

2022

# CLIMATE RESILIENCE PROJECTS FOR THE EASTERN CAROLINA REGION



**NCORR**  
**RISE**

Regions Innovating for Strong  
Economies and Environment



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# LAND ACKNOWLEDGMENT

We wish to acknowledge and honor the Indigenous communities native to this region and recognize that this vulnerability assessment covers communities and structures that are built on Indigenous homelands and resources. We recognize the Coree, Lumbee, Mánú: Yí Jsuwá, Neusiok, Pamlico (Pomouik), and the Skaruhreh/Tuscarora 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.

## INTRODUCTION

### North Carolina Office of Recovery and Resiliency Overview

In the wake of Hurricane Florence in 2018, the State of North Carolina established the Office of Recovery and Resiliency (NCORR) to lead the state's efforts in rebuilding smarter and stronger. At that time, eastern North Carolina communities were still recovering from Hurricane Matthew in 2016. NCORR manages 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) funds and Community Development Block Grant – Mitigation (CDBG-MIT) funds, 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 the Economic Development Administration Disaster Supplemental Funds. NCORR manages programs statewide that include homeowner recovery, infrastructure, affordable housing, resiliency, and strategic buyouts. To learn more about NCORR programs, visit the [ReBuild.NC.Gov](https://ReBuild.NC.Gov) website. NCORR is a division of the Department of Public Safety.

### RISE Regional Resilience Portfolio Program Overview

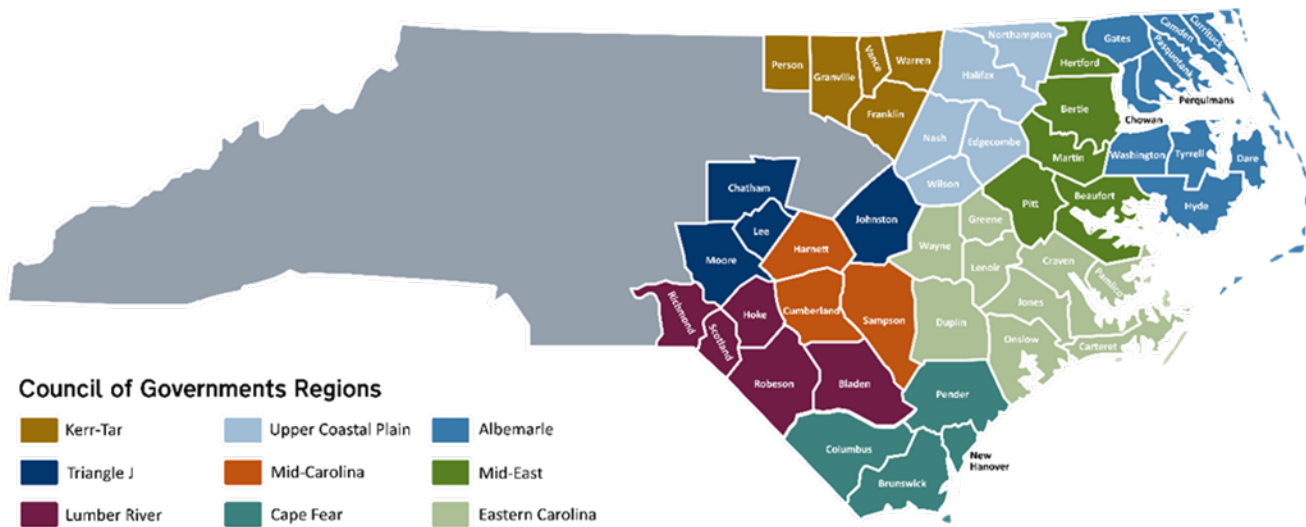
Developed in partnership with North Carolina Rural Center, NCORR's Regions Innovating for Strong Economies and Environment (RISE) program supports resilience in North Carolina by:

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

RISE is funded by the U.S. Economic Development Administration and the U.S. HUD CDBG – Mitigation funds, with in-kind support from NCORR and North Carolina Rural Center. In addition, the Duke Energy Foundation committed \$600,000 in grant funding to support the Regional Resilience Portfolio Program.



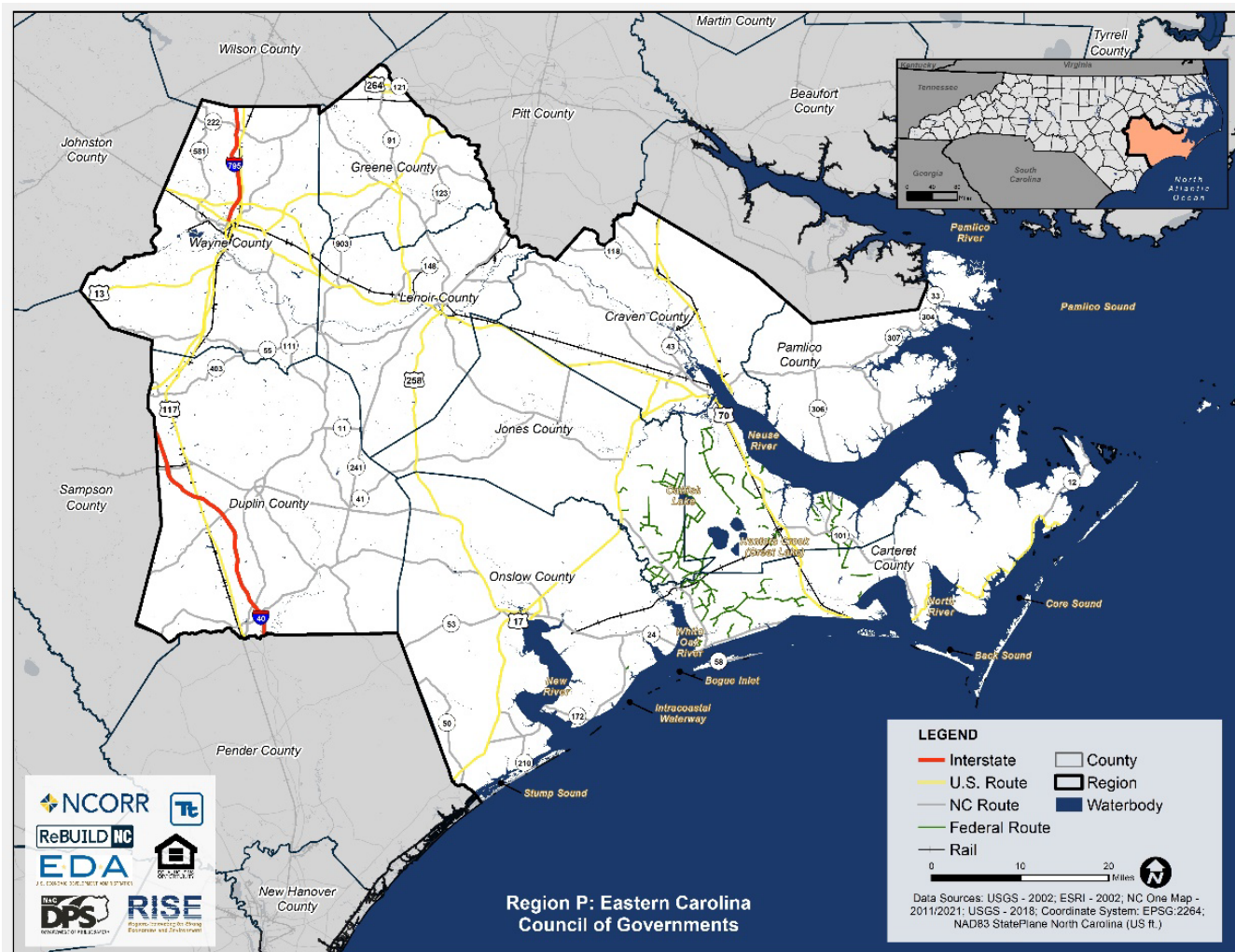
**Figure 1. RISE Councils of Government**



## The Eastern Carolina Region

The RISE Regional Resilience Portfolio Program covers nine areas, which align with the North Carolina Council of Government regions. The Eastern Carolina Region occupies the central portion of North Carolina's coast. The region includes the counties of Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, and Wayne, as shown in [Figure 2](#). The Eastern Carolina Region has a total land area of 5,710 square miles. As noted in the 2019 Comprehensive Economic Development Study for the Eastern Carolina Region, the region “consists of nine counties and 62 municipalities. The geography of the region varies significantly from rural agriculture to urbanizing areas and coastal tourist towns.” (Eastern Carolina Council 2019).

**Figure 2. The Eastern Carolina Region**



## Regional Team

The planning effort in the Eastern Carolina Region is led by a project team composed of an NCORR representative, the Eastern Carolina Council, Tetra Tech, Inc., and a regional facilitator. The Eastern Carolina Council offered project guidance, and Tetra Tech, Inc. provided technical assistance. The North Carolina Rural Center hired a local leader to provide facilitation support at the many stakeholder and public meetings held during the planning process.

## Stakeholder Partnership

The planning effort in the region is informed by a Stakeholder Partnership to ensure the vulnerabilities identified reflect local priorities. The Stakeholder Partnership's responsibilities include the following:

- Steer the implementation of the project by providing local input and perspective;
- Review project materials to ensure materials reflect local priorities and address local concerns; and
- Attend monthly meetings.

The Stakeholder Partnership, consisting of 54 local subject matter experts, represents a cross-section of stakeholders from the region, including representatives from all counties and sectors. Development of the Stakeholder Partnership also considered diversity in race, gender, abilities, and age.



## Letter of Support from Regional Council of Governments



December 20, 2022

Dear Eastern Carolina Residents,

The Eastern Carolina Council region, encompassing Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, and Wayne counties, is a dynamic area that has a rich agricultural / aquaculture tradition, strong manufacturing base, proud military community, coastal amenities, and the unique Eastern Carolina quality of life. Our region is proactively working to meet the needs of its residents, employers, and employees; protect our assets and communities; and expand opportunities, moving forward. Natural hazards continue to challenge and impact the region's social, environmental, and economic systems and infrastructure. The region has been working diligently through collective action and proactive planning efforts to reduce the impacts of future natural hazard occurrence.

The Eastern Carolina region has developed a Regional Resilience Project Portfolio in response to climate exacerbated natural hazards. The actions proposed in the portfolio address the major concerns identified in the Eastern Carolina Vulnerability Assessment. The Resilience Project Portfolio provides an in-depth project overview and implementation pathway for each proposed project. The projects identified in the portfolio represent needs identified through numerous meetings and input from residents, elected officials, and local leaders with assistance from the North Carolina Office of Resiliency, the North Carolina Rural Center, our consultants at Tetra Tech, and the Eastern Carolina Council.

As you read through the Eastern Carolina's Portfolio of Projects, 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. Thank you for your continued support and interest in helping lead our region forward.

Sincerely,

A handwritten signature in blue ink, appearing to read 'David Bone'.

David Bone  
Executive Director

Eastern Carolina Council • P0 Box 1717 • 233 Middle St. Ste. 300 • New Bern, NC 28563-1717  
Phone 252.638.3185 • Fax 252.638-3187 • Web: <http://www.eccog.org> • Email: [eccadmin@eccog.org](mailto:eccadmin@eccog.org)

# REGIONAL RESILIENCE PORTFOLIO DEVELOPMENT

The Regional Resilience Portfolio Program is a two-part effort consisting of the *Climate Change and Natural Hazards Vulnerability Assessment for the Eastern Carolina Region* and a Project Portfolio (refer to **Figure 3**). The vulnerability assessment bridges science and local knowledge to identify current and future hazards impacting the region and to determine the region's strengths and challenges when faced with those hazards. For a summary of the analysis completed for the vulnerability assessment, please refer to the **Analysis** section. To view the vulnerability assessment in its entirety, please visit the [Eastern Carolina Regional Resilience Portfolio](#) website.

The Project Portfolio is a compilation of regionally focused projects that will provide benefits throughout the Eastern Carolina Region. The portfolio is designed to identify funding opportunities and potential project implementers and provide a clear pathway to enable the successful implementation of each project. Projects identified for inclusion in the portfolio were vetted by local leaders and community members and further developed by technical and subject matter experts.

**Figure 3. The Eastern Carolina Region Regional Resilience Program Process**



Additionally, public input was solicited through a series of online surveys, virtual meetings, and in-person meetings to identify vulnerabilities, challenges, and potential solutions throughout the region. The project team worked with the Regional Stakeholder Partnership during the first half of 2022 to identify vulnerabilities and challenges throughout the region. A series of virtual public workshops was held in April 2022 to engage community members in the program, solicit feedback on vulnerabilities and challenges, and identify additional local concerns and needs.

Once the vulnerability assessment was completed, the project team and Regional Stakeholder Partnership identified potential projects to address the vulnerabilities and challenges identified in the assessment. Proposed projects included public awareness and messaging, construction and nature-based solutions, program and policy development, and studies and analyses.

The Regional Stakeholder Partnership prioritized 10 projects to present to community members to gain feedback and input. In-person workshops were held in October 2022, where all 10 projects were introduced to members of the public, stakeholders, and community leaders. These participants voted on the projects which they deemed most beneficial to the region and also submitted written and verbal comments.

The next step in prioritizing projects involved incorporating feedback from the public workshops and ranking each project based on criteria developed by the Regional Stakeholder Partnership. After projects were refined to include feedback or combined to increase efficacy, projects were ranked based if they did or did not meet the ranking criteria. The following criteria and questions were utilized to develop a resilience score card rating for each of the 10 potential projects. The resilience score card ratings are available in Appendix B: Resilience Scorecard.

**Table 1. Ranking Criteria**

Category	Considerations
<b>Reduction in Risk</b>	How many hazards are addressed? What is the probability the hazard(s) will occur?
	Does the project protect life or property or both?
	Does the project address current and future hazards?
	Does the project reduce the risk at a regional scale?
	Does the project reduce a non-climate stressor?
<b>Scale</b>	Is the project regional?
	Can the project be replicated?
<b>Cost</b>	What is the range of cost? Low (Under \$50K)? Medium (\$50K–\$1M)? High (Over \$1M)?
<b>Benefits</b>	Do benefits outweigh the costs?
<b>Timeframe</b>	How long will it take to implement the project? Short: Less than 5 years. Medium: 5–15 years. Long: More than 15 years
<b>Feasibility</b>	Is the project technically and legally possible?
	Will permitting be required?
	Are project sponsors identified, engaged, and have the capacity to implement the project?
	Is a funding source identified?
<b>Socioeconomic</b>	Does the project aid in building a strong economy?
	Does the project support improving community infrastructure (e.g., road network)?
<b>Climate Justice and Equity</b>	Does the project benefit areas with a high Social Vulnerability Index?
	Does the project have a positive, qualitative impact on populations that identify as Black, Indigenous, or People of Color (BIPOC)?

Category	Considerations
	Does the project improve health resources?
<b>Environmental Impacts</b>	Does the project address drivers of climate change?
	Does the project use nature-based solutions?
	Does the project provide habitat restoration for threatened and endangered species?
<b>Public and Stakeholder Support</b>	Is there strong support for the project? Was it ranked as a high priority by the Stakeholder Partnership and community?

The results from the resilience score card and general support of the Regional Stakeholder Partnership were combined to identify the five projects most likely to be successfully implemented. These prioritized projects are included in this Project Portfolio. The remaining projects that are not included in the portfolio are included in Appendix A: Full List of Proposed Resilience Projects in the Eastern Carolina Region for reference.

## Analysis

As a first deliverable, the Eastern Carolina Region completed a vulnerability assessment to analyze risks to the Eastern Carolina Region, which covers Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, and Wayne Counties.


The Climate Change and Natural Hazards Vulnerability Assessment for the Eastern Carolina Region is a report describing past problems and future risks associated with extreme weather events such as hurricanes, flooding, extreme temperatures, droughts, and wildfires. The report outlines the impacts of these climate hazards on housing, the environment, and the economy.

To review the report, visit:


<https://www.rebuild.nc.gov/resiliency/resilient-communities/rise/eastern-carolina#vulnerability-assessment>

An overall summary of the impact of natural hazards and climate change on these impacted areas is presented below:


## Social Vulnerability and Equity, Health, and Safety

	<ul style="list-style-type: none"> <li>Roughly 16% of the population of the Eastern Carolina Region live at or below the poverty level. A lack of access to resources and opportunities can make disaster preparedness and recovery more difficult for people experiencing poverty than others in the community.</li> </ul>
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## Housing, Critical Infrastructure, and Community Support Systems

	<ul style="list-style-type: none"> <li>Limited safe and affordable housing options throughout the region increases recovery time post-disaster and exacerbates pre-existing disparities and social vulnerabilities. Disasters are felt more severely in communities that are already facing challenges with accessing safe and affordable housing.</li> <li>Roadway infrastructure throughout the region is vulnerable to multiple hazards. Past flooding and hurricane events have resulted in extended closures and put the population at risk when evacuation routes are inaccessible. High tide events and extreme rainfall events both cause regular road closures preventing travel to and from work, impacting school transportation, and disrupting the flow of goods and services throughout the region.</li> </ul>
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## Economy

	<ul style="list-style-type: none"> <li>Agriculture accounts for a significant sector of the regional economy. Flooding, extreme heat, erosion, sea level rise, and drought all threaten the farming and livestock operations which are fundamental to the Eastern Carolina Region's economy.</li> </ul>
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## Natural and Historical Resources

	<ul style="list-style-type: none"> <li>Climate change is already impacting natural systems in the region. For example, sea level rise is causing saltwater intrusion, resulting in the loss of coastal forests.</li> <li>Climate change is causing rising temperatures and stronger weather events which stress natural environmental systems.</li> <li>Already stressed natural environmental systems are being impacted by invasive species, partially driven by shifting ranges of species due to rising temperatures.</li> </ul>
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## Historical and Cultural Resource

	<ul style="list-style-type: none"> <li>Projected population increases will drive new development, particularly in areas that are currently suburban and rural. This development will reduce the amount of natural lands available to absorb rainwater and will result in increased flooding.</li> </ul>
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Summary points for each of the hazards of concern identified by the Stakeholder Partnership are included below.




## Drought

	<ul style="list-style-type: none"> <li>The areas of western Wayne County and western Lenoir County rely on surface water and are at higher risk of severe drought impacts.</li> <li>Droughts could pose significant risk to the region's agricultural industry.</li> </ul>
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## Erosion

	<ul style="list-style-type: none"> <li>Numerous beaches in Onslow County and Carteret County experience erosional rates of more than 6 feet per year, placing oceanfront development at risk.</li> <li>Wetland migration due to sea level rise is likely to lead to significant loss of tidal wetlands in the region.</li> </ul>
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## Extreme Temperature

	<ul style="list-style-type: none"> <li>Due to climate change, extreme heat events are likely to become more frequent and severe in the region, while extreme cold events should become less frequent and less severe.</li> <li>Populations that lack proper heating and cooling are most at risk of extreme temperature events.</li> <li>Droughts associated with extreme heat events could pose significant risk to the region's agricultural industry.</li> </ul>
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## Flood

	<ul style="list-style-type: none"> <li>The region is exposed to various types of flooding, with coastal flooding and stormwater flooding being the largest concerns.</li> <li>Heavy rainfall is becoming more frequent in the Eastern Carolina Region.</li> <li>Stormwater components are not designed to handle larger rainfall and can be damaged or contribute to stormwater flooding.</li> </ul>
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## Hurricane and Severe Storms

	<ul style="list-style-type: none"> <li>The region experiences a variety of severe weather events, including numerous secondary hazards like wind, lightning, and hail.</li> <li>These events have led to significant damages and impacts.</li> <li>The frequency and severity of these events are likely to increase in the future due to climate change.</li> </ul>
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## Sea Level Rise

	<ul style="list-style-type: none"> <li>Sea level rise is likely to increase the frequency and severity of coastal flooding. Flood maps do not account for sea level rise and therefore under-represent future risk. The region's rate of sea level rise (roughly 0.18 inches per year) is higher than the global average and roughly twice the rate of the southern portions of the state (Kunkel 2020).</li> </ul>
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## Tornado

	<ul style="list-style-type: none"> <li>All of the Eastern Carolina Region is exposed to tornadoes and high wind. The Eastern Carolina Region is located in FEMA Wind Zone III, where wind speeds can reach up to 200 mph (NIST 2011).</li> <li>Climate change is warming the atmosphere in the Eastern Carolina Region, meaning storms have potential to be more intense and occur more often.</li> </ul>
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## Wildfire



- Increasing frequency and severity of wildfire will lead to increased damage to natural systems and potential damage to structures.
- Projected increases in wildfire risks and associated emissions can have harmful impacts on health.

## Portfolio of Projects

The second and final deliverable of each region's RISE Regional Resilience Portfolio Program is this Project Portfolio, which describes the high-priority projects identified for the Eastern Carolina Region. These projects were concepts identified by the Stakeholder Partnership after review of past impacts, the vulnerability assessment, and strategies that have been used before in the Eastern Carolina Region or elsewhere in the nation. These project ideas were further developed through community input and expert consultation. This portfolio outlines implementation steps, funding opportunities, and potential project partners to enable a clear path toward implementation for each project. A summary of the projects included in the portfolio is located on the following pages.

## SUMMARY TABLE OF PROPOSED PROJECTS

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
<b>Regional Resilience Funding</b>	<p><b>DESCRIPTION</b> Necessary funding and support mechanisms to implement resilience projects are often lacking.</p> <p><b>SOLUTION</b> Establish a circuit rider program in the region to provide grant application services.</p>	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Erosion</li> <li>• Extreme Temperature</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Medium	Regional
<b>Regional Drainage Capacity Assessment</b>	<p><b>DESCRIPTION</b> Poor debris management, dumping, and aging critical infrastructure have contributed to poor regional drainage capacity.</p> <p><b>SOLUTION</b> Develop a regional drainage capacity assessment to identify blocked culverts, ditches, and natural systems within the region.</p>	<ul style="list-style-type: none"> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> </ul>	Local Floodplain Managers	Low	Regional
<b>Beneficial Reuse of Acquired Properties</b>	<p><b>DESCRIPTION</b> Flooding frequency and severity are expected to rise over the next few decades. As flood-prone properties get acquired by municipalities, development plans for the properties must be made.</p> <p><b>SOLUTION</b> Prioritize “green” development of</p>	<ul style="list-style-type: none"> <li>• Flood</li> <li>• Sea Level Rise</li> </ul>	Local Planning Departments	Medium	Parcel level

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
	acquired flood-prone properties to support natural watershed functioning.				
<b>Vegetated Swales in Urban Flooding Hotspots</b>	<p><b>DESCRIPTION</b></p> <p>Chronic urban flooding is negatively impacting the structural integrity of homes, businesses, and critical infrastructure.</p> <p><b>SOLUTION</b></p> <p>Installing vegetated swales in urban flooding hotspots will prevent flood conditions from overwhelming critical infrastructure.</p>	<ul style="list-style-type: none"> <li>• Erosion</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> </ul>	Local Public Works Departments	Medium	Parcel level
<b>Regional Resilience Staff Position</b>	<p><b>DESCRIPTION</b></p> <p>Coordination of resilience activities across Eastern Carolina requires the full-time effort of a staff member within an established organization.</p> <p><b>SOLUTION</b></p> <p>A Regional Resilience Coordinator would work to support projects and secure resources for regional and local resilience initiatives.</p>	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Erosion</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Medium	Regional

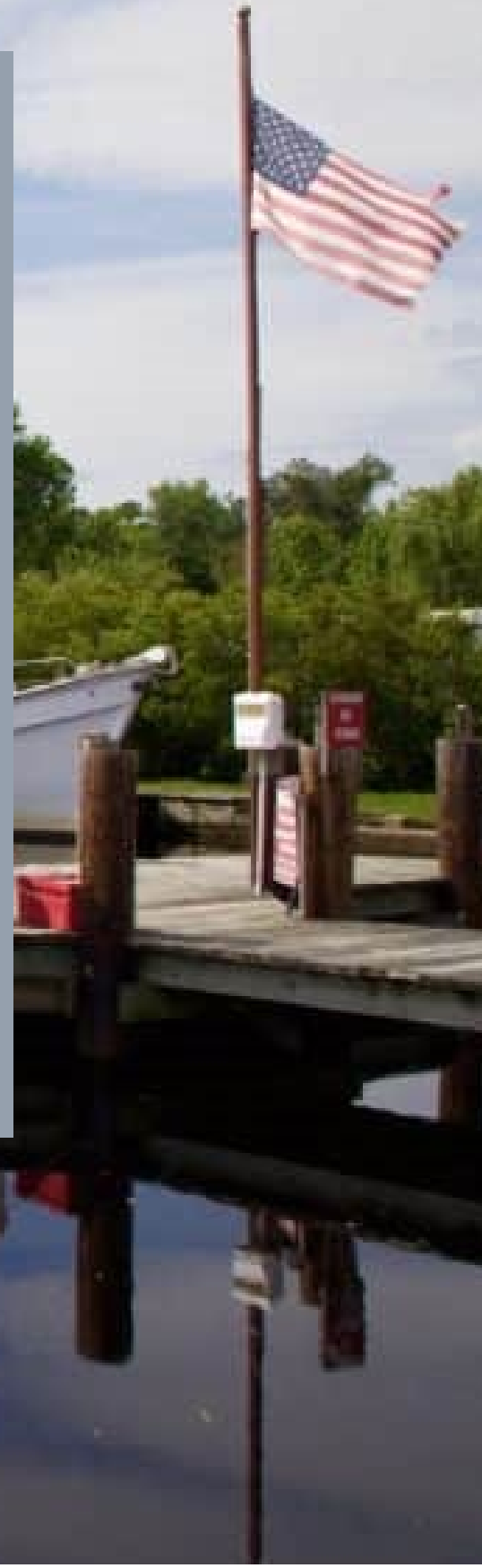


# Regional Resilience Funding & Circuit Rider Program

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A common theme in resilience work throughout the country is a lack of funding. Municipalities and counties often go through planning efforts that result in the identification of potential projects which would increase their resilience. However, the necessary funding and support mechanisms to implement these projects are often lacking. While local budgets may provide some funding, it is often not enough to complete the identified work. Funding is available from state and federal agencies, but often requires a local match that may not be feasible for smaller jurisdictions. Even applying for grant funding support may be beyond the staff capabilities for some jurisdictions, as applications require expertise and investment of time in order to be successful in a competitive grant field.

In order to support regional resilience efforts in the Eastern Carolina Region, a circuit rider program will be established to provide grant application services. A corresponding funding support program will be established to raise potential funds for grants that require a local match through endowments and charitable donations.



# REGIONAL RESILIENCE FUNDING

## Description

Counties and municipalities in the Eastern Carolina Region regularly complete planning efforts to identify vulnerabilities and potential projects that would increase resilience. Examples include hazard mitigation plans, stormwater management plans, post-disaster recovery plans, and capital improvement plans. These plans have been completed using local knowledge, public and stakeholder input, and guidance from state and federal agencies. Unfortunately, many projects identified are not implemented due to a lack of funding support. However, numerous funding pathways can be considered.

FEMA provides robust funding for resilience projects through Hazard Mitigation Assistance (HMA) grants. Grant opportunities include the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), Flood Mitigation Assistance (FMA), and HMGP Post-Fire Assistance. The state has numerous recurring grant programs as well.

Each grant program offers unique opportunities to fund projects but also includes differences in prerequisites, application processes, and local match requirements. Many jurisdictions lack the staffing and expertise to successfully apply for these programs.

An important component of many federal grants is including a benefit-cost analysis (BCA) to ensure that the expected outcomes of a project will exceed the project budget. This requirement often results in communities declining to pursue opportunities due to the inability to complete a BCA or incorrectly completing a BCA, resulting in not meeting program requirements.



It is critical to maintain momentum following planning efforts and avoid “planning fatigue” by placing as much emphasis on implementation as there is on the identification of actions. To do this, homeowners, business owners, municipalities, and counties require assistance to complete successful grant applications to state and federal grant program opportunities.

Funding support must also be made available to provide a local funding match where necessary, especially in locations that are home to socially vulnerable populations that have historically received limited investment in resilience/recovery funding. The primary goal of this project is to put in place a circuit rider program to provide grant application services.

## Hazards Addressed

Drought, Erosion, Extreme Temperature, Flood, Hurricanes and Severe Storms, Sea Level Rise, Tornadoes, Wildfire

## Sectors Addressed

The following sectors will be supported by this project:

- Social Vulnerability and Equity, Health, and Safety
- Housing, Critical Infrastructure, and Community Support Systems
- Economy
- Natural Environmental Systems

### **Location/Service Area**

This project will benefit the entire Eastern Carolina Region, with the most immediate benefits being provided to small communities requiring assistance to meet their resilience-related goals.

### **Potential Impact**

This project will include a two-pronged effort to support the implementation of resilience projects throughout the Eastern Carolina Region. The project will focus on positioning the region for success in competitive grants that can provide funding support for resilience projects.

This project is closely related to the Regional Resilience Staffing project described later in this portfolio. However, the Regional Resilience Funding and Circuit Rider is designed to serve as the first phase of regional resilience efforts which would produce region-wide and local grant applications. In the future, when the region's resilience funding capacity is better established, the staff role would serve as a project manager and a liaison with state/federal entities.

### **Circuit Rider Program**

A circuit rider program will be established to provide valuable support in the development of grant applications. Circuit riders will have expertise in state and federal grant programs and be able to help jurisdictions find appropriate grant opportunities based on:

- Hazard type
- Cost-benefit analysis

- Grant application deadlines
- Likelihood of grant application awards based upon available funding and level of competition

Circuit riders will work hand-in-hand with contacts at jurisdictions that are interested in applying for grant funding support and guide them through:

- A go-no go evaluation based on available grants and rough cost-benefit analysis
- Development and submission of grant applications, including cost-benefit analysis
- Grant progress reporting for awarded grants.

### **Regional Resilience Matching Fund**

A local resilience funding support program will also be established. The fund will be developed through the recruitment of benefactors and charitable donations. This fund will be put in place to provide a source of local match for various state and federal grant programs. The fund will primarily focus on supporting projects that serve socially vulnerable populations and areas that have historically received little to no investment for resilience projects. The fund will also provide funding for home and business owners that have successfully secured reimbursement grants to fund initial construction costs. When reimbursed, those funds will be returned to the local match resiliency fund.

### **Population(s) Served**

This project will serve the entire population of the Eastern Carolina Region, with emphasis on projects that support socially vulnerable populations and jurisdictions that have historically received little investment in resilience projects. Communities that could particularly benefit from this project include Jones County, Greene County, Duplin County, and the municipalities of each.

## Roles of Lead and Supporting Agencies

This project will establish a circuit rider program for grant application professionals to support municipal and county governments and the establishment of a local match resiliency fund to assist with local match and reimbursement grant costs for local governments, homeowners, and business owners.

### Lead Implementer

The Eastern Carolina Council (ECC) is the most appropriate organization to coordinate regional resilience funding. The ECC has the most capacity of any organization in the region to support this project over a long timeframe, as well as the most connections with other organizations in the area to increase support for the project.

### Supporting Agencies

County and local governments in the ECC Region will be invited to participate in the circuit rider program to increase the number, quality, and success of grant funding applications for implementation of resilience projects. Governments that elect to participate will sign agreements with the ECC for the services of the program.

The local resiliency fund will recruit the support of private donors and philanthropic organizations. It is anticipated that most contributions to the fund will be single contributions, but organizations/individuals that make recurring sustaining contributions will be encouraged to join the advisory committee responsible for reviewing requests for funding support.

### Cost Estimate

Medium – Ongoing funding will be needed for the circuit rider, which would ideally come from Eastern Carolina counties and municipalities. According to the U.S. Bureau of Labor Statistics, the median salary for an urban or regional planner nationwide is \$78,500 (Bureau of Labor Statistics 2022). In North Carolina, the

annual mean wage for urban planners is \$67,250 – \$72,250 (BLS 2021). Benefits and other overhead costs may need to be covered.

### Potential Funding Sources

The circuit rider program will require agreements between communities and monetary contributions from each participating community. Additional circuit rider funding may be available through the U.S. Department of Agriculture's Rural Utilities Service and the State Revolving Fund, similar to the circuit rider program of the North Carolina Rural Water Association.

The local match resiliency fund will be supported through private and corporate donations. Philanthropic organizations such as the Duke Energy Foundation, Climate Resilience Fund and the Rockefeller Foundation could be approached for investment in the local match resiliency fund.

### Benefits Provided

The two-pronged approach of a circuit rider providing direct assistance to communities and a source of match funding for regional initiatives will provide a significant boon to communities' capacity for resilience investments well into the future.

### Physical Benefits

Physical benefits from the regional funding source would be dependent on the resilience efforts implemented by regional funding. Examples could include home elevations in floodplains, stormwater improvements, and/or retrofits of critical facilities and infrastructure.

### Socioeconomic Benefits

A regional resilience funding source would support local resilience initiatives that reduce damages and impacts from hazard events, protecting life, property, and the local economy.

### **Environmental Benefits**

Environmental benefits will depend upon the projects implemented using the regional funding source. Example projects could include wetlands restoration, living shorelines, urban green infrastructure such as vegetated swales, and natural floodplain function improvements.

### **Equity Outcomes**

This project will provide a much-needed re-balancing of resilience investments in the Eastern Carolina Region. Jurisdictions that have lacked the capacity to apply for grant support will be provided with the opportunity to put forth strong grant applications. Award of a percentage of these applications will have embedded, a stated proportion that must be spent in historically disenfranchised communities.

The local match resiliency fund will prioritize projects that support socially vulnerable populations, leading to investment in projects that would otherwise be unlikely to be implemented.

### **Steps for Implementation**

The ECC will work with interested parties to establish agreements and hire staff to fill the circuit rider role.

Once the circuit rider program is in place, the ECC will pivot to recruiting donations and support for the local match resilience fund. While recruitment occurs, the ECC will write program guidance. Once the funding is in place, the ECC will advertise the availability of funding support, establish an advisory committee for the evaluation of applicants, provide support, and work to grow the program.

### **Implementation Timeframe**

This project has a short implementation timeframe (less than 5 years) with start up expected within 1–2 years. Recruitment of

fundors for the local match resilience fund, as well as the first allocation of support, is likely to take several years.

### **Integration with Existing Plans, Programs, and Policies**

This project will support and build upon grant-writing efforts currently underway in the Eastern Carolina Region. The project also supports regional hazard mitigation plans, which discuss finding ways to fund mitigation efforts within the region.

### **Challenges/Obstacles**

The success of this project depends upon the participation of local governments. Making financial contributions may be a challenge for some municipalities and counties, while others may lack the capacity to immediately participate. However, in terms of financial contributions and project participation, this project becomes simpler and more beneficial for communities with more contributing entities.

Demonstrating the benefits of this program to all municipalities and counties will be essential to garnering long-term support from all communities in the Eastern Carolina Region.

### **Legislative Challenges, Permitting, Zoning Requirements**

This project will likely have legislative challenges around fund management and distribution of benefits. There are likely to be no permitting, or zoning issues associated with this endeavor.

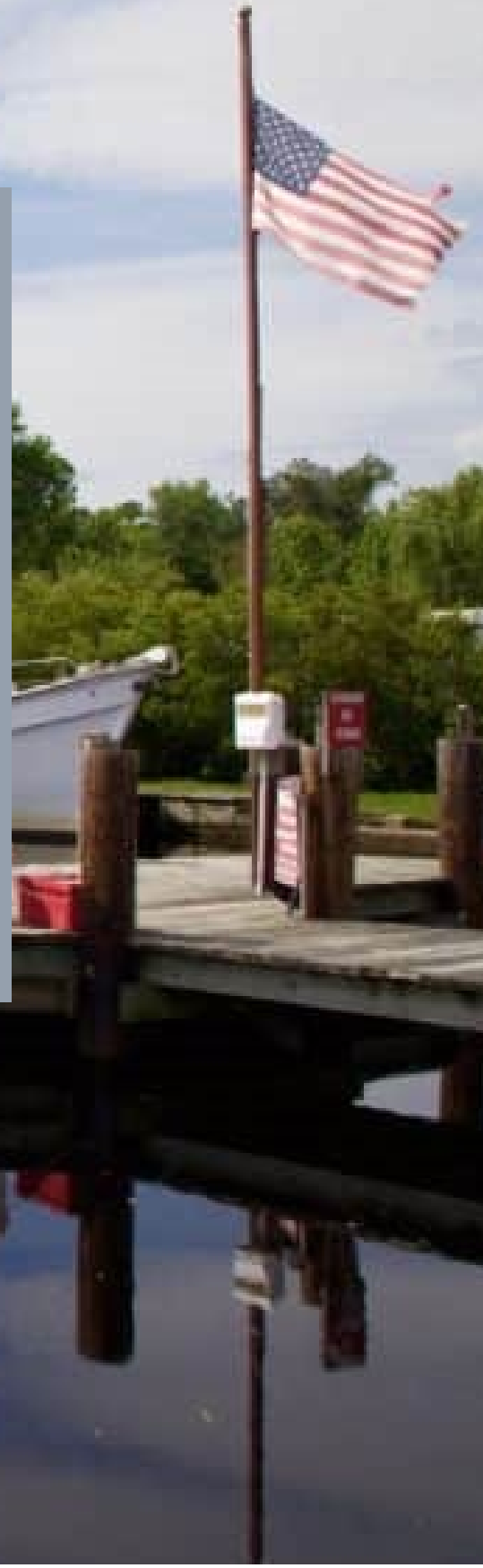


# Regional Drainage Capacity Assessment

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Flooding is the dominant hazard facing the Eastern Carolina Region. While persistent hurricanes, severe storms, and sea level rise are present, poor drainage capacity has been noted as an additional aspect to the flooding issue. Poor debris management, dumping, and aging critical infrastructure all have contributed to the issue, prompting calls in the community for improvements.

Undertaking a Regional Drainage Capacity Assessment will serve to identify blocked culverts, ditches, and natural systems within the Eastern Carolina Region. Using GIS software to identify the areas with the greatest impact, the region will use this information to garner funding and resources to improve regional infrastructure and address chronic flooding.



# REGIONAL DRAINAGE CAPACITY ASSESSMENT

## Description

Nuisance flooding is a longtime issue in the Eastern Carolina Region. Poor debris management, persistent flood events, and dumping have clogged many natural and man-made drainage areas within the region. This results in overwhelmed drainage systems that cause area flooding during any time of great precipitation.

Poor drainage impacts local commerce and quality of life. Communities that deal with blocked drainage cannot recover as quickly following a disaster, resulting in lost business revenues and essential services. Overflowing sewers and septic systems can lead to adverse health impacts, spreading disease throughout a community.

## Hazards Addressed

Flood, Hurricanes and Severe Storms, Sea Level Rise

## Sectors Addressed

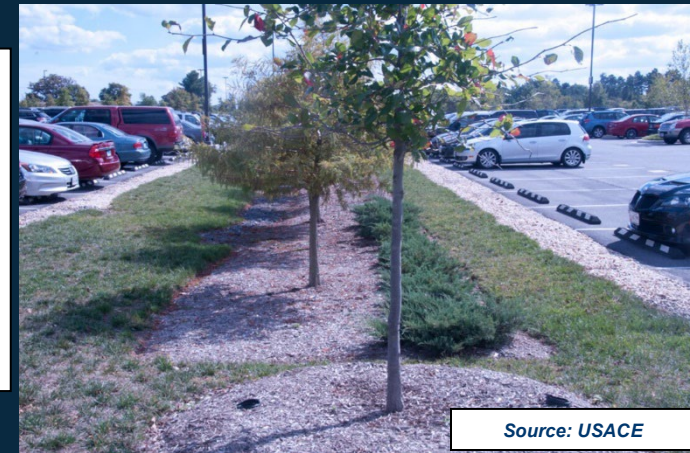
The following sectors will be supported by this project:

- Social Vulnerability and Equity, Health, and Safety
- Housing, Critical Infrastructure, and Community Support Systems
- Economy
- Natural Environmental Systems

## Location/Service Area

The Eastern Carolina Region

*Bioretention systems such as the installation pictured at Fort Meade, Maryland, mitigate localized flooding and improve regional drainage capacity.*



Source: USACE

## Potential Impact

An assessment of the drainage capacity of regional watersheds will help mitigate the impacts of flooding and provide benefit to ecosystems throughout the Eastern Carolina Region. This assessment can be used to inform or prioritize mitigation projects in the future which will increase the natural flow and drainage of water. It can also be used to better understand how the ebb and flow throughout regional watersheds is impacting natural habitat of aquatic and terrestrial flora and fauna.

Two tools which would be beneficial in the development of a regional drainage capacity assessment are:

1. The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling tool
2. NC Emergency Management Flood Risk Information Systems (FRIS) mapping tool

HEC-RAS software allows users to perform a variety of watershed modeling, including one-dimensional steady flow, one and two-dimensional unsteady flow calculations, sediment transport/mobile bed computations, and water temperature/water quality modeling (USACE n.d.).

FRIS is a flood mapping tool maintained by the North Carolina Department of Environmental Quality. It contains digitally accessible flood hazard data, models, maps, risk assessments and reports that are database driven. Users can also access and download geospatial base map data, imagery, LiDAR data, and hydraulic and hydrologic models.

### **Population(s) Served**

Residents of the Eastern Carolina Region, particularly those in flood-prone communities such as:

- Coastal Carteret, Craven, Onslow, and Pamlico Counties
- Riverfront municipalities such as Goldsboro, Havelock, Jacksonville, Kinston, New Bern, and more.

### **Roles of Lead and Supporting Agencies**

The lead and supporting agencies chosen to head this effort will play key roles in seeing this project to completion. The following describes the most likely lead and supporting agencies that would best lead this effort.

#### **Lead Implementer**

Local floodplain managers would be best equipped to lead the effort in identifying culverts, ditches, and other drainage problem areas within the region's watersheds.

#### **Supporting Agencies**

Local GIS-trained staff, local public works staff, the Eastern Carolina Council, soil and water conservation district staff,

environmental nonprofit organizations such as Coastal Carolina Riverwatch, local community members.

### **Cost Estimate**

The costs associated with this project are likely to be low. If prioritized by participating municipalities, staff time would be the biggest expense associated with this project.

Travel time to meetings with local and regional support agencies (IRS standard mileage rate is 62.5 cents/mile) (IRS 2022) and the use of GIS software would add to the cost. While addressing the root cause of a drainage issue may be more costly, the assessment of problem areas could likely be accomplished without the purchase of additional software or materials.

### **Potential Funding Sources**

Funding for projects such as drainage capacity assessments is currently plentiful through the American Rescue Plan Act (ARPA). Through ARPA, the North Carolina Department of Environmental Quality has created the Local Assistance for Stormwater Infrastructure Investments Fund. Other sources include:

- FEMA's Building Resilient Infrastructure and Communities (BRIC) program
- FEMA Flood Mitigation Assistance (FMA)
- FEMA Public Assistance (PA)
- The U.S. Department of Housing and Urban Development's (HUD) Community Development Block Grant (CDBG, CDBG-MIT, CBDG - Infrastructure)
- The U.S. Environmental Protection Agency's (EPA) Urban Waters Small Grants (UWSG) Program
- NC Department of Public Safety Emergency Management Transportation Infrastructure Resiliency Fund Grant

- NC Department of Environmental Quality (DEQ) Land and Water Fund (LWF, formally Clean Water Management Fund (CWMF)
- NC DEQ Water Resources Development Grant Program (WRDG via USDA NRCS EQUIP)
- NC DEQ / US EPA 319(h) Impaired Waters Restoration
- NC DEQ / US EPA 205(j) Impaired Waters Restoration
- NC Department of Justice Environmental Enhancement Grant (EEG)
- NC Clean Water State Revolving Fund (CWSRF)
- NC Division of Water Infrastructure American Rescue Plan Act (ARPA) Asset Inventory and Assessment (AIA) Grant program for utilities (water, wastewater, and stormwater)
- NC Division of Water Infrastructure American Rescue Plan Act (ARPA) Local Assistance for Stormwater Infrastructure Investments (LASII) Program Funding
- NC DEQ Division of Mitigation Services Stream Mitigation and Restoration
- FHWA/NCDOT Locally Administered Project Program (LAPP) – BikePed, Roadway, Transit
- NC State Parks - Parks and Recreation Trust Fund (PARTF)

### **NC Golden LEAF Foundation Benefits Provided**

Assessing regional drainage capacity will provide many benefits that increase regional resilience across the Eastern Carolina Region.

#### **Physical Benefits**

Identifying problem areas for drainage provides regional public works departments with invaluable information that can be used to improve regional infrastructure.

This can lead to improvements that decrease flooding impacts in communities, providing greater protection for homes, businesses,

and critical facilities. Physical sewer and septic systems will be less overwhelmed by flood waters, protecting physical structures and community health.

#### **Socioeconomic Benefits**

Identifying drainage problem areas can allow communities to better address potential flooding impacts, prioritizing valuable economic areas. This will protect local businesses from the worst flooding impacts, allowing communities to continue with essential functions and commerce.

#### **Environmental Benefits**

Assessing regional drainage capacity in natural systems can allow those systems to perform more optimally. This will promote activity and growth with native flora and fauna, enhancing regional biodiversity.

#### **Equity Outcomes**

Many of the region's floodplains are home to several communities, including those who live in more vulnerable manufactured homes. Assessing problem drainage areas within the region will protect all residents and will prevent the most vulnerable within the community from facing recurring flooding impacts.

### **Steps for Implementation**

Regional floodplain managers and related officials should first examine the drainage capacity of regional natural systems to improve flood management. This team should also identify culverts and regional problem areas in watersheds where drainage is typically blocked and use GIS modeling to assess likely flood impacts. This information will be used to identify the areas where drainage is most impeded and to apply for funding to mitigate those problem areas.

The steps to implementing the assessment would likely include the following:

1. Floodplain managers develop a survey to collect information from relevant support agencies and members of the public about problem drainage areas.
2. Hydrologic data is used to calculate water flow across the region.
3. Survey results and GIS data are used to develop a map of the most common drainage problem areas.
4. All collected information is compiled into a report to inform future resilience projects such as upsizing stormwater infrastructure, implementing nature-based drainage solutions, and creating future documents such as regional hazard mitigation plans.

### **Implementation Timeframe**

This project would take place over the short-term, within 5 years. If given high priority by all participating municipalities, gathering all essential municipal staff and community organizations would likely occur within several weeks.

### **Integration with Existing Plans, Programs, and Policies**

Counties and municipalities throughout the Eastern Carolina Region maintain plans such as stormwater management plans and water and sewer plans which are directly related to this project. These plans should inform the development of this project and be updated accordingly following its completion.

### **Challenges/Obstacles**

Local planning and zoning regulations should be considered when assessing regional drainage systems. Potential changes in drainage may impact other locations, depending on the degree of the change made. Local departments should establish

communication to determine how changes in drainage capacity may impact different communities.

### **Legislative Challenges, Permitting, Zoning Requirements**

Municipalities may need to collaborate on drainage projects in natural systems, as impacts could affect issues noted in regional floodplain management plans.





# Beneficial Reuse of Acquired Properties

The Eastern Carolina Region has faced numerous instances of small- and large-scale flooding over several recent years, including severe impacts from Hurricane Matthew. The frequency and severity of both coastal and riverine flooding are also expected to rise over the next few decades.

To address issues of flooding, several municipalities have begun to acquire flood-prone lands, with the desire to restore the natural drainage functions and provide a natural buffer for their residents.

# BENEFICIAL REUSE OF ACQUIRED PROPERTIES

## Description

Riverine flooding, storm surge, and sea level rise present major challenges to the Eastern Carolina Region. As even more residential land becomes flood-prone, governments may continue a strategy known as "buyouts". This strategy, which is locally administered and often federally funded, has been pursued aggressively in the Eastern Carolina Region. Almost 2,100 acres have been acquired across the region's nine counties (North Carolina Emergency Management n.d.).

Since the late 1990s, several municipalities and counties have purchased flood-prone parcels as part of a long-term strategy to mitigate flooding impacts. These parcels then serve as a floodplain's natural and most ideal use – to take on water using natural systems without causing property damage or threats to human life. The large-scale acquisition of thousands of acres of flood-prone land parcels has created new challenges. Many buyout sites have become areas of blight, with illegal dumping turning vacant parcels into nuisance sites. Many communities want to transition open parcels to sites that would be of additional community benefit besides flood mitigation, such as programmed parks, outdoor education spaces, and greenway trails.

## Hazards Addressed

Flood, Sea Level Rise

## Sectors Addressed

The following sectors will be supported by this project:

- Housing, Critical Infrastructure, and Community Support Systems



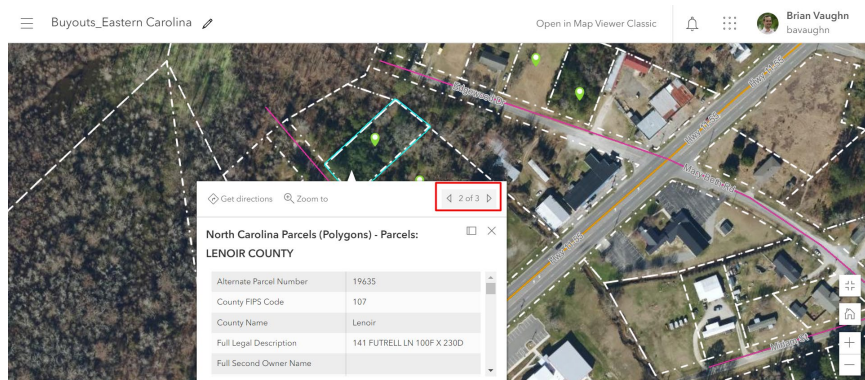
***Community members from across the Eastern Carolina Region should play a role in envisioning potential uses for buyout properties. Beneficial uses can include parks, trails, and education spaces.***

- Social Vulnerability and Equity, Health, and Safety
- Natural Environmental Systems

## Location/Service Area

Parcels acquired via the hazard mitigation acquisition process in The Eastern Carolina Region. See a map of these parcels here: <https://ncsu.maps.arcgis.com/apps/mapviewer/index.html?webmap=9bc577c7237f4d008fe9611cb00f1db6>

Green markers indicate parcels that have been acquired via the buyout process. Users can search relevant property information by clicking the parcel on which the green markers are located. Once the relevant parcel is clicked, click the arrow shown below until North Carolina Parcels (Polygons) appears.



Relevant restrictions for buyout properties are listed in the parcel's deed, which can be found on county Register of Deeds databases as depicted below.

North Carolina Parcels (Polygons) - Parcels:	
LENOIR COUNTY	
Site Address Zip	
Source Document Date	
Source Document Date Text	2000
Source Document Reference	Deed Book/Page 1199/743
State FIPS Code	37
State Name	NC

## Potential Impact

Beneficial reuse of acquired parcels allows for communities to use open space for their benefits and improve their resilience to flooding, sea level rise, and storm surge.

Most buyout program stipulations require that impervious surfaces on a site are demolished and removed. Therefore, a wise choice of permeable materials utilized on a buyout site can support the most fundamental purpose of a floodplain: to hold flood water.

This project would also provide floodplain restoration, partially restoring the floodplain of waterways in the Eastern Carolina Region to their original condition prior to development. Restoration of regional floodplains will result in such benefits as slowed and reduced runoff, increased soil water retention, reduced pollutant sources, creation of habitat, and reduced erosion.

Green development also enables communities to develop sites that have environmental and community benefits. Examples of projects include recreation areas, nature preserves, community ecological classrooms, and neighborhood gardens.

## Population(s) Served

Eastern Carolina Region residents in flood-prone areas. Potential locations for pilot programs include:

- Duplin County on the Northeast Cape Fear River
- Wayne County on the Neuse and Northeast Cape Fear Rivers
- Greene County on the Contentnea Creek
- Lenoir County on the Contentnea Creek and Neuse River
- Craven County on the Neuse and Trent Rivers
- Onslow County on the New River

The locations listed above all contain multiple buy-out properties ideal for a beneficial reuse project as described here.

## Roles of Lead and Supporting Agencies

This project will require close collaboration between local planning officials, environmental organizations, and subject matter experts. Strong community input can result in beneficial reuse of acquired

properties which provides innovative benefits and meets the unique needs of a community.

### Lead Implementer

The lead implementer should be the local planning office that controls the permitting of approved plans for the acquired parcels.

### Supporting Agencies

The North Carolina Coastal Federation, local emergency managers, local parks/recreation staff, environmental nonprofit organizations, local conservation districts, the ECC, the U.S. Department of Agriculture Natural Resources Conservation Services. Communities in the Eastern Carolina Region should also work with FEMA to make use of their acquisition program for repetitive flood loss properties.

### Cost Estimate

The cost estimate for this project is medium. The land has already been acquired by the county or municipality, so those costs are not factored into the development.

Since the acquired land is required to maintain most of its green space, much of the cost would be constructing pavilions (ex. if the space were a community classroom or garden) which can vary between \$6,000 and \$20,000 depending on the number, size, and scale (American Landscape Structures 2022).

Staff time will also be necessary to maintain the property. An effective way to minimize these costs is to partner with community organizations, such as nonprofits and schools, that may provide these resources in kind.

### Potential Funding Sources

Funding for the development of acquired parcels is anticipated to be provided from several different sources, including federal, state, and local. Larger grants from federal entities may be used to

purchase land parcels. Implementation of development designs is expected to be funded by state-level and private foundation grants, although some federal sources may be available to support development.

Specific potential funding sources include:

- North Carolina Parks & Recreation Trust Fund
- North Carolina Schools Go Outside Grant
- North Carolina Department of Commerce Rural Transformation Grants, “Community Enhancements for Economic Growth” category
- Duke Energy Foundation Grants
- Golden Leaf Foundation Grants
- North Carolina Land & Water Fund Grants
- U.S. Department of Agriculture Farm to School Grant Program

### Benefits Provided

Tremendous benefit can be gained by transforming buyout properties into spaces which meet the needs of the community.

#### ***Best Practices – Lumberton, NC Community Floodprint***

After experiencing devastating impacts from Hurricanes Matthew and Florence, the City of Lumberton applied for and was awarded \$7.2 million to demolish 50 flood-prone homes. Working with elected officials and city staff, Lumberton prioritized converting these vacant parcels into places for water storage, habitat and ecologically sensitive trails, parks, and programs. The finalized “Lumberton Loop” organizes 108 parcels into a citywide trail network that connects over 806 acres of vacant land, 99% of which is in the 100-year floodplain (American Society of Landscape Architects 2020).

The specifics of various benefit depend upon each community and their desired outcomes for buyout properties.

### **Physical Benefits**

Physical benefits of the project include decreasing the number of impervious surfaces in flood-prone areas and allowing for faster drainage in the event of floods and storm surge.

### **Socioeconomic Benefits**

This project will encourage improved resilience from flooding, storm surge, and sea level rise through the improvement of natural drainage. This should result in the reduction of personal and community property damage due to flooding, allowing residents to maintain access to essential services. Residents and businesses in flood-prone areas adjacent to reuse sites would have the most to gain from implementation of the project.

### **Environmental Benefits**

Acquiring parcels of land for green development allows the land to return to its natural function. This can facilitate the growth of native plant and animal species.

### **Equity Outcomes**

Acquiring flood-prone parcels of land will better protect vulnerable communities from flood impacts, lessening the costs of evacuation and property repair.

Parcels acquired by municipalities can also be turned into sites of community benefit, such as parks, community classrooms, or community agriculture.

### **Steps for Implementation**

The steps to implement green development on acquired properties would likely include the following:

1. Local planning offices in the Eastern Carolina Region work with FEMA to make use of their acquisition program for repetitive flood loss properties. Planning offices should also consider utilizing conservation easements as a method of property protection, partnering with land trusts such as NC Coastal Land Trust as needed.
2. Local planning office collaborating with environmentally focused local NGOs and educational institutions on green development ideas.
3. Lead and support agencies determine the best use of a property based on survey results of community needs.
4. Beneficial reuse projects implemented on acquired properties.

### **Implementation Timeframe**

The implementation of this project would happen over a medium-length timeframe. If planners and supporting agencies are able to collaborate on design, responsibility, approval from emergency management officials, and implementation, green development of an acquired parcel could occur within a matter of months. This is possible because the proposed areas have already been acquired and there are several interested parties interested in being the lead implementor.

### **Integration with Existing Plans, Programs, and Policies**

Green development in acquired flood-prone parcels will integrate well with existing regional hazard mitigation plans, the Hurricane Matthew Resilient Redevelopment Plans, and local floodplain management plans.

### **Challenges/Obstacles**

The most significant challenges associated with this project are likely to come from establishing consensus among partner agencies regarding the ideal use of each property. The voice and



vision of community members coupled with available funding opportunities should dictate the use of each.

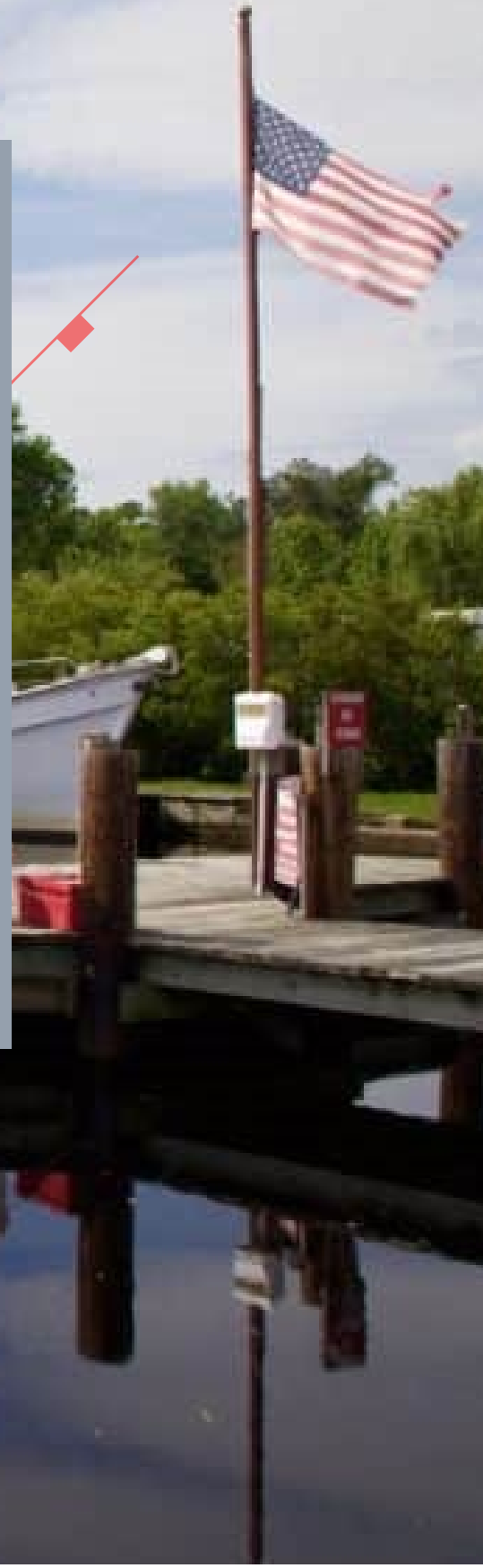
#### **Legislative Challenges, Permitting, Zoning Requirements**

There are no known legislative challenges, permitting, or zoning requirements. Depending upon the type of green development chosen by stakeholders, challenges could be posed by any increased traffic that the project would encourage. Any proposal for development on buyout properties would need to adhere to the deed restrictions listed.

# Green Infrastructure in Urban Flooding Hotspots

Flooding is a chronic hazard within the Eastern Carolina Region. In the event of hurricanes and severe storms, as well as high tides, local stormwater systems are being overrun, causing areas of chronic urban flooding. Stormwater runoff and erosion are additionally impacting the structural integrity of homes, businesses, and critical infrastructure.

Installing green infrastructure in urban flooding hotspots will help prevent storm surge and flood conditions from overwhelming critical infrastructure, while also preventing erosion and improving local water quality. This solution is lower in cost than traditional infrastructure improvements and can add to the community's aesthetic appeal while mitigating flood and erosion hazards.





# GREEN INFRASTRUCTURE IN URBAN FLOODING HOTSPOTS

## Description

Erosion, intensifying storm surges, and increasing rates of sea level rise are leading to flooding and sediment surges within coastal communities in the Eastern Carolina Region. This weakens critical infrastructure, disrupting the livelihoods of coastal communities. Although oceanfront erosion provides the most dramatic displays of coastal erosion in the Eastern Carolina Region, coastal erosion can take place on natural shorelines bordering any coastal waterbodies. Areas along the inland sounds and tributaries in the Eastern Carolina Region are dominated by coastal wetlands. Wetlands can experience episodic erosion when strong storms create enough wave energy on inland waterways to result in the scouring of the wetlands' edge.

The Eastern Carolina Region will install green infrastructure, prioritizing native vegetation, in urban areas that are known for heavy flooding and intense storm surge. This project will address compounding flooding in a lower-cost fashion than traditional stormwater infrastructure while also improving community green space and fostering nature-based solutions to critical infrastructure issues.

## Hazards Addressed

Erosion, Flooding, Hurricanes and Severe Storms, Sea Level Rise

## Sectors Addressed

The following sectors will be supported by this project:

- Housing, Critical Infrastructure, and Community Support Systems
- Natural Environmental Systems

*Nature-based stormwater management systems such as vegetated swales can mitigate the impacts of urban flooding while increasing community beautification.*



Source: NCSU

## Location/Service Area

Coastal communities within the Eastern Carolina Region including Goldsboro, Havelock, Jacksonville, Kinston, New Bern, and more.

## Potential Impact

Green infrastructure in urban flooding hotspots can reduce stormwater runoff and erosion. Filtering water directly into the ground allows for smaller runoff volumes and improved water quality. This also prevents sediment from clogging stormwater systems, allowing for improved stormwater infrastructure function.

## Population(s) Served

Local communities in Eastern Carolina that install green infrastructure.

## Roles of Lead and Supporting Agencies

The lead and supporting agencies for this project will play a critical role in the success of the project.

### Lead Implementer

Local public works departments would take the lead as they would need to design green infrastructure to best suit the community's drainage needs and infrastructure layout. Local planning department staff who are in charge of plan, policy, and code/standard updates would also be valuable project leads.

### Supporting Agencies

North Carolina Sea Grant, North Carolina Coastal Federation, ECC, Albemarle-Pamlico National Estuary Partnership

### Cost Estimate

The cost estimate for this project is medium. Project costs will be dependent on the type of green infrastructure chosen and its size and scale. Projects like vegetated swales can cost \$1,500 per acre (Federal Highway Administration n.d.) and other green infrastructure projects can vary from over \$100,000 to over \$1,000,000 (FEMA 2021).

Grant funding and staff time will be used to identify the best areas in the region for green infrastructure. Most federal and state grants accept in-kind services such as staff planning time as part of the local cost-share.

### Potential Funding Sources

Funding for this project could be partially supplemented by local municipalities where the green infrastructure project would be installed. Other sources of funding include federal sources like EPA's grant programs and FEMA's BRIC program. State sources include NC DEQ's Local Assistance for Stormwater Infrastructure Investments Fund.

## Benefits Provided

There are several benefits that can be gained from installing green infrastructure in high-flooding urban areas.

### Physical Benefits

Green infrastructure projects can ease stormwater runoff and erosion, protect homes, businesses, and critical infrastructure within the Eastern Carolina Region.

### Socioeconomic Benefits

Green infrastructure projects are often lower in cost than conventional "grey" stormwater infrastructure improvements, reducing the amount of taxpayer dollars applied to improvements. Green infrastructure projects can filter pollutants from flooding, potentially lowering water treatment costs, facilitating better water quality, and improving public health. These projects can also mitigate the heat island effect and lessen the impacts from extreme heat events. The heat island effect occurs in urbanized areas where more structures hold more heat, causing higher temperatures than areas with more natural landscapes.

### Environmental Benefits

Green infrastructure can decrease the number of impervious surfaces and result in more natural habitat and permeable surfaces. In addition, they increase stormwater infiltration and storage capacity to slow down and soak in the rain which reduces pollutant discharges to surface waters.

### Equity Outcomes

Communities that have been typically underserved by lack of adequate drainage infrastructure can be prioritized.

### Steps for Implementation

The steps to implement the partnership would likely be the following:

1. Local public works and planning department staff would develop a coordinated strategy to address urban flooding hotspots where green infrastructure projects are best suited.
2. Staff will collaborate with support agencies such as the ECC and the North Carolina Coastal Federation to design and install green infrastructure, as well as obtain funding for each project site.

### **Implementation Timeframe**

This project could be implemented within a medium time frame, likely within 2–3 years. Identifying the best areas for green infrastructure projects will likely take several weeks.

### **Integration with Existing Plans, Programs, and Policies**

This project aligns with goals listed in the Hurricane Matthew Resilient Redevelopment Plans, as well as those in Eastern Carolina Regional Hazard Mitigation Plans, local floodplain management plans, and the North Carolina Climate Risk Assessment and Resilience Plan.

### **Challenges/Obstacles**

New additions to infrastructure can cause challenges and obstacles in the planning process.

#### **Legislative Challenges, Permitting, Zoning Requirements**

The construction of green infrastructure projects are unlikely to face legislative challenges but could be impeded by local permitting issues, or conflict with zoning requirements and the guidelines of surrounding transportation infrastructure engineering requirements.

Communities should review their plans, policies, and regulations to identify how these are working for or against implementation of green infrastructure and reducing any impediments. Many tools are available to incorporate and encourage the use of green

infrastructure in development, such as incentive programs for development and redevelopment or through land use regulations, such as ordinances and codes.

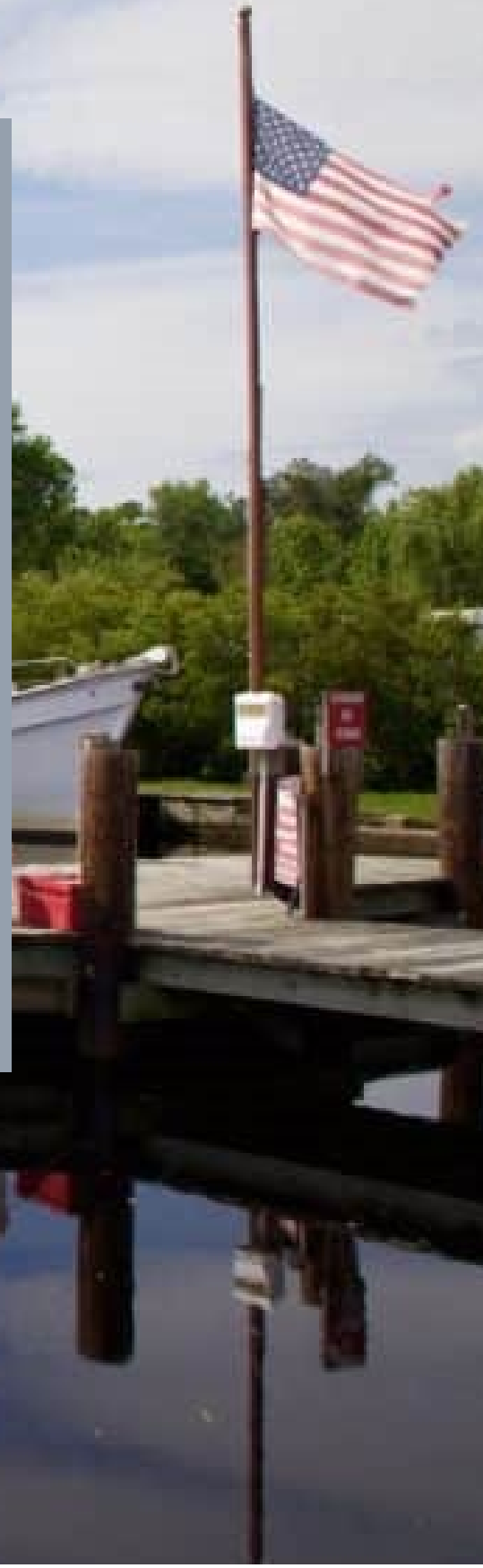
Green infrastructure project installations support regional goals and objectives outlined in Eastern Carolina's regional hazard mitigation plans, Hurricane Matthew Resilient Redevelopment Plans, and local floodplain management plans.

# Regional Resilience Staff Position within the Eastern Carolina Council

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Coordination of resilience activities across the Eastern Carolina Region is a large and complex task requiring the full-time effort of at one staff member within an established organization. Given the current development coordination role of the Eastern Carolina Council, they are the ideal organization to employ such a staff position supporting resilience initiatives across the region.

A regional resilience coordinator would work to secure funding for regional and local resilience initiatives, direct regional projects, support local projects, and serve as a critical link between local staff and counterparts at the state and national level who can direct additional resources to the Eastern Carolina Region.



# REGIONAL RESILIENCE STAFF POSITION WITHIN THE EASTERN CAROLINA COUNCIL

## Description

Staffing inadequacy is regarded as a major problem by several stakeholders within the Eastern Carolina Region. Often local and county governments do not have the bandwidth to devote additional staff time to resilience-related grants or initiatives, costing them invaluable funding and resources to address ongoing hazards and the long-term security of regional communities.

The Eastern Carolina Council (ECC) has the organizational infrastructure and relationships necessary order to make this role successful. This position is linked to the Regional Resilience Funding and Circuit Rider and will be critical to the successful implementation of many other projects within this portfolio.

## Hazards Addressed

Drought, Erosion, Extreme Temperature, Flooding, Hurricanes and Severe Storms, Sea Level Rise, Tornadoes, Wildfire

## Sectors Addressed

The following sectors will be impacted by this project:

- Social Vulnerability and Equity, Health, and Safety
- Housing, Critical Infrastructure, and Community Support Systems
- Economy
- Natural Environmental Systems

## Location/Service Area

The Eastern Carolina Region



***Resilience staff, such as the Chief Resilience Officers gathered at a national summit hosted by the Rockefeller Foundation, can significantly improve a city's safety, economic prosperity, and equity.***

Source: The Rockefeller Foundation

## Potential Impact

Adding a staff position to the ECC focused on regional resilience will provide immediate and long-term benefit to all communities in the region and increase the capacity of the Council. This position would ideally be funded through the Regional Resilience Fund or a grant secured by the Regional Circuit Rider as described earlier in this portfolio, allowing for greater resilience support in Eastern Carolina.

Regional resilience staff would be tasked primarily with supporting local resilience initiatives and coordinating regional resilience efforts. This staff member would play an integral role in assisting local emergency and floodplain managers in their short- and long-term strategies towards improving public safety and environmental health. This staff member also would be responsible for the coordination of several regional projects proposed in this portfolio,



particularly the Community Rating System Users' Group and the Hazard Information Sharing Partnership.

Viewing resilience not just as a matter of disaster management but whole community safety, a regional resilience staff member would be a valuable support to existing ECC program areas such as community planning, economic development, GIS/data management, and regional transportation.

### **Population(s) Served**

This project will serve all 636,051 residents of the Eastern Carolina Region.

### **Roles of Lead and Supporting Agencies**

The Eastern Carolina Council will host the regional resilience staff member, but the position will require the support of all ECC governments to make this position successful.

### **Lead Implementer**

The ECC will serve as the lead implementer of this project.

### **Supporting Agencies**

Eastern Carolina Region's local and county governments.

### **Cost Estimate**

Medium – Securing the long-term funding for the yearly salary of this position will likely take several years. This will likely involve the use of grant funding and possible contributions from state, local and county governments. The U.S. Bureau of Labor Statistics estimates Social and Community Service Managers nationally (like the resilience staff) earn a median of \$74,000 per year (U.S. Bureau of Labor Statistics 2021). In North Carolina, the annual mean wage for these positions ranges from \$66,480 to \$70,770 (BLS 2021).

### **Potential Funding Sources**

Funding for this staff position would come from the ECC's annual budget and could be supplemented by additional grants through organizations such as the Climate Resilience Fund and Rockefeller Foundation.

### **Benefits Provided**

Adding a regional resilience staff member to the ECC will bring increased capacity for community resilience activities to all counties and municipalities of the Eastern Carolina Region. This position will support ongoing initiatives and coordinate new regional projects which benefit the whole community.

### **Physical Benefits**

Physical benefits of a regional resilience staff member would depend upon the projects that this staff member is able to facilitate. Projects of physical benefit could include property elevations or acquisitions of flood-prone areas.

### **Socioeconomic Benefits**

A regional resilience staff member would allow the Eastern Carolina Region to take greater advantage of available resilience initiatives and funding. Using funds and expertise from the position to improve the region's resilience will protect life, property, and the regional economy.

### **Environmental Benefits**

The environmental benefits of a regional resilience staff member would be contingent on the projects supported by the staff member. Projects of environmental benefit could include living shorelines, green infrastructure, or improvements to the land use planning model.



### **Equity Outcomes**

Improved regional equity is a key determinant of success for the regional resilience staff member. Jurisdictions that have historically lacked the ability or capacity to apply for funding or devote staff time to implementing resilience projects will be able to successfully compete with larger jurisdictions and bring much-needed resources to their community.

### **Steps for Implementation**

The steps to implement the partnership would likely be the following:

1. ECC to consult with their Board of Directors, regional communities, and current staff members to determine how a regional resilience staff member can be mostly effectively utilized.
2. Secure funding from ECC budget and grants to establish the new position.
3. Develop a position description based upon needs expressed by partners in step 1.
4. Recruit, hire and oversee the new hire. .

### **Implementation Timeframe**

The timeframe for this project is likely short-term (within the next five years). Identifying the long-term funding sources for the position, as well as the best possible candidate, will likely take several months. Conversations with local and county governments need to highlight the local benefit of the position to ensure contribution.

### **Integration with Existing Plans, Programs, and Policies**

The regional resilience staff person will support current regional goals and policies. This project will build off and support grant-writing efforts underway by local and county governments.

This project will also complement planning efforts that result in the identification of potential projects to improve resiliency such as hazard mitigation, stormwater management, and capital improvement plans, offering pathways for the implementation of identified projects.

### **Challenges/Obstacles**

Securing funding for a resilience staff member will be challenging. Local and county governments will need to be on board with the goals of the position to provide any support. If the position were grant funded, long-term funding would need to be secured since most grants have a specific timeframe during which funding is provided.

Recruiting and retaining a qualified candidate will also be challenging. Salary, benefits, and job requirements will need to be sufficient to appeal to talented individuals.

### **Legislative Challenges, Permitting, Zoning Requirements**

This project has no known permitting, or zoning requirements. Ensuring local legislative challenges are met to establish and ensure long-term funding from local budgets may require some time and effort.

## APPENDIX A: FULL LIST OF PROPOSED RESILIENCE PROJECTS IN THE EASTERN CAROLINA REGION

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
<b>Regional Resilience Funding</b>	<b>DESCRIPTION</b> Necessary funding and support mechanisms to implement resilience projects are often lacking. <b>SOLUTION</b> Establish a circuit rider program in the region to provide grant application services.	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Erosion</li> <li>• Extreme Temperature</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Medium	Regional
<b>Regional Drainage Capacity Assessment</b>	<b>DESCRIPTION</b> Poor debris management, dumping, and aging critical infrastructure have contributed to poor regional drainage capacity. <b>SOLUTION</b> Develop a regional drainage capacity assessment to identify blocked culverts, ditches, and natural systems within the region.	<ul style="list-style-type: none"> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> </ul>	Local Floodplain Managers	Low	Regional
<b>Beneficial Reuse of Acquired Properties</b>	<b>DESCRIPTION</b> Flooding frequency and severity are expected to rise over the next few decades. As flood-prone properties get acquired by municipalities, development plans for the properties must be made. <b>SOLUTION</b>	<ul style="list-style-type: none"> <li>• Flood</li> <li>• Sea Level Rise</li> </ul>	Local Planning Departments	Medium	Parcel level

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
<b>Vegetated Swales in Urban Flooding Hotspots</b>	<p>Prioritize “green” development of acquired flood-prone properties to support natural watershed functioning.</p> <p><b>DESCRIPTION</b></p> <p>Chronic urban flooding is negatively impacting the structural integrity of homes, businesses, and critical infrastructure.</p> <p><b>SOLUTION</b></p> <p>Installing vegetated swales in urban flooding hotspots will prevent flood conditions from overwhelming critical infrastructure.</p>	<ul style="list-style-type: none"> <li>• Erosion</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> </ul>	Local Public Works Departments	Medium	Parcel level
<b>Regional Resilience Staff Position</b>	<p><b>DESCRIPTION</b></p> <p>Coordination of resilience activities across Eastern Carolina requires the full-time effort of a staff member within an established organization.</p> <p><b>SOLUTION</b></p> <p>A Regional Resilience Coordinator would work to support projects and secure resources for regional and local resilience initiatives.</p>	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Erosion</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Medium	Regional
<b>Regional CRS Coordination/Users’ Group</b>	<p><b>DESCRIPTION</b></p> <p>Limited knowledge of the CRS program and limited staff capabilities are preventing communities from capitalizing on the benefits of the program.</p> <p><b>SOLUTION</b></p> <p>Creating a regional CRS user group will provide support and resources to communities focused on CRS.</p>	<ul style="list-style-type: none"> <li>• Flood</li> </ul>	The Eastern Carolina Council	Low	Regional

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
<b>Regional Hazard Information Sharing</b>	<p><b>DESCRIPTION</b></p> <p>Eastern Carolina residents have expressed frustration at the lack of public information available on community-specific natural hazard mitigation strategies and documents.</p> <p><b>SOLUTION</b></p> <p>Develop a Regional Hazard Information Sharing Partnership to reduce the burden on local authorities to prepare and provide natural hazard-focused information.</p>	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Erosion</li> <li>• Extreme Temperature</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Low	Regional
<b>Multi-Jurisdictional Sheltering Collaboration</b>	<p><b>DESCRIPTION</b></p> <p>Natural hazard events produce widespread damage and can isolate communities from sheltering for several days.</p> <p><b>SOLUTION</b></p> <p>A multi-jurisdictional sheltering collaboration will provide all Eastern Carolina residents with greater access to shelter from natural disasters.</p>	<ul style="list-style-type: none"> <li>• Extreme Temperature</li> <li>• Flood</li> <li>• Sea Level Rise</li> <li>• Hurricanes and Severe Storms</li> <li>• Tornadoes</li> <li>• Wildfire</li> </ul>	The Eastern Carolina Council	Low	Regional
<b>Installation of Living Shorelines</b>	<p><b>DESCRIPTION</b></p> <p>Erosion and sea level rise are causing widespread damage to Eastern Carolina's coastal communities.</p> <p><b>SOLUTION</b></p> <p>Installing living shorelines can reduce coastal erosion while restoring and/or maintaining the shoreline's natural system.</p>	<ul style="list-style-type: none"> <li>• Erosion</li> <li>• Flood</li> <li>• Hurricanes and Severe Storms</li> <li>• Sea Level Rise</li> </ul>	Jurisdictional Planning Departments	Medium	Parcel level or watershed level
<b>Rainwater Harvesting on Farms</b>	<p><b>DESCRIPTION</b></p>	<ul style="list-style-type: none"> <li>• Drought</li> </ul>	The Eastern Carolina Council	Low	Parcel level

Project Name	Project Description	Hazards	Lead Agency	Estimated Cost	Scale
	<p>Warming temperatures and extended droughts present a challenge to the region's agricultural water supplies.</p> <p><b>SOLUTION</b></p> <p>Work with farmers to implement new or expanded rainwater harvesting systems, including rain barrels, vegetated swales, and dams.</p>	<ul style="list-style-type: none"> <li>• Extreme Temperature</li> <li>• Wildfire</li> </ul>			

## APPENDIX B: RESILIENCE SCORECARD

Category	Considerations	Program and Policy			Construction				Public Awareness and Messaging	Community Resilience	
Reduction in Risk	How many hazards are addressed? What is the probability the hazard(s) will occur?	0	0	0	0	0	0	0	1	1	1
	Does the project protect life or property or both?	1	1	1	1	0	0	0	1	1	1
	Does the project address current and future hazards?	1	1	1	1	1	1	1	1	1	1
	Does the project reduce the risk at a regional scale?	1	1	1	0	0	0	0	1	1	1
	Does the project reduce a non-climate stressor?	1	1	1	1	1	1	1	1	1	1
Scale	Is the project regional?	1	1	1	-1	-1	-1	-1	1	1	1
	Can the project be replicated?	1	1	1	1	1	1	1	1	1	1
Cost	What is the range of cost? Low (Under \$50K)? Medium (\$50k-\$1m)? High (Over \$1m)?	1	1	1	0	1	0	0	1	0	0
Benefits	Do benefits outweigh the costs?	1	1	1	1	1	1	1	1	1	1
Timeframe	How long will it take to implement the project? Short: < 5 years. Medium: 5-15 years. Long: > 15 years	1	1	1	1	1	1	1	1	1	1
Feasibility	Is the project technically and legally possible?	1	1	1	1	1	1	1	1	1	1
	Will permitting be required?	1	1	1	-1	-1	-1	0	1	1	1
	Are project sponsors identified, engaged, and have the capacity to implement the project?	0	0	0	0	0	0	0	0	1	1
	Is a funding source identified?	-1	-1	0	-1	-1	-1	-1	0	-1	-1
Socioeconomic	Does the project aid in building a strong economy?	-1	-1	1	0	1	0	0	0	1	1
	Does the project supports improving community infrastructure (e.g., road network)?	1	-1	0	1	-1	0	0	-1	0	0
Climate Justice and Equity	Does the project benefit areas with a high Social Vulnerability Index?	1	1	1	1	0	0	1	1	1	1
	Does the project have a positive, qualitative impact on populations that identify as Black, Indigenous, or People of Color (BIPOC)?	0	0	1	0	0	0	0	1	1	1
	Does the project improve health resources?	-1	-1	-1	-1	-1	-1	-1	0	0	0
Environmental Impacts	Does the project address drivers of climate change?	1	-1	1	1	1	1	1	1	1	1
	Does the project use nature-based solutions?	0	-1	0	1	0	1	0	-1	-1	-1
	Does the project provide habitat restoration for threaten and endangered species?	-1	-1	-1	-1	-1	1	1	0	0	0
Public and Stakeholder Support	Is there strong support for the project? Was it ranked as a high priority by the stakeholder partnership and community?	1	1	0	1	0	0	1	-1	0	1
TOTAL		11	6	13	7	3	5	7	12	14	15
		Regional Drainage Capacity Assessment	Multi-Jurisdictional Sheltering Collaboration	Regional CRS Support/ Users' Group	Vegetated Swales in Urban Flooding Hotspots	Rainwater Harvesting on Farms	Installation of Living Shorelines	Beneficial Reuse of Acquired Properties	Regional Hazard Information Sharing Partnership	Regional Resilience Staff Position	Regional Resilience Funding
Priority	Scoring	Total projects									
Low Priority	<1										
Medium Priority	1-3										
Medium-High Priority	4-6										
High Priority	>6										



## APPENDIX C: REFERENCES

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## APPENDIX D: EASTERN CAROLINA STAKEHOLDER PARTNERSHIP PARTICIPANT LIST

First Name	Last Name	Affiliation	Title/Role
Micajah	Anderson	Eastern Carolina Council of Governments	Transportation Planner
Jennifer	Ansell	Town of Swansboro	Planner
Matthew	Barwick	Duplin County	Emergency Management Director/Fire Marshal
Laurence	Bergman	Town of Wallace	Town Manager
Schumata	Brown	Town of Maysville	Town Manager
Tim	Buck	Pamlico County	County Manager
Cayla	Cothron	NC Sea Grant	Climate Resilience Extension Associate
Bobby	Croom	City of Goldsboro	Engineering Director
Heather	Deck	Sound Rivers	Executive Director
Frankie	Eubank	Pollocksville Volunteer Fire Department, Inc.	Asst. Chief
Denise	Evans	Seymour Johnson Air Force Base	Community Planner
B.J.	Eversole	Down East Rural Planning Organization	Director
Eryn	Futral	Department of Public Safety, Risk Management	NFIP Eastern branch Planner
Steve	Garrett	North Carolina Emergency Management	State NFIP Coordinator
Lariza	Garzon	Episcopal Farmworker Ministry	Executive Director
Rachel	Gittman	East Carolina University	Assistant Professor
Choci	Gray	1901 Building Group	Artist / CEO
Catherine	Grimm	Town of Tarboro	Planning Director
Leila	Hajibabai	North Carolina State University	Assistant Professor
James	Harper	Jones County	Jones County Commissioner
Paul	Ingram	Jones County Government	Building Inspector/ Floodplain Administration
Jimmy	Johnson	Albemarle-Pamlico National Estuary Partnership	Coastal Habitats Coordinator
Michael	Jordan	Maysville Fire and EMS	Chief
Brian	Joyner	Seymour Johnson Air Force Base	Base Civil Engineer
First Name	Last Name	Affiliation	Title/Role
Carolyn	Kenyon	Town of Faison	Mayor
David	Landcaster	Greene County Emergency Services	Fire Marshal/EM Coordinator
Jay	Levine	NC State University	Professor of Epidemiology and Public Health

Carmen	Lombardo	Camp LeJeune Marine Corps Base	Deputy AC/S, G-7, MCIEAST
Brooke	Massa	NC Wildlife Resources Commission	Land Conservation Biologist
Kimberly	Maxey	New Bern Area Metropolitan Planning Organization (NBAMPO)	Administrator
Felicia	McRee	New Bern Area MPO	MPO Planner
Diane	Miller	Town of Oriental	Town Manager/Land Use Administrator
Amanda	Ohlensehlen	City of New Bern	Community & Economic Development Manager
Ann	Pike	Jones County Health Department	Nursing Supervisor
Derrick	Remer	Duke Energy	District Manager   Government and Community Relations
Maria	Robles	Town of Pollocksville	Town Commissioner
Juvencio	Rocha Peralta	Association of Mexicans in North Carolina in North Carolina, Inc. (AMEXCAN)	Executive Director
Dan	Ryan	Town of Maysville	Commissioner
Rick	Savage	Carolina Wetlands Association	Executive Director
Jennifer	Sawyer	Carteret County Emergency Services	Emergency Management Coordinator
Robert	Sherman	City of Goldsboro	WRF Superintendent / Interim Public Utilities Director
Adam	Short	Lenoir County Government	Assistant County Manager & Planning Director
Adrian	Smith	Jones County Health Department	Public Health Education Specialist
Sarah	Spiegler	NC Sea Grant	Coastal Resilience Specialist
Elizabeth	Stalls	Duplin County	Planning Director
Zachary	Steffey	Town of Cape Carteret	Town Manager
Deanna	Trebil	Jacksonville MPO	MPO Administrator
Wendy	Winslow	Jones County Department of Social Services	Director

First Name	Last Name	Affiliation	Title/Role
Karen	Amspacher	Core Sound Waterfowl Museum and Heritage Center in Harkers Island	Executive Director
Martin	Korenek	Marine Corps Installations East G-7	Regional Strategic Planner, Government and External Affairs
Rhonda	Murray	MCAS Cherry Point	
Ethan	Brogden	MCAS Cherry Point	
Brian	Vaughn	NC State University	Design and Resilience Liaison
Tom	Potter	NC Foundation for Soil & Water Conservation	Projects Manager