs

NC DEQ. (n.d.). *Stormwater Infrastructure Mapping - Case Study: Newport Stormwater Mapping.* Retrieved from https://files.nc.gov/ncdeq/Water%20Quality/Planning/NPU/205J/205j-case-studies/Newport_CaseStudy.pdf

NCDPS. (2017). *Hurricane Matthew Resilient Redevelopment Plan - Bladen County.* Retrieved from https://files.nc.gov/rebuildnc/documents/matthew/rebuildnc_bladen_plan_combined.pdf

NCDPS. (2017). *Hurricane Matthew Resilient Redevelopment Plan - Scotland County.* Retrieved from https://files.nc.gov/rebuildnc/documents/matthew/rebuildnc_scotland_plan_combined.pdf

NDCPS. (2017). *Hurricane Matthew Resilient Redevelopment Plan - Richmond County.* Retrieved from https://files.nc.gov/rebuildnc/documents/matthew/rebuildnc_richmond_plan_combined.pdf

New flood gauge in Pender County increases public safety, expand flood prediction capacity. (2018, June 8). Retrieved from Pender County: https://www.pendercountync.gov/2018/06/new-flood-gauge-in-pender-county-increases-public-safety-expand-flood-prediction-capacity/

North Carolina Coastal Federation. (2022). *Large Scale Wetland Restoration (NRCS)*. Retrieved from NC Coast: https://www.nccoast.org/project/nrcs/

North Carolina Emergency Management. (2015). *NC Flood Inundation Mapping and Alert Network*. Retrieved from FIMAN: https://fiman.nc.gov/About.aspx

ReBuildNC. (2017). *Hurricane Matthew Resilient Redevelopment Plan - Robeson County.* NCDPS. Retrieved from https://files.nc.gov/rebuildnc/documents/matthew/rebuildnc_robeson_plan_combined.pdf

Urban Sustainability Directors Network. (2019). *Guide to Developing Resilience Hubs.* Retrieved from http://resilience-hub.org/wp-content/uploads/2019/10/USDN_ResilienceHubsGuidance-1.pdf

US Fish and Wildlife Service. (2020). *National Wetland Inventory*. Retrieved from https://www.fws.gov/program/national-wetlands-inventory

Vermont Agency of Natural Resources - Watershed Management Division. (n.d.). *Wetland Functions and Values: Water Storage for Flood Water and Storm Runoff*. Retrieved from Department of Environmental Conservation: https://dec.vermont.gov/watershed/wetlands/functions/storage

Wildlands Engineering. (2022). *Our Projects*. Retrieved from https://www.wildlandseng.com/category/our-projects/