DOWN EAST CARTERET COUNTY RESILIENCE STRATEGY

North Carolina Resilient Coastal Communities Program

JUNE 2025

Dewberry

SUBMITTED BY

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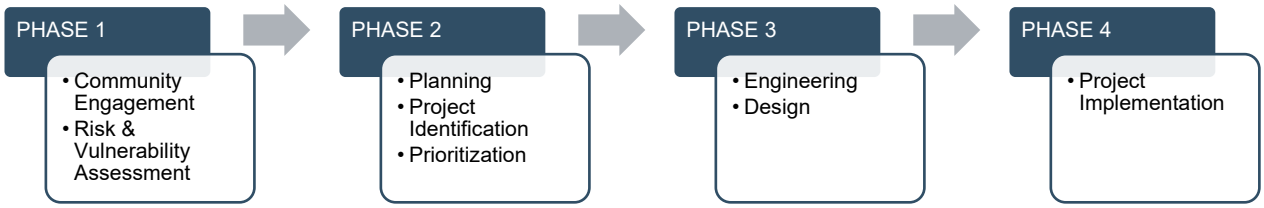
Summary

The Resilient Coastal Communities Program (RCCP) is a grant program administered by the North Carolina Division of Coastal Management (NCDCM). The program's objectives are to address barriers to coastal resilience in North Carolina, to assist communities in the preparation of risk and vulnerability assessments, the development of projects to address community risks, to advance coastal resilience projects to construction, and to link communities to funding streams for project implementation. The RCCP emphasizes the identification of, and outreach to, traditionally underserved communities and the incorporation of natural or nature-based solutions (NNBS) to address community vulnerabilities. The phases of the RCCP are illustrated below.

Figure 1. RCCP Phases



Carteret County was selected in 2023 to participate in Phases 1 & 2 of the RCCP. This Resilience Strategy focuses on Down East Carteret County, an area frequently impacted by flooding and other coastal hazards.

Phases 1 and 2 of the RCCP included the preparation of a Risk and Vulnerability Assessment (RVA), community engagement, and the development of a Project Portfolio with project recommendations to address community vulnerability to coastal hazards. The entire effort was guided by the input of a Community Action Team (CAT) comprised of members of the Down East community.

Using the Risk and Vulnerability Assessment and knowledge of previous flooding and other coastal hazard events, the CAT identified areas throughout Down East Carteret County at risk for flooding and other hazards. While flooding from major storm events, such as hurricanes and tropical storms, cause damage to private properties and community infrastructure, more frequent heavy rainfall events also impact these areas.

The information gathered during Phase 1 of the process was used to develop an initial list of project recommendations, which were prioritized and further detailed based on feedback from the CAT and the public. Fifteen projects (or project types) are recommended in the Project Portfolio, presented in Appendix D of this report. A drainage inventory and condition assessment is recommended as the top priority in the portfolio, as it would provide data needed to scope and prioritize improvements to drainage infrastructure throughout the Down East region. However, the portfolio also includes recommendations on emergency preparedness and community outreach that would provide important resources for Down East communities before and after hazard events. Implementation of any of the projects in the portfolio may be funded under later phases of the RCCP or through other federal, state, or local resilience programs.

The enclosed report provides a more in-depth look at the RCCP process and the major outcomes of the effort.

1. Community Overview

1.1 Community Description

Carteret County is situated in southeastern North Carolina, extending from the White Oak River to the Pamlico Sound and includes both inland and barrier island communities. The area known as "Down East" Carteret County encompasses the peninsula in the eastern portion of the County between the western limit of Adams Creek and North River and the unincorporated community of Cedar Island to the east. This low-lying region of the County is surrounded by the Neuse River and Core Sound, with multiple rivers and creeks as well as an extensive network of salt marshes and wetlands that drain into these waters. Down East is separated from the Atlantic Ocean by multiple barrier islands that are part of the Cape Lookout National Seashore.

Figure 2. Down East Assessment Area

Down East is populated by a series of small unincorporated communities, most of which are located along U.S. 70 and N.C. 12, which follow a route along the southern and eastern border of the peninsula. These communities include Otway, Straits, Harkers Island, Gloucester, Marshallberg, Smyrna, Williston, Davis, Stacy, Sea Level, Atlantic, and Cedar Island. Three communities are located on the western and northern portions of the peninsula, North River, Merrimon, and South River.

Publicly-owned facilities in this region include transportation and utility infrastructure, a regional library, multiple community fire departments, schools, and several waste collection stations. The N.C. Department of Transportation (NCDOT) operates a ferry terminal at Cedar Island that serves the Cedar Island – Ocracoke ferry. A Marine Corps Outlying Landing Field is located in Atlantic, and the Cedar Island National Wildlife Refuge is located along N.C. 12 between the communities of Atlantic and Cedar Island.

Figure 3. North River Fire Department

For the purpose of this resilience strategy, the Down East assessment area includes the entire peninsula that extends between the North River and

Cedar Island communities. It does not include the barrier islands within the Cape Lookout National Seashore, nor is the Cedar Island National Wildlife Refuge included in the assessment.

1.2 Community Resilience Challenges

Figure 4. Sunny Day Flooding in Davis

Down East experiences flooding from storms and other heavy rainfall events, impacting both public infrastructure and private property. According to Down East residents, street flooding has impacted the ability to access property or to travel to/from work and other destinations, sometimes for days following an event. As U.S. 70 and N.C. 12 provide the only roadway connections to the rest of Carteret County, flooding impacts resident evacuation, emergency access, and infrastructure restoration. While flooding impacts all of Carteret County, the impacts are especially significant in the Down East region, as the lower elevations and infrastructure condition increases the time needed for floodwaters to recede. Down East is more likely to be isolated following these events; community members have noted the effects of this isolation on vulnerable populations such as elderly residents as well as children who may miss school when roadways are impassible. In addition, vital community resources, including public services and cultural features (churches, cemeteries), have experienced damage from continual flooding, leading residents to consider long-term options for these facilities.

Drainage in the Down East region is provided through a series of roadside culverts and ditches, which connect to ditches and outfalls typically located on private property. Maintenance of drainage facilities within transportation right-of-way are the responsibility of NCDOT, while maintenance of ditches and outfalls on private property can only be conducted with the permission of the property owner. Carteret County received an appropriation from the state legislature in 2023 for a one-time effort to remove debris and clean out outfalls throughout the County, but further funding, as well as coordination with private property owners, will be needed to maintain these facilities on a regular basis.

Due to the impacts of repetitive flooding and other coastal hazards, Down East has been the focus of several university-level research studies, community engagement initiatives, and natural resource planning efforts funded through federal, state, or local grant and research programs. These studies and programs have provided for data collection, community discussions related to continued resilience and the emergency preparedness needs of Down East residents, and opportunities to identify natural resource preservation and enhancement projects that would increase community resilience. Each of these studies and programs have provided opportunities for continuing conversations about resilience with Down East residents; however, these efforts have resulted in limited infrastructure improvements to date, as funding for potential improvements has been minimal.

1.3 Community Vision and Goals

Based on feedback from the County and from the Community Action Team (see Section 2.0), the community vision for Down East is ***to build the region's long-term resiliency to flooding and other coastal hazards, ensuring that Down East has the infrastructure needed to serve its residents and providing continued access to and from Down East communities following storm events***. To achieve this vision, community goals include **developing and improving existing infrastructure**, **ensuring that residents have the needed resources** to prepare for and recover from storms, and to **continue the conversation on resilience** both within the community and with partners at the local, state, and federal levels of government.

Community Vision

To build the region's long-term resiliency to flooding and other coastal hazards, ensuring that Down East has the infrastructure needed to serve its residents and providing continued access to and from Down East communities following storm events.

Community Goals

1. *Developing and improving existing infrastructure*
2. *Ensuring residents have needed resources*
3. *Continue the conversation on resilience*

2. Community Action Team

The Resilient Coastal Communities Program (RCCP) requires each community to establish a multi-disciplinary Community Action Team (CAT), to be composed of diverse stakeholders who will provide input throughout the RCCP process. The CAT also works to help engage the community at-large to ensure broad community participation in the RCCP. Under-represented communities should be reflected in the CAT and in community engagement efforts. Carteret County established the CAT for this effort through input from County staff and the Board of Commissioners. The membership of the CAT, which included six residents representing several of the Down East communities, is listed in **Table 1**.

Table 1. Community Action Team

COMMUNITY ACTION TEAM	
NAME	REPRESENTING
Sherman Goodwin	Cedar Island
Dean Smith	Atlantic
Harry Taylor	Sea Level, Stacy
Barry Guthrie	Harkers Island
Tony Cahoon	South River
Trey Rivenbark	North River

In addition to the membership, representatives from the NC Division of Coastal Management (NCDCM), the NC Department of Recovery and Resiliency (NCORR), and North Carolina Sea Grant attended each CAT meeting to answer questions and provide insight on other state and regional resilience efforts that would be relevant to the RCCP effort.

Meetings of the CAT were held in March, July, and September 2024 and again in March 2025; a summary of each meeting is included in **Appendix A**. At each meeting, the CAT provided insight on historic hazard planning efforts, infrastructure needs, and community sentiment pertaining to coastal hazards. In the initial discussions, the CAT described previous experience

with flooding events, noting the challenges experienced following heavy rainfall and coastal storms.

Throughout the Down East region, there are several active community groups and committees, which the CAT and County staff recommended utilizing during the community engagement process. The CAT recommended working directly with communities to join planned community meetings or to schedule separate events. The CAT also provided recommendations on the approach to these meetings and ways to advertise to reach the broadest audience possible, including utilizing Facebook groups and distributing announcements at local churches. The community engagement effort is detailed in **Section 3.0**.

The CAT provided feedback on the initial findings of the Risk and Vulnerability Assessment (RVA), noting additional road segments that experience flooding and other areas of inadequate drainage. A summary of the RVA is provided in **Section 5.0**.

Following the completion of the RVA, the CAT reviewed and provided insight on the prioritization of the projects to be included in the project portfolio. As discussed in **Section 6.0**, a drainage inventory and assessment, groundwater well installation and monitoring, and continued ditch clearing and maintenance were identified as top community priorities; additional projects seen as community priorities in the project portfolio and recommended for implementation were resizing culverts and the funding for a community liaison.

3. Community Engagement Strategy

The RCCP community engagement strategy utilized both in-person and online public outreach opportunities to provide the broadest audience possible an opportunity to participate. Four in-person public events were held for RCCP:

- The first public meeting, held on April 21, 2024, was conducted as a part of an existing community meeting at the Sea Level Fire and Rescue. At the meeting, the RCCP project team was available to gather community feedback on the types of coastal hazards that impact Down East and the areas typically impacted by hazards. A map was available for attendees to indicate areas of concern.
- A Community Open House and Storm Preparation Roundtable event was held at the Core Sound Waterfowl Museum on Harkers Island on May 30, 2024. Hosted by the Museum, the purpose of the event was to provide information and resources to community members on storm preparation, as well as gather feedback on the types of coastal hazards impacting Down East and the areas typically impacted by the hazards. The RCCP project team participated in the Open House portion of the event, answering questions about the

Figure 5. Harkers Island Public Meeting 5/30/24

RCCP and gathering feedback. Copies of the public survey were available as well as a map for attendees to indicate where hazards and damage had been witnessed.

- The RCCP team participated in a community meeting with members of the North River community at Mount Tabor Missionary Baptist Church on July 13, 2024. The RCCP team gave a presentation about the purpose of the RCCP and guided participants through a series of questions about the community's experiences with coastal hazards. The public survey, along with maps of the community, were available to participants to provide more detailed feedback.
- On November 13, 2024, an open house event was hosted at the Down East Scout Center in Davis. The purpose of the event was to hear from the community about their experience with coastal hazards and to gather feedback on potential projects to mitigate these impacts. Participants were guided through three stations and asked to provide feedback on locations and the types of hazards experienced, preferences on the types of projects preferred, and the locations of proposed improvements. A survey was also available for attendees to fill out during or after the meeting.

Figure 6. North River Community Meeting 7/13/24

A separate survey was prepared for Phases 1 and 2 of the RCCP; the Phase 1 survey was available at the first three public meetings, while the Phase 2 survey was provided at the November 13th meeting in Davis. Additional copies of each survey were provided to the County and to community representatives in order to encourage as broad participation as possible. While an online version of the Phase 1 survey was created, there was no response to this version; all survey input was collected from the hard copy version. Responses to the hard copy version of the survey were collected at each event and could also be submitted to the project team via email or mail. In total, the project team received 38 responses to the Phase 1 survey and 25 responses to the Phase 2 survey. A copy of the surveys and other public engagement materials, along with summaries of all the comments received, are included in **Appendix B**.

Figure 7. Davis Community Public Meeting 11/13/24

Due to the strong community groups present in the region, the in-person events were well attended. Flooding was the major concern noted by survey respondents, and projects that would address stormwater infrastructure on neighborhood streets, such as clearing ditches and increased sizing of culverts, were the most frequent recommendations. Respondents noted locations throughout Down East that would benefit from infrastructure upgrades.

4. Review of Existing Local and Regional Plans

Table 2 summarizes the previous plans prepared at the County or regional level that apply to the RCCP.

Table 2. Existing Local and Regional Plans

EXISTING LOCAL AND REGIONAL PLANS		
YEAR	TITLE	DESCRIPTION
2017	Hurricane Matthew Resilient Redevelopment Plan-Carteret County	Identifies county-wide need for recovery and redevelopment from Hurricane Matthew.
2020	North Carolina Climate Risk Assessment & Resilience Plan Appendix D	NCDCM and NC Coastal Federation invited public, private and non-profit partners to learn how communities and the science community are measuring and managing changes exacerbated by climate change.
2020	Pamlico Regional Hazard Mitigation Plan	Includes hydrology data, demographics, housing characteristics and land development trends for Beaufort, Carteret, Craven, Hyde and Pamlico Counties. The plan looked to identify, assess, and mitigate hazards risk to better protect people and property in the area by developing a mitigation action plan.
2021	White Oak River Basin Water Resource Plan	Basin-wide planning is a watershed-based approach to identify areas across the state where water resource concerns should be addressed. The planning process identifies areas that need additional protection, restoration, or preservation to ensure waters of the state are meeting their designated use. This Basin Plan reflects the planning process and serves as a summary document for the river basin.
2022	Carteret County CAMA Land Use Plan	Outlines how Carteret County should manage development within designated Areas of Environmental Concern.
2023	National Risk Index-Carteret County	Risk data for Carteret County related to natural disasters.
2025	Pamlico Sound Regional Hazard Mitigation Plan	Includes hydrology data, demographics, housing characteristics and land development trends for Beaufort, Carteret, Craven, Hyde and Pamlico Counties. The plan looked to identify, assess, and mitigate hazards risk to better protect people and property in the area by developing a mitigation action plan.

* The Transportation Planning Division of NCDOT, along with Carteret County and the Down East Rural Planning Organization were in the process of developing the Carteret County Comprehensive Transportation Plan (CTP) at the time this report was completed.

5. Risk and Vulnerability Assessment

As outlined in the RCCP Handbook (December 2023), a Risk and Vulnerability Assessment (RVA) was conducted to evaluate the susceptibility of critical built and natural infrastructure in the Down East region to coastal hazards. The assessment process and results of the RVA are summarized on the following pages, and the full report is included in **Appendix C**.

Previous studies pertaining to vulnerability or risk and/or highlighting critical assets were used as a starting point for the RVA. Process steps included the following:

- Identify and Map Hazards
- Assess Vulnerability
- Estimate Risk

Hazards identified in the RVA included storm surge, coastal flooding, fluvial flooding and wildfires. Pluvial flooding was qualitatively described in the assessment but was excluded in the RVA due to a lack of available data. Subsidence and other groundwater effects were also excluded from the RVA. Even though excluded from the RVA, pluvial flooding and subsidence are important factors and worth consideration when evaluating potential projects. The vulnerability assessment includes an individual examination of each hazard as well as a discussion of cumulative hazard vulnerability.

Vulnerability and risk scores are assigned for several categories of public and natural infrastructure with the limits of the Down East assessment area, including the following:

- **Critical Built Infrastructure** includes the physical structures that house or perform essential functions to maintain government operations and are essential to human health and safety or economic safety. This can include Town Halls, emergency facilities, schools, and libraries.
- **Critical Network Infrastructure** includes networks that support the continuous operation of government and business functions and are essential to human health and safety or economic safety. Network infrastructure can include publicly-owned transportation facilities (roadways, bridges, greenways) as well as utility infrastructure (water, sewer lines and associated facilities).
- **Natural Assets** are lands actively managed to serve specific community needs, such as growing food, recreational space, and support for local ecosystems. Vulnerability is evaluated based on loss of functionality.
- **Natural Infrastructure** consists of naturally occurring landscapes and systems that perform ecosystem services that benefit nearby communities, such as flood protection or abatement, erosion control, and water purification. Vulnerability is evaluated based on loss of habitat.

As outlined in the RCCP Handbook, Vulnerability and Risk scores are calculated for each identified asset using the following formulas:

Figure 8. Components of Vulnerability

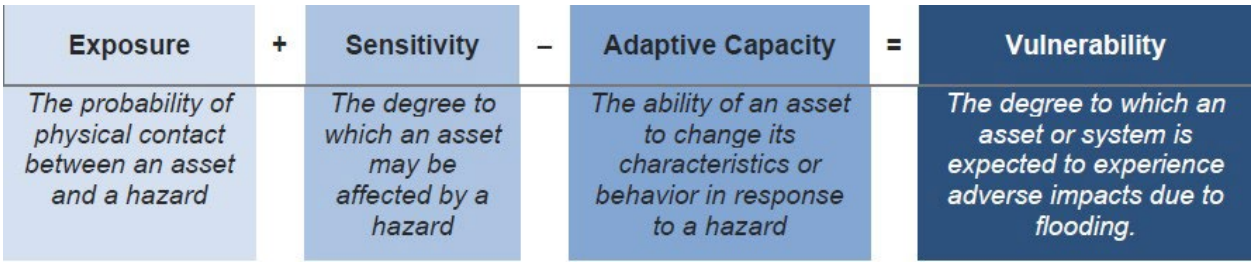
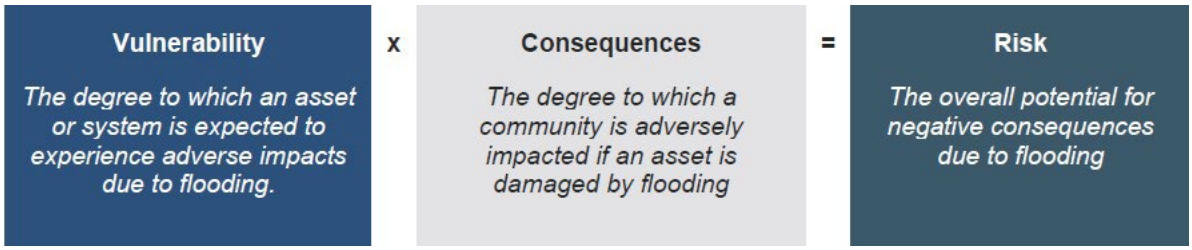


Figure 9. Components of Risk



The assessment assigned risk scores for both present-day and future conditions, relying on the present-day and future cumulative hazard vulnerability scores developed for each asset. As illustrated in **Figure 10** (present-day conditions) and **Figure 11**(future conditions), key findings of the RVA include:

- Critical building infrastructure assets with the highest risk scores are the Atlantic Compaction Station, Highway 101 Compaction Station, and Otway Compaction Stations, with a risk score of 3 (moderate risk). Under future conditions, the Davis Compaction Station, Down East Fire & Rescue, East Carteret High School, and South River Compaction station also have risk scores of 3.

- Segments of U.S. 70, N.C. 101, and N.C. 12 have the highest risk scores for network infrastructure, with a risk score of 2 (low risk). The majority of roads, sidewalks and trails have a risk score of 1 (very low risk). This score does not account for service disruptions (i.e., access to critical facilities).

- No natural assets have high risk scores; many agricultural land parcels and Manley Gaskill Park have risk scores of 2 (low risk) under future conditions.

The RVA includes recommendations for future study or further refinement of this assessment, including the incorporation of more specific building characteristics, modeling impacts to natural infrastructure, conducting a pluvial flood analysis of Carteret County specific to the Down East region, and consideration of additional climate-influenced hazards included in the 2020 Pamlico Sound Regional Hazard Mitigation Plan.

Down East

Down East Overview

Present Day Risk Scores

Legend

Present Day Risk Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

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Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

Down East

Down East Overview

Future Conditions Risk Scores

Legend

Future Conditions Risk Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

6. Project Portfolio

Utilizing input from the Risk and Vulnerability Assessment (RVA), feedback from the public, and input from the CAT, a list of projects to address specific coastal hazards and recommended locations was developed. The Project Portfolio, detailed in **Appendix D**, lists the following information on each project:

- Project title and description
- Anticipated cost and needs addressed
- Funding status
- Natural or Nature-Based Solution (NNBS) opportunity
- Project timeline and priority

Factors considered in the development of the Project Portfolio include:

- Inclusion of natural or nature-based solutions (included in the RCCP criteria)
- The need(s) addressed and the scope of the project's benefit
- Project implementation timeline (i.e., an emphasis on shovel-ready projects)
- Other potential funding sources for the project
- Community input and support

Table 3 highlights the top five project priorities included in the Portfolio; the complete Portfolio, including detail sheets on each project, is included in **Appendix D**.

Table 3. Priority Projects

PRIORITY PROJECTS	
PROJECT	**DESCRIPTION**
Drainage Inventory and Condition Assessment	Survey location and document condition of all drainage features, including ditches, outfalls, and culverts. Create location and condition database for use in future assessments and in maintenance planning.
Groundwater Well Installation and Monitoring	Install and monitor groundwater wells in each community to identify groundwater table elevation and changes experienced after storm events
Ditch Clearing/ Maintenance	Clear debris from, and potentially widen/deepen, ditches in select locations to facilitate roadway drainage.
Resizing Culverts	Resize culverts to facilitate water flow underneath roadway infrastructure.
Community Liaison	Hire a paid staff member who would be a trusted local resident who could serve as a conduit between government resilient programming and the community.

7. Conclusion and Lessons Learned

The community engagement process provided valuable insight on the extent of infrastructure impacts caused by coastal hazard events and the community's ability to adapt to these impacts in the absence of infrastructure improvements. Named storms, such as Hurricane Florence, and pluvial rainfall events that are increasing in frequency and intensity are impacting daily life on a regular basis, jeopardizing access to jobs, services, and education for Down East residents.

The initial Risk and Vulnerability Assessment (RVA), which used available data on storm events, sea level rise scenarios, roadway vulnerability, and asset condition, yielded results that were consistent with community experience and CAT input. Qualitative discussion of localized flooding events helped capture the commonly cited hazards experienced in Down East; however, a more robust localized rainfall dataset would be helpful to model the impact of these events on community assets.

The RCCP process provided Carteret County an opportunity to build upon previous regional planning efforts and to establish a Project Portfolio specific to the Down East region, creating opportunities for future project funding and implementation. Potential funding sources include Phases 3 and 4 of the RCCP, which funds the engineering and construction, respectively, for projects that meet specific identified community needs. As not all of the projects identified in this process will be eligible for funding under the RCCP, other potential funding opportunities at the federal, state, and local level have been identified to the extent possible.

The Project Portfolio includes data collection, infrastructure improvements, emergency preparedness, and community education and outreach projects intended to address a variety of community concerns and coastal hazard issues. While the infrastructure improvement recommendations represent viable options for the Down East region, the data collection efforts should be prioritized for further funding, as these projects will provide specific insight on infrastructure condition and system hydrology that will be critical to determining the appropriate location and scope for specific infrastructure improvements. Because this data was not available during development of this resilience plan, recommendations on specific project locations were not included. Completion of the drainage inventory and condition assessment and the groundwater monitoring should also provide insight on opportunities to incorporate natural or nature-based solutions into future infrastructure projects, in keeping with the goals of the RCCP.

Regardless of the timeline and scope of future infrastructure improvements, continued community conversations about resilience to coastal hazards and their impacts is strongly recommended. The increasing frequency and intensity of these events has prompted extensive informal and formal discussions about resilience throughout Down East, with residents eager to share their experiences and recommendations for increasing community resilience. Continued engagement between Down East communities and the Carteret County government is recommended to continue these discussions on resilience and the long-term solutions to coastal hazards, with the support of appropriate federal and state agencies, non-profit organizations, and community liaisons as appropriate.

Acknowledgements

We would like to thank the Carteret County staff for its efforts associated with the development of this report and the Project Portfolio. In particular, we would like to thank the members of the Community Action Team for their honest feedback on the community's needs and guidance on how to engage the community during this process. We also thank the N.C. Division of Coastal Management, as well as the N.C. Sea Grant and N.C. Office of Recovery and Resiliency, for the guidance and insight they provided throughout this process.

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APPENDIX A

COMMUNITY ACTION TEAM MEETING SUMMARIES

JUNE 2025

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DOWN EAST CAT MEETING #1 DISCUSSION

MEETING DATE: March 19, 2024

TIME: 11:00 a.m.

LOCATION: Carteret County offices, 210 Turner Street, Beaufort

PURPOSE: Down East Resilient Coastal Communities Program Community Action Team Meeting –Discuss Threats to Community Resilience

SUMMARY DATE: June 27, 2024

ATTENDEES: Sherman Goodwin, Harry Taylor, Barry Guthrie, Tony Cahoon, Trey Rivenbark, Gene Foxworth, Arrington Moore, Kasen Wally, Kara Guthrie, Holly White, Sarah Spiegler, Beth Smyre, Joseph McIver (*Not present: Dean Smith*)

Discussion Topics

1. **Threats/Challenges to Community Resilience:**

   The CAT was asked to provide thoughts on what coastal or climate hazards represented a threat or challenge for the Down East region. The following threats and challenges were discussed, organized here by topic/theme:

   - Drainage:
     - Storm surge is a problem, primarily due to the time it takes for the water to recede. Ditches and outfalls are not regularly cleaned, preventing the water from clearing out quickly.
       - Suggestion is for a master permit for ditch/outfall clearing, allowing county to clean these as needed; the permitting process prevents this from occurring regularly.
     - Regular/non-storm rainfall events are causing ponding at homes; problem has worsened over the last 20 years. Water can remain for days at a time.
     - Most of the state-maintained ditches are smaller than those on private property.
     - Outlets are the main issue.
     - NCDOT hasn't cleaned the ditches on Harkers Island over the last 20 years, unlike before that time. Property owners are told not to fill the ditches but won't clean them.
     - Inadequate drainage, because of clogged outfalls, has led to saltwater intrusion that has killed a lot of trees.
     - New construction has filled in a lot of ditches and forced runoff to adjacent properties that relied on the ditches to remove water.
     - Gene has been working with NCDOT to get funding for regular drainage clean-out, whether through a direct appropriation or other mechanism.
   - Hazard Types:
     - Eye-opening events are the once-a-month rainfall events.
     - Will always get storm surge from a hurricane. There have been more tidal fluctuations since Ophelia; seeing tides from both directions.
   - Impact Examples/Locations:
     - Main impact is on kids missing school (through delays or cancellations for eastern portion of the county). Other residents drive through the water where possible.

    - Tidewater was on the road this morning
    - Campground in Sea Level purchase was impacted once potential buyers learned of flooding.
    - Cedar Island – ¼-mile section that especially floods.
    - People will be able to tell us the locations of smaller/neighborhood streets that flood (during the public outreach process).
    - North River- east side at Ralph Taylor's.
- County is working on CTP; Gene recommended that we pull together priority list of potential street improvements. Would need the list within the next 60 days.

2. **Community Engagement Strategy:**

   <u>What techniques (in-person meetings, virtual options) would be the most effective at getting feedback?</u>

- Recommended that the team go to each community, working with a community host.
- 4-5 meetings recommended, look at fundraisers and other events.
- Facebook page could be used to advertise events; could also use local groups to advertise. Groups noted include Carteret County Traffic, Carteret County Anything But Traffic, Sea Level Cemetery Association
- Could also pass out materials at churches.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Schedule Public Engagement event(s)	Dewberry	4/1/24	Underway
Provide feedback on Meeting #1 discussion	CAT	4/15/24	Complete
Schedule second CAT meeting	Dewberry	6/1/24	Complete

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DOWN EAST CAT MEETING #2 DISCUSSION

MEETING DATE: July 23, 2024

TIME: 11:00 a.m.

LOCATION: Carteret County offices, 210 Turner Street, Beaufort

PURPOSE: Down East Resilient Coastal Communities Program Community Action Team Meeting – Gather Input on Hazard Experience and Begin Discussion on Potential Resilience Projects

SUMMARY DATE: April 10, 2025

ATTENDEES: Tony Cahoon, Trey Rivenbark, Barry Guthrie, Sherman Goodwin, Gene Foxworth, Mackenzie Todd, Kasen Wally, Sarah Spiegler, Beth Smyre, Ellie Hair (Not present: Harry Taylor, Dean Smith,)

Discussion Topics

1. **Review of Public Meetings:**
   The group discussed the feedback received during the previous three outreach events regarding coastal hazards faced by the Down East region and the CAT was asked to provide additional thoughts on coastal hazards Down East faces. The following threats and challenges were brought up for discussion:

   - Widespread flooding on roads and throughout neighborhoods.
   - Encroaching sea level.
   - What should be done regarding emergency supply storage?
   - Concern regarding fallen trees on structures and roads.
   - Issues with existing ditches in the area; many of them drain poorly, are constantly filled with water, or have been filled up by new residents.

   The discussion focused on which one of these issues was the highest priority. Flooding was seen as the predominant issue with many of the others of a more tertiary nature. Suggestions were made of incorporating Nature Based Solutions (NBS) to deal with flooding in contrast to the continued digging of ditches. The suggestion was brought forth of the creation of an inventory drainage and drainage assessment to help inform the county of where the predominant issues are located and get a better understanding of the current infrastructure.

2. **Project Recommendations:**

   The project team wanted to start preliminary conversation on what types of projects the county and CAT wanted to see in the region. The following suggestions were made:

   - Areas of Down East, such as Wilson, Davis and Sea Level, are in need of bigger and innovative ideas. Suggestions were made to try and build out marshes and other nature-based solutions to help the area deal with storm surge and other coastal hazards.

- Identified problem areas
    - Area by the high school, North River Rd, Lower Rd, East Carter and Tom's Farm by Bridge Creek
    - Ophelia Inlet has become much deeper and is experiencing saltwater intrusion with more saltwater species being found in the inlet's waters.
- Discussion of incorporation of resilience tactics to road project being integrated into the Comprehensive Transportation Plan which is being updated currently.

3. Future Public Meetings:

The group explored which dates, times, and locations would be best for the 4th public meeting. The group suggested Thursday at the Boy Scout Facility in Davis. The group recommended including an educational piece along with the presentation to help residents get a better understanding of the projects being suggested and their benefits. Looking for the next stakeholder meeting to be in mid-August and public meeting to be in late October.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Provide project ideas and corresponding educational pieces	Dewberry	10/30/24	Underway
Provide Dewberry with stream documentation, Comprehensive Transportation Plan, and Completed Project map	Carteret County	9/1/24	Underway

Dewberry

DOWN EAST CAT MEETING #3 DISCUSSION

MEETING DATE: September 30, 2024

TIME: 11:00 a.m.

LOCATION: Carteret County offices, 210 Turner Street, Beaufort

PURPOSE: Down East Resilient Coastal Communities Program Community Action Team Meeting –Discuss Proposed Projects to Address Community Resilience

SUMMARY DATE: October 4, 2024

ATTENDEES: Harry Taylor, Barry Guthrie, Tony Cahoon, Gene Foxworth, Gregg Hartman, Mackenzie Todd, Kasen Wally, Sarah Spiegler, Beth Smyre, Ellie Hair (*Not present: Dean Smith, Sherman Goodwin, Trey Rivenbark*)

Discussion Topics

1. Initial Project Portfolio Recommendations:

The CAT was provided an initial list of project recommendations for review. Projects were divided into three categories: Data Collection/Planning, Infrastructure, and Emergency Preparedness. The projects discussed, along with comments received during the discussion, are summarized below.

Data Collection/Planning:

Groundwater well installation and monitoring: Install and monitor groundwater wells in each community to identify groundwater table elevation in frequent flooding areas.	
Drainage inventory and condition assessment: Survey location and document condition of all drainage features, including ditches, outfalls, and culverts. Create location and condition database for use in future assessments and in maintenance planning.	- This should be the top priority on this list, as it helps staff to go back for funding for specific infrastructure improvements. - When this is being performed, encourage working with local residents in each community to help identify ditches that can't be found (plan to spend a day in each community to ground truth everything) - Note in the description that this work could lead to nature-based solutions (to meet requirement)
Septic system alternatives assessment: Develop alternative recommendations for the replacement/upgrade to existing residential septic tanks threatened by flooding or other hazards.	

- The County also wants to look at installing tide gauges and consider the success of the existing gauges (example, at Crab Point Inlet). NC Sea Grant has funds for communities for installation of low cost tide gauges.

Infrastructure:

Ditch clearing/maintenance: Clear debris from, and potentially widen/deepen, ditches in select locations to facilitate roadway drainage.	- Recommend removing "Facilitate roadway drainage" from the description- this is one purpose, but there could be other benefits.
Pump system: Install pump system to help water flow at ditches/outfalls during heavy rainfall events.	- The County's main concern is the maintenance of pump stations; any project item should include a maintenance plan and funds for continued maintenance. Maintenance duties will

	need to be assigned, preferably to an entity other than the County.
Tide gates: Install tide gates at ditch/outfall locations to prevent backflow onto roadway infrastructure.	- Maintenance of these facilities is big issue; County has concerns for the continued cost and staff commitment.
Detention pond construction: Construct detention pond(s) to capture excess runoff during heavy rainfall events. (Initial location identified at East Carteret High School.)	- Option for incorporating NNBS components into this project.
Culvert sizing: Resize culverts to facilitate water flow underneath roadway infrastructure.	- Comment noted that it would be good to know how many have been replaced over the years.

- **Other Suggestions:** Raise roadway (specifically NC 12 within Cedar Island) and offshore barrier (east of Cedar Island). These options can be added to the project list, but there is a concern that other communities outside of Cedar Island would want to see these options implemented.

Emergency Preparedness:

Emergency preparedness public outreach: Develop emergency preparedness materials to distribute pre-storm (door hanger format, etc.) for each community to understand evacuation procedures and shelter options, emergency preparedness awareness, and emergency contact information. Redistribute information annually in conjunction with community outreach sessions.	- Recommended that the program include identifying resources for raising homes. - The County currently sends out a Flood Tips brochure every year with tax bill.
Danger tree clearing program: Identify and remove trees that could impact emergency facilities, community resources, or other infrastructure during high wind or other storm events. Identify potential funding sources for private property owners to remove dead trees that could impact infrastructure.	
Emergency shelter: Construct storm-resilient structure for emergency sheltering and supply storage; include raised area to allow for resident parking.	- While this is a good goal and should be on the list, realize that there are challenges associated with locating, constructing, and maintaining these facilities (to get rated, etc.). - Recommended breaking out this project into emergency storage vs. sheltering elements. - Issue will be access to the shelter. - A location as far east as possible should be considered to provide for communities most threatened by flooding. Construction of a primary Down East shelter and satellite shelters could be considered.

Fire Department protection measures: Elevate structure and/or install operational gates that could be closed during tidal flooding events.	- The County has applied for a BRIC grant to construct new station at Sea Level at a location high enough ground for vehicles.
High water rescue vehicle: Purchase high water rescue vehicle(s) to be stationed at community staging areas/fire departments in advance of flood events.	- The County has one that is staged wherever it is needed. Harkers Island also has one. - The County is open to having more available.

- **Overall feedback:** The list represents a good start; feedback from the public will be important to add ideas and prioritize this list. NCDCM would like to see more natural or nature-based solutions (NNBS) included in the list.

2. Next Public Meeting:

- Confirmed that the preference is to use the Boy Scout facility in Davis for this meeting. It can be held in the late afternoon/early evening based on the availability of the facility.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Schedule Public Meeting	Dewberry	10/15/24	Underway
Provide feedback on Meeting #3 discussion	CAT	10/15/24	Underway
Hold Public Meeting	Dewberry	11/15/24	Underway

Dewberry

DOWN EAST CAT MEETING #4 DISCUSSION

MEETING DATE: March 26, 2025

TIME: 11:00 a.m.

LOCATION: Carteret County offices, 210 Turner Street, Beaufort

PURPOSE: Down East Resilient Coastal Communities Program Community Action Team Meeting – Final Discussion of Proposed Projects to Address Community Resilience and Draft Report

SUMMARY DATE: March 27, 2025

ATTENDEES: Harry Taylor, Gregg Hartman, Kasen Wally, Sarah Spiegler, Beth Smyre, Zachary Lang (Not present: Dean Smith, Sherman Goodwin, Trey Rivenbark, Barry Guthrie, Tony Cahoon)

Discussion Topics

1. **Project Portfolio Recommendations:**

The CAT was provided with the current draft of project recommendations based off previous CAT and public review. Projects were divided into 4 categories: Data collection/planning, Infrastructure, Emergency Preparedness, and Community Education and Outreach. Each project was given a ranking based off previous conversation and feedback received from the CAT and public. The projects discussed, along with comments received during the discussion, can be seen below.

Data Collection/ Planning

Overall Ranking	Project Description	Notes
2	**Groundwater well installation and monitoring**: Install and monitor groundwater wells in each community to identify groundwater table elevation in frequent flooding areas.	
1	**Drainage inventory and condition assessment**: Survey location and document condition of all drainage features, including ditches, outfalls, and culverts. Create location and condition database for use in future assessments and in maintenance planning. The assessment could be conducted as a single effort across the entire Down East region or divided into multiple sub-regional efforts, performing the assessment for a group of neighboring communities at a time.	- Want to do this project in conjunction with another for phase 3 and 4 of RCCP program. - Goal would be to perform vital data collection work with physical projects. - Would like to double check the cost to perform drainage

		inventory for full DE community.
6	**Septic system alternatives assessment**: Develop alternative recommendations for the replacement/upgrade to existing residential septic tanks threatened by flooding or other hazards. Identify potential funding sources for private property owners to complete upgrades.	

Infrastructure

Overall Ranking	Project Description	Notes
3	**Ditch clearing/maintenance**: Clear debris from, and potentially widen/deepen, ditches in select locations to facilitate roadway drainage.	- Group feels this project would be best paired with drainage inventory for next phase. - The group understands that the groundwater well and drainage inventory will help with the decision making for project locations but does feel strongly about this project and would like it to be prioritized.
15	**Pump system**: Install pump system to help water flow at ditches/outfalls during heavy rainfall events.	
11	**Tide gates**: Install tide gates at ditch/outfall locations to prevent backflow onto roadway infrastructure.	
14	**Detention pond construction**: Construct detention pond(s) to capture excess runoff during heavy rainfall events. (Initial location identified at East Carteret High School.)	
4	**Culvert sizing**: Resize culverts to facilitate water flow underneath roadway infrastructure.	- The group understands that the groundwater well and drainage inventory will help with the decision making for project locations but does feel strongly about

		this project and would like it to be prioritized.
8	**Roadway protection measures**: Complete a feasibility analysis, followed by the design and construction of an infrastructure solution for the protection of the section of NC 12 leading to and within Cedar Island. Potential protection measures to be evaluated and constructed include: ○ **Offshore barrier**: Construct offshore barrier to reduce wave energy within Cedar Island Bay ○ **Living shoreline**: Construct living shoreline to enhance the existing marsh system east of the NC 12 roadway and provide protection for public and private infrastructure leading to and within the Cedar Island community. ○ **Roadway elevation**: Elevate NC 12 roadway leading to and within Cedar Island, using combination of roadway fill and bridging over existing ditches as needed.	- Roadway elevation was another possible project that could be paired with the drainage inventory for the first project selected for the next phase; Elevated roadway was brought up often at the community meetings. - CAT noted that US-12 felt safer than other roads due to having a shoulder; group discussed possible funding options for projects to construct shoulders on roads; Example was the scenic byway program for US-12.

Emergency Preparedness

Overall Ranking	Project Description	Notes
9	**Emergency Facilities Condition Assessment:** Complete an assessment of all Fire Departments and other emergency facilities within the Down East region to determine if further protection or mitigation measures (building elevation, flood gates, facility relocation, etc.) are needed, and identify specific mitigation strategies for each facility. Following completion of the assessment, fund and implement the identified measures.	

7	**Danger tree clearing program**: Identify and remove trees that could impact emergency facilities, community resources, or other infrastructure during high wind or other storm events. Identify potential funding sources for private property owners to remove dead trees that could impact infrastructure.	
13	**Emergency storage facilities**: Construct storm-resilient structure(s) to be used for emergency supply storage for individual or multiple neighboring communities; these structures should be situated in locations accessible to the broader community and elevated as appropriate to avoid or minimize potential flooding impacts.	
10	**High water rescue vehicle**: Purchase high water rescue vehicle(s) to be stationed at community staging areas/fire departments in advance of flood events.	

Community Education and Outreach

Overall Ranking	Project Description	Notes
5	**Community Liaison:** Funding for a local liaison who could serve as a conduit between government resilient programming, such as the RCCP program, and the community. The community liaison would help ensure that unincorporated towns, which make up the bulk of the communities Down East are well represented in resilience efforts. The liaison role could be filled by a local resident, regional non-profit organization, or other entity with established community trust.	

12	**Community Outreach Campaigns:** Conduct public outreach efforts on any of the following topics (individually or in combination) to promote community conversations on these issues and provide greater awareness of available resources. These campaigns could be led by local government, the community liaison, regional non-profit organizations, or members of the community. ○ **Emergency Preparedness**: Develop emergency preparedness materials to distribute pre-storm (door hanger format, etc.) for each community to understand evacuation procedures and shelter options, emergency preparedness awareness, and emergency contact information. Redistribute information annually in conjunction with community outreach sessions. ○ **Natural and Nature-Based Solutions (NNBS) Awareness**: Identify and provide resources to residents on the potential scope and uses of NNBS projects, including the protection of public infrastructure and private property. Utilize resources from federal and state agencies along with regional non-profit organizations to aid this public outreach. ○ **Transportation/Infrastructure Planning – Public Outreach:** Connect Down East residents to agencies and resources pertaining to the planning and construction process for transportation facilities and other public infrastructure, to help residents understand the process and their role in the development of infrastructure projects.	

- Additional Feedback:
  - For Phase 3 of RCCP program most funding is between $25,000 and $750,000.
    - Can apply for multiple projects.
  - For help identifying areas for drainage inventory LIDAR use would be helpful; Group mentioned connections with a professor at Western Carolina.
    - Group felt this would be particularly helpful for Davis and Sea Level communities.
  - CAT and group felt having physical documents (i.e. one-pagers) would be helpful to inform public of communities that have gone through the entire RCCP program and have had success.
    - Examples given at the meeting were New Bern and Belhaven
    - This would help community members see that progress can be made and keep them engaged in the program as it does take a good amount of time

from when the community applies to when they see physical projects being implemented.

2. **Final comments on RCCP Report for Down East:**

Group overall was happy with the project selections and ranking. The group is looking forward to having the completed report and continuing to the next phase of the program.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Complete and Submit RCCP Final report	Dewberry	4/18/25	Underway

Dewberry

APPENDIX B

PUBLIC ENGAGEMENT MATERIALS AND SUMMARY RESULTS

JUNE 2025

Dewberry

DOWN EAST PUBLIC OUTREACH EVENT #1-3 SUMMARY

INTRODUCTION

Public Outreach for the Down East region was performed between April 21st and July 13th 2024. The outreach events took place at the Sea Level Fire Rescue in Sea Level, the Core Sound Waterfowl Museum and Heritage Center in Harkers Island, and the Mt Tabor Missionary Baptist Church in Beaufort.

The purpose of these events was to provide information and resources to Down East community members on storm preparation and response resources, as well as updates on relevant planning and research efforts underway in the community. During these open houses, the RCCP team was available to gather each community's feedback on the types of coastal hazards that impact Down East and the areas typically impacted by these hazards.

At each open house a single "interactive station" was set up. The station included a welcome poster that described the purpose of the RCCP, a map of Down East, and copies of the public survey (both hard copies and a posted QR code to access the online survey). The map was available for attendees to indicate areas where hazards and/or damage has been witnessed.

Representatives with Carteret County, NC Sea Grant, Down East VAT and the RCCP consultant team were in attendance.

ATTENDANCE

Given the structure of the events, formal attendance was not logged. At the Sea Level outreach event 13 responses were received while over 25 people visited the interactive station. At the Harkers Island outreach event over 30 people visited the interactive station and were encouraged to complete the survey with one survey being completed. At the Beaufort outreach meeting 24 responses were received.

SURVEY RESULTS

The following section highlights the major response trends of the survey, including the responses received both through the online platform and via hard copy.

1. **Coastal hazards of concern**

<u>What type of coastal or climate hazards concern you the most?</u>

- Of the coastal hazards listed, the top two responses were Flooding (33) and Hurricanes, Tropical Storms and Nor'easters (26). This was followed up by Severe Weather (17), Extreme Heat (9) and Shoreline or Beach Erosion (8).
- The Sea Level community was significantly more inclined to state Shoreline or Beach Erosion as a coastal or climate hazard with seven (7) of the eight (8) individuals who selected it being from that community.
- Wildfires were not seen as coastal or climate hazard concern and received only 5% of the votes.

If you selected flooding, what kind of flooding concerns you the most?

- Between the three communities all three types of flooding received concern from respondents evenly.
- Between the three communities, rainfall flooding was seen as the biggest flooding concern. This was particularly true in the Sea Level community.
- In the North River community, tidal flooding received the highest level of concern.

On a scale of 1 to 5, how significant of a risk are coastal hazards and/or flooding to your community?

- In these three communities there was already a high level of perceived risk regarding flooding to the area.
- 70% of respondents said that the risk from flooding currently is a 5 out of 5 with 90% saying the risk of flooding presently is at least a 4 out of 5.
- 82% of respondents said that the risk from flooding in the future was a 5 out of 5 and 95% saying at least a 4 out of 5 risk in the future.

2. Damage and Areas of Concern

Have you ever witnessed property or infrastructure damage due to coastal or climate hazards in your community?

- Over 80% of individuals answered in the affirmative.
- The areas of greatest concern in the Sea Level community were Shell Hill and Nelson Neck. These locations were brought up by the most individuals. Multiple other individuals also brough up Cedar Creek and Hwy 70. Other areas of concern in Sea Level were Oak Drive, Canal Drive, Backfield Rd, and where Croaker Street and Community Rd meet.
- In the North River meeting many individuals mentioned that the North River community is affected by coastal and climate hazards more than other local communities. The areas of Merrimon Rd and Laurel Street were brought up by the most individuals. Other areas of concern in the North River Community were Kevin Court and Creek Rd.

What are the top three challenges facing the Down East Carteret County immediately after a storm, flood, or other coastal hazard event?

- The three challenges receiving the most votes were 'Repairing or Rebuilding Physical Infrastructure', 'Restoring Power, Electricity, or Other Utilities', and 'Informing Citizens About Available Assistance and Resources'.
- 'Restoring Power, Electricity, and Other Utilities' received the most votes and the most votes as the top challenge.
- 'Repairing or Rebuilding Physical Infrastructure' received the second most votes and trailed very close behind "Restoring Power, Electricity, and Other Utilities'.

- Receiving the 3rd most votes and the most 3rd place votes as the top challenge was 'Informing Citizens About Available Assistance and Resources'.

3. Resilience projects to be implemented

Survey respondents were asked to provide recommendations on the types and locations of projects to help address the coastal or climate hazards they identified earlier in the survey.

- Between all of the communities the type of project that was stated the most to help minimize future damage from storms, flooding and other coastal hazards in Carteret County was 'Cleaning Out Ditches and Canals'.
- In the Sea Level community, the idea of 'Dredging the Core Sound' was given as well as 'Raising Homes', 'Removing Dead Trees', and 'Cleaning the Ophelia Inlet'.
- In the North River community, respondents said that more community outreach and resource explaining would be beneficial a well as the construction of more shelters.

North Carolina Resilient Coastal Communities Program
Public Input Questionnaire

Carteret County is gathering public feedback on proposed options to improve the County's resilience to coastal hazards. The County received a grant under North Carolina's Resilient Coastal Communities Program to develop a list of projects to address critical infrastructure needs, and public input is a key part of the process to determine what improvements are most important to the Down East community.

1. What type of coastal hazards concern you the most? *(Select all that apply.)*

	Flooding (Tidal, Storm Surge, Rainfall)		Severe Weather (Thunderstorm, Wind, Lightning, Hail)
	Shoreline or Beach Erosion		Wildfire
	Extreme Heat		Other:
	Hurricane, Tropical Storm, Nor'easter		

2. If you selected flooding, what kind of flooding concerns you the most? Rank these options from **least (1)** to **most (3)** concerning.

	Tidal (from king tides, etc.)		Rainfall (stormwater, urban flooding)
	Storm surge (from hurricanes, tropical storms, nor'easters, etc.)		

3. On a scale of 1 to 5, how significant of a risk do you think coastal hazards currently pose to the Down East area of Carteret County? (Circle one)

1 ***(not a concern)***	**2**	**3**	**4**	**5** ***(extreme risk)***

4. On a scale of 1 to 5, how significant of a risk do you think coastal hazards will pose to the Down East area of Carteret County in the future? (Circle one)

1 ***(not a concern)***	**2**	**3**	**4**	**5** ***(extreme risk)***

5. Have you ever witnessed property or infrastructure damage due to coastal hazards (including any of the hazards listed in Question #1) in your community? (Circle one: **YES/NO**) If **Yes**, where did you witness the damage? (Be as specific as possible – note the neighborhood, street name, etc.)

_____

_____

Please send your comments to:
Beth Smyre, Dewberry, 2610 Wycliff Road, Suite 410, Raleigh NC 27607
or **rccp@dewberry.com**.

6. If you answered **Yes** to question 5, what type of damage did you witness?

	Property damage, including homes, businesses, or personal possessions (including vehicles)		Damage or disruption to transportation systems (e.g., flooded roadways, transportation delays)
	Utility disruption, including power loss or lack of access to clean drinking water		Limited access to services, such as healthcare, education, or government offices
	Injury, illness, and/or concerns for personal health and safety		Other:

7. Based on your experience, please rank the **top <u>three</u> challenges** facing Down East Carteret County immediately after a storm, flood, or other coastal hazard event.

	Repairing or rebuilding physical infrastructure		Re-opening businesses, government offices, or other community facilities
	Loss of income or wages		Informing citizens about available assistance and resources
	Loss or damage of natural infrastructure, including parks and recreation areas		Restoring power, electricity, or other utilities
	Other:		

8. What types of projects should Carteret County implement to minimize future damage from storms, floods, and other coastal hazards? Where should these projects be located?

_____

_____

Thank you for taking this survey! If you want to know more about how this survey will be used, please feel free to contact us at the address or email listed below.

(<u>Optional</u>) Please identify the zip code of your primary residence: _____

(<u>Optional</u>) How would you like the County to communicate with you or your community regarding this project or similar projects in the future?

	Newspaper		Mail
	Email		Online forum (NextDoor, Community Page, etc.)
	Social Media		In Person Meeting
	Other:		

Please send your comments to:
Beth Smyre, Dewberry, 2610 Wycliff Road, Suite 410, Raleigh NC 27607
or **<u>rccp@dewberry.com</u>**.

NORTH CAROLINA RESILIENT COASTAL COMMUNITIES PROGRAM

PURPOSE

The NC Resilient Coastal Communities Program (RCCP) provides financial grants and technical assistance to coastal local governments to support a proactive, equitable, and locally-driven approach to coastal resilience planning and project implementation.

North Carolina RESILIENT COASTAL COMMUNITIES PROGRAM

Building resilience to natural hazards is vital for communities to help maintain quality of life, healthy growth, durable systems, and conservation of resources for present and future generations.

GOALS

1. Strengthen coastal communities through resilience planning and projects that increase local capacity, overcome economic constraints, and foster diverse and inclusive decision-making.

2. Assist local communities in conducting comprehensive risk and vulnerability assessments to develop a portfolio of prioritized resilience projects tailored to the community's needs.

3. Advance identified resilience projects to "shovel-ready" status, meaning ready for implementation.

4. Provide competitive funding opportunities for project identification and implementation and link communities to additional financial resources to sustain long-term resilience efforts.

Phase 1: Community Engagement; Risk & Vulnerability Assessment

Phase 2: Planning, Project Identification, & Prioritization

Phase 3: Engineering & Design

Phase 4: Implementation & Construction

CLIMATE RESILIENCE

Phases 1 and 2 are designed to help NC coastal communities with resiliency planning. Following completion of Phases 1 and 2, communities will have performed a data and community-driven risk and vulnerability assessment and developed a portfolio of prioritized solutions to address these risks, including the incorporation of natural or nature-based solutions.

CONTEXT

Coastal hazards such as flooding and erosion have had devastating impacts on the economies and livelihoods of communities across eastern North Carolina. Economic and local capacity constraints hinder the actions needed to enhance resilience and reduce vulnerability within coastal communities.

Participating in the RCCP has many benefits. The program fosters education, community involvement, and partnerships in resilience planning. It also breaks down barriers to engagement, involving new stakeholders in planning initiatives, and bringing resilience planning directly to communities in need.

ACCOMPLISHMENTS (2020 - 2023)

$1.86M awarded to conduct vulnerability assessments and identify projects in **41 communities.**

$1.14M awarded to design and engineer **20 top-priority resilience projects**.

$1.16M awarded to implement **5 shovel-ready projects** with nature-based components.

ENGINEERING & DESIGN PROJECT INSIGHTS

95% addressed Stormwater Management & Flooding.

80% included Natural & Nature-Based Components.

30% involved Policy & Planning Initiatives.

PROGRAM PARTNERS

N.C. Division of Coastal Management

National Fish and Wildlife Foundation NFWF

Sea Grant North Carolina

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

The Nature Conservancy

NCORR North Carolina Office of Recovery and Resiliency

The Great Seal of the State of North Carolina

For more information:

Or send us an email at:

RCCP@deq.nc.gov

COMMUNITY
OPEN HOUSE
AND STORM PREPARATION ROUNDTABLE

Thursday, MAY 30

Core Sound Waterfowl Museum & Heritage Center on Harkers Island

Hurricane Season Starts June 1st - Are WE ready for the next Florence? Isabel? Hazel?
Let's talk about it...

2pm
Open House begins

National Weather Service, Carteret County Emergency Services, Carteret Long-Term Recovery, Down East Flood Monitoring Program, Duke Energy Foundation, NC Department of Insurance, NC Department of Public Safety - National Flood Insurance Program

5-6:30pm
Supper for everyone

RSVP for supper at www.CoreSound.com/stormprepsupper
(Supper is free, RSVP not required but very helpful)

6:30pm
Program begins

DOWN EAST Community Roundtable

Hosted by Carteret County Emergency Services, discussion will include pre-storm supply locations, supply distribution post-storm, potential road closures, power outages, evacuation and re-entry procedures, what can we do now to prepare? This discussion will be specific to the Down East communities along with North River, South River and Merrimon.

Fire departments, churches and community leaders who were actively involved in the days and weeks after Florence are very much welcome to share lessons learned.

Please submit your questions at
WWW.CORESOUND.COM/STORMPREP

DOWN EAST resilience network
DUKE ENERGY FOUNDATION
CARTERET COUNTY EMERGENCY SERVICES
CARTERET COUNTY NORTH CAROLINA

Flip Chart Notes

Coastal Hazards/Impacts:

- Flooding
  - Trotter Lane
  - Merrimon Road
  - Corner along church
- Concerns about heavy rain
- High tide
- Need to move cars to high ground
- Erosion along side of road for pedestrians
  - Canals
- Power outages (general)
- Ditches not cleared (canals)
  - House has to individually call
- Lack of evacuation shelter
  - Used to use old Beaufort Elementary
- Lack of lighting on highway
- Kids having trouble getting to school

- Elevated houses makes weather events easier
- Wind damage (roofs)
- Long process to re-build (waiting list to elevate)
  - Quality of work
- Emergency services impacted

Potential Projects/Actions:

- Emergency plans prior to event (door to door)
- Place to shelter
- Tree services
- Evaluations of soundness/safeness
- Water/food supplies to elderly
- Fire department often clears roads
- Community storage for emergency equipment (generator needs)

    - Expand capacity
- Inspect gas lines after storm

Dewberry

DOWN EAST PUBLIC OUTREACH #4 SUMMARY

DATE: November 13, 2024

TIME: 5:00 p.m.-7:00 p.m.

MEETING LOCATION: Down East Scout Center, Davis

PURPOSE: Resilient Coastal Communities Program – Down East Public Outreach Event #4

SUMMARY DATE: December 3, 2024

A Public Involvement opportunity for the Resilient Coastal Communities Program (RCCP) was held on November 13, 2024; this outreach was conducted as part of a Community Open House and Storm Preparation Roundtable, hosted at the Down East Scout Center in Davis, NC. The purpose of the event was to hear from the community on coastal hazards and flooding and hear feedback on potential projects to mitigate these issues. During the open house, the RCCP team was available to gather the community's feedback on the types of coastal hazards that impact Down East, the areas typically impacted by these hazards, as well as possible mitigation efforts.

At the open house there were three "stations", with two being "interactive station" where community members could give their input. At one of the "interactive stations, individuals were directed to indicate where they had seen damage caused by natural hazards on a map of Down East and specific regions within Down East. At the second "interactive station", individuals were asked to select 5 strategies they would like to see to improve the region's resiliency. The other station included a welcome poster that described the purpose of the RCCP, and copies of the public survey (both hard copies and a posted QR code to access the online survey).

Representatives with Carteret County, NC Sea Grant, and the RCCP consultant team were in attendance to answer questions.

Attendance

Given the structure of the event, formal attendance was not logged. Over 40 people visited the interactive station to ask questions or submit comments. All visitors were encouraged to complete the survey during or after the open house.

Event "Interactive Station" Results

Areas of Concern & Issues Spotted in the Community:

See separate Down East Map and Maps of specific communities within Down East within the project folder.

Mitigation Efforts Supported

What 5 resilience strategies would you like to see in your community?

- At the interactive station, the top 2 choices for resilience strategies were ditch clearing/maintenance (25) and resizing culverts or road raising (24), which mirrored the results received in the survey.
- Other strategies receiving notable amounts of votes were danger tree clearing programs (13) and high-water vehicles (13). Danger tree clearing mirrored the survey results, but high-water vehicles were significantly more popular at the interactive station.
- The least two popular options were pump system (1) and detention pond (3). The results for pump system mirrored the survey but detention ponds were significantly less popular at the interactive station than in the survey.

Roundtable – Notable Comments

- Even though offshore barrier received a very low number of votes by participants at the interactive station, the construction of a living shoreline received multiple votes as a write-in.

Survey Results

Natural Hazards

What type of natural hazards concern you the most?

- The majority of respondents where most concerned about flooding (24) and hurricanes, tropical Storms, and nor'easters (20), which both received votes from over 90% of the respondents.
- The bottom two answers were extreme heat (4) and wildfires (6).

Have you ever witnessed property or infrastructure damage due to natural hazards in your community?

- Nearly all respondents answered in the affirmative with nearly all respondents saying they had witnessed property damage (24), utility damage (20), and damaged to the transportation network (19).
- The types of damage individuals had seen the least amount were injury, illness, and/or concerns for personal health (10) and limited access to services, such as healthcare, education, or government offices (10).

Mitigation Efforts

Top 5 actions that would make your community more resilient to natural hazards?

- The community had a varied response to which actions would make the community more resilient. elevated homes (19) received the most votes, followed nature-based solutions like living shorelines (18).
- Increased stormwater drainage capacity (16) and resilience planning (14) received the third and fourth most votes respectively.
- Utility upgrades (5), acquisition of land (6) and public education (8) received the least number of votes of the supplied actions.
- Multiple individuals wrote in clean ditches (3).

Which project to increase the resilience of your community do you think is best?

- Ditch clearing/ maintenance (21) was the most popular choice of any of the supplied projects by the community.
- Resizing culverts or raised roads (19), danger tree clearing program (17), and tide gates (12) received the next highest amount.
- Installation of pump system (6) and construction of an offshore barrier (5) where the bottom 2 answers.

Areas of Interest

Location that multiple individuals specified would be good spots to implement resiliency projects were:

- Community Road, Davis (5)*
- Stacy Loop Rd, Sea Level (3)
- Mollie Rd, Davis (2)
- Croaker Rd, Davis (2)
- Marshallberg Fire Department, Marshallberg (2)

*All pictures submitted were from Community Road in Davis, NC

Additional Comments

After the community meeting Dewberry received 2 additional letters regarding the resilient coastal community program- one form the county regarding community feedback over the past 2 years and one from Lighthouse Environment Partners. These letters have been summarized below.

Community Feedback from Carteret County

- Areas of concern regarding flooding affecting all of Down East;
    - Highway 70 across North River Marsh floods often and even has Sunny Day Flooding. This road is the only way to get to all of the Down East Communities.
    - Other roads of concern: Shell Hill Rd (Sea Level), Stacy Loop Rd (Stacy), Croaker-Community Rd (Davis)
- Areas of concern regarding flooding affecting specific communities in Down East;
    - *Davis:* Davis community has worse flooding in Down East. Community Rd is particularly concerning.
    - *Marshallberg:* Most critical flooding on Star Church Rd and Goosepond through the Woods Rd.
    - *Sea Level*: Shell Hill Rd, Nelson Neck, and Highway 70
    - *Stacy, Williston and Cedar Island*: All have specific locations that flood but need elevation assessment to plan drainage options
    - *Cemeteries and Churches throughout Down East*
- Length of High Tides and increase of excessive High Tides have compromised docks and support structures of the county harbors.
- Need updated mapping of nursery-wetlands area to protect migrating wetlands as saltwater intrusion is affecting once dry forests.
- Provide funding and technical support to a representative group of leaders from each Down East community to develop an Emergency Plan specific to Down East.

Lighthouse Environment Partner

- In the process of implementing NC State's Coastal Dynamics Design Lab's Floodprint program

with North River, Laurel Road and Siver Dollar Road communities.

- Support Emergency Shelter, Emergency Preparedness Outreach, Fire Department Resiliency, and High-Water rescue Vehicle project that were proposed by Dewberry
- Suggested 3 additional projects: 1. Funding a community liaison to support unincorporated communities in implementing infrastructure plans and projects addressing coastal vulnerabilities. 2. Identifying locations for incorporating nature-based solutions. 3. Exploring innovative financing structures such as Community-Based Catastrophe Insurance.

North Carolina Resilient Coastal Communities Program
Public Input Questionnaire – November 2024

Carteret County is gathering public feedback on proposed options to improve the County's resilience to natural hazards. The County received a grant under North Carolina's Resilient Coastal Communities Program to develop a list of projects to address critical infrastructure needs. Public input is a key part of the process to determine what improvements are the most important to the Down East community.

1. What type of natural hazards concern you the most? *(Place an '**X**' next to all that apply.)*

	Flooding (Tidal, Storm Surge, Rainfall)		Severe Weather (Thunderstorm, Wind, Lightning, Hail)
	Shoreline or Beach Erosion		Wildfire
	Extreme Heat		Other:
	Hurricane, Tropical Storm, Nor'easter		

2. Have you ever witnessed property or infrastructure damage due to natural hazards in your community? Circle one: **YES** **NO** If Yes, place an '**X**' next to the type of damage you witnessed (you can select more than one).

	Property damage, including homes, businesses, or personal possessions (including vehicles)		Damage or disruption to transportation systems (e.g., flooded roadways, transportation delays)
	Utility disruption, including power loss or lack of access to clean drinking water		Limited access to services, such as healthcare, education, or government offices
	Injury, illness, and/or concerns for personal health and safety		Other:

3. Place an '**X**' next to the top five actions that you think would make your community more resilient to storms, floods, and other natural hazards. (*Select up to **5** options*.)

	Nature-based solutions, such as living shorelines or habitat restoration		Elevating homes, businesses, and public infrastructure, including roads
	Acquisition and conservation of flood-prone land		Utility upgrades for community facilities, such as increased generator capacity for hospitals
	Increased stormwater drainage capacity		Resilience planning, policies, and development standards
	Structural protection, such as floodwalls or tide gates		Public education and outreach
	Other:		

Please send your comments to:
Beth Smyre, Dewberry, 2610 Wycliff Road, Suite 410, Raleigh NC 27607
or **rccp@dewberry.com**.

4. Carteret County is considering several types of projects to increase resilience to natural hazards. Place an '**X**' next to your top five choices for projects that you think would benefit Down East:

Improving Infrastructure	
	Ditch clearing/maintenance: Clear debris from, and potentially widen/deepen, ditches in select locations to facilitate roadway drainage.
	Pump system: Install pump system to help water flow at ditches/outfalls during heavy rainfall events.
	Tide gates: Install tide gates at ditch/outfall locations to prevent backflow onto roadway infrastructure.
	Detention pond construction: Construct detention pond(s) to capture excess runoff during heavy rainfall events.
	Re-size culverts or raise roadways: Increase the size of culverts to facilitate water flow underneath roadways or raise the height of roadways above projected flooding levels.
	Offshore barrier: Construct offshore barrier, in combination with living shoreline elements where possible, to reduce wave energy.
Preparing for Emergencies	
	Emergency preparedness public outreach: Develop materials to distribute pre-storm (as door hangers or flyers) for each community to understand evacuation procedures and shelter options, emergency preparedness awareness, and emergency contact information. Send out every year as needed.
	Danger tree clearing program: Identify and remove trees that could impact emergency facilities, community resources, or other infrastructure during high wind or other storm events. Identify potential funding sources for private property owners to remove dead trees that could impact infrastructure.
	Emergency shelter: Construct storm-resilient building for emergency sheltering and supply storage; include raised area to allow for resident parking.
	Fire Department protection measures: Elevate the buildings and/or install operational gates that could be closed during tidal flooding events.
	High water rescue vehicle: Purchase high water rescue vehicle(s) to be stationed at community staging areas/fire departments in advance of flood events.
	Other:

5. Where should these projects be located? Be specific – provide street names, intersections, or buildings in your response.

_____

_____

Please send your comments to:
Beth Smyre, Dewberry, 2610 Wycliff Road, Suite 410, Raleigh NC 27607
or **rccp@dewberry.com**.

Community Open House

An Open House for the Down East community is being held to get your ideas about projects that would help the County address flooding and other coastal hazards.

Drop by at any time during the hours listed below. Refreshments to be served – stop by and pick up a sandwich!

Wednesday, November 13, 2024
5:00 – 7:00pm
Down East Scout Center
585 US 70
Davis, NC 28524

Can't make it?
Email us at rccp@dewberry.com
We'll send you a survey so that you can be a part of the process!

We hope to see you there!

N.C. DIVISION OF COASTAL MANAGEMENT

Carteret County NORTH CAROLINA

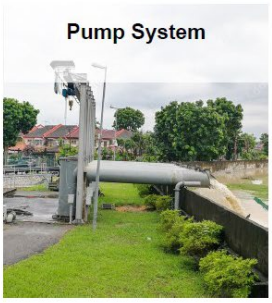
North Carolina RESILIENT COASTAL COMMUNITIES PROGRAM

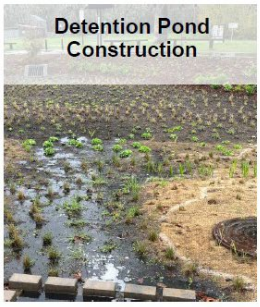
Dewberry

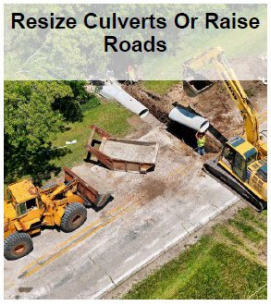
DOWN EAST PUBLIC OUTREACH #4- DAVIS

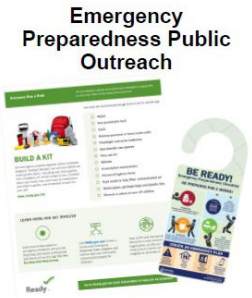
Interactive Station- Voting on Resilience Strategies

What resilience strategies would you like to see in your neighborhood?

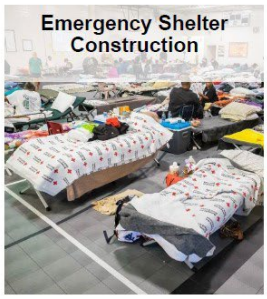






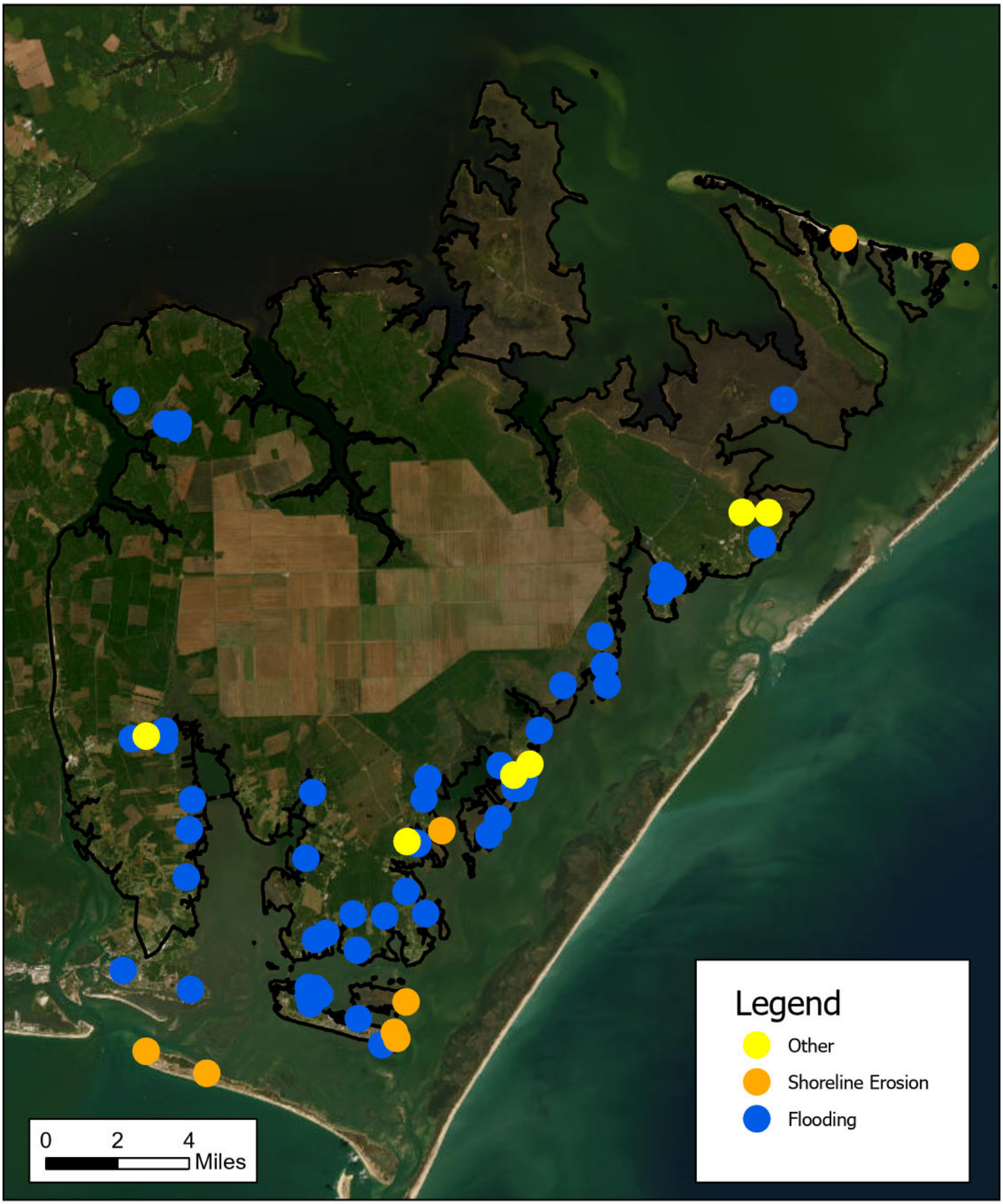


What resilience strategies would you like to see in your neighborhood?



What Else?

Are there other strategies that should be considered? Tell us! List your ideas here.



Prepared by

Dewberry

Prepared for

Natural Hazards in the Community Map

N

Dewberry

APPENDIX C

RISK AND VULNERABILITY ASSESSMENT

JUNE 2025

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1.0 Background

With support from the North Carolina Division of Coastal Management's Resilient Coastal Communities Program (RCCP), a Risk and Vulnerability Assessment was conducted to evaluate the susceptibility of critical assets and natural infrastructure in the Down East region of Carteret County (Down East)) to coastal hazards. The RCCP facilitates a community-driven process for setting coastal resilience goals, assessing existing and needed local capacity, and identifying and prioritizing "shovel-ready" projects to enhance community resilience to coastal hazards.[1]

As part of Phase 1 of the RCCP (**Figure 1.1**)**,** this assessment supports the program objectives by identifying and mapping structures and areas vulnerable to potential damage or harm from coastal hazards. Determining whether these assets are or will be exposed to hazards facilitates the identification and prioritization of resilience projects in Phase 2 of the Program. These projects and strategies are critical to bolstering Down East's resilience to existing and future coastal risks. The North Carolina Office of Recovery and Resiliency defines "a resilient North Carolina is a state where our communities, economies, and ecosystems are better able to rebound, positively adapt to, and thrive amid changing conditions and challenges, including disasters and climate change; to maintain quality of life, healthy growth, and durable systems; and to conserve resources for present and future generations.[2]"

Figure 1.1 RCCP Program Phases

[1] North Carolina Department of Environmental Quality. *North Carolina Resilient Coastal Communities Program.* Division of Coastal Management. https://deq.nc.gov/about/divisions/coastal-management/coastal-adaptation-and-resiliency/nc-resilient-coastal-communities-program

[2] North Carolina Office of Recovery and Resiliency. https://www.deq.nc.gov/climate/2020-climate-risk-assessment-resilience-plan/open.

2.0 Assessment Framework

The RCCP Handbook (August 2023) provides the basis for this framework to assess the risk and vulnerability of assets in Down East. Based on the RCCP Handbook, this method and the following section is organized in the following three steps:

Identify and Map Hazards
Review Pamlico Sound Regional Hazard Mitigation Plan and other plans and studies developed for Down East and/or region, including the Hurricane Matthew Resilient Redevelopment Plan for Carteret County. Augment hazard assessment based on input from the Community Action Team (CAT). Collect relevant spatial asset and hazard data.

Assess Vulnerability
Examine the likelihood that an asset will be affected by coastal hazards. Develop an index to assign Vulnerability Scores to estimate asset susceptibility to coastal hazards.

Estimate Risk
Determine potential risk to assets to prioritize actions that increase resilience to future hazards. Develop an index to assign Risk Scores to estimate potential impacts on community assets. Assess community asset risk scores to inform potential community-wide impacts of hazards.

This assessment focuses on coastal flooding hazards and their potential impacts on Down East. As identified in the RCCP Handbook, this process considers the following hazards: rainfall, riverine, storm surge and tidal flooding, and sea level rise; in addition, this assessment considers wildfire hazard, based on a review of the Pamlico Sound Regional Hazard Mitigation Plan, available hazard data, and community interest in evaluating wildfire hazard. Note that the evaluation of rainfall (pluvial) flooding in this report is qualitative, due to limited data availability. As a result, pluvial flood impacts are not included in the cumulative vulnerability or risk score calculations. Subsidence impacts are also not included in the cumulative vulnerability or risk score calculations.

A primary goal of the RCCP is to support the identification and implementation of resilient projects in participating communities. In support of this goal, this assessment focuses on potential impacts on critical built infrastructure, critical network infrastructure, natural assets, and natural infrastructure, defined as the following:

Critical Built Infrastructure
Physical structures that house or perform functions that enable the continuous operation of government and business functions and are essential to human health and safety or economic safety.[3] This includes buildings such as government service offices, schools, health services, and public safety or emergency services.

Critical Network Infrastructure
Physical infrastructure networks that support the continuous operation of government and business functions and are essential to human health and safety or economic safety. These include infrastructure networks such as roads, pedestrian trails, and water or sewer lines. Transportation networks facilitate the movement of people and goods, and water and sewer networks provide potable water and remove wastewater.

[3] Federal Emergency Management Agency. *Community Lifelines.* https://www.fema.gov/emergency-managers/practitioners/lifelines

Natural Assets

Lands that are actively managed to serve specific community needs, such as growing food (agricultural lands), providing recreational space (recreational lands), and support local ecosystems (natural lands). Natural Asset vulnerability is evaluated based on potential loss of functionality.

Natural Infrastructure

Naturally occurring landscapes and systems that perform ecosystem services that benefit nearby communities, like flood protection or abatement, erosion control, and water purification. Natural Infrastructure vulnerability is evaluated based on loss of habitat, rather than loss of ecosystem service functionalities that directly benefit communities.

Note that to avoid double-counting impacts to land-based assets (natural assets and natural infrastructure), natural assets are excluded from the natural infrastructure evaluation. Preserved lands (e.g., Cedar Island National Wildlife Refuge) are included as natural assets. The US Marine Corps Outlying Landing Field - Atlantic and associated assets are excluded from this assessment. However, natural infrastructure (i.e., wetlands and associated marsh migration modeling) located within the military site boundary are included in this assessment, as changes to naturally occurring landscapes within the site have the potential to impact the surrounding communities within Down East.

After identifying and mapping hazards, the assessment determines which critical built infrastructure, natural infrastructure, and natural assets are vulnerable – the degree to which they are expected to experience adverse impacts – to coastal hazards, primarily flooding. This framework considers three components that contribute to vulnerability: exposure, sensitivity, and adaptive capacity.

Metrics are developed for each component, and assets are scored zero to three for each component of the vulnerability score. As outlined in the RCCP Handbook, an asset's Vulnerability Score is determined by adding the Exposure and Sensitivity Score and subtracting the Adaptive Capacity Score (**Figure 2.1**).

Figure 2.1. Components of Vulnerability

Exposure	+	**Sensitivity**	–	**Adaptive Capacity**	=	**Vulnerability**
The probability of physical contact between an asset and a hazard		*The degree to which an asset may be affected by a hazard*		*The ability of an asset to change its characteristics or behavior in response to a hazard*		*The degree to which an asset or system is expected to experience adverse impacts due to a hazard.*

As noted in **Figure 2.1**, an asset's ***Vulnerability*** defines the degree to which coastal hazards threaten its physical structure or core function. However, interruption to services or physical damage to assets can affect entire communities, depending on the asset's importance to the region and the regional context. These consequences can amplify an asset's vulnerability to the adverse impacts of hazards.

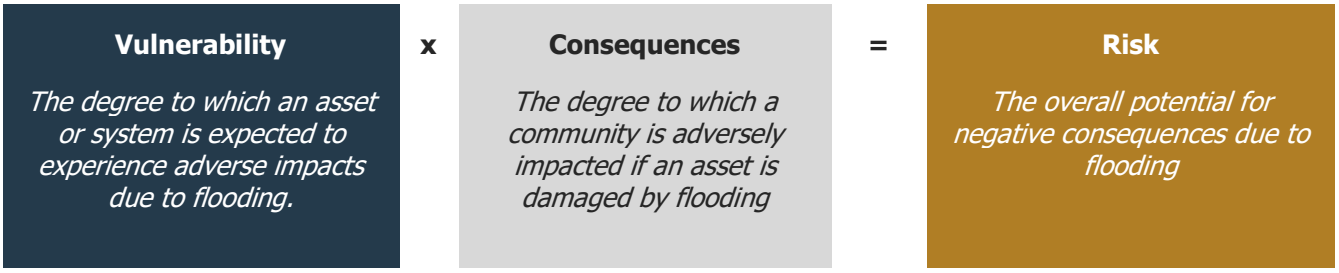
After examining vulnerability, the assessment estimates ***Risk*** – the overall potential for negative consequences – by considering two components: vulnerability and consequences. Vulnerability is measured using the Vulnerability Score. Consequences refer to the degree to which a community is adversely impacted if an asset is damaged by a hazard.

The assessment examines two factors that contribute to its severity to understand the consequences of potential coastal hazards: social vulnerability and asset criticality. *Social vulnerability* refers to the susceptibility of social groups, indicated by certain social conditions such as poverty, to experience

adverse impacts during hazard events. *Asset criticality* aims to characterize how important an asset is to its surrounding community based on the potential scale of economic loss caused by its damage during a flood.

Consequence metrics are multiplied by the Vulnerability Score to produce a Risk Score for each asset (**Figure 2.2**). Due to limited data, this step is not applied to natural infrastructure.

Figure 2.2 Components of Risk



3.0 Identify & Map Hazards

3.1 Hazard Identification

Based on a review of recent community plans and CAT meeting discussions, four relevant hazards were selected to examine in the assessment process: coastal flooding, storm surge, riverine flooding, and wildfires (as noted above, rainfall-driven flooding and subsidence were excluded due to a lack of available data). Down East has experienced each of the flood hazards and would experience severe consequences from a wildfire. Each hazard is considered a high-priority hazard in the 2020 Pamlico Sound Regional Hazard Mitigation Plan.

Coastal flooding is assessed using floodplain data produced for the North Carolina Sea Level Rise Impact Study. Present (baseline) and future flood conditions are considered for three frequency events: mean higher high water (MHHW), 100-year, and 500-year. Future flood conditions approximate a 30-year projection for sea level rise by using a 1.3-feet (40-centimeter) sea level rise scenario to estimate coastal hazards for 2050.

Storm surge is assessed using surge flood depth data from NOAA's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model[4] for two storm scenarios: Category 1 and Category 2 storms. The Category 1 storm surge flood depths are used to represent present-day flooding conditions, and the Category 2 storm is a proxy for potential future increases in storm severity.

Riverine flooding is assessed based on the 100-year and 500-year Flood Hazard Areas provided by North Carolina's Flood Risk Information System (FRIS). The assessment for riverine flooding does not include a climate projection scenario.

[4] NOAA, NWS, National Hurricane Center. Sea, Lake, and Overland Surges from Hurricanes (SLOSH). https://www.nhc.noaa.gov/surge/slosh.php

Wildfire hazard is evaluated based on burn probability data from USFS[5], which estimates the annual probability of wildfires burning in a specific location. The assessment for wildfire does not include a climate projection scenario.

Rainfall-driven flooding is qualitatively described in this assessment, based on documentation of flooding from notable storm events. Information on existing modeling, monitoring, and reporting systems for flooding in Down East are also discussed in this section.

3.2 Asset Identification

3.2.1 CRITICAL BUILT INFRASTRUCTURE

Critical built infrastructure refers to physical structures that house or perform functions that enable the continuous operation of government and business functions and are essential to human health and safety or economic safety. The assessment identified critical built infrastructure assets using multiple datasets available on the Carteret County Open GIS Portal[6] and feedback from the project's advisory committee, known as the Community Action Team (CAT). Built infrastructure assets are individual sites – point-level data representing structures, facilities, and other buildings. The Federal Emergency Management Agency's (FEMA) Community Lifeline framework served as a starting point to identify and categorize critical built infrastructure assets.

Table 3.1 summarizes the individual sites examined within Down East. For assets that perform multiple functions, such as a fire and rescue station, the asset is evaluated separately under each category (in this example, as both an Emergency Medical Services asset and a Fire Station). These assets, hazard exposure extents, and all other maps can be found in the **Appendix**.

Table 3.1 Summary of Critical Built Infrastructure Sites by Type

TYPE	INCLUDES	NO. OF ASSETS
Communications Infrastructure	Infrastructure that supports communications, alerts, warnings, and messages to first responders and the general public.	13
Emergency Medical Services	Locations where EMS personnel are stationed, based out of, or store the equipment used to carry out their job functions, including independent ambulatory services.	4*
Energy Facilities	Facilities that generate or distribute electric power, or store or transfer energy resources (e.g., petroleum products).	0
Fire Stations	Buildings that house firefighting personnel and their equipment.	3
Government Services	Buildings and facilities that provide government services, including town halls, government agency offices, and government agency operational facilities (e.g., Public Works maintenance yard).	10

[5] Referred to as Wildfire Likelihood in Wildfire Risk to Communities web application: https://wildfirerisk.org/

[6] Carteret County Open GIS Portal: https://gisdata-cc-gis.opendata.arcgis.com/

TYPE	INCLUDES	NO. OF ASSETS
Law Enforcement Sites	Buildings that house local, state, federal, and special jurisdiction law enforcement agencies, e.g., municipal police, county sheriffs, and park police.	0
Local Food Markets	Businesses that sell produce and other food products.	3
Medical Facilities	Facilities that provide health and medical services, including hospitals, nursing homes, mental health homes, and hospices.	2
Public Schools	Locations of pre-kindergarten, elementary, middle, high, and early college schools.	8
Wastewater Facilities	Locations of wastewater discharge sites and treatment plants.	0
Water Supplies	Locations of public water supply sources, including both ground, spring, and surface water sources.	5
Total		49
* Three of the four Emergency Medical Services are provided by Fire and Rescue facilities. These facilities are counted in both the "Fire Stations" and "Emergency Medical Services" asset types.		

3.2.2 CRITICAL NETWORK INFRASTRUCTURE

Physical infrastructure networks support the continuous operation of government and business functions and are essential to human health and safety or economic safety. Roadway data is from the NC Department of Transportation (NCDOT)[7], and pedestrian trail and sidewalk data is from the Carteret County Open GIS portal. Road networks are classified by use and ownership: state, secondary, and other road networks. The Federal Emergency Management Agency's (FEMA) Community Lifeline framework served as a starting point to identify and categorize critical network infrastructure assets.

Table 3.2 summarizes the network infrastructure examined within Down East. These assets, hazard exposure extents, and all other maps can be found in **Appendix**.

Table 3.2 Summary of Critical Network Infrastructure Sites by Type

TYPE	INCLUDES	LENGTH OF ASSETS (MILES)
Federal Roads	Roads maintained by federal agencies.	30.7
State Roads	Roads maintained by NCDOT that are cross-state routes.	20.6
Secondary Roads	Local roads that are maintained by NCDOT.	114.6
Other Roads	Local roads that are not maintained by NCDOT.	128.4
Pedestrian Trails and Sidewalks	Sidewalks along roads and trail networks separate from roadways.	54.4
Sewer outfalls	Drainage pipes that channel stormwater from on-road drains to outfall locations	1.4
Total		350.2

[7] NCDOT. GIS Data Layers [database]. https://connect.ncdot.gov/resources/gis/Pages/GIS-Data-Layers.aspx

3.2.3 NATURAL ASSETS

Natural assets are lands that are actively managed to serve specific community needs, such as growing food (agricultural lands), providing recreational space (recreational lands), and supporting local ecosystems (natural lands). Natural asset vulnerability is evaluated based on potential loss of functionality. Natural asset data is from the Carteret County Open GIS Portal[8] and supplementary information from the CAT. While natural assets are geographic areas, this analysis relies on the center point of asset locations to evaluate exposure and vulnerability. The Federal Emergency Management Agency's (FEMA) Community Lifeline framework and FEMA's definition of ecosystem service benefits[9] served as a starting point to identify and categorize natural assets.

Table 3.3 summarizes the natural assets examined within the Down East Region. These assets, hazard exposure extents, and all other maps can be found in the **Appendix**.

Table 3.3 Summary of Natural Asset Sites by Type

TYPE	INCLUDES	NO. OF ASSETS	ACREAGE
Agricultural Land	Lands used for the growing of produce or other agricultural activities, including community gardens.	62	59,880*
Recreational Land	Lands used for recreational activities that are not preserved lands.	7	55
Preserved Land	Lands preserved and protected from development.	5	38,379
Total		13	101,296
* Note that Open Grounds Farm is a substantial portion of agricultural land in Down East, at 50,600 acres.			

3.2.4 NATURAL INFRASTRUCTURE

Areas containing natural infrastructure were identified using marsh land cover data from the National Oceanic and Atmospheric Administration's (NOAA) Sea Level Affecting Marshes Model (SLAMM). This data focuses on marsh habitats, such as tidal and non-tidal wetlands, and identifies upland habitats and parks in developed areas. **Table 3.4**, below, provides estimated habitat acreages for present-day conditions.

Table 3.4 Natural Infrastructure by Habitat Type

HABITAT TYPE	PRESENT-DAY ACREAGE
Non-Tidal Wetland	885
Tidal Wetland	660
Unconsolidated Shore	7.0
Upland Habitat	2,086
Total Habitat Acres	**3,639**

[8] Carteret County Open GIS Portal: https://gisdata-cc-gis.opendata.arcgis.com/

[9] https://www.fema.gov/sites/default/files/2020-09/fema_ecosystem-service-benefits_policy_september-2020.pdf

4.0 Assess Vulnerability

An asset's vulnerability is a function of its exposure, sensitivity, and adaptive capacity to coastal hazards. Assessing the vulnerability of a structure, like critical built infrastructure, differs from that of natural infrastructure. Thus, the metrics for evaluating exposure, sensitivity, and adaptive capacity differ for the two types of assets considered.

A Vulnerability Score is calculated for **critical built infrastructure** by assessing exposure, sensitivity, and adaptive capacity separately to produce scores for each component. For each metric, assets are assigned a score from zero to three. Following the equation outlined in **Figure 4.1** (for reference only; identical to **Figure 2.1**), the Vulnerability Score is the sum of the exposure and sensitivity scores, less the adaptive capacity score. This process makes it possible for critical built infrastructure to receive a negative Vulnerability Score. A negative score does not indicate an asset would be unaffected by hazards. For clarity, assets with a negative score are manually assigned a vulnerability score of zero.

Figure 4.1 Components of Vulnerability

Exposure	+	Sensitivity	–	Adaptive Capacity	=	Vulnerability
The probability of physical contact between an asset and a hazard		*The degree to which an asset may be affected by a hazard*		*The ability of an asset to change its characteristics or behavior in response to a hazard*		*The degree to which an asset or system is expected to experience adverse impacts due a hazard.*

For **natural infrastructure**, this assessment leverages NOAA's Sea Levels Affecting Marshes Model (SLAMM) to identify changes in marsh land cover. SLAMM assumes that specific types of wetlands can exist within an established range of tidal elevations, based on which vegetation can thrive given the varying frequency, time, and salinity impacts of inundation.[10] The model incorporates a habitat's exposure, sensitivity, and adaptive capacity into one metric: projected habitat lost to open water due to sea level rise. Vulnerability Scores are assigned to a habitat type based on its overall projected land loss.

This chapter presents individual asset vulnerability first by each hazard type; this data is then used to generate cumulative vulnerability scores under present-day and future conditions for each asset (see **Section 4.5: Cumulative Hazard Vulnerability Assessment**).

4.1 Storm Surge

The storm surge assessment relies on storm surge extent and flood depth modeling outputs from the National Weather Service (NWS) at NOAA's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model[11]. Specifically, this assessment looks at flood depths from the Maximum of Maximum Envelopes of Water (MOMs) composite modeling output. SLOSH model outputs are typically used for emergency management purposes and are the best available data for the planning area to analyze vulnerability to hurricane storm surge. The composite modeling includes thousands of hypothetical hurricanes to account

[10] NOAA Office for Coastal Management. 2017. "Detailed Method for Mapping Sea Level Rise Marsh Migration." NOAA. https://coast.noaa.gov/data/digitalcoast/pdf/slr-marsh-migration-methods.pdf

[11] NOAA, NWS, National Hurricane Center. Sea, Lake, and Overland Surges from Hurricanes (SLOSH). https://www.nhc.noaa.gov/surge/slosh.php

for forecasting uncertainty, but it is often considered a "worst case scenario" when used for planning purposes.

This assessment uses the MOM flood depths for Category 1 storms for current storm surge hazard exposure and Category 2 storm MOM flood depths for as a proxy for future conditions. The findings below summarize storm surge vulnerability for critical built infrastructure, natural assets, and critical network infrastructure.

Key Findings:

- Built infrastructure vulnerability increases significantly between Category 1 and Category 2 storms.
- South River, Cedar Island, and Davis compactions stations have the highest vulnerability scores due to these assets siting near floodplains, high sensitivity to flooding, and low adaptive capacity.
- The highest vulnerability natural assets are all agricultural lands, with all of those lands listed in **Table 4.10** having projected vulnerability scores of 4. These agricultural lands are privately owned.
- Few roads experience vulnerability under a Category 1 storm; those that do are local roads, with the exception of US 70 between Williston and Davis, and NC 12 through the National Wildlife Refuge to Cedar Island. Storm surge vulnerability increases significantly under a Category 2 storm, with the majority of roadway miles experiencing some vulnerability.

As a reminder, Vulnerability is calculated by the following formula. The components of the Vulnerability scores as they pertain to the Storm Surge hazard are detailed below, in **Sections 4.1.1 (Exposure Scoring)** and **4.1.2 (Sensitivity and Adaptive Capacity Scoring)**. Vulnerability is ranked on a relative scale from 0 (no vulnerability) to 5 (highest vulnerability).

Exposure	+	Sensitivity	–	Adaptive Capacity	=	Vulnerability

4.1.1 EXPOSURE SCORING

Assets are assigned **Exposure Scores** from zero (no flood depth exposure) to three (greater than four feet of flood surge depth exposure) based on flood depths assets are expected to experience under Category 1 (Baseline) and Category 2 (Projection) storm surge events.

Assets' Exposure Scores are referenced from low to high exposure, as summarized in **Table 4.1**, to facilitate the discussion of these results.

Table 4.1 Exposure Scoring for Storm Surge Hazards

SCORE	FLOOD DEPTH
0	No flooding
1	Less than or equal to two feet of surge
2	Greater than two feet and less than or equal to four feet of surge
3	Greater than four feet of surge

Table 4.2 Critical Built Infrastructure Exposure Scores for Assets with High Vulnerability to Storm Surge Hazards. Exposure scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure	
		Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)
Government Services	South River Compaction Station	1	3
Government Services	Cedar Island Compaction Station	1	3
Government Services	Davis Compaction Station	0	3
Government Services	NC 101 Compaction Station	0	2
Government Services	Old Otway Compaction Station	0	1
Government Services	New Otway Compaction Station	0	1
Government Services	Compaction Station, Atlantic	0	1
Water Supplies	Jonaquins Creek Well House	1	3
Communications Infrastructure	2003-Aso-2361-Oe – US-70	2	3
Communications Infrastructure	2006-Aso-2080-Oe – Nelson Bay Rd	2	3
Transportation	Harbor Of Refuge Harkers Island	2	3
Transportation	Cedar Island Harbor	2	3
Communications Infrastructure	Unnamed Cell Tower – Merrimon Rd	2	3

Table 4.3 Natural Assets Exposure Scores for Assets with High Vulnerability to Storm Surge Hazards

Asset Type	Asset Name	Exposure	
		Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)
Agricultural Land	Bay Point LLC	2	3
Agricultural Land	Cnx5 Trees LLC	2	3
Agricultural Land	Jordan, Eugene N	2	3
Agricultural Land	Mcintyre, William H Jr Etal	2	3
Agricultural Land	Bay Point LLC Etal Tr Briere	1	3
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	1	3
Agricultural Land	Ellis, Ronald W Etux Susan E	1	3
Agricultural Land	Gmattox LLC	1	3
Agricultural Land	Ivictus Investing LLC	1	3
Agricultural Land	Joel H Davis Family Ltd Partns	1	3
Agricultural Land	Mcintyre, William H Jr	1	3
Agricultural Land	Merrill, June	1	3
Agricultural Land	Oyster Creek Sporting Club LLC	1	3

Asset Type	Asset Name	Exposure	
		Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)
Agricultural Land	P&J Properties & Invstmnts LLC	1	3
Agricultural Land	Paul, Dianna Golden Etux Nelson	1	3
Agricultural Land	Vick, William Temple Etux Darla	1	3
Agricultural Land	Willis, Steven Ketih	1	3
Agricultural Land	Won, Lianne Etvir Reburn	1	3

Table 4.4 Network Miles by Asset Type and Exposure Scores for Storm Surge Hazards

Asset Type	Storm Category	Miles of network by Exposure Score			
		0	1	2	3
Federal Roads	Cat 1	17.77	9.87	2.88	0.21
	Cat 2	4.25	3.63	4.53	18.32
State Roads	Cat 1	12.88	4.44	3.11	0.18
	Cat 2	5.87	2.58	5.00	7.17
Secondary Routes	Cat 1	70.59	35.72	7.98	0.35
	Cat 2	14.63	12.07	27.17	60.78
Other Roads	Cat 1	79.38	36.62	10.66	1.77
	Cat 2	16.44	13.51	29.70	68.78
All Roads	**Cat 1**	180.62	86.66	24.63	2.51
	Cat 2	41.18	31.80	66.40	155.05
Sidewalks	Cat 1	31.71	16.17	6.08	0.47
	Cat 2	12.40	5.91	9.11	27.00
Outfalls	Cat 1	0.29	0.43	0.64	0.01
	Cat 2	0.04	0.22	0.23	0.89

Supporting maps of storm surge hazard extents and asset exposure scores can be found in the **Appendix**.

4.1.2 SENSITIVITY AND ADAPTIVE CAPACITY SCORING

Sensitivity reflects the potential damage to critical built infrastructure's materials, functions, or the surrounding environment if it were flooded. Critical built infrastructure that cannot immediately accommodate floodwaters or increased water levels is more likely to experience higher damage levels. **Sensitivity Scores** are assigned by asset types and consider the potential for damage and disruption of essential services or functions.

Adaptative capacity illustrates the ability of an asset to change its characteristics or behavior in response to a hazard. An asset's potential to adapt depends on the potential suite of options available and a community's ability to implement those actions. The **Adaptive Capacity Scores** are assigned by asset types and consider the potential for assets to be relocated or adapt to flood depths.

Table 4.5 Sensitivity and Adaptive Capacity Scoring

ASSET CATEGORY	ASSET TYPE	SENSITIVITY	ADAPTIVE CAPACITY
Critical Built Infrastructure	Buildings[1]	2	3
	Energy facilities	2	2
	Communications infrastructure	1	2
	Waste infrastructure	3	1
	Water Supplies[2]	2	2
Critical Network Infrastructure	Transportation	1	2
Natural Assets	Agricultural land	3	2
	Natural land	1	2
	Recreational land	1	2

1. Includes all critical built infrastructure except for communications infrastructure, energy facilities, wastewater facilities, and water supplies.
2. Outfall lines are classified as Water/Sewer assets that are Critical Network Infrastructure. Note that this assessment for Down East does not include outfall lines.

Table 4.6 Critical Built Infrastructure Sensitivity and Adaptive Capacity Scores for Assets with High Vulnerability to Storm Surge Hazards. Sensitivity and adaptive capacity scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Government Services	South River Compaction Station	3	1
Government Services	Cedar Island Compaction Station	3	1
Government Services	Davis Compaction Station	3	1
Government Services	NC 101 Compaction Station	3	1
Government Services	Old Otway Compaction Station	3	1
Government Services	New Otway Compaction Station	3	1
Government Services	Compaction Station, Atlantic	3	1
Water Supplies	Jonaquins Creek Well House	2	2
Communications Infrastructure	2003-Aso-2361-Oe – US-70	1	2
Communications Infrastructure	2006-Aso-2080-Oe – Nelson Bay Rd	1	2
Transportation	Harbor Of Refuge Harkers Island	1	2
Transportation	Cedar Island Harbor	1	2
Communications Infrastructure	Unnamed Cell Tower – Merrimon Rd	1	2

Table 4.7 Natural Assets Sensitivity and Adaptive Capacity Scores for Storm Surge Hazards

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	Bay Point LLC	3	2
Agricultural Land	Cnx5 Trees LLC	3	2
Agricultural Land	Jordan, Eugene N	3	2

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	Mcintyre, William H Jr Etal	3	2
Agricultural Land	Bay Point LLC Etal Tr Briere	3	2
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	2
Agricultural Land	Ellis, Ronald W Etux Susan E	3	2
Agricultural Land	Gmattox LLC	3	2
Agricultural Land	Ivictus Investing LLC	3	2
Agricultural Land	Joel H Davis Family Ltd Partns	3	2
Agricultural Land	Mcintyre, William H Jr	3	2
Agricultural Land	Merrill, June	3	2
Agricultural Land	Oyster Creek Sporting Club LLC	3	2
Agricultural Land	P&J Properties & Invstmnts LLC	3	2
Agricultural Land	Paul, Dianna Golden Etux Nelson	3	2
Agricultural Land	Vick, William Temple Etux Darla	3	2
Agricultural Land	Willis, Steven Ketih	3	2
Agricultural Land	Won, Lianne Etvir Reburn	3	2

Table 4.8 Sensitivity and Adaptive Capacity Scores by Network Asset Type for Storm Surge Hazards

Asset Type	Storm Category	Sensitivity	Adaptive Capacity
Federal Roads	Cat 1	1	2
	Cat 2		
State Roads	Cat 1	1	2
	Cat 2		
Secondary Routes	Cat 1	1	2
	Cat 2		
Other Roads	Cat 1	1	2
	Cat 2		
All Roads	**Cat 1**	**1**	**2**
	Cat 2		
Sidewalks	Cat 1	1	2
	Cat 2		
Outfalls	Cat 1	2	2
	Cat 2		

4.1.3 VULNERABILITY RESULTS

Flood depths increase significantly between Category 1 and Category 2 model results. Compaction stations, in particular, have high vulnerability scores due to high exposure, high sensitivity, and low adaptive capacity.

Table 4.9 Critical Built Infrastructure Vulnerability Scores for Assets with High Vulnerability to Storm Surge Hazards. Vulnerability scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)			Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)
Government Services	South River Compaction Station	1	3	3	1	3	5
Government Services	Cedar Island Compaction Station	1	3	3	1	3	5
Government Services	Davis Compaction Station	0	3	3	1	2	5
Government Services	NC 101 Compaction Station	0	2	3	1	2	4
Government Services	Old Otway Compaction Station	0	1	3	1	2	3
Government Services	New Otway Compaction Station	0	1	3	1	2	3
Government Services	Compaction Station, Atlantic	0	1	3	1	2	3
Water Supplies	Jonaquins Creek Well House	1	3	2	2	1	3
Communications Infrastructure	2003-Aso-2361-Oe – US-70	2	3	1	2	1	2
Communications Infrastructure	2006-Aso-2080-Oe – Nelson Bay Rd	2	3	1	2	1	2
Transportation	Harbor Of Refuge Harkers Island	2	3	1	2	1	2
Transportation	Cedar Island Harbor	2	3	1	2	1	2
Communications Infrastructure	Unnamed Cell Tower – Merrimon Rd	2	3	1	2	1	2

Table 4.10 Natural Assets Vulnerability Scores for Assets with High Vulnerability to Storm Surge Hazards

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)			Cat 1 Storm Surge (Baseline)	Cat 2 Storm Surge (Projected)
Agricultural Land	Bay Point LLC	2	3	3	2	3	4
Agricultural Land	Cnx5 Trees LLC	2	3	3	2	3	4
Agricultural Land	Jordan, Eugene N	2	3	3	2	3	4
Agricultural Land	Mcintyre, William H Jr Etal	2	3	3	2	3	4
Agricultural Land	Bay Point LLC Etal Tr Briere	1	3	3	2	2	4
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	1	3	3	2	2	4
Agricultural Land	Ellis, Ronald W Etux Susan E	1	3	3	2	2	4
Agricultural Land	Gmattox LLC	1	3	3	2	2	4
Agricultural Land	Ivictus Investing LLC	1	3	3	2	2	4
Agricultural Land	Joel H Davis Family Ltd Partns	1	3	3	2	2	4
Agricultural Land	Mcintyre, William H Jr	1	3	3	2	2	4
Agricultural Land	Merrill, June	1	3	3	2	2	4
Agricultural Land	Oyster Creek Sporting Club LLC	1	3	3	2	2	4
Agricultural Land	P&J Properties & Invstmnts LLC	1	3	3	2	2	4
Agricultural Land	Paul, Dianna Golden Etux Nelson	1	3	3	2	2	4
Agricultural Land	Vick, William Temple Etux Darla	1	3	3	2	2	4
Agricultural Land	Willis, Steven Ketih	1	3	3	2	2	4
Agricultural Land	Won, Lianne Etvir Reburn	1	3	3	2	2	4

Table 4.11 Network Miles by Asset Type and Vulnerability Scores for Storm Surge Hazards*

Network Type	Storm Category	Vulnerability Scores					
		0	1	2	3	4	5
Federal Roads	Cat 1	27.65	2.88	0.21	0	0	0
	Cat 2	7.88	4.53	18.32	0	0	0
State Roads	Cat 1	17.33	3.11	0.18	0	0	0
	Cat 2	8.45	5.00	7.17	0	0	0
Secondary Routes	Cat 1	106.31	7.98	0.35	0	0	0
	Cat 2	26.70	27.17	60.78	0	0	0
Other Roads	Cat 1	116.00	10.66	1.77	0	0	0
	Cat 2	29.95	29.70	68.78	0	0	0
All Roads	Cat 1	267.28	24.63	2.51	0	0	0
	Cat 2	72.98	66.40	155.05	0	0	0
Sidewalks and Trails	Cat 1	47.88	6.08	0.47	0	0	0
	Cat 2	18.32	9.11	27.00	0	0	0
Outfalls	Cat 1	0.29	0.43	0.64	0.01	0	0
	Cat 2	0.04	0.22	0.23	0.89	0	0

*While critical network infrastructure assets have a full range of exposure values, vulnerability scores for these assets are generally low due to the low sensitivity and high adaptive capacity of these assets.

Down East

Down East Overview

Category 1 Storm Surge Vulnerability

Storm surge data source: NOAA Meteorological Development Laboratory. SLOSH model outputs, 2022

Legend

Storm Surge Vulnerability Scores

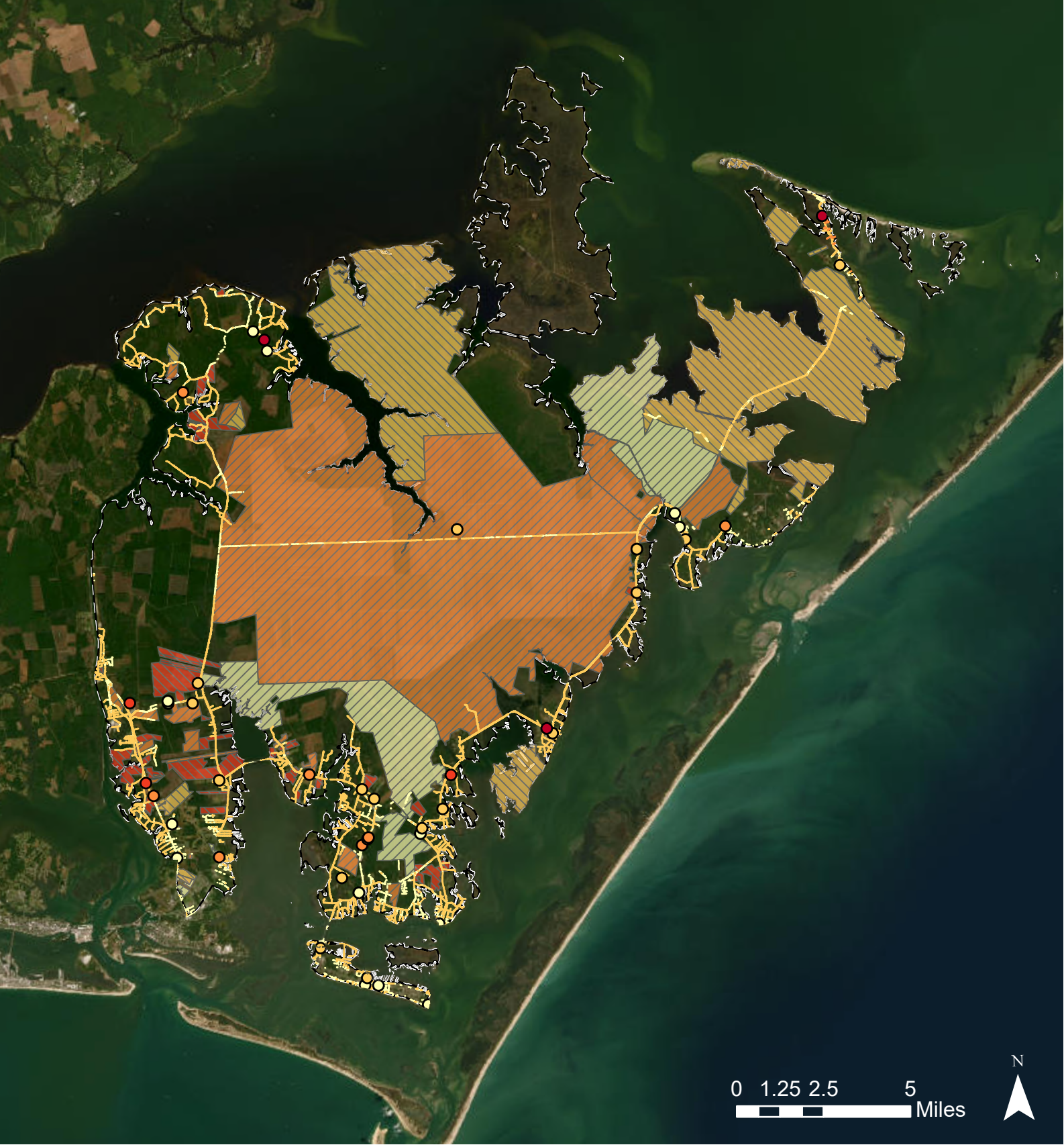
Critical Facilities	Roads and Trails	Natural Assets
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/



Down East

Down East Overview

Category 2 Storm Surge Vulnerability

Storm surge data source: NOAA Meteorological Development Laboratory. SLOSH model outputs, 2022

Legend

Storm Surge Vulnerability Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

4.2 Coastal Flood and Sea Level Change

This hazard addresses the RCCP requirement to evaluate tidal flooding and a 30-year sea level change projection. While the storm surge assessment in the previous section evaluates asset vulnerability to flood depths from hurricanes and other extreme weather events, this section evaluates asset vulnerability to coastal flooding benchmarked to specific flood probabilities, both today and into the future. Data relies on modeling output from the North Carolina Sea Level Impact Study (2014) for coastal storm frequencies and extents. Based on current sea level change projections, sea levels are projected to rise by approximately 40cm (1.3 feet) by 2050.

This analysis considers storm surge and tidally driven flooding for both present-day and a 2050 projection scenario for 100-year (1% annual exceedance probability) and 500-year (0.2% annual exceedance probability) storm events. The findings below summarize coastal flooding and sea level change vulnerability for critical built infrastructure, natural assets, and critical network infrastructure.

Key Findings:

- Vulnerability scores for built infrastructure, natural assets, and network infrastructure do not change significantly between present-day and future conditions. Built infrastructure and natural lands already experience significant vulnerability to coastal flooding.
- Compaction stations have the highest vulnerability scores due to these assets siting near floodplains, high sensitivity to flooding, and low adaptive capacity. South River, Cedar Island, Davis, NC 101, Old Otway, and New Otway compaction stations all have the highest possible vulnerability score (5) for both present-day and 2050 flooding conditions.
- The highest vulnerability natural assets are all privately owned agricultural lands. Those included in this report in **Table 4.21** all have present and future condition vulnerability scores of 4 out of 5, indicating high vulnerability.
- No roads experience high vulnerability, but critical roadways and evacuation routes experience moderate vulnerability under both current conditions and projected conditions of sea level rise. These roadways include NC 12, US 70, and NC 101.

As a reminder, Vulnerability is calculated by the following formula. The components of the Vulnerability scores as they pertain to the Coastal Flooding hazard are detailed below, in Sections **4.2.1 (Exposure Scoring)** and **4.2.2 (Sensitivity and Adaptive Capacity Scoring)**. Vulnerability is ranked on a relative scale from 0 (no vulnerability) to 5 (highest vulnerability).

Exposure	+	Sensitivity	–	Adaptive Capacity	=	Vulnerability

4.2.1 EXPOSURE SCORING

Assets are assigned **Exposure Scores** from zero (no storm annual exceedance probability) to three (greater than or equal to one percent) based on storm annual exceedance probabilities assets are expected to experience under Baseline (present-day) and Projected (1.5 feet of sea level rise) sea level rise conditions.

Assets' Exposure Scores are referenced from low to high exposure, as summarized in **Table 4.12**, to facilitate the discussion of these results.

Table 4.12: Exposure Scoring for Coastal Flood Hazards

SCORE	STORM ANNUAL EXCEEDANCE PROBABILITY
0	None
1	Less than 0.2%
2	Less than one percent and greater than or equal to 0.2%
3	Greater than or equal to one percent

Table 4.13 Critical Built Infrastructure Exposure Scores for Assets with High Vulnerability to Coastal Flood Hazards. Exposure scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 FT SLR)
Government Services	South River Compaction Station	3	3
Government Services	Cedar Island Compaction Station	3	3
Government Services	Davis Compaction Station	3	3
Government Services	NC 101 Compaction Station	3	3
Government Services	Old Otway Compaction Station	3	3
Government Services	New Otway Compaction Station	3	3
Government Services	Compaction Station, Atlantic	1	3
Water Supplies	Jonaquins Creek Well House	3	3
Water Supplies	Laurel Road Water Treatment Plant Main Building	3	3
Water Supplies	Laurel Road Water Treatment Plant	3	3
Water Supplies	Beaufort Water Tower	3	3
Water Supplies	Harkers Island Water Tower	1	3

Table 4.14 Natural Assets Exposure Scores for Assets with High Vulnerability to Coastal Flood Hazards

Asset Type	Asset Name	Exposure	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 FT SLR)
Agricultural Land	Arthur, Patricia T	3	3
Agricultural Land	Arthur, Richard Earl Trustee	3	3
Agricultural Land	Bay Point LLC	3	3
Agricultural Land	Bay Point LLC Etal Tr Briere	3	3
Agricultural Land	Buckland, Janice Clark L/T	3	3
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	3

Asset Type	Asset Name	Exposure	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 FT SLR)
Agricultural Land	Carteret Farm LLC	3	3
Agricultural Land	Cnx5 Trees LLC	3	3
Agricultural Land	Compton, Sara Rogers	3	3
Agricultural Land	Core Creek Dev Partners LLC	3	3
Agricultural Land	Ellis, Ronald W Etux Susan E	3	3
Agricultural Land	Gillikin, Jerry K Etux Etal	3	3
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3	3
Agricultural Land	Gmattox LLC	3	3
Agricultural Land	Heavner, Patrick T Etal Joseph	3	3
Agricultural Land	Ivictus Investing LLC	3	3
Agricultural Land	Joel H Davis Family Ltd Partns	3	3
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	3
Agricultural Land	Jordan, Eugene N	3	3
Agricultural Land	Jst Farms LLC	3	3
Agricultural Land	King, Michael J	3	3
Agricultural Land	Lawrence, Rodney Ray	3	3
Agricultural Land	Mcintyre, William H Jr	3	3
Agricultural Land	Mcintyre, William H Jr Etal	3	3
Agricultural Land	Merrell, Johnnie Jr Etux Myrtle	3	3
Agricultural Land	Merrill, June	3	3
Agricultural Land	Oyster Creek Sporting Club LLC	3	3
Agricultural Land	P&J Properties & Invstmnts LLC	3	3
Agricultural Land	Pake, Juanita H L/T	3	3
Agricultural Land	Paul, Dianna Golden Etux Nelson	3	3
Agricultural Land	Simpson, George D Etal Trust	3	3
Agricultural Land	Simpson, John D Etal Stinson	3	3
Agricultural Land	Smith, Anthony L Etux Kerry	3	3
Agricultural Land	Snug Harbor Farms LLC	3	3
Agricultural Land	Taylor, Timothy R Etux Kimberly	3	3
Agricultural Land	Temple, Cary Grey Etux Maggie R	3	3
Agricultural Land	The Campen Family LLC	3	3
Agricultural Land	Trade-Win Iv Farm LLC	3	3
Agricultural Land	Vick, William Temple Etux Darla	3	3

Asset Type	Asset Name	Exposure	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 FT SLR)
Agricultural Land	Willis, Steven Ketih	3	3
Agricultural Land	Wilson Creek Timber LLC	3	3
Agricultural Land	Won, I J Etal Susan	3	3
Agricultural Land	Won, Lianne Etvir Reburn	3	3
Agricultural Land	Wright, Mary B	3	3
Agricultural Land	Wysocking Wildlfe Sanctury Inc	3	3

Table 4.15 Network Miles by Asset Type and Exposure Scores for Coastal Flood Hazards

Asset Type	Storm Category	Miles of network by Exposure Score			
		0	1	2	3
Federal Roads	Baseline	0	6.91	0	23.82
	Projected	0	3.85	0	26.88
State Roads	Baseline	0	5.61	0	15.01
	Projected	0	3.89	0	16.72
Secondary Routes	Baseline	0	31.11	0	83.53
	Projected	0	18.26	0	96.39
Other Roads	Baseline	0	36.70	0	91.72
	Projected	0	20.11	0	108.32
All Roads	Baseline	0	80.34	0	214.08
	Projected	0	46.12	0	248.31
Sidewalks	Baseline	0	13.71	0	40.72
	Projected	0	9.67	0	44.76
Outfalls	Baseline	0	0.21	0	1.16
	Projected	0	0.06	0	1.31

Supporting maps of coastal flooding hazard extents and asset exposure scores can be found in the **Appendix**.

4.2.2 SENSITIVITY AND ADAPTIVE CAPACITY SCORING

Sensitivity reflects the potential damage to critical built infrastructure's materials, functions, or the surrounding environment if it were flooded. Critical built infrastructure that cannot immediately accommodate floodwaters or increased water levels is more likely to experience higher damage levels. **Sensitivity Scores** are assigned by asset types and consider the potential for damage and disruption of essential services or functions.

Adaptative capacity illustrates the ability of an asset to change its characteristics or behavior in response to a hazard. An asset's potential to adapt depends on the potential suite of options available and a community's ability to implement those actions. The **Adaptive Capacity Scores** are assigned by asset types and consider the potential for assets to be relocated or adapt to coastal flooding exposure.

Table 4.16 Sensitivity and Adaptive Capacity Scoring

ASSET CATEGORY	ASSET TYPE	SENSITIVITY	ADAPTIVE CAPACITY
Critical Built Infrastructure	Buildings[1]	2	3
	Energy facilities	2	2
	Communications infrastructure	1	2
	Waste infrastructure	3	1
	Water Supplies[2]	2	2
Critical Network Infrastructure	Transportation	1	2
Natural Assets	Agricultural land	3	2
	Natural land	1	2
	Recreational land	1	2

1. Includes all critical built infrastructure except for communications infrastructure, energy facilities, wastewater facilities, and water supplies.
2. Outfall lines are classified as Water/Sewer assets that are Critical Network Infrastructure. Note that this assessment for Down East does not include outfall lines.

Table 4.17 Critical Built Infrastructure Sensitivity and Adaptive Capacity Scores for Assets with High Vulnerability to Coastal Flooding Hazards. Sensitivity and adaptive capacity scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Government Services	South River Compaction Station	3	1
Government Services	Cedar Island Compaction Station	3	1
Government Services	Davis Compaction Station	3	1
Government Services	NC 101 Compaction Station	3	1
Government Services	Old Otway Compaction Station	3	1
Government Services	New Otway Compaction Station	3	1
Government Services	Compaction Station, Atlantic	3	1
Water Supplies	Jonaquins Creek Well House	2	2
Water Supplies	Laurel Road Water Treatment Plant Main Building	2	2
Water Supplies	Laurel Road Water Treatment Plant	2	2
Water Supplies	Beaufort Water Tower	2	2
Water Supplies	Harkers Island Water Tower	2	2

Table 4.18 Natural Assets Sensitivity and Adaptive Capacity Scores for Coastal Flooding Hazards

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	Arthur, Patricia T	3	2
Agricultural Land	Arthur, Richard Earl Trustee	3	2
Agricultural Land	Bay Point LLC	3	2
Agricultural Land	Bay Point LLC Etal Tr Briere	3	2
Agricultural Land	Buckland, Janice Clark L/T	3	2

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	2
Agricultural Land	Carteret Farm LLC	3	2
Agricultural Land	Cnx5 Trees LLC	3	2
Agricultural Land	Compton, Sara Rogers	3	2
Agricultural Land	Core Creek Dev Partners LLC	3	2
Agricultural Land	Ellis, Ronald W Etux Susan E	3	2
Agricultural Land	Gillikin, Jerry K Etux Etal	3	2
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3	2
Agricultural Land	Gmattox LLC	3	2
Agricultural Land	Heavner, Patrick T Etal Joseph	3	2
Agricultural Land	Ivictus Investing LLC	3	2
Agricultural Land	Joel H Davis Family Ltd Partns	3	2
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	2
Agricultural Land	Jordan, Eugene N	3	2
Agricultural Land	Jst Farms LLC	3	2
Agricultural Land	King, Michael J	3	2
Agricultural Land	Lawrence, Rodney Ray	3	2
Agricultural Land	Mcintyre, William H Jr	3	2
Agricultural Land	Mcintyre, William H Jr Etal	3	2
Agricultural Land	Merrell, Johnnie Jr Etux Myrtle	3	2
Agricultural Land	Merrill, June	3	2
Agricultural Land	Oyster Creek Sporting Club LLC	3	2
Agricultural Land	P&J Properties & Invstmnts LLC	3	2
Agricultural Land	Pake, Juanita H L/T	3	2
Agricultural Land	Paul, Dianna Golden Etux Nelson	3	2
Agricultural Land	Simpson, George D Etal Trust	3	2
Agricultural Land	Simpson, John D Etal Stinson	3	2
Agricultural Land	Smith, Anthony L Etux Kerry	3	2
Agricultural Land	Snug Harbor Farms LLC	3	2
Agricultural Land	Taylor, Timothy R Etux Kimberly	3	2
Agricultural Land	Temple, Cary Grey Etux Maggie R	3	2
Agricultural Land	The Campen Family LLC	3	2
Agricultural Land	Trade-Win Iv Farm LLC	3	2
Agricultural Land	Vick, William Temple Etux Darla	3	2
Agricultural Land	Willis, Steven Ketih	3	2
Agricultural Land	Wilson Creek Timber LLC	3	2
Agricultural Land	Won, I J Etal Susan	3	2
Agricultural Land	Won, Lianne Etvir Reburn	3	2
Agricultural Land	Wright, Mary B	3	2
Agricultural Land	Wysocking Wildlfe Sanctury Inc	3	2

Table 4.19 Sensitivity and Adaptive Capacity Scores by Network Asset Type for Coastal Flooding Hazards

Asset Type	Coastal Flooding Scenario	Sensitivity	Adaptive Capacity
Federal Roads	Baseline	1	2
	Projection		
State Roads	Baseline	1	2
	Projection		
Secondary Routes	Baseline	1	2
	Projection		
Other Roads	Baseline	1	2
	Projection		
All Roads	Baseline	**1**	**2**
	Projection		
Sidewalks	Baseline	1	2
	Projection		
Outfalls	Baseline	1	2
	Projection		

4.2.3 VULNERABILITY RESULTS

Much of the Down East region is vulnerable to coastal flooding. The least vulnerable areas are located within Open Ground Farm. The areas and assets vulnerable to coastal flooding are similar to those vulnerable to storm surge hazards, with water infrastructure assets vulnerable to coastal flooding in addition to compaction stations.

Table 4.20 Critical Built Infrastructure Vulnerability Scores for Assets with High Vulnerability to Coastal Flooding Hazards. Vulnerability scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)			Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)
Government Services	South River Compaction Station	3	3	3	1	5	5
Government Services	Cedar Island Compaction Station	3	3	3	1	5	5
Government Services	Davis Compaction Station	3	3	3	1	5	5
Government Services	NC 101 Compaction Station	3	3	3	1	5	5

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)			Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)
Government Services	Old Otway Compaction Station	3	3	3	1	5	5
Government Services	New Otway Compaction Station	3	3	3	1	5	5
Government Services	Compaction Station, Atlantic	1	3	3	1	3	5
Water Supplies	Jonaquins Creek Well House	3	3	2	2	3	3
Water Supplies	Laurel Road Water Treatment Plant Main Building	3	3	2	2	3	3
Water Supplies	Laurel Road Water Treatment Plant	3	3	2	2	3	3
Water Supplies	Beaufort Water Tower	3	3	2	2	3	3
Water Supplies	Harkers Island Water Tower	1	3	2	2	1	3

Table 4.21 Natural Assets Vulnerability Scores for Assets with High Vulnerability to Coastal Flood Hazards

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)			Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)
Agricultural Land	Arthur, Patricia T	3	3	3	2	4	4
Agricultural Land	Arthur, Richard Earl Trustee	3	3	3	2	4	4
Agricultural Land	Bay Point LLC	3	3	3	2	4	4
Agricultural Land	Bay Point LLC Etal Tr Briere	3	3	3	2	4	4
Agricultural Land	Buckland, Janice Clark L/T	3	3	3	2	4	4
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	3	3	2	4	4

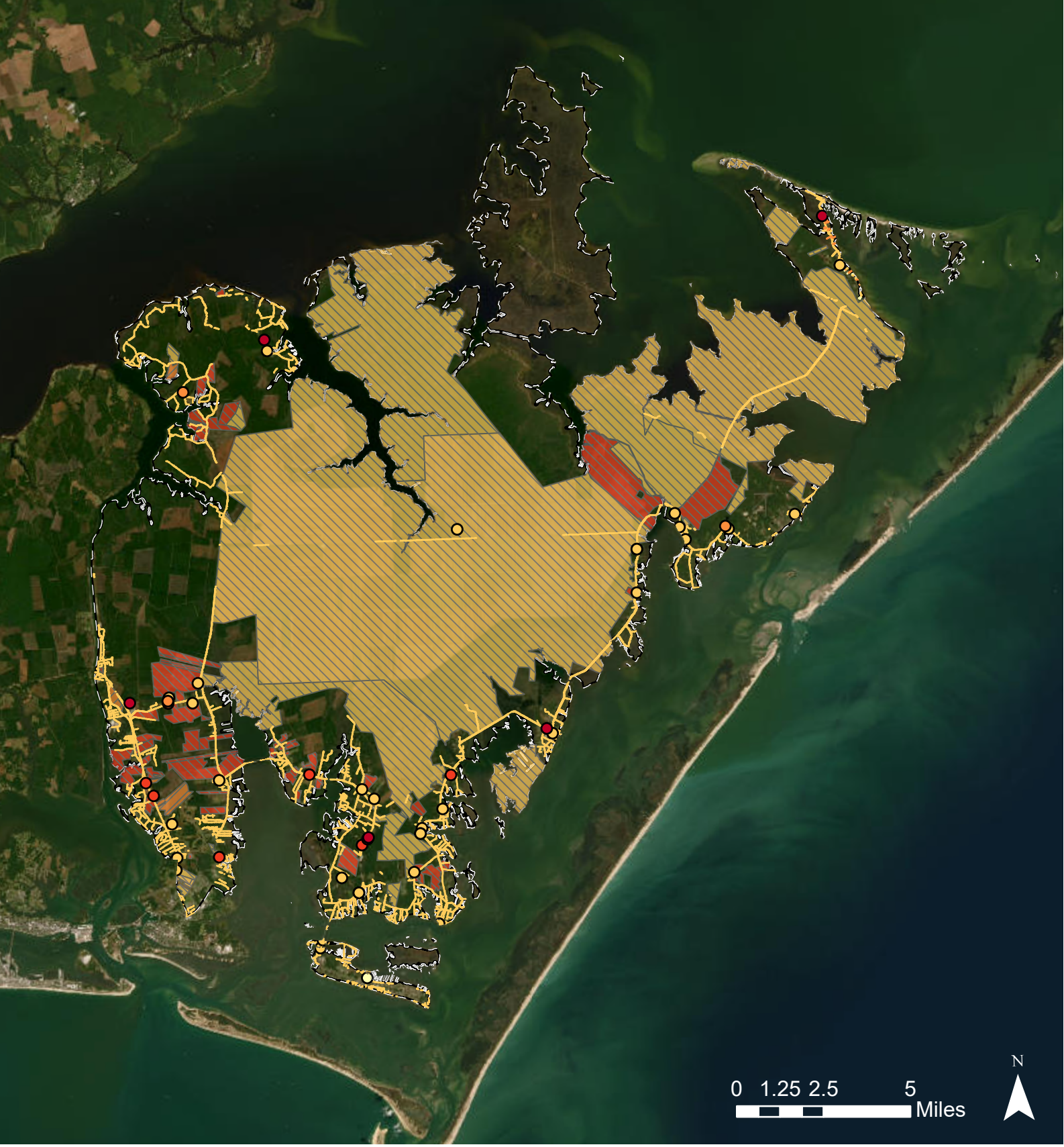
Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)			Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)
Agricultural Land	Carteret Farm LLC	3	3	3	2	4	4
Agricultural Land	Cnx5 Trees LLC	3	3	3	2	4	4
Agricultural Land	Compton, Sara Rogers	3	3	3	2	4	4
Agricultural Land	Core Creek Dev Partners LLC	3	3	3	2	4	4
Agricultural Land	Ellis, Ronald W Etux Susan E	3	3	3	2	4	4
Agricultural Land	Gillikin, Jerry K Etux Etal	3	3	3	2	4	4
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3	3	3	2	4	4
Agricultural Land	Gmattox LLC	3	3	3	2	4	4
Agricultural Land	Heavner, Patrick T Etal Joseph	3	3	3	2	4	4
Agricultural Land	Ivictus Investing LLC	3	3	3	2	4	4
Agricultural Land	Joel H Davis Family Ltd Partns	3	3	3	2	4	4
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	3	3	2	4	4
Agricultural Land	Jordan, Eugene N	3	3	3	2	4	4
Agricultural Land	Jst Farms LLC	3	3	3	2	4	4
Agricultural Land	King, Michael J	3	3	3	2	4	4
Agricultural Land	Lawrence, Rodney Ray	3	3	3	2	4	4
Agricultural Land	Mcintyre, William H Jr	3	3	3	2	4	4
Agricultural Land	Mcintyre, William H Jr Etal	3	3	3	2	4	4
Agricultural Land	Merrell, Johnnie Jr Etux Myrtle	3	3	3	2	4	4
Agricultural Land	Merrill, June	3	3	3	2	4	4

Asset Type	Asset Name	Exposure		Sens.	A.C.	Vulnerability	
		Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)			Present-Day Coastal Flooding (Baseline)	2050 Coastal Flooding (Projected 1.5 SLR)
Agricultural Land	Oyster Creek Sporting Club LLC	3	3	3	2	4	4
Agricultural Land	P&J Properties & Invstmnts LLC	3	3	3	2	4	4
Agricultural Land	Pake, Juanita H L/T	3	3	3	2	4	4
Agricultural Land	Paul, Dianna Golden Etux Nelson	3	3	3	2	4	4
Agricultural Land	Simpson, George D Etal Trust	3	3	3	2	4	4
Agricultural Land	Simpson, John D Etal Stinson	3	3	3	2	4	4
Agricultural Land	Smith, Anthony L Etux Kerry	3	3	3	2	4	4
Agricultural Land	Snug Harbor Farms LLC	3	3	3	2	4	4
Agricultural Land	Taylor, Timothy R Etux Kimberly	3	3	3	2	4	4
Agricultural Land	Temple, Cary Grey Etux Maggie R	3	3	3	2	4	4
Agricultural Land	The Campen Family LLC	3	3	3	2	4	4
Agricultural Land	Trade-Win Iv Farm LLC	3	3	3	2	4	4
Agricultural Land	Vick, William Temple Etux Darla	3	3	3	2	4	4
Agricultural Land	Willis, Steven Ketih	3	3	3	2	4	4
Agricultural Land	Wilson Creek Timber LLC	3	3	3	2	4	4
Agricultural Land	Won, I J Etal Susan	3	3	3	2	4	4
Agricultural Land	Won, Lianne Etvir Reburn	3	3	3	2	4	4
Agricultural Land	Wright, Mary B	3	3	3	2	4	4
Agricultural Land	Wysocking Wildlfe Sanctury Inc	3	3	3	2	4	4

Table 4.22 Network Miles by Asset Type and Vulnerability Scores for Coastal Flood Hazards*

NETWORK TYPE	COASTAL FLOODING SCENARIO	VULNERABILITY SCORE					
		0	1	2	3	4	5
Federal Roads	Baseline	6.91	0	23.82	0	0	0
	Projected	3.85	0	26.88	0	0	0
State Roads	Baseline	5.61	0	15.01	0	0	0
	Projected	3.89	0	16.72	0	0	0
Secondary Routes	Baseline	31.11	0	83.53	0	0	0
	Projected	18.26	0	96.39	0	0	0
Other Roads	Baseline	36.70	0	91.72	0	0	0
	Projected	20.11	0	108.32	0	0	0
All Roads	**Baseline**	80.34	0	214.08	0	0	0
	Projected	46.12	0	248.31	0	0	0
Sidewalks and Trails	Baseline	13.71	0	40.72	0	0	0
	Projected	9.67	0	44.76	0	0	0
Outfalls	Baseline	0	0.21	0.00	1.16	0	0
	Projected	0	0.06	0.00	1.31	0	0

*While critical network infrastructure assets have a full range of exposure values, vulnerability scores for these assets are generally low due to the low sensitivity and high adaptive capacity of these assets.



Down East

Down East Overview

Coastal Flooding and Sea Level Change Vulnerability: Baseline Conditions

Existing and Projected Coastal Flood Hazard: NC SLR Impact Study, 2014

Legend

Coastal Flooding Vulnerability Scores

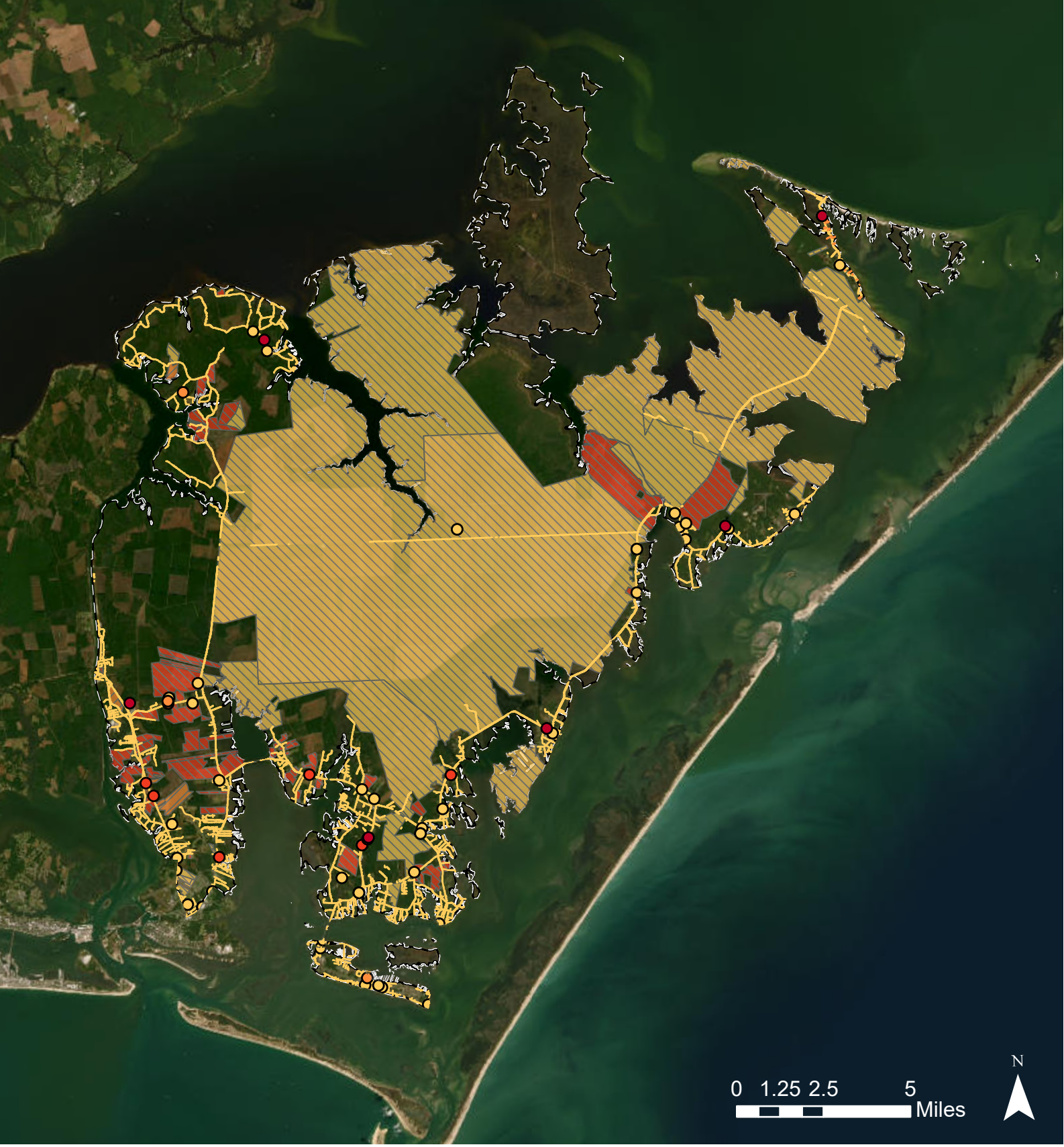
Critical Facilities	Roads and Trails	Natural Assets
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/



Down East

Down East Overview

Coastal Flooding and Sea Level Change Vulnerability: Projected Conditions

Existing and Projected Coastal Flood Hazard: NC SLR Impact Study, 2014

Legend

Coastal Flooding Vulnerability Scores

Critical Facilities	Roads and Trails	Natural Assets
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

4.3 Riverine Flooding

This analysis relies on the 100-year and 500-year Flood Hazard Areas from North Carolina's Flood Risk Information System (FRIS). The hazard analysis for riverine flooding does not include a climate projection scenario. While riverine flooding extents and probabilities may change with changing climatic conditions, there is agreement across modeling methods for us to incorporate forward-looking riverine flooding probability exposure scores in this analysis. Despite this, there is qualitative information available that suggests that changing precipitation regimes (including longer and more intense dry periods) and changing land use patterns (primarily increased development) can contribute to more frequent, higher-intensity riverine flooding events in the future compared to current conditions.

Using data from North Carolina's FRIS, this analysis uses flood hazard areas consistent with annual exceedance probabilities for coastal storm events.

Key Findings:

- Assets' vulnerability to riverine flooding are similar to assets' vulnerability to coastal flooding.
- Compaction stations have the highest vulnerability scores due to these assets siting near floodplains, high sensitivity to flooding, and low adaptive capacity. Cedar Island, Davis, Old Otway and New Otway compaction stations all have the highest possible riverine flooding vulnerability values (5).
- The highest vulnerability natural assets are all agricultural lands, and privately owned. Those included in this report in **Table 4.32** all have present and future condition vulnerability scores of 4 out of 5, indicating high vulnerability.
- Local coastal roads and US 70 have vulnerability scores of 2. The Cedar Island Outfall is also particularly vulnerable, with a score of 3.

As a reminder, Vulnerability is calculated by the following formula. The components of the Vulnerability scores as they pertain to the Riverine Flooding hazard are detailed below, in Sections **4.3.1 (Exposure Scoring)** and **4.3.2 (Sensitivity and Adaptive Capacity Scoring)**. Vulnerability is ranked on a relative scale from 0 (no vulnerability) to 5 (highest vulnerability).

Exposure	+	Sensitivity	–	Adaptive Capacity	=	Vulnerability

4.3.1 EXPOSURE SCORING

Assets are assigned **Exposure Scores** from zero (no riverine flooding annual exceedance probability) to three (annual exceedance probability greater than or equal to one percent) based on riverine flood zone areas assets fall within. The riverine flooding hazard does not include a climate projection scenario.

Assets' Exposure Scores are referenced from low to high exposure, as summarized in **Table 4.23**, to facilitate the discussion of these results.

Table 4.23 Exposure, Sensitivity, and Adaptive Capacity Approach Scoring for Riverine Flood Hazards

SCORE	ANNUAL EXCEEDANCE PROBABILITY
0	None
1	Less than 0.2%
2	Less than one percent and greater than or equal to 0.2%
3	Greater than or equal to one percent

Table 4.24 Critical Built Infrastructure Exposure Scores for Assets with High Vulnerability to Riverine Flood Hazards. Exposure scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure Riverine Flooding
Government Services	Cedar Island Compaction Station	3
Government Services	Davis Compaction Station	3
Government Services	Old Otway Compaction Station	3
Government Services	New Otway Compaction Station	3
Government Service	NC 101 Compaction Station	2
Government Services	Compaction Station, Atlantic	2
Government Services	South River Compaction Station	2
Water Supplies	Jonaquins Creek Well House	3

Table 4.25 Natural Assets Exposure Scores for Assets with High Vulnerability to Riverine Flood Hazards

Asset Type	Asset Name	Exposure Riverine Flooding
Agricultural Land	Arthur, Patricia T	3
Agricultural Land	Arthur, Richard Earl Trustee	3
Agricultural Land	Bay Point LLC	3
Agricultural Land	Bay Point LLC Etal Tr Briere	3
Agricultural Land	Buckland, Janice Clark L/T	3
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3
Agricultural Land	Carteret Farm LLC	3
Agricultural Land	Cnx5 Trees LLC	3
Agricultural Land	Compton, Sara Rogers	3
Agricultural Land	Core Creek Dev Partners LLC	3
Agricultural Land	Ellis, Ronald W Etux Susan E	3
Agricultural Land	Gillikin, Jerry K Etux Etal	3
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3
Agricultural Land	Gmattox LLC	3
Agricultural Land	Heavner, Patrick T Etal Joseph	3
Agricultural Land	Hynes, Michael G Etux Etal	3
Agricultural Land	Hynes, Michael G Etux Traci	3
Agricultural Land	Ivictus Investing LLC	3
Agricultural Land	Joel H Davis Family Ltd Partns	3
Agricultural Land	Joel Henry Davis Ltd Partnshp	3
Agricultural Land	Jordan, Eugene N	3
Agricultural Land	Jst Farms LLC	3
Agricultural Land	King, Michael J	3
Agricultural Land	Lawrence, Rodney Ray	3
Agricultural Land	Mcintyre, William H Jr	3
Agricultural Land	Mcintyre, William H Jr Etal	3
Agricultural Land	Merrill, June	3
Agricultural Land	Oyster Creek Sporting Club LLC	3
Agricultural Land	P&J Properties & Invstmnts LLC	3
Agricultural Land	Pake, Juanita H L/T	3
Agricultural Land	Paul, Dianna Golden Etux Nelson	3
Agricultural Land	Simpson, George D Etal Trust	3

Asset Type	Asset Name	Exposure
		Riverine Flooding
Agricultural Land	Simpson, John D Etal Stinson	3
Agricultural Land	Snug Harbor Farms LLC	3
Agricultural Land	Temple, Cary Grey Etux Maggie R	3
Agricultural Land	Trade-Win Iv Farm LLC	3
Agricultural Land	Vick, William Temple Etux Darla	3
Agricultural Land	Willis, Steven Ketih	3
Agricultural Land	Wilson Creek Timber LLC	3
Agricultural Land	Won, I J Etal Susan	3
Agricultural Land	Won, Lianne Etvir Reburn	3
Agricultural Land	Wright, Mary B	3
Agricultural Land	Wysocking Wildlife Sanctury Inc	3

Table 4.26 Network Miles by Asset type and Exposure Scores for Riverine Flood Hazards

Asset Type	Miles of network by Exposure Score			
	0	1	2	3
Federal Roads	0	4.17	2.79	23.78
State Roads	0	2.91	4.81	12.90
Secondary Routes	0	18.67	17.37	78.61
Other Roads	0	17.99	24.47	85.97
All Roads	0	43.74	49.44	201.25
Sidewalks	0	6.32	6.13	41.98
Outfalls	0	0	0	1.34

Supporting maps of riverine flooding hazard extents and asset exposure scores can be found in the **Appendix**.

4.3.2 SENSITIVITY AND ADAPTIVE CAPACITY SCORING

Sensitivity reflects the potential damage to critical built infrastructure's materials, functions, or the surrounding environment if it were flooded. Critical built infrastructure that cannot immediately accommodate floodwaters or increased water levels is more likely to experience higher damage levels. **Sensitivity Scores** are assigned by asset types and consider the potential for damage and disruption of essential services or functions.

Adaptative capacity illustrates the ability of an asset to change its characteristics or behavior in response to a hazard. An asset's potential to adapt depends on the potential suite of options available and a community's ability to implement those actions. The **Adaptive Capacity Scores** are assigned by asset types and consider the potential for assets to be relocated or adapt to coastal flooding exposure.

Table 4.27 Sensitivity and Adaptive Capacity Scoring

ASSET CATEGORY	ASSET TYPE	SENSITIVITY	ADAPTIVE CAPACITY
Critical Built Infrastructure	Buildings[1]	2	3
	Energy facilities	2	2
	Communications infrastructure	1	2
	Waste infrastructure	3	1
	Water Supplies[2]	2	2
Critical Network Infrastructure	Transportation	1	2
Natural Assets	Agricultural land	3	2
	Natural land	1	2
	Recreational land	1	2

1. Includes all critical built infrastructure except for communications infrastructure, energy facilities, wastewater facilities, and water supplies.
2. Outfall lines are classified as Water/Sewer assets that are Critical Network Infrastructure. Note that this assessment for Down East does not include outfall lines.

Table 4.28 Critical Built Infrastructure Sensitivity and Adaptive Capacity Scores for Assets with High Vulnerability to Riverine Flooding Hazards. Sensitivity and adaptive capacity scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Government Services	Cedar Island Compaction Station	3	1
Government Services	Davis Compaction Station	3	1
Government Services	Old Otway Compaction Station	3	1
Government Services	New Otway Compaction Station	3	1
Government Services	NC 101 Compaction Station	3	1
Government Services	Compaction Station, Atlantic	3	1
Government Services	South River Compaction Station	3	1
Water Supplies	Jonaquins Creek Well House	2	2

Table 4.29 Natural Assets Sensitivity and Adaptive Capacity Scores for Riverine Flooding Hazards

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	Arthur, Patricia T	3	2
Agricultural Land	Arthur, Richard Earl Trustee	3	2
Agricultural Land	Bay Point LLC	3	2
Agricultural Land	Bay Point LLC Etal Tr Briere	3	2
Agricultural Land	Buckland, Janice Clark L/T	3	2
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	2
Agricultural Land	Carteret Farm LLC	3	2
Agricultural Land	Cnx5 Trees LLC	3	2
Agricultural Land	Compton, Sara Rogers	3	2
Agricultural Land	Core Creek Dev Partners LLC	3	2

Agricultural Land	Ellis, Ronald W Etux Susan E	3	2
Agricultural Land	Gillikin, Jerry K Etux Etal	3	2
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3	2
Agricultural Land	Gmattox LLC	3	2
Agricultural Land	Heavner, Patrick T Etal Joseph	3	2
Agricultural Land	Hynes, Michael G Etux Etal	3	2
Agricultural Land	Hynes, Michael G Etux Traci	3	2
Agricultural Land	Ivictus Investing LLC	3	2
Agricultural Land	Joel H Davis Family Ltd Partns	3	2
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	2
Agricultural Land	Jordan, Eugene N	3	2
Agricultural Land	Jst Farms LLC	3	2
Agricultural Land	King, Michael J	3	2
Agricultural Land	Lawrence, Rodney Ray	3	2
Agricultural Land	Mcintyre, William H Jr	3	2
Agricultural Land	Mcintyre, William H Jr Etal	3	2
Agricultural Land	Merrill, June	3	2
Agricultural Land	Oyster Creek Sporting Club LLC	3	2
Agricultural Land	P&J Properties & Invstmnts LLC	3	2
Agricultural Land	Pake, Juanita H L/T	3	2
Agricultural Land	Paul, Dianna Golden Etux Nelson	3	2
Agricultural Land	Simpson, George D Etal Trust	3	2
Agricultural Land	Simpson, John D Etal Stinson	3	2
Agricultural Land	Snug Harbor Farms LLC	3	2
Agricultural Land	Temple, Cary Grey Etux Maggie R	3	2
Agricultural Land	Trade-Win Iv Farm LLC	3	2
Agricultural Land	Vick, William Temple Etux Darla	3	2
Agricultural Land	Willis, Steven Ketih	3	2
Agricultural Land	Wilson Creek Timber LLC	3	2
Agricultural Land	Won, I J Etal Susan	3	2
Agricultural Land	Won, Lianne Etvir Reburn	3	2
Agricultural Land	Wright, Mary B	3	2
Agricultural Land	Wysocking Wildlife Sanctury Inc	3	2

Table 4.30 Sensitivity and Adaptive Capacity Scores by Network Asset Type for Riverine Flooding Hazards

Asset Type	Sensitivity	Adaptive Capacity
Federal Roads State Roads	1 1	2 2
Secondary Routes	1	2
Other Roads	1	2
All Roads	**1**	**2**
Sidewalks	1	2
Outfalls	1	2

4.3.3 VULNERABILITY RESULTS

Much of Down East is vulnerable to riverine flooding and follows similar exposure patterns to coastal flooding. The areas and assets with high vulnerability to riverine flooding are a subset of those with high vulnerability to coastal flooding.

Table 4.31 Critical Built Infrastructure Vulnerability Scores for Assets with High Vulnerability to Riverine Flood Hazards. Vulnerability scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure	Sens.	A.C.	Vulnerability
		Riverine Flooding			Riverine Flooding
Government Services	Cedar Island Compaction Station	3	3	1	5
Government Services	Davis Compaction Station	3	3	1	5
Government Services	Old Otway Compaction Station	3	3	1	5
Government Services	New Otway Compaction Station	3	3	1	5
Government Services	NC 101 Compaction Station	2	3	1	4
Government Services	Compaction Station, Atlantic	2	3	1	4
Government Services	South River Compaction Station	2	3	1	4
Water Supplies	Jonaquins Creek Well House	3	2	2	3

Table 4.32 Natural Assets Vulnerability Scores for Assets with High Vulnerability to Riverine Flood Hazards

Asset Type	Asset Name	Exposure	Sens.	A.C.	Vulnerability
		Riverine Flooding			Riverine Flooding
Agricultural Land	Arthur,Patricia T	3	3	2	4
Agricultural Land	Arthur,Richard Earl Trustee	3	3	2	4
Agricultural Land	Bay Point LLC	3	3	2	4
Agricultural Land	Bay Point LLC Etal Tr Briere	3	3	2	4
Agricultural Land	Buckland,Janice Clark L/T	3	3	2	4
Agricultural Land	Carraway,Hervey Iii Etal Cahoo	3	3	2	4
Agricultural Land	Carteret Farm LLC	3	3	2	4
Agricultural Land	Cnx5 Trees LLC	3	3	2	4
Agricultural Land	Compton,Sara Rogers	3	3	2	4
Agricultural Land	Core Creek Dev Partners LLC	3	3	2	4
Agricultural Land	Ellis,Ronald W Etux Susan E	3	3	2	4

Agricultural Land	Gillikin,Jerry K Etux Etal	3	3	2	4
Agricultural Land	Gillikin,Narvia Mae Ebron L/T	3	3	2	4
Agricultural Land	Gmattox LLC	3	3	2	4
Agricultural Land	Heavner,Patrick T Etal Joseph	3	3	2	4
Agricultural Land	Hynes,Michael G Etux Etal	3	3	2	4
Agricultural Land	Hynes,Michael G Etux Traci	3	3	2	4
Agricultural Land	Ivictus Investing LLC	3	3	2	4
Agricultural Land	Joel H Davis Family Ltd Partns	3	3	2	4
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	3	2	4
Agricultural Land	Jordan,Eugene N	3	3	2	4
Agricultural Land	Jst Farms LLC	3	3	2	4
Agricultural Land	King,Michael J	3	3	2	4
Agricultural Land	Lawrence,Rodney Ray	3	3	2	4
Agricultural Land	Mcintyre,William H Jr	3	3	2	4
Agricultural Land	Mcintyre,William H Jr Etal	3	3	2	4
Agricultural Land	Merrill,June	3	3	2	4
Agricultural Land	Oyster Creek Sporting Club LLC	3	3	2	4
Agricultural Land	P&J Properties & Invstmnts LLC	3	3	2	4
Agricultural Land	Pake,Juanita H L/T	3	3	2	4
Agricultural Land	Paul,Dianna Golden Etux Nelson	3	3	2	4
Agricultural Land	Simpson,George D Etal Trust	3	3	2	4
Agricultural Land	Simpson,John D Etal Stinson	3	3	2	4
Agricultural Land	Snug Harbor Farms LLC	3	3	2	4
Agricultural Land	Temple,Cary Grey Etux Maggie R	3	3	2	4
Agricultural Land	Trade-Win Iv Farm LLC	3	3	2	4
Agricultural Land	Vick,William Temple Etux Darla	3	3	2	4
Agricultural Land	Willis,Steven Ketih	3	3	2	4
Agricultural Land	Wilson Creek Timber LLC	3	3	2	4
Agricultural Land	Won,I J Etal Susan	3	3	2	4
Agricultural Land	Won,Lianne Etvir Reburn	3	3	2	4
Agricultural Land	Wright,Mary B	3	3	2	4

Agricultural Land	Wysocking Wildlife Sanctury Inc	3	3	2	4

Table 4.33 Network Miles by Asset Type and Vulnerability Scores for Riverine Flood Hazards*

NETWORK TYPE	VULNERABILITY SCORE					
	0	1	2	3	4	5
Federal Roads	4.17	2.79	23.78	0	0	0
State Roads	2.91	4.81	12.90	0	0	0
Secondary Routes	18.67	17.37	78.61	0	0	0
Other Roads	17.99	24.47	85.97	0	0	0
All Roads	**43.74**	**49.44**	**201.25**	**0**	**0**	**0**
Sidewalks and Trails	6.32	6.13	41.98	0	0	0
Outfalls	0	0	0.03	1.34	0	0

*While critical network infrastructure assets have a full range of exposure values, vulnerability scores for these assets are generally low due to the low sensitivity and high adaptive capacity of these assets.

Down East

Down East Overview

Riverine Flooding Vulnerability

Riverine hazard data: North Carolina Flood Risk Information System (FRIS).

Legend

Riverine Flooding Vulnerability Scores

Critical Facilities	Roads and Trails	Natural Assets
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

4.4 Wildfire

This analysis relies on burn probability data from USFS[12], which estimates the annual probability of wildfire burning in a specific location. The hazard analysis for wildfire does not include a climate projection scenario. While wildfire probabilities are likely to change with changing climatic conditions, there is insufficient projection data available to incorporate forward-looking burn probability exposure scores in this analysis. Despite this, there is qualitative information available that suggests that changing precipitation regimes (including longer and more intense dry periods) can contribute to wildfire probabilities increasing, and encroachment of development into forested or other natural landscapes can increase exposure to high wildfire probability areas.

Using burn probability data, this analysis uses breakpoints of burn probability consistent with annual exceedance probabilities for coastal storm events. Asset sensitivity and adaptive capacity scores for wildfire hazards differ from those assigned to assets for flood hazards. The findings below summarize wildfire vulnerability for critical built infrastructure, natural assets, and critical network infrastructure.

Key Findings:

- Built infrastructure located near natural assets (agricultural lands, preserved lands) generally have higher vulnerability scores than those located in more developed areas.
- High sensitivity and limited adaptive capacity are the primary drivers of vulnerability wildfire hazard.
- The Cedar Island, Davis, NC 101, Old Otway, and New Otway Compaction Stations all have high vulnerability, with a score of 4. Many other assets in the critical built infrastructure category also share a score of 4; these can be seen in **Table 4.42**.
- Local roads experience low vulnerability to wildfire hazards, but evacuation routes (NC 12, US 70, and NC 101) have moderate vulnerability to wildfire hazards.

As a reminder, Vulnerability is calculated by the following formula. The components of the Vulnerability scores as they pertain to the Wildfire hazard are detailed below, in Sections **4.4.1 (Exposure Scoring)** and **4.4.2 (Sensitivity and Adaptive Capacity Scoring)**. Vulnerability is ranked on a relative scale from 0 (no vulnerability) to 5 (highest vulnerability).

Exposure	+	Sensitivity	–	Adaptive Capacity	=	Vulnerability

4.4.1 EXPOSURE SCORING

Assets are assigned **Exposure Scores** from zero (no annual burn probability) to three (annual burn probability greater than or equal to one percent) based on annual wildfire burn probabilities.

Assets' Exposure Scores are referenced from low to high exposure, as summarized in

Table 4.34, to facilitate the discussion of these results.

[12] referred to as Wildfire Likelihood in Wildfire Risk to Communities web application: https://wildfirerisk.org/)

Table 4.34 Exposure, Sensitivity, and Adaptive Capacity Approach Scoring for Wildfire Hazards

SCORE	ANNUAL BURN PROBABILITY
0	Zero percent
1	Less than 0.2 percent and greater than zero percent
2	Less than one percent and greater than or equal to 0.2 percent
3	One percent or greater

Table 4.35 Critical Built Infrastructure Exposure Scores for Assets with High Vulnerability to Wildfire Hazards. Exposure scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Exposure
		Wildfire
Government Services	Cedar Island Compaction Station	2
Government Services	Davis Compaction Station	2
Government Services	NC 101 Compaction Station	2
Government Services	Old Otway Compaction Station	2
Government Services	New Otway Compaction Station	2
Government Services	Compaction Station, Atlantic	2
Local Food Markets	Cape Lookout Grocery	2
Local Food Markets	Davis Provisions	2
Fire Stations	Down East Fire & Rescue	2
Fire Stations	Otway Rescue	2
Public Schools	East Carteret High	2
Government Services	Down East Library	2
Emergency Medical Services	Carteret County Ems 1	2
Medical Facilities	Pruitt Health	2
Transportation	Snug Harbor	2
Public Schools	Down East Middle	2
Public Schools	Smyrna Elementary	2
Government Services	Down East Branch Cc Library	2
Government Services	Mariners Park Restroom	2

Table 4.36 Natural Assets Exposure Scores for Assets with High Vulnerability to Wildfire Hazards

Asset Type	Asset Name	Exposure Wildfire
Agricultural Land	1953 Company LLC	2
Agricultural Land	Bay Point LLC	2
Agricultural Land	Bay Point LLC Etal Tr Briere	2
Agricultural Land	Buckland, Janice Clark L/T	2
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	2
Agricultural Land	Cnx5 Trees LLC	2
Agricultural Land	Compton, Sara Rogers	2
Agricultural Land	Core Creek Dev Partners LLC	2
Agricultural Land	Ellis, Ronald W Etux Susan E	2
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	2
Agricultural Land	Heavner, Patrick T Etal Joseph	2
Agricultural Land	Joel H Davis Family Ltd Partns	2
Agricultural Land	Joel Henry Davis Ltd Partnshp	2
Agricultural Land	Jordan, Eugene N	2
Agricultural Land	King, Michael J	2
Agricultural Land	Lampe, Guy L Etal	2
Agricultural Land	Lawrence, Rodney Ray	2
Agricultural Land	Mcintyre, William H Jr Etal	2
Agricultural Land	Merrill, June	2
Agricultural Land	Oyster Creek Sporting Club LLC	2
Agricultural Land	Pake, Juanita H L/T	2
Agricultural Land	Snug Harbor Farms LLC	2
Agricultural Land	Taylor, Timothy R Etux Kimberly	2
Agricultural Land	The Campen Family LLC	2
Agricultural Land	Tr, George C Rogers Jr	2
Agricultural Land	Wilson Creek Timber LLC	2

Table 4.37 Network Miles by Asset Type and Exposure Scores for Wildfire Hazards

Asset Type	Miles of network by Exposure Score			
	0	1	2	3
Federal Roads	0	7.36	23.25	0
State Roads	0	6.11	14.48	0
Secondary Routes	13.02	56.85	44.77	0
Other Roads	9.48	64.53	54.42	0
All Roads	**22.65**	**134.84**	**136.93**	**0**
Sidewalks	0	9.55	44.58	0
Outfalls	0	0	1.02	0

Supporting maps of wildfire hazard extents and asset exposure scores can be found in the **Appendix**.

4.4.2 SENSITIVITY AND ADAPTIVE CAPACITY SCORING

Sensitivity reflects the potential damage to critical built infrastructure's materials, functions, or the surrounding environment if it were exposed to wildfire. Critical built infrastructure that would be impacted by fire or high temperatures associated with fire is more likely to experience higher damage levels. **Sensitivity Scores** are assigned by asset types and consider the potential for damage and disruption of essential services or functions.

Adaptative capacity illustrates the ability of an asset to change its characteristics or behavior in response to a hazard. An asset's potential to adapt depends on the potential suite of options available and a community's ability to implement those actions. The **Adaptive Capacity Scores** are assigned by asset types and consider the potential for assets to be relocated or to adapt to wildfire exposure.

Table 4.38 Sensitivity and Adaptive Capacity Scoring

ASSET CATEGORY	ASSET TYPE	SENSITIVITY	ADAPTIVE CAPACITY
Critical Built Infrastructure	Buildings[1]	3	1
	Energy facilities	3	1
	Communications infrastructure	2	1
	Waste infrastructure	3	1
	Water Supplies[2]	3	1
Critical Network Infrastructure	Transportation	2	1
Natural Assets	Agricultural land	3	1
	Natural land	2	2
	Recreational land	2	2

1. Includes all critical built infrastructure except for communications infrastructure, energy facilities, wastewater facilities, and water supplies.
2. Outfall lines are classified as Water/Sewer assets that are Critical Network Infrastructure. Note that this assessment for Down East does not include outfall lines.

Table 4.39 Critical Built Infrastructure Sensitivity and Adaptive Capacity Scores for Assets with High Vulnerability to Wildfire Hazards. Sensitivity and adaptive capacity scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Government Services	Cedar Island Compaction Station	3	1
Government Services	Davis Compaction Station	3	1
Government Services	NC 101 Compaction Station	3	1
Government Services	Old Otway Compaction Station	3	1
Government Services	New Otway Compaction Station	3	1
Government Services	Compaction Station, Atlantic	3	1
Local Food Markets	Cape Lookout Grocery	3	1
Local Food Markets	Davis Provisions	3	1
Fire Stations	Down East Fire & Rescue	3	1
Fire Stations	Otway Rescue	3	1
Public Schools	East Carteret High	3	1
Government Services	Down East Library	3	1

Emergency Medical Services	Carteret County Ems 1	3	1
Medical Facilities	Pruitt Health	3	1
Transportation	Snug Harbor	3	1
Public Schools	Down East Middle	3	1
Public Schools	Smyrna Elementary	3	1
Government Services	Down East Branch Cc Library	3	1
Government Services	Mariners Park Restroom	3	1

Table 4.40 Natural Assets Sensitivity and Adaptive Capacity Scores for Wildfire Hazards

Asset Type	Asset Name	Sensitivity	Adaptive Capacity
Agricultural Land	1953 Company LLC	3	1
Agricultural Land	Bay Point LLC	3	1
Agricultural Land	Bay Point LLC Etal Tr Briere	3	1
Agricultural Land	Buckland, Janice Clark L/T	3	1
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	3	1
Agricultural Land	Cnx5 Trees LLC	3	1
Agricultural Land	Compton, Sara Rogers	3	1
Agricultural Land	Core Creek Dev Partners LLC	3	1
Agricultural Land	Ellis, Ronald W Etux Susan E	3	1
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	3	1
Agricultural Land	Heavner, Patrick T Etal Joseph	3	1
Agricultural Land	Joel H Davis Family Ltd Partns	3	1
Agricultural Land	Joel Henry Davis Ltd Partnshp	3	1
Agricultural Land	Jordan, Eugene N	3	1
Agricultural Land	King, Michael J	3	1
Agricultural Land	Lampe, Guy L Etal	3	1
Agricultural Land	Lawrence, Rodney Ray	3	1
Agricultural Land	Mcintyre, William H Jr Etal	3	1
Agricultural Land	Merrill, June	3	1
Agricultural Land	Oyster Creek Sporting Club LLC	3	1
Agricultural Land	Pake, Juanita H L/T	3	1
Agricultural Land	Snug Harbor Farms LLC	3	1
Agricultural Land	Taylor, Timothy R Etux Kimberly	3	1
Agricultural Land	The Campen Family LLC	3	1
Agricultural Land	Tr, George C Rogers Jr	3	1
Agricultural Land	Wilson Creek Timber LLC	3	1

Table 4.41 Sensitivity and Adaptive Capacity Scores by Network Asset Type for Wildfire Hazards

Asset Type	Sensitivity	Adaptive Capacity
Federal Roads State Roads	1 1	1 1
Secondary Routes	1	1
Other Roads	1	1
All Roads	**1**	**1**
Sidewalks	1	1
Outfalls	3	1

4.4.3 VULNERABILITY RESULTS

Some areas in Down East with denser development have lower wildfire burn probabilities, however, assets near wetlands and other natural areas may experience higher wildfire vulnerability. Where wildfire exposure is possible, fire may spread quickly, and Down East may face challenges with limited egress options to evacuate from these areas.

Table 4.42 Critical Built Infrastructure Vulnerability Scores for Assets with High Vulnerability to Wildfire Hazards. Vulnerability scores for all assets are provided in the **Appendix**.

		Exposure			Vulnerability
Asset Type	Asset Name	Wildfire	Sens.	A.C.	Wildfire
Government Services	Cedar Island Compaction Station	2	3	1	4
Government Services	Davis Compaction Station	2	3	1	4
Government Services	NC 101 Compaction Station	2	3	1	4
Government Services	Old Otway Compaction Station	2	3	1	4
Government Services	New Otway Compaction Station	2	3	1	4
Government Services	Compaction Station, Atlantic	2	3	1	4
Local Food Markets	Cape Lookout Grocery	2	3	1	4
Local Food Markets	Davis Provisions	2	3	1	4
Fire Stations	Down East Fire & Rescue	2	3	1	4
Fire Stations	Otway Rescue	2	3	1	4
Public Schools	East Carteret High	2	3	1	4
Government Services	Down East Library	2	3	1	4
Emergency Medical Services	Carteret County Ems 1	2	3	1	4

Medical Facilities	Pruitt Health	2	3	1	4
Transportation	Snug Harbor	2	3	1	4
Public Schools	Down East Middle	2	3	1	4
Public Schools	Smyrna Elementary	2	3	1	4
Government Services	Down East Branch Cc Library	2	3	1	4
Government Services	Mariners Park Restroom	2	3	1	4

Table 4.43 Natural Assets Vulnerability Scores for Assets with High Vulnerability to Wildfire Hazards

		Exposure			Vulnerability
Asset Type	Asset Name	Wildfire	Sens.	A.C.	Wildfire
Agricultural Land	1953 Company LLC	2	3	1	4
Agricultural Land	Bay Point LLC	2	3	1	4
Agricultural Land	Bay Point LLC Etal Tr Briere	2	3	1	4
Agricultural Land	Buckland,Janice Clark L/T	2	3	1	4
Agricultural Land	Carraway,Hervey Iii Etal Cahoo	2	3	1	4
Agricultural Land	Cnx5 Trees LLC	2	3	1	4
Agricultural Land	Compton,Sara Rogers	2	3	1	4
Agricultural Land	Core Creek Dev Partners LLC	2	3	1	4
Agricultural Land	Ellis,Ronald W Etux Susan E	2	3	1	4
Agricultural Land	Gillikin,Narvia Mae Ebron L/T	2	3	1	4
Agricultural Land	Heavner,Patrick T Etal Joseph	2	3	1	4
Agricultural Land	Joel H Davis Family Ltd Partns	2	3	1	4
Agricultural Land	Joel Henry Davis Ltd Partnshp	2	3	1	4
Agricultural Land	Jordan,Eugene N	2	3	1	4
Agricultural Land	King,Michael J	2	3	1	4
Agricultural Land	Lampe,Guy L Etal	2	3	1	4
Agricultural Land	Lawrence,Rodney Ray	2	3	1	4
Agricultural Land	Mcintyre,William H Jr Etal	2	3	1	4
Agricultural Land	Merrill,June	2	3	1	4
Agricultural Land	Oyster Creek Sporting Club LLC	2	3	1	4
Agricultural Land	Pake,Juanita H L/T	2	3	1	4
Agricultural Land	Snug Harbor Farms LLC	2	3	1	4

Agricultural Land	Taylor,Timothy R Etux Kimberly	2	3	1	4
Agricultural Land	The Campen Family LLC	2	3	1	4
Agricultural Land	Tr,George C Rogers Jr	2	3	1	4
Agricultural Land	Wilson Creek Timber LLC	2	3	1	4

Table 4.44 Network Miles by Asset Type and Vulnerability Scores for Wildfire Hazards*

NETWORK TYPE	VULNERABILITY SCORE					
	0	1	2	3	4	5
Federal Roads	0.12	7.36	23.25	0	0	0
State Roads	0.03	6.11	14.48	0	0	0
Secondary Routes	13.02	56.85	44.77	0	0	0
Other Roads	9.48	64.53	54.42	0	0	0
All Roads	22.65	134.84	136.93	0	0	0
Sidewalks and Trails	0.30	9.55	44.58	0	0	0
Outfalls	0	0	0.02	0.33	1.02	0

*While critical network infrastructure assets have a full range of exposure values, vulnerability scores for are generally low due to the low sensitivity and high adaptive capacity of these assets.

Down East

Down East Overview

Wildfire Vulnerability

Wildfire hazard data: USFS. LANDFIRE data, updated November 2020

Legend

Wildfire Vulnerability Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

4.5 Cumulative Hazard Vulnerability Assessment

The cumulative hazard vulnerability assessment aggregates the vulnerability scores across all the hazards evaluated in this assessment. This assessment includes a current condition (present-day) and a future condition vulnerability score. **Figure 4.2**, below, describes the components of the current and future conditions cumulative hazard vulnerability scores. Details of vulnerability scores for each specific hazard are provided in the subsections preceding this summary. The findings below summarize cumulative vulnerability for critical built infrastructure, natural assets, and critical network infrastructure.

Key Findings Across Hazards

- Across hazards, all built infrastructure and natural assets experience some level of vulnerability.
- Flood hazards are a significant driver of cumulative hazard vulnerability.
- Vulnerability is projected to increase under future conditions, with:
    - 57 percent of built infrastructure assets increase in vulnerability between current and future conditions,
    - 11 percent of roadway miles increasing in vulnerability between current and future conditions, and
    - 30 percent of natural assets increase in vulnerability score between current and future conditions.
- The built infrastructure assets found to have the highest vulnerability are compaction stations, including:
    - Cedar Island Compaction Station
    - Atlantic Compaction Station
    - Davis Compaction Station
    - NC 101 Compaction Station
    - Otway Compaction Stations (both old and new)
    - South River Compaction Station
- Notable roadway sections with higher vulnerability include:
    - NC 12 between Sea Level and Cedar Island
    - US 70 along the eastern coast of Down East
    - NC 101 and Merrimon Road in North River.

Current and Future Cumulative Vulnerability scores are calculated by the following formulas. The vulnerability components of the Cumulative Vulnerability scores are detailed in the preceding sections.

Figure 4.2 Hazard Vulnerability Scores Used to Calculate Current Cumulative and Future Cumulative Vulnerability Scores

Category 1 Storm Surge Vulnerability	**+**	**Current Coastal Flooding Vulnerability**	**+**	**Riverine Flooding Vulnerability**	**+**	**Wildfire Vulnerability**	**=**	**Current Cumulative Vulnerability**

Category 2 Storm Surge Vulnerability	**+**	**2050 Coastal Flooding Vulnerability**	**+**	**Riverine Flooding Vulnerability**	**+**	**Wildfire Vulnerability**	**=**	**Future Cumulative Vulnerability**

4.5.1 VULNERABILITY RESULTS

Cumulative vulnerability scores are based on assets' scores for each individual hazard, described in the preceding sections.

Table 4.45 Critical Built Infrastructure Vulnerability Scores for Assets with High Current Cumulative Vulnerability. Vulnerability scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Category 1 Storm Surge (Baseline)	Present Coastal Flooding	Wildfire	Riverine Flood Vulnerability	Current Cumulative Vulnerability
Government Services	Cedar Island Compaction Station	3	5	4	5	5
Government Services	Compaction Station, Atlantic	2	3	4	4	4
Government Services	Davis Compaction Station	2	5	4	5	4
Government Services	NC 101 Compaction Station	2	5	4	4	4
Government Services	New Otway Compaction Station	2	5	4	5	4
Government Services	Old Otway Compaction Station	2	5	4	5	4
Government Services	South River Compaction Station	3	5	3	4	4

Table 4.46 Critical Built Infrastructure Vulnerability Scores for Assets with High Future Cumulative Vulnerability. Vulnerability scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Category 2 Storm Surge (Projection)	2050 Coastal Flooding	Wildfire	Riverine Flood Vulnerability	Future Cumulative Vulnerability
Government Services	Cedar Island Compaction Station	5	5	4	5	5
Government Services	Davis Compaction Station	5	5	4	5	5
Government Services	NC 101 Compaction Station	4	5	4	4	5
Government Services	New Otway Compaction Station	3	5	4	5	5
Government Services	Old Otway Compaction Station	3	5	4	5	5

Government Services	South River Compaction Station	5	5	3	4	5
Government Services	Compaction Station, Atlantic	3	5	4	4	4

Table 4.47 Natural Assets Vulnerability Scores for Assets with High Current Cumulative Vulnerability

Asset Type	Asset Name	Category 1 Storm Surge (Baseline)	Present Coastal Flooding	Wildfire	Riverine Flood Vulnerability	Current Cumulative Vulnerability
Agricultural Land	Bay Point LLC	3	4	4	4	4
Agricultural Land	Bay Point LLC Etal Tr Briere	2	4	4	4	4
Agricultural Land	Buckland, Janice Clark L/T	1	4	4	4	4
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	2	4	4	4	4
Agricultural Land	Cnx5 Trees LLC	3	4	4	4	4
Agricultural Land	Compton, Sara Rogers	1	4	4	4	4
Agricultural Land	Core Creek Dev Partners LLC	1	4	4	4	4
Agricultural Land	Ellis, Ronald W Etux Susan E	2	4	4	4	4
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	1	4	4	4	4
Agricultural Land	Gmattox LLC	2	4	3	4	4
Agricultural Land	Heavner, Patrick T Etal Joseph	1	4	4	4	4
Agricultural Land	Ivictus Investing LLC	2	4	3	4	4
Agricultural Land	Joel H Davis Family Ltd Partns	2	4	4	4	4
Agricultural Land	Joel Henry Davis Ltd Partnshp	1	4	4	4	4
Agricultural Land	Jordan, Eugene N	3	4	4	4	4
Agricultural Land	King, Michael J	1	4	4	4	4
Agricultural Land	Lawrence, Rodney Ray	1	4	4	4	4
Agricultural Land	Mcintyre, William H Jr	2	4	3	4	4
Agricultural Land	Mcintyre, William H Jr Etal	3	4	4	4	4
Agricultural Land	Merrill, June	2	4	4	4	4

Agricultural Land	Oyster Creek Sporting Club LLC	2	4	4	4	4
Agricultural Land	P&J Properties & Invstmnts LLC	2	4	3	4	4
Agricultural Land	Pake, Juanita H L/T	1	4	4	4	4
Agricultural Land	Paul, Dianna Golden Etux Nelson	2	4	3	4	4
Agricultural Land	Snug Harbor Farms LLC	2	4	4	4	4
Agricultural Land	Vick, William Temple Etux Darla	2	4	3	4	4
Agricultural Land	Willis, Steven Ketih	2	4	3	4	4
Agricultural Land	Wilson Creek Timber LLC	1	4	4	4	4
Agricultural Land	Won, Lianne Etvir Reburn	2	4	3	4	4

Table 4.48 Natural Assets Vulnerability Scores for Assets with High Future Cumulative Vulnerability

Asset Type	Asset Name	Category 2 Storm Surge (Projection)	2050 Coastal Flooding	Wildfire	Riverine Flood Vulnerability	Future Cumulative Vulnerability
Agricultural Land	Bay Point LLC	4	4	4	4	4
Agricultural Land	Bay Point LLC Etal Tr Briere	4	4	4	4	4
Agricultural Land	Buckland, Janice Clark L/T	4	4	4	4	4
Agricultural Land	Carraway, Hervey Iii Etal Cahoo	4	4	4	4	4
Agricultural Land	Cnx5 Trees LLC	4	4	4	4	4
Agricultural Land	Compton, Sara Rogers	3	4	4	4	4
Agricultural Land	Core Creek Dev Partners LLC	4	4	4	4	4
Agricultural Land	Ellis, Ronald W Etux Susan E	4	4	4	4	4
Agricultural Land	Gillikin, Narvia Mae Ebron L/T	4	4	4	4	4
Agricultural Land	Gmattox LLC	4	4	3	4	4
Agricultural Land	Heavner, Patrick T Etal Joseph	4	4	4	4	4
Agricultural Land	Ivictus Investing LLC	4	4	3	4	4
Agricultural Land	Joel H Davis Family Ltd Partns	4	4	4	4	4

Agricultural Land	Joel Henry Davis Ltd Partnshp	4	4	4	4	4
Agricultural Land	Jordan, Eugene N	4	4	4	4	4
Agricultural Land	King, Michael J	3	4	4	4	4
Agricultural Land	Lawrence, Rodney Ray	4	4	4	4	4
Agricultural Land	Mcintyre, William H Jr	4	4	3	4	4
Agricultural Land	Mcintyre, William H Jr Etal	4	4	4	4	4
Agricultural Land	Merrill,June	4	4	4	4	4
Agricultural Land	Oyster Creek Sporting Club LLC	4	4	4	4	4
Agricultural Land	P&J Properties & Invstmnts LLC	4	4	3	4	4
Agricultural Land	Pake, Juanita H L/T	3	4	4	4	4
Agricultural Land	Paul, Dianna Golden Etux Nelson	4	4	3	4	4
Agricultural Land	Snug Harbor Farms LLC	3	4	4	4	4
Agricultural Land	Vick, William Temple Etux Darla	4	4	3	4	4
Agricultural Land	Willis, Steven Ketih	4	4	3	4	4
Agricultural Land	Wilson Creek Timber LLC	3	4	4	4	4
Agricultural Land	Won, Lianne Etvir Reburn	4	4	3	4	4
Agricultural Land	1953 Company LLC	3	3	4	3	4
Agricultural Land	Arthur, Patricia T	4	4	3	4	4
Agricultural Land	Arthur, Richard Earl Trustee	4	4	3	4	4
Agricultural Land	Carteret Farm LLC	3	4	3	4	4
Agricultural Land	Gillikin, Jerry K Etux Etal	4	4	3	4	4
Agricultural Land	Jst Farms LLC	3	4	3	4	4
Agricultural Land	Merrell, Johnnie Jr Etux Myrtle	3	4	3	3	4
Agricultural Land	Simpson, George D Etal Trust	3	4	3	4	4
Agricultural Land	Simpson, John D Etal Stinson	4	4	3	4	4

Agricultural Land	Smith, Anthony L Etux Kerry	4	4	3	3	4
Agricultural Land	Taylor, Timothy R Etux Kimberly	3	4	4	3	4
Agricultural Land	Temple, Cary Grey Etux Maggie R	4	4	3	4	4
Agricultural Land	The Campen Family LLC	3	4	4	3	4
Agricultural Land	Trade-Win Iv Farm LLC	4	4	3	4	4
Agricultural Land	Won,I J Etal Susan	4	4	3	4	4
Agricultural Land	Wright, Mary B	4	4	3	4	4
Agricultural Land	Wysocking Wildlife Sanctury Inc	4	4	3	4	4

Table 4.49 Network Miles by Critical Network Infrastructure Asset Type and Vulnerability Scores Aggregated Across Hazards*

NETWORK MILES BY VULNERABILITY SCORE							
Network Type	**Time Horizon**	**Vulnerability Score**					
		0	**1**	**2**	**3**	**4**	**5**
Federal Roads	Current	0	7.33	23.41	0	0	0
	Future	0	5.26	25.48	0	0	0
State Roads	Current	0	8.32	12.30	0	0	0
	Future	0	4.88	15.74	0	0	0
Secondary Routes	Current	6.90	31.75	76.00	0	0	0
	Future	6.15	19.95	88.54	0	0	0
Other Roads	Current	1.54	44.25	82.64	0	0	0
	Future	1.41	28.38	98.63	0	0	0
All Roads	**Current**	8.44	91.64	194.35	0	0	0
	Future	7.56	58.47	228.40	0	0	0
Sidewalks and Trails	Current	0.03	14.26	40.14	0	0	0
	Future	0.03	10.46	43.93	0	0	0
Outfalls	Current	0	0.00	0.23	1.14	0	0
	Future	0	0.00	0.07	0.43	0.9	0

*While critical network infrastructure assets have a full range of exposure values, vulnerability scores for these assets are generally low due to the low sensitivity and high adaptive capacity of these assets.

4.6 Natural Infrastructure

This section focuses specifically on the impacts of sea level rise on wetlands in and around Down East that provide ecosystem services to the community. This assessment does not include other hazards due to limited mechanisms for evaluating natural infrastructure vulnerability to these hazards. Relying on marsh migration modeling associated with the sea level rise modeling efforts used in the coastal flooding hazard analysis, vulnerability scores for wetlands are based on the present changes in acreage for each habitat type.

Key Findings

- The Cape Lookout National Seashore barrier islands to the East and South of Down East provide significant protection from coastal storms. These barrier islands are vulnerable to sea level rise and breaches from coastal storms.
- Under the sea level rise projection for 2050, Down East will lose less than one percent of existing tidal wetland habitats and see a dramatic increase in unconsolidated shore habitat.
- Marsh migration inland may be possible along undeveloped shorelines. Marsh migration success is dependent on a variety of factors, including rate of sea level rise and sediment accretion rates.

Table 4.50 Natural Infrastructure Vulnerability to Sea Level Change by Habitat Type

HABITAT TYPE	STARTING ACREAGE	CHANGE IN ACREAGE	% CHANGE	VULNERABILITY
Non-Tidal Wetland	885	2.8	0.32%	No Vulnerability
Tidal Wetland	660	-17.9	-2.7%	Low
Unconsolidated Shore	7.0	26.6	383%	No Vulnerability
Upland Habitat	2,086	-22.7	-1.1%	Low
Total Habitat Acres	**3,639**	**-11.1**	0.31%	
Change in acreage is calculated for present-day (baseline) conditions, and a sea level change scenario for 2050 associated with 1.3ft (40cm) of sea level rise.				

4.6.1 RECURRING PLUVIAL FLOODING HOTSPOTS

Down East experiences periodic rain-driven, localized flooding events that can have significant disruptive impacts on roadway networks in the region. The majority of roadways in Down East are maintained by NCDOT[13] and designed with drainage ditches to manage stormwater. Due to data limitations, this assessment does not include quantitative evaluation of pluvial exposure or vulnerability. This section will narratively describe impacts of rainfall-driven flooding in Down East associated with notable flood events and identify several existing resources that model or monitor roadway flooding in the region.

This qualitative hazard analysis for pluvial flood hotspots does not include a climate projection scenario. However, shifting precipitation regimes coupled with sea level rise and an associated higher water table are likely to contribute to more frequent and intense pluvial flooding.

NOTABLE FLOOD EVENTS

There is limited data available on pluvial flood impacts in Down East. However, documentation from NOAA's National Centers for Environmental Information (NCEI) database on major storm events provides some context on which roadways and roadway networks have historically flooded during significant rainfall events. Flooding on roads can occur during less severe storms as well and may not correspond exactly to the locations documented during major storm events. Despite this, documentation from these storm events is the best data currently available on roadway flooding during rainfall events.

Hurricane Idalia reached the coast of South Carolina on August 31, 2023, as a tropical storm. In the southern half of Eastern North Carolina, five to 10 inches of rain fell in most areas. In areas with the heaviest rain, numerous roads closed due to flash flooding. Storm surge levels reached as high as four feet above ground level in Carteret County. NCDOT verified high water covering some roadways in Down East, including NC 12 and Morris Mariana Road which became impassable to some vehicles[14], and Golden Farm Rd in Otway was completely flooded[15].

A **coastal storm** that formed off the Southeastern coast of the U.S. in November of 2021 coincided with King tides and resulted in water level rises of up to two to four feet above ground level. In Sea Level, the high water levels made many roads impassable. Other areas impacted include Old Ferry Dock Rd. in Harkers Island. Flooding was also reported in Marshallburg, Davis, Gloucester, Harlowe, and Atlantic.[16]

Hurricane Florence in September of 2018 produced extensive wind, storm surge, and rainfall damage in Carteret County. This hurricane drove the first ever county-wide mandatory evacuation order for Carteret County. Storm surge of nine to 13 feet was observed, and rainfall of 20 to 30 inches, with some local observations as high as 36 inches. The Otway Fire Department began to flood with about two inches of water in the bay, resulting in all 911 responses stopping for safety of the crew and patients. Extremely heavy rainfall resulted in flash flooding across the county with numerous roads impassable. US 70 closed in numerous spots, and multiple tornados touched down in Down East.

Tropical Storm Gabrielle reached Down East on September 9th, 2007. This storm had a maximum storm surge of three feet, and rainfall amounts of five to eight inches were common in the region. The highest storm total precipitation was 8.3 inches, measured along NC 101 North of Beaufort.[17]

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[13] NC OneMap. NCDOT State Maintained Roads. https://arcg.is/000mjq0
[14] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=1134783
[15] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=1133979
[16] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=992237
[17] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=57321

FLOOD MONITORING AND MODELING RESOURCES

Data on rainfall-driven (pluvial) flood impacts in Down East are limited in scale, and currently there is insufficient data for a quantitative exposure analysis. However, there are spot locations where the Sunny Day Flooding Project and FIMAN monitor roadway flooding and water levels. Additionally, the Coastal Observer app is an example of crowdsourced/community-based documentation of climate and weather impacts. There appear to be some active users of Coastal Observer in Down East, which indicates that data collated via this app could support future assessments.

Table 4.51 Flood Monitoring and Modeling Resources

RESOURCE	DESCRIPTION	OWNERSHIP	DOWN EAST CONNECTION	LINK
Sunny Day Flooding Project	This project team works with local communities to measure, model, and better understand the causes and impacts of chronic flooding in North Carolina	UNC Chapel Hill	There are five flood cameras and Water Level Sensors in or near Down East: • Front Street • North River • Davis • Sea Level • Cedar island	https://tarheels.live/sunny/
FIMAN	This website aims to provide real-time flood inundation maps and alerts, among other functions.	North Carolina Emergency Management	There are four water level gauges in or near Down East: • Bogue Sound (Beaufort) • Ward Creek (Otway) • Pamlico Sound (Cedar Island) • Cape Lookout (National Seashore)	https://fiman.nc.gov/#/
Coastal Observer	An app-based crowdsourcing of the local impacts of flooding and other weather events.	University of Delaware, Sea Grant Delaware, DelRAP	There are some locations in Down East where community members have documented flooding via the Coastal Observer app. However, participation and documentation appears to have peaked in October of 2023.	https://www.coastalobserver.net/

Key Findings:

- Flooding on roadways during minor pluvial events has been reported by community members and is disruptive to everyday travel in the region.
- A majority of rainfall-driven flood impact (i.e., pluvial flooding) information is limited to major storms. This limited the ability assess exposure and vulnerability and determine viable actions. Expanding rainfall-driven flood information will help understand what level of rain is causing impacts in what locations to inform tailored interventions. In order to expand information, the Down East Region may consider use of sensors, digital capture mechanisms (e.g., public work staff or public logging of impacts via a smartphone/website), and manual documentation (e.g., collection of high water marks, images of impacts, and on-site rain gauge per event). Additionally, a hydrologic and hydraulic (H&H) model for rain-driven events in areas facing issues would also support further development of strategies, and this could be validated with additional collected information.

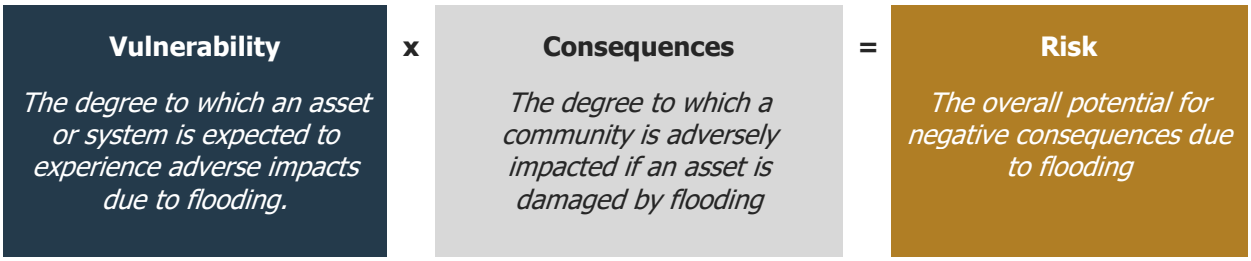
- Some monitoring and reporting systems exist in Down East and may support future exposure and vulnerability assessments.
- Increased roadway ditch maintenance and clearing will likely help alleviate rain-driven flood impacts, but maintenance activities will likely need to be combined with additional improvements to maximize effectiveness. Roadway ditch maintenance is one component of a comprehensive floodplain management strategy. To optimize ditch maintenance, the Down East Region may need to consider clarifying jurisdictional responsibility (e.g., town, county, state, private) for ditches, digitizing ditch locations, and formalizing as maintenance schedule that prioritizing maintenance of ditches likely to reduce the greatest flood impacts.

5.0 Estimate Risk

After assessing the vulnerability of identified assets, the risk – referring to the overall potential for negative impacts – to each asset is estimated by considering two components: vulnerability and consequences. An asset's vulnerability is determined using the Vulnerability Score calculated in the previous step. Consequences refer to the potential impacts on the surrounding systems and community if an asset is badly damaged or cannot function due to flooding. Due to limited data, this assessment does not quantify the risk to natural infrastructure assets.

Consequences are determined by considering the social vulnerability of the surrounding community and the asset's criticality, or importance, to the community. Each of these metrics is converted into a score ranging from zero to three, which are then summed to produce a single Consequence Score for each asset. This score is divided by the maximum possible score (six) to produce a percentage that is then multiplied by the Vulnerability Score, as outlined in **Figure 5.1** (for reference only; identical to **Figure 2.2**).

Figure 5.1. Components of Risk (Identical to **Figure 2.2**)



5.1 Social Vulnerability

Social vulnerability refers to the susceptibility of social groups to adverse impacts. This susceptibility is indicated by certain social conditions, such as high poverty, limited vehicle access, or crowded households, that affect a community's ability to prevent human suffering and financial loss in the event of a flood.[18] Social vulnerability is a compounding factor to risk because communities with high social vulnerability are more likely to experience adverse impacts.

The assessment leverages the Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) to measure social vulnerability. This index uses census data to assess characteristics that indicate social vulnerability within a community. Census tracts are assigned a percentile ranking compared to the rest of the State of North Carolina. A **Social Vulnerability Score**, ranging from zero to three, is assigned to an asset based on its surrounding tract's SVI percentile compared to the rest of the state. Higher social vulnerability reflects a higher susceptibility of a community surrounding the asset to the adverse impacts of coastal hazards.

Of the five census tracts of Down East, one is assigned a social vulnerability score of 1, three are assigned a score of 2, and one is assigned a score of 3. These scores are based on terciles (0 – 0.33, 0.33 – 0.66, 0.66 – 1) of values from the CDC's SVI. The census tract encompassing Open Grounds Farm and communities North of the farm (Merrimon, South River, Cedar Island) has an SVI score of 0.06, indicating low social vulnerability. The three census tracts encompassing (1) North River; (2) communities

[18] Centers for Disease Control and Prevention. 2020. *CDC Social Vulnerability Index Documentation 2018.* https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/SVI_documentation_2018.html

south of Open Grounds excluding Harker's Island; and (3) Atlantic and Sea Level have SVI scores of 0.36, 0.33, and 0.42; indicating low to moderate social vulnerability. The census tract of Harker's Island has an SVI score of 0.69, indicating moderate to high social vulnerability.

In 2022, the Council on Environmental Quality published the Climate and Economic Justice Screening Tool (CEJST). The tool categorizes census tracts as disadvantaged if the census tract exceeds at least one threshold for a category of burden or are on land within the boundaries of Federally Recognized Tribes[19]. Federal agencies use the CJEST tool to help identify disadvantaged communities that will benefit from programs including the Justice40 Initiative, which seeks to deliver 40 percent of the overall benefits of investments in climate, clean energy, and related areas to disadvantaged communities. Down East encompasses five census tracts; three of which are identified as disadvantaged in the CEJST tool. These three census tracts include the communities of Atlantic and Sea Level in the East and communities south of Open Grounds Farm and US 70. These census tracts are identified as disadvantaged because of expected high impacts of climate change and energy, health, and/or transportation burdens.

5.2 Criticality

5.2.1 Critical Built Infrastructure

Criticality scores for built infrastructure are based on asset type and structure value, where available. Structure valuation is sourced from building footprint data. Some assets, such as cell towers (communications infrastructure), could not be assigned to a building footprint. This metric assumes that structures with higher values are more critical to the surrounding community, and that an asset's value can illustrate the scale of potential costs required to repair or replace the structure if damaged in a flood. Assets with redundancy (e.g., multiple of the same asset type within Down East) receive a lower criticality score than those asset types for which there is one or few assets.

Table 5.1 Summary of Built Infrastructure Criticality Scores

TYPE	NUMBER EXPOSED	AVG UNIT VALUE*	TOTAL VALUE*	CRITICALITY SCORE
Communications Infrastructure	13	N/A	N/A	2
Emergency Medical Services**	4	$102,228	$408,913	3
Energy Facilities	0	N/A	N/A	N/A
Fire Stations	3	$82,219	$246,677	3
Government Services	10	$25,568	$255,677	2
Law Enforcement Sites	0	N/A	N/A	N/A
Local Food Markets	3	$80,471	$241,413	2
Medical Facilities	2	$841,458	$1,682,916	3
Public Schools	8	$1,200,130	$9,601,040	3
Wastewater Facilities	0	N/A	N/A	N/A
Water Supplies	5	$8,840,020	$44,200,099	3
Total	**49**		**$60,315,814**	

* Structure values could not be determined for 27 exposed assets. Further review of these assets may be required to determine asset value and potential economic risk.
** Three of the four Emergency Medical Services are provided by Fire and Rescue facilities. These facilities are counted in both the "Fire Stations" and "Emergency Medical Services" asset types.

[19] Climate and Economic Justice Screening Tool. Methodology. https://screeningtool.geoplatform.gov/en/methodology

5.2.2 CRITICAL NETWORK INFRASTRUCTURE

Criticality of network infrastructure is determined by the network type. For roadways, criticality is based on road segments' functional classifications, derived from NC Department of Transportation data. This classification is based on the character of the traffic service the road segment aims to provide. Road segments that serve larger traffic volumes are assumed to be more critical to the community, as outlined in Table 5.2. Sidewalks and trails are assigned a criticality score of 1, and outfalls a score of 2.

Table 5.2 Summary of Network Infrastructure Criticality Scores

Criticality	Includes	Criticality Score
High	Interstates, Highways	3
Moderate	Minor Arterials, Major Collectors, Stormwater Outfalls	2
Low	Local Roads, Sidewalks, Trails	1

5.2.3 Natural Assets

Criticality of natural assets is determined by asset type. **Table 5.3**, below, summarizes criticality scores for natural assets and the count and acreage of each asset type in Down East. Note that these assets exclude natural infrastructure, which evaluated separately (see **Section 5.3**), and for which there is insufficient information to evaluate criticality and risk.

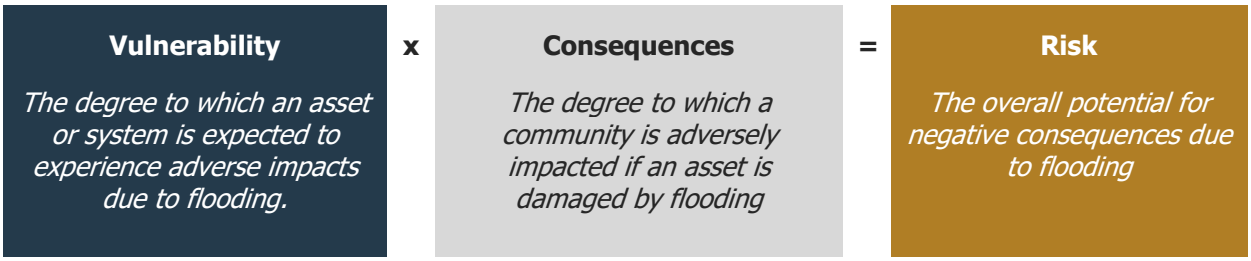
Table 5.3 Summary of Natural Asset Criticality Score

TYPE	NUMBER EXPOSED	ACREAGE DETERMINED	ACREAGE EXPOSED	CRITICALITY SCORE
Agricultural Land	19	19	3,929*	2
Recreational Land	4	4	34	1
Preserved Land	3	3	22,875	1
* Note that Open Grounds Farm is a substantial portion of agricultural land in Down East, at 50,600 acres.				

5.2.4 Risk Assessment Results

After assessing vulnerability and consequences, assets are assigned **Risk Scores** that characterize the potential for adverse consequences of hazard exposure. As shown in Figure 13, risk is calculated as the product of vulnerability and consequence. For ease of scoring, risk scores are normalized to range from zero to five (i.e., the product of the vulnerability and consequence components is divided by three, the maximum value for consequence). The integer scores below are the ceiling value of the calculated product risk. Thus, only assets with a vulnerability score of zero across all hazards evaluated can receive a risk score of zero.

Figure 5.2 Components of Risk (Identical to **Figure 2.2**)



This assessment includes risk scores for both present-day and future conditions. These risk scores rely on the present-day and future cumulative hazard vulnerability scores, respectively. Results are presented for critical built infrastructure, natural assets, and critical network infrastructure.

Key Findings:

- The critical building infrastructure assets with the highest risk scores are the Atlantic Compaction Station, NC 101 Compaction Station, and Otway Compaction Stations, with a risk score of 3 (moderate risk). Under future conditions, the Davis Compaction Station, Down East Fire & Rescue, East Carteret High School, and South River Compaction station also have risk scores of 3.

Segments of US 70, NC 101, and NC 12 have the highest risk scores for network infrastructure, with a risk score of 2 (low risk). The majority of have a risk score of 1 (very low risk). This score does not account for service disruptions (i.e., access to critical facilities).

- **Table 5.7** and **Table 5.8** provide specific locations where the risk scores are the highest for network infrastructure.
- No natural assets have high risk scores; many agricultural land parcels and Manley Gaskill Park have risk scores of 2 (low risk) under future conditions.

Table 5.4 Critical Built Infrastructure Vulnerability Scores for Assets with High Risk Scores. Risk scores for all assets are provided in the **Appendix**.

Asset Type	Asset Name	Cumulative Vulnerability		Consequence	SV Tercile	Risk	
		Current	Future			Current	Future
Government Services	Compaction Station, Atlantic	4	4	2	2	3	3
Government Services	NC 101 Compaction Station	4	5	2	2	3	3
Government Services	New Otway Compaction Station	4	5	2	2	3	3
Government Services	Old Otway Compaction Station	4	5	2	2	3	3

Government Services	Davis Compaction Station	4	5	2	1	2	3
Fire Stations	Down East Fire & Rescue	2	3	3	2	2	3
Public Schools	East Carteret High	2	3	3	2	2	3
Government Services	South River Compaction Station	4	5	2	1	2	3

Table 5.5 Natural Lands Risk Scores for Assets with High Risk Scores.

Asset Type	Asset Name	Cumulative Vulnerability		Criticality	SV Tercile	Risk	
		Current	Future			Current	Future
Agricultural Land	1953 Company LLC	3	4	1	2	2	2
Agricultural Land	Arthur,Patricia T	3	4	1	2	2	2
Agricultural Land	Arthur,Richard Earl Trustee	3	4	1	2	2	2
Agricultural Land	Bay Point LLC	4	4	1	2	2	2
Agricultural Land	Bay Point LLC Etal Tr Briere	4	4	1	2	2	2
Agricultural Land	Buckland,Janice Clark L/T	4	4	1	1	2	2
Agricultural Land	Carraway,Hervey Iii Etal Cahoo	4	4	1	1	2	2
Agricultural Land	Carteret Farm LLC	3	4	1	2	2	2
Agricultural Land	Cnx5 Trees LLC	4	4	1	1	2	2
Agricultural Land	Compton,Sara Rogers	4	4	1	1	2	2
Agricultural Land	Core Creek Dev Partners LLC	4	4	1	2	2	2
Agricultural Land	Ellis,Ronald W Etux Susan E	4	4	1	1	2	2
Agricultural Land	Gillikin,Jerry K Etux Etal	3	4	1	2	2	2
Agricultural Land	Gillikin,Narvia Mae Ebron L/T	4	4	1	1	2	2
Agricultural Land	Gmattox LLC	4	4	1	2	2	2
Agricultural Land	Heavner,Patrick T Etal Joseph	4	4	1	2	2	2
Agricultural Land	Hynes,Michael G Etux Etal	3	3	1	2	2	2
Agricultural Land	Hynes,Michael G Etux Traci	3	3	1	2	2	2

Agricultural Land	Ivictus Investing LLC	4	4	1	1	2	2
Agricultural Land	Joel H Davis Family Ltd Partns	4	4	1	2	2	2
Agricultural Land	Joel Henry Davis Ltd Partnshp	4	4	1	2	2	2
Agricultural Land	Jordan,Eugene N	4	4	1	2	2	2
Agricultural Land	Jst Farms LLC	3	4	1	2	2	2
Agricultural Land	King,Michael J	4	4	1	2	2	2
Agricultural Land	Lampe,Guy L Etal	3	3	1	2	2	2
Agricultural Land	Lawrence,Rodney Ray	4	4	1	1	2	2
Agricultural Land	Mcintyre,William H Jr	4	4	1	1	2	2
Agricultural Land	Mcintyre,William H Jr Etal	4	4	1	1	2	2
Agricultural Land	Meares,Elbert Clifton Etal	3	3	1	2	2	2
Agricultural Land	Merrell,J W Jr D/B/A	3	3	1	2	2	2
Agricultural Land	Merrell,Johnnie Jr Etux Myrtle	3	4	1	2	2	2
Agricultural Land	Merrill,June	4	4	1	2	2	2
Agricultural Land	Oyster Creek Sporting Club LLC	4	4	1	1	2	2
Agricultural Land	P&J Properties & Invstmnts LLC	4	4	1	1	2	2
Agricultural Land	Pake,Juanita H L/T	4	4	1	1	2	2
Agricultural Land	Paul,Dianna Golden Etux Nelson	4	4	1	2	2	2
Agricultural Land	Safrit,Leonard Jr Etux	3	3	1	2	2	2
Agricultural Land	Simpson,John D Etal Stinson	3	4	1	2	2	2
Agricultural Land	Smith,Anthony L Etux Kerry	3	4	1	2	2	2
Agricultural Land	Snug Harbor Farms LLC	4	4	1	1	2	2
Agricultural Land	Springle,L D Jr D/B/A	3	3	1	2	2	2
Agricultural Land	Taylor,Timothy R Etux Kimberly	3	4	1	2	2	2
Agricultural Land	Temple,Cary Grey Etux Maggie R	3	4	1	2	2	2

Agricultural Land	The Campen Family LLC	3	4	1	2	2	2
Agricultural Land	Trade-Win Iv Farm LLC	3	4	1	2	2	2
Agricultural Land	Vick,William Temple Etux Darla	4	4	1	2	2	2
Agricultural Land	Willis,Steven Ketih	4	4	1	1	2	2
Agricultural Land	Wilson Creek Timber LLC	4	4	1	2	2	2
Agricultural Land	Won,I J Etal Susan	3	4	1	2	2	2
Agricultural Land	Won,Lianne Etvir Reburn	4	4	1	2	2	2
Agricultural Land	Wright,Mary B	3	4	1	2	2	2
Agricultural Land	Wysocking Wildlife Sanctury Inc	3	4	1	2	2	2
Recreational Land	Harkers Island Beach Access	2	2	1	3	2	2
Agricultural Land	Bowen,Lucille Wright	2	3	1	2	1	2
Agricultural Land	Simpson,George D Etal Trust	3	4	1	1	1	2
Agricultural Land	Wright,David W	2	3	1	2	1	2
Recreational Land	Manley Gaskill Park	1	2	1	3	1	2

Table 5.6 Network Miles by Asset Type and Aggregate Risk Scores

NETWORK MILES BY RISK SCORE							
Network Type	**Time Horizon**	**Risk Score**					
		0	**1**	**2**	**3**	**4**	**5**
Federal Roads	Current	0	19.73	11.01	0	0	0
	Future	0	7.16	23.57	0	0	0
State Roads	Current	0	20.24	0.37	0	0	0
	Future	0	17.43	3.19	0	0	0
Secondary Routes	Current	6.90	104.17	3.58	0	0	0
	Future	6.15	61.75	46.75	0	0	0
Other Roads	Current	1.54	126.87	0.02	0	0	0
	Future	1.41	125.60	1.42	0	0	0
All Roads	**Current**	8.44	271.01	14.98	0	0	0
	Future	7.56	211.95	74.92	0	0	0
Sidewalks and Trails	Current	0.03	54.40	0.00	0	0	0
	Future	0.03	54.23	0.17	0	0	0
Outfalls	Current	0	0.23	1.15	0	0	0
	Future	0	0.07	1.30	0	0	0

Table 5.7 Location and Length of Roadways with Risk Scores of 2 for Current Time Horizon

Roadway Name	Sum of Mileage (Risk Score of 2)
US 70 Williston	2.57
US 70 Beaufort	2.57
US 70 Sea Level	2.13
US 70 Otway	1.16
Seashore Dr	1.11
Merrimon Rd	0.91
Oak Hammock Dr	0.81
US 70 Davis	0.53
Island Rd	0.45
US 70 Bettie	0.36

Table 5.8 Location and Length of Roadways with Risk Scores of 2 for Future Time Horizon

Roadway Name	Sum of Mileage (Risk Score of 2)
Merrimon Rd	4.97
US 70 Williston	4.69
US 70 Stacy	3.97
US 70 Davis	3.62
Crow Hill Rd	2.89
NC 101	2.88
NC 70 Beaufort	2.65
Marshallberg Rd	2.37
US 70 Otway	2.28
Harkers Island Rd	2.23

Down East

Down East Overview

Present Day Risk Scores

Legend

Present Day Risk Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

Down East

Down East Overview

Future Conditions Risk Scores

Legend

Future Conditions Risk Scores

Critical Facilities

- 1
- 2
- 3
- 4
- 5

Roads and Trails

- 1
- 2
- 3
- 4
- 5

Natural Assets

- 1
- 2
- 3
- 4
- 5

Down East Border

Down East Border

Dewberry

Carteret County GIS data sourced from: https://gisdata-cc-gis.opendata.arcgis.com/

5.3 Natural Infrastructure

Natural infrastructure provides vital ecosystem services to communities, such as natural flood protection, water quality benefits, recreation opportunities, and ecotourism. Due to limited data on ecosystem services, this assessment does not quantify the values of natural infrastructure assets. However, it should be noted that repeated inundation does cause sustained, long-term consequences for natural infrastructure assets by impacting their ability to provide valuable ecosystem services. Repeated flooding of saltwater marshes and other wetland assets reduces their protective function over time.

6.0 Considerations for Future Assessments

This assessment may serve as a starting point for future analyses and research efforts. The following list summarizes key areas for further refining this assessment and its results:

- **Rainfall-Driven Flood Hazards** – Conduct a pluvial flood analysis of Carteret County that considers multiple events in varying intensities, durations, and return frequencies to facilitate future exposure, vulnerability, and risk assessments of the region's critical built infrastructure. May consider the use of sensors, digital capture mechanisms and manual documentation. Additionally, a hydrologic and hydraulic (H&H) model for rain-driven events in areas facing issues would also support further development of strategies, and this could be validated with additional collected information.
- **Drainage Characteristics** – Use technologies such as LIDAR to help identify areas of greatest concern regarding drainage and to get a better understanding of the topography of the land and how water travels throughout the region.
- **Infrastructure Characteristics** – Refine the vulnerability assessment to incorporate more specific building characteristics, such as base floor elevation and first floor elevation, or site-specific information, such as the existence of mitigation projects. This additional data would improve analyses and the understanding of consequences. Additionally, confirmation is needed for some existing infrastructure locations and characteristics.
- **Natural Infrastructure** – Incorporate complex modeling of impacts to natural infrastructure, including ecosystem service valuation. This modeling would include running scenarios on impacts to natural infrastructure and quantifying natural infrastructure based on damage reduction. Studying natural infrastructure would inform how this infrastructure can lessen impacts from events.
- **Climate-Influenced Hazards** – Consider additional climate-influenced hazards included in the 2020 Pamlico Sound Regional Hazard Mitigation Plan (updated in 2025), such as extreme heat, and based on priorities as identified by the county.
- **Groundwater-Influenced Hazards** – Consider groundwater-influenced hazards, such as subsidence, and their impact on infrastructure and natural assets in Down East.

7.0 Next Steps

The final Risk and Vulnerability Scores serve as inputs to RCCP Phase 2, through which the community of Down East plans to select and prioritize resilience projects. These assessment results can support this process by ranking assets by final scores or individual components, such as exposure.

Appendix; Risk and Vulnerability Mapping

Dewberry

APPENDIX D
COMMUNITY PROJECT PORTFOLIO

JUNE 2025

COMMUNITY PROJECT PORTFOLIO

A critical component of the Resilient Coastal Communities Program is the identification and prioritization of a series of projects that are intended to address community vulnerabilities to coastal hazards. The enclosed list of projects, which includes infrastructure improvements (structural, non-structural, natural or nature-based solutions, or hybrid options), policy and planning efforts, and asset management actions, have been synthesized from previous local and regional planning efforts, input from the Community Action Team, and feedback from the public.

Included in Appendix D is a summary list of the proposed projects, followed by an individual sheet for each project. Each project sheet summarizes the factors that were considered in the project identification and prioritization process, including:

Project Name	Name referred to for the each given project.
Project Description	Description of strategy being proposed and the scope of the work.
Location	The geographic location of the project.
Hazard(s) addressed by project	A summary of the community-specific coastal hazards that impact the project location. This can include flooding, storm surge, wind damage, or other coastal hazards.
Type of Solution	A description of whether the project represents infrastructure improvements, policy and planning effort, or an asset management/mapping program.
Natural and Nature Based Solution Opportunity? 	A symbol is used to denote whether the project includes a natural or nature-based solution (NNBS) component.
Project Estimated Cost	A qualitative analysis of the total project cost, including initial engineering and construction as well as future maintenance (as available). Project cost is shown symbolically ranging from $ to $$$$
Potential Implementation Funding Sources	Recommendations on potential sources to construct or otherwise implement the project, including the Resilient Coastal Communities Program and other federal and state funding sources.
Project Estimated Timeline	An estimated timeline to complete the project, including notes on any expected delays in the timeline.
Preliminary Tasks/ Data Required	A description of tasks and information that should be complete before starting the listed project.
Advantages/Disadvantages	An analysis of the benefits and drawbacks of the proposed solution.
Similar Project Examples	Examples of similar projects completed and identification of where information on the projects can be found.
Priority Rating	A qualitative ranking of the project's priority in the context of the entire Project Portfolio. Rankings of **High**, **Medium**, or **Low** are provided for each project.

Proposed Project Summary

Project Priority	Project Title	Description	Location	Anticipated Cost	NNBS Opportunity	Potential Funding Sources	Timeline	Needs Addressed	Pro/Con Assessment	Notes
Data Collection / Planning										
1	**Drainage Inventory and Condition Assessment**	Survey all drainage ditches, outfalls, and related inventory; create location database for use in future assessments and maintenance planning and document existing condition of each feature. Using drainage inventory, groundwater monitoring (if available), and other data, document condition of each drainage feature and develop prioritized list of maintenance and improvements.	Project could be conducted as a single effort across the entire Down East region or divided into multiple sub-regional efforts, performing the assessment for a group of neighboring communities at a time.	Expected to be low to medium cost dependent on size of the assessment (conducted regionally or by sub-region). Similar projects that have included stormwater inventory and assessment have ranged in cost from $50,000 to $200,000 depending on level of survey effort. Anticipated to cost $50 per structure.	No, but will lead to potential NNBS	Federal: EDA - Investment for Public Works and Economic Development Facilities, FEMA – BRIC, and the National Fish and Wildlife Federation- National Coastal Resilience Fund. State sources: Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ Asset and Inventory Assessment Grants	Near-term, within first year. Data needed for implementation of other projects.	Flooding (all types), storm surge.	The drainage inventory and assessment will provide insight on the prioritized infrastructure need and will help understand the scale of improvements that are needed. Infrastructure projects cannot begin before the inventory and assessment is complete.	Highest priority of CAT. As roadway drainage infrastructure is maintained by NCDOT, the inventory and condition assessment would need to be conducted in close coordination with NCDOT, utilizing agency data where appropriate. The identification and prioritization of infrastructure improvements (those that would involve work within state-owned right-of-way) would also need to be developed in conjunction with NCDOT.

2	**Groundwater Well Installation and Monitoring**	Install groundwater monitoring wells to determine groundwater table and changes resulting from rainfall events.	Ground water well installation and monitoring would be recommended for all communities in the Down East region. Potential locations provided by the community can be found below; North River- Recommend locations along and east of Merrimon Road between Laurel Road and US 70 approach to the North River Bridge Sea Level - Recommend locations within the Shell Hill Road/Nelson Neck Road "loop" and along US 70.	Expected to be low cost. Gauges are expected to be between $500 and $1500 (each) in cost.	No, but will lead to a better understanding of the current conditions and what strategies are needed which may include NBBS.	Potential funding sources: Partnerships with non-governmental organizations or university studies may provide opportunities to fund the installation and short-term monitoring of groundwater wells. State sources may include several NCDEQ programs- Drinking Water State Revolving Fund, Clean Water State Revolving Fund, and Asset Inventory and Assessment Grant Program.	Near-term, within first year. Data needed for implementation of other projects.	Purpose is to understand changes in groundwater table particularly after heavy rainfall events.	Wells will provide comprehensive dataset on groundwater levels and any changes following high rain events. This data, in conjunction with drainage survey and condition assessment, will allow for prioritization and design of specific drainage improvements. Depending on the type of wells installed, onsite data collection and maintenance may be required. Will need to plan for wells that may be damaged or otherwise need to be replaced during the monitoring timeframe.	High priority of CAT.
6	**Septic System Alternatives Assessment**	Develop alternative recommendations for the replacement/upgrade to existing residential septic tanks threatened by flooding or other hazards. Identify potential funding sources for private property owners to complete upgrades. The program would encompass an outreach program on septic system alternatives and include assessments for interested parties. The final outcome of this project would be increased awareness of alternatives to traditional septic tanks, and support for property owners with septic tanks throughout Down East.	Community-wide	Expected to be low to medium cost. Cost of outreach and feasibility study associated with septic system alternatives is expected to be between $100,000 and $150,000 depending upon the level of effort.	No	State: NCDEQ Section 319 Grant, Federal: EPA Clean Water State Revolving Fund, HUB Community Block Grants; EDA; Rural Home Loan Program, Single-Family Repair Loans and Grant Program, Rural Decentralized Water Systems Grant Program	Near-term	Flooding (all types)	Developing alternative recommendations and identifying resources to help fund them is intended to alleviate the impacts of flooding hazards, and potentially the costs associated with septic tank replacements, on property owners and help ensure that property owners can stay in the region.	

Infrastructure										
3	**Ditch Clearing and Maintenance**	Clear debris from, and potentially widen/deepen, ditches in select locations to facilitate roadway drainage.	Prioritized locations to be determined based on Drainage Inventory/Assessment (Project #1). Potential starting locations include: North River: - ditch east of East Carteret High School driveway - ditch east of Isiah Murray Drive - ditch east of Merrimon Road, south of Armania Lane Sea Level: - ditch east of Nelson Neck Road - ditches south of US 70, both west of Nelson Neck Road and east of Cedar Creek Road	Cost estimate between $100,000 and $250,000 depending on size and scope of project.	Potential, if performed in conjunction with NNBS at the sites.	Federal: EDA-Investment for Public Works, National Fish and Wildlife Federation - National Coastal Resilience Fund, and Economic Development Facilities, FEMA Flood Mitigation Assistance Program State sources: Rural Grant Programs, EPA-Clean Water State Revolving Funds	Near-term; ongoing maintenance anticipated	Pluvial flooding events, especially high-intensity, localized flooding.	This project was the most desired by the public and will be a way to quickly show that work is being done to address flooding and coastal hazards. This project will help with the immediate flooding in the area, especially if completed in combination with other project options (tide gates, pump systems, NNBS to enhance surrounding marsh system, etc.). This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	High priority based on public feedback. Would be an ongoing project. NNBS aspect would benefit with public education on NNBS and offshore barriers.
4	**Culvert Sizing**	Resize/replace culverts to facilitate water flow underneath roadway infrastructure.	Utilize input from drainage inventory and assessment to determine priority culvert locations. RCCP analysis indicated potential need on Merrimon Road to facilitate west to east water drainage. Other locations in Davis, Stacy, and Sea Level may also warrant consideration.	High cost expected, dependent on sizing of culverts and extent of roadway repair required. Culvert resizing or constructions can range in cost between $500,000 and $1.5 mil.	No	Culvert projects located within state (NCDOT) right-of-way will likely be funded through NCDOT. Additional funding sources could include: Federal: FEMA – BRIC State: Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ Asset and Inventory Assessment Grants	Mid-term (3-7 years out)	Flooding (all types), storm surge.	Project will help alleviate flooding on major roads and help ensure access to critical infrastructure in the region. The proposed locations on Merrimon Road in North River and in Davis are a high priority for the community, so implementation of the project will build trust with these communities. Culvert resizing can be time consuming and expensive projects depending on the scope of the project. These efforts will help alleviate the impacts due to coastal hazards, but larger culverts will be needed to address the increasing frequency and intensity of flooding events that the region is expected to experience, increasing the up-front construction costs of the projects.	Projects located within state (NCDOT) right-of-way will require coordination with NCDOT.

11	**Tide gates**	Install tide gates at ditches to prevent backflow onto roadway infrastructure.	Utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations. RCCP analysis indicated potential need at the ditch east of East Carteret High School drive to facilitate continued access to shelter and to US 70 bridge approach.	Expected to be medium to high cost, dependent on size of ditch/waterway selected for tide gates.	Yes (potentially), if there are NNBS involved in the ditches or area around tide gates.	Federal: FEMA Flood Mitigation Assistance Grant Program State: Currently no programs are looking at funding something like this, but NCDEQ has made it known they would like to reestablish the LASII program	Near-term, following completion of groundwater monitoring	Tidal flooding	Tide gates will help to prevent flooding of key infrastructure, particularly critical infrastructure like roadways. Installation of tide gates will help prevent the flooding that has become a common occurrence in Down East. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	Maintenance of these tide gates, including the continued cost and staff commitment, is a concern for the county.
14	**Detention Pond Construction**	Construct detention pond to capture excess runoff during heavy rainfall events.	Utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations. RCCP analysis identified potential location at East Carteret High School (west of baseball field).	Low cost expected. Typical project costs between $25,000 and $100,000 per site.	Yes (potential)	State: NCDEQ'S Water Resource Development Grant (WRDG)	Near-term, following completion of groundwater monitoring	Flooding (all types)	Project would help protect critical infrastructure in the area. The implementation of NNBS would help the project qualify for more grant opportunities moving forward and should be considered if possible.	Project would benefit from NNBS components being incorporated.
15	**Pump System**	Install pump system to help water flow at ditches during heavy rainfall events.	Utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations. RCCP analysis identified potential location in at ditch east of East Carteret High School drive to facilitate continued access to shelter and to US 70 bridge approach, as well as at the southern intersection of Shell Hill Road and Nelson Neck Road in Sea Level.	Expected to be medium cost, dependent on number of locations and sizing. Cost can vary from $100,000 to $300,000 per site.	No	State: Water and Waste Disposal Loan and Grant Program Federal: FEMA Flood Mitigation Assistance Grant Program	Mid-term, following completion of groundwater monitoring	Flooding (all types).	The installation of a pump system will help alleviate the worst flooding that occurs during extreme weather events and other events that cause excess flooding. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with this locality and its risks.	County has concerns regarding he maintenance of a pump station. Preference would be for maintenance duties to fall to an entity other than the County.

8	**Roadway Protection Measures:** **Complete a feasibility analysis, followed by the design and construction of an infrastructure solution for the protection of the section of NC 12 leading to and within Cedar Island. Potential protection measures to be evaluated and constructed could include:**									
	Offshore Barrier	Construct offshore breakwater to reduce wave energy within Cedar Island Bay that may impact NC 12 roadway.	Further assessments gathered from additional community outreach and drainage inventory and assessment should be utilize. Potential locations that have received interest from the community are below; Cedar Island - Potential locations include: - east of NC 12 near Goodwin Ridge Road intersection - east of NC 12 between intersections with Landing Road and Boogie Acres Road	Expected to be high cost, dependent on material used, location and scope of project. Similar projects, such as construction of living shoreline, typically range between $150,000 and $250,000.	Yes (potential), Dependent on type of material used for offshore barrier.	Federal: NOAA - Coastal & Estuarine Land Conservation Program, NOAA - National Coastal Resilience Fund, and NFWF – National Coastal Resilience Fund & 5 Star and Urban Water Restoration. State: EPA - Clean Water State Revolving Fund, Z. Smith Reynolds Foundation, and NCDWR Water Resources Development Project Grants.	Mid-term; 5-10 years	Storm surge	The construction of an offshore barrier, particularly a NNBS offshore barrier would help address multiple hazards while helping mitigate the issue of coastal erosion and building up the region's defenses against coastal hazards such as hurricanes and other forms of extreme weather. The construction of offshore barriers and nature-based solutions did not rank very high with the public. Also, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	
	Living Shoreline	Construct living shoreline to enhance the existing marsh system east of the NC 12 roadway and provide protection for public and private infrastructure leading to and within the Cedar Island community.	Further assessments gathered from additional community outreach and drainage inventory and assessment should be utilize. Potential locations that have received interest from the community are below; Cedar Island - NC 12 north of Cedar Island National Wildlife Refuge	Expected to have a high cost. Project could range from $250,000 to over $2 million. The Town of Duck recently completed a similar project for $1.85 million. This project encompasses an approximate one quarter-mile area.	Yes	Federal: NOAA - Coastal & Estuarine Land Conservation Program, NOAA - National Coastal Resilience Fund, and NFWF – National Coastal Resilience Fund & 5 Star and Urban Water Restoration. State: EPA - Clean Water State Revolving Fund, Z. Smith Reynolds Foundation, and NCDWR Water Resources Development Project Grants.	Mid-term; 5-10 years	Storm surge	The construction of a living shorelines along the coastline somewhere in the Down East region could go a long way in helping to address coastal hazards effecting the region. A living shoreline would incorporate NBBS, which would make the project more appealing for grant applicant in the future. The strategy also helps mitigate the issue of coastal erosion and builds up the region's defenses against coastal hazards like hurricanes and other forms of extreme weather. The construction of living shorelines has a high cost associated with the strategy. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	

	Roadway Elevation	Elevate NC 12 roadway within Cedar Island, using combination of roadway fill and bridging over existing ditches as appropriate. Proposed elevation approximately 18", pending further engineering review and current 100-year storm analysis.	Further assessments gathered from additional community outreach and drainage inventory and assessment should be utilize. Potential locations that have received interest from the community/ identified in the risk analysis are below; Cedar Island - NC 12 north of Cedar Island National Wildlife Refuge	Expected to be medium to high cost, dependent on height and scope of solution. Estimated costs vary from $200,000 to over $1.5 million.	Yes (Potentially), if there are NNBS in structure that leads to the raised roads	Facility is state-maintained roadway; funding would likely be through NCDOT STIP funds, with potential contributions from federal (USDOT) grant sources. Federal Grant Sources: FEMA – BRIC & Flood Mitigation Assistance Program and EDA - Investment for Public Works and Economic Development Facilities State Grant Sources: Rural Grant Programs and NCDEQ Clean Water State Revolving Fund	Mid-term; 5-10 years	Flooding (all types)	Project would protect critical infrastructure and the only transportation route in and out of Cedar Island. Roadway projects are expensive and time consuming. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	For projects on state roads will require coordination with NCDOT.
Emergency Preparedness										
7	**Danger Tree Clearing Program**	Identify and remove trees that could impact emergency facilities, community resources, or other infrastructure during high wind or other storm events. Identify potential funding sources for private property owners to remove dead trees that could impact infrastructure.	Community-wide	Expected to be low to medium cost, dependent on the number of trees identified. Similar projects in other parts of the state cost $600,000 to $1,000,000. These programs though also contain tree planting and pruning so cost may be significantly lower for just dangerous tree removal.	No	Federal: FEMA BRIC program State: NCFS Urban and Community Forestry Financial Assistance Program	Near-term	All	The establishment of a danger tree clearing program will help mitigate the extent of damage that coastal hazards, particularly hurricanes and other tropical storms, have on the Down East community. The project is a proactive measure to minimize future infrastructure and private property damage. This strategy will help alleviate potential hazard impacts, particularly from wind events. However, additional strategies will be needed to address other types of hazards, such as flooding and storm surge.	Coordination with power utilities to remove trees that threaten electric lines; community fire departments will remove trees within roadways pre- and post-storm. Identify gaps on private property that could impact public facilities.

9	**Emergency Facilities Condition Assessment**	Complete an assessment of all Fire Departments and other emergency facilities within the Down East region to determine if further protection or mitigation measures (building elevation, flood gates, facility relocation, etc.) are needed, and identify specific mitigation strategies for each facility. Following completion of the assessment, fund and implement the identified measures.	Emergency facilities across Down East region. It would be beneficial to utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations.	Assessment of the emergency facilities is expected to be a low cost. Estimates are between $50,000 and $100,000. Cost of implementation of strategies identified in assessment vary but are expected to be medium cost, dependent on scope of protection measures. The typical cost to elevate a small structure using piers or pilings in the case of flooding ranges from $20,000 to $80,000. Installation of an operation gate to prevent flooding ranges between $15,000 and $70,000. These would be the cost per project.	No; At least with the current strategies proposed	Federal: FEMA BRIC Program State: Volunteer Fire Department Fund, OSFM FEMA 2022 Supplemental Grant	Mid-term; 5-10 years	Flooding (all types); storm surge	Emergency facilities condition assessment will help identify what critical infrastructure is in the most need of additional resources and strategies for protection. Doing this will ensure that the critical infrastructure is protected, and the equipment housed at the emergency facilities are not damaged due to flooding or storm surge. Improvements to the emergency facilities will ensure that residents of Down East have access to these vital services during and after extreme weather events. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.	The County had previously applied for a BRIC grant to construct new station at Sea Level at a location with a high enough elevation for vehicles but was not selected.
10	**High Water Rescue Vehicle**	Purchase high water rescue vehicle to be based at Sea Level or adjacent Fire and Rescue Department/ community staging areas in advance of flood events.	Emergency facilities across Down East region. It would be beneficial to utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations.	Expected to be medium cost, dependent on vehicle selected. Similar projects have cost between $100,000 and $300,000 per vehicle.	No	Federal: FEMA BRIC program State: Volunteer Fire Department Fund, OSFM FEMA 2022 Supplemental Gran		Flooding (all types); storm surge	Project would ensure that during extreme weather events and times of coastal hazards that emergency personnel are able to come and rescue residents. Project is reactive to the coastal hazards and does not work to mitigate the issues involved with the coastal hazards.	The County currently has one that is staged wherever it is needed but is open to having more available for the Down East community.

13	**Emergency Storage Facilities**	Construct storm-resilient structure to be used for emergency supply storage; include raised area to allow for resident parking.	Community-wide	Expected to be medium to high cost, dependent on size and material used during construction. Costs are expected to be between $100,000 and $500,000 but larger facilities have price ranges in the millions of dollars.	No	Shelter facilities would likely qualify for federal hazard mitigation funding. FEMA has multiple funding opportunities, including Shelter and Services Program and Building Resilient Infrastructure Communities (BRIC)	Mid-term; 5-10 years	All	The construction of a storm resilient facility/facilities will ensure that emergency supplies are available for residents after extreme weather events. The project makes the locality more prepared for extreme weather and more adept and ready for emergency response. With this project being rated as a low priority and no funds currently identified, it may be some time before this project comes to fruition. The creation of adequate emergency storage facilities does not influence the locality's ability to address hazards associated with extreme weather like flooding. To make the strategy as effective as possible, it will need to be paired with infrastructure projects.	An emergency shelter as far east as possible should be considered to provide for communities most threatened by flooding.

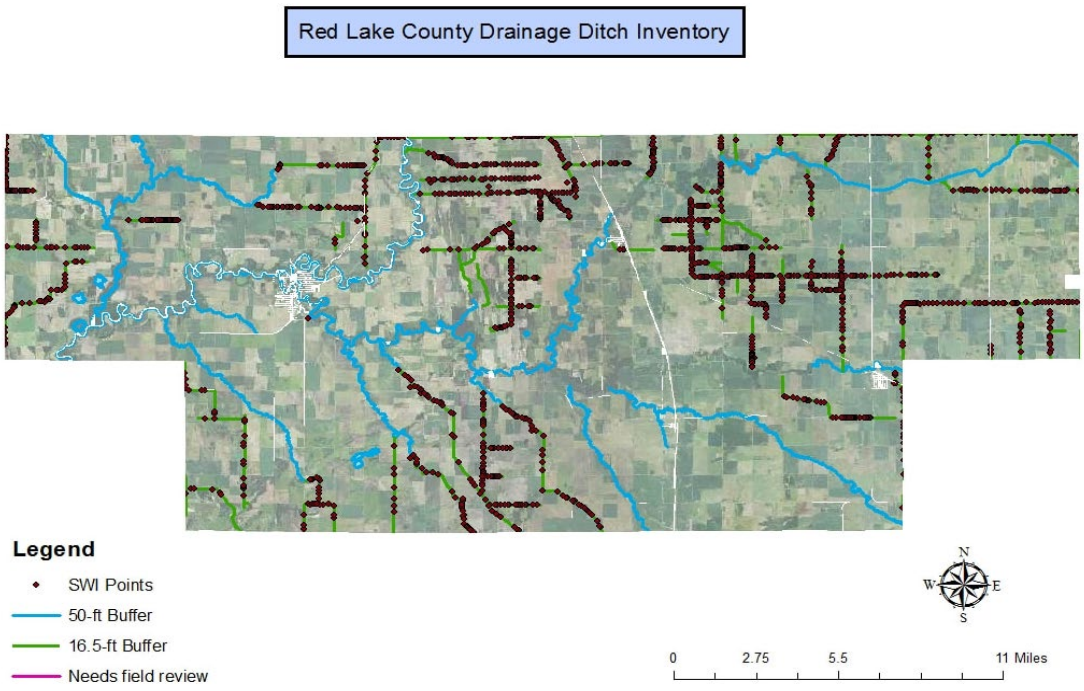
Community Education & Outreach										
5	**Community Liaison**	Hire a paid staff member who would be a trusted local resident who could serve as a conduit between government resilient programming, such as the RCCP program, and the community. The community liaison would help ensure that the unincorporated towns located Down East are represented in resilience efforts. The liaison role could be filled by a local resident, regional non-profit organization, or other entity with established community trust.	Community-wide	Expected to be low cost. Costs are expected to be between $60,000 and $100,000 annually depending upon the level of effort and number of individuals employed.	No	Potential funding sources: Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.	Near-term	All	The hiring of a community liaison would help build trust with the communities that are being served and help ensure they are knowledgeable on the projects. The project would also ensure better communication from the communities. The project is also a low-cost solution. The community liaison would also be able to help with the education of NNBS and help with buy in from the community.	Idea was submitted by Lighthouse Environment partners as way to continue to keep communities involved and engaged.

	Community Outreach Campaigns: **Conduct public outreach efforts on any of the following topics (individually or in combination) to promote community conversations on these issues and provide greater awareness of available resources. These campaigns could be led by local government, the community liaison, regional non-profit organizations, or members of the community.**									
12	**Emergency preparedness public outreach**	Develop emergency preparedness materials to distribute pre-storm, such as door hangers, for each community to know understand evacuation procedures and shelter options, emergency preparedness awareness, and emergency contact information. Redistribute annually in conjunction with community outreach sessions.	Community-wide	Expected to be low cost. Cost are expected to be between $10,000 and $50,000 annually depending upon the level of effort.	No	Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.	Near-term/ Ongoing	All	Performing emergency preparedness public outreach will help to create a more informed community and help with buy-in for other resilience projects. The project is also one of the lowest costs of any of the resilience projects listed in the report. Public outreach has no effect on the infrastructure and natural resources found in the community and will need to be paired with infrastructure projects to bring physical change to the community.	NWS conducts preparedness sessions throughout the region. Partner with NWS to continue community conversations and develop pre- and post-storm materials.

12	**Natural and Nature-Based Solutions (NNBS) Awareness**	Identify and provide resources to residents on the potential scope and uses of NNBS projects, including the protection of public infrastructure and private property. Utilize resources from federal and state agencies along with regional non-profit organizations to aid this public outreach.	Community-wide	Expected to be low cost. Cost are expected to be between $10,000 and $50,000 annually depending upon the level of effort.	No	Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.	Near-term/ Ongoing	All	Performing natural and nature-based solutions public outreach will help to create a more informed community and help with buy-in for other resilience projects. The project is also one of the lowest costs of any of the resilience projects listed in the report. Public outreach has no effect on the infrastructure and natural resources found in the community and will need to be paired with infrastructure projects to bring physical change to the community.	
	Transportation / Infrastructure Planning - Public Outreach	Connect Down East residents to agencies and resources pertaining to the planning and construction process for transportation facilities and other public infrastructure, to help residents understand the process and their role in the development of infrastructure projects.	Community-wide	Expected to be low cost. Cost are expected to be between $10,000 and $50,000 annually depending upon the level of effort.	No	Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.	Near-term/ Ongoing	All	Performing transportation/infrastructure planning public outreach will help to create a more informed community and help with buy-in for other resilience projects. The project is also one of the lowest costs of any of the resilience projects listed in the report. Public outreach has no effect on the infrastructure and natural resources found in the community and will need to be paired with infrastructure projects to bring physical change to the community.	

Project Name	**Drainage Inventory and Assessment**
Project Description	Survey all drainage ditches, outfalls, and related inventory; create location database for use in future assessments and maintenance planning and document existing condition of each feature. Using drainage inventory, groundwater monitoring, and other data, document condition of each drainage feature and develop prioritized list of maintenance and improvements.
Location	Assessment can be conducted across the entire Down East region or divided into multiple sub-regional efforts, performing the assessment for a group of neighboring communities at a time.
Hazard(s) addressed by project	Flooding (all types), storm surge
Type of Solution	Data collection
Natural and Nature Based Solution Opportunity?	No; However, information gathered from this assessment could identify opportunities for NNBS solutions.
Project Estimated Cost	Expected to be low to medium cost dependent on size of the assessment (conducted regionally or by sub-region). Similar projects that have included stormwater inventory and assessment have ranged in cost from $50,000 to $200,000 depending on level of survey effort. Anticipated to cost $50 per structure. **Cost Level: $$**
Potential Implementation Funding Sources	Federal source: EDA - Investment for Public Works and Economic Development Facilities, FEMA – BRIC, and the National Fish and Wildlife Federation- National Coastal Resilience Fund. State sources: Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ Asset and Inventory Assessment Grants.
Project Estimated Timeline	Strategy to be implemented in the near term; may take between six months to a year to complete. This project was

	identified as the CAT's top priority, as it will aid in the identification of future infrastructure projects.
Preliminary Tasks/ Data Required	RVA, CAT, and community provide initial feedback on areas of concern.
Advantages/Disadvantages	A Drainage Inventory and Assessment will provide needed information on the locations with the biggest need and will help understand which projects to prioritize moving forward. Infrastructure project cannot begin before the inventory and assessment is complete.
Similar Project Examples	Stormwater Mapping; Swansboro Resilience Strategy as part of RCCP.
Priority Rating	**High**- Project was identified as top priority by the Down East CAT.



Example Drainage Inventory

Source: Drainage Inventory of Red Lake County (https://redlakecountyswcd.org/drainage-ditch-inventory.html)

Project Name	**Groundwater Well Installation and Monitoring**
Project Description	Install and monitor groundwater wells in each community to identify groundwater table elevation and changes experienced after storm events.
Location	Recommendation is for well installation in all Down East communities in repetitive flooding spots. Potential locations based off of community feedback can be found below: North River- Recommend locations along and east of Merrimon Road between Laurel Road and U.S. 70 approach to the North River Bridge. Sea Level - Recommend locations within the Shell Hill Road/Nelson Neck Road "loop" and along U.S. 70.
Hazard(s) addressed by project	Flooding (All Types)
Type of Solution	Data Collection
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Expected to be low cost. Gauges are expected to be between $500 and $1500 each. Total cost depends on the number of wells installed. **Cost Level: $**
Potential Implementation Funding Sources	Partnerships with non-governmental organizations or university studies may provide opportunities to fund the installation and short-term monitoring of groundwater wells. State sources: include several NCDEQ programs- Drinking Water State Revolving Fund, Clean Water State Revolving Fund, and Asset Inventory and Assessment Grant Program.
Project Estimated Timeline	Wells should be installed and monitored for at least 6 months, preferably coinciding with at least one hurricane season.
Preliminary Tasks/ Data Required	Finalize well locations based on community input. RCCP Risk and Vulnerability Assessment (RVA) provides initial insight and recommendations.

Advantages/Disadvantages	Wells will provide comprehensive dataset on groundwater levels and any changes following high rain events. This data, in conjunction with drainage survey and condition assessment, will allow for prioritization and design of specific drainage improvements. Depending on the type of wells installed, onsite data collection and maintenance may be required. Will need to plan for wells that may be damaged or otherwise need to be replaced during the monitoring timeframe.
Similar Project Examples	Brunswick County & USGS cooperative program to monitor aquifer levels and chloride concentration; https://www.usgs.gov/centers/sawsc/science/brunswick-county-nc-groundwater-level-monitoring#overview
Priority Rating	**High**

Groundwater Well Installation

Source: USGS groundwater well webpage (https://www.usgs.gov/media/images/groundwater-monitoring-well)

Project Name	**Septic System Alternatives Assessment**
Project Description	Develop alternative recommendations for the replacement/upgrade to existing residential septic tanks threatened by flooding or other hazards. Identify potential funding sources for private property owners to complete upgrades.
Location	Assessment should be conducted across the Down East region.
Hazard(s) addressed by project	Flooding (all types)
Type of Solution	Data collection
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Expected to be low to medium cost. Cost of outreach associated with septic system alternatives is expected to be between $100,000 and $150,000 annually depending upon the level of effort. **Cost Level: $$**
Potential Implementation Funding Sources	State sources: NCDEQ Section 319 Grant. Federal: EPA Clean Water State Revolving Fund, HUB Community Block Grants; EDA; Rural Home Loan Program, Single-Family Repair Loans and Grant Program, Rural Decentralized Water Systems Grant Program.
Project Estimated Timeline	The project is expected to be started in the near term.
Preliminary Tasks/ Data Required	Community input will be needed to know where most at risk resident are as well as the RVA to understand social vulnerability of population.
Advantages/Disadvantages	Developing alternative septic system recommendations and guiding residents to resources to help residents acquire them will help alleviate stress on property owners and help ensure that property owners can continue to stay in the region.

	The project does not look to address the mitigation of flooding and other risks associated with increased extreme weather events.
Similar Project Examples	Alternative Septic Project in Middle Peninsula, VA; https://www.whro.org/environment/2024-05-08/in-rural-virginia-sea-level-rise-swamps-septic-systems-a-local-partnership-is-testing-a-solution# Partnership and grant for septic system in Cape Cod, MA; https://www.epa.gov/water-research/innovativealternative-septic-systems#:~:text=Enhanced%20IA%20septic%20systems%20can,are%20considered%20for%20broader%20use.
Priority Rating	**Medium**

Sources: WHRO Public Media https://www.whro.org/environment/2024-05-08/in-rural-virginia-sea-level-rise-swamps-septic-systems-a-local-partnership-is-testing-a-solution

Project Name	**Ditch Clearing/Maintenance**
Project Description	Clear debris from, and potentially widen/deepen, ditches and/or outfalls in select locations to facilitate roadway drainage.
Location	Utilize input from drainage inventory and assessment to determine priority locations; focus initial clearing/maintenance work in repetitive flooding spots. Potential Locations from Community Feedback: North River: - ditch east of East Carteret High School driveway - ditch east of Isiah Murray Drive - ditch east of Merrimon Road, south of Armania Lane Sea Level: - ditch east of Nelson Neck Road - ditches south of US 70, both west of Nelson Neck Road and east of Cedar Creek Road
Hazard(s) addressed by project	Pluvial flooding events; especially high-intensity, localized flooding
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	**Yes**; if NNBS elements can be implemented in area around or within the ditches.
Project Estimated Cost	Cost estimate between $100,000 and $250,000 depending on size and scope of project. Overall, relatively low-cost solution to issue. **Cost Level: $$**
Potential Implementation Funding Sources	Federal source: EDA- Investment for Public Works, National Fish Wildlife Federation: National Coastal Resilience Fund, and Economic Development Facilities, FEMA Flood Mitigation Assistance Program. State sources: Rural Grant Programs, EPA- Clean Water State Revolving Funds.

Project Estimated Timeline	As the project was the highest priority for community, project should be one of the first tasks taken. Project could begin in the short-term and is intended to be ongoing.
Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform a prioritized approach and schedule.
Advantages/Disadvantages	This project was the most desired by the public and will be a way to quickly show that work is being done to address flooding and coastal hazards in the region. This project will help with the immediate flooding that is occurring in the area. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.
Similar Project Examples	City of High Point Drainage Maintenance program; https://www.highpointnc.gov/681/Drainage-Maintenance City of Raleigh Ditch Improvement project; https://raleighnc.gov/projects/north-ridge-drainage-improvements
Priority Rating	**High**. Project was identified as the top priority in public outreach events.

Ditch off US 70 in Davis North Carolina

Sources: Google Maps- Davis, NC

Project Name	**Culvert Sizing**
Project Description	Identify and construct culverts that need to be resized.
Location	Utilize input from drainage inventory and assessment to determine priority culvert locations. RCCP analysis and community feedback have identified the potential locations in North River (Merrimon Road), Davis, Stacy and Sea Level.
Hazard(s) addressed by project	Flooding (all types), storm surge
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	High cost expected, dependent on sizing of culverts and extent of roadway repair required. Culvert resizing or constructions can range in cost between $500,000 and $1.5 million. **Cost Level: $$$**
Potential Implementation Funding Sources	Culvert projects located within state (NCDOT) right-of-way will likely be funded through NCDOT. Additional funding sources could include: Federal: FEMA – BRIC State: Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, and NCDEQ Asset and Inventory Assessment Grants.
Project Estimated Timeline	Due to required coordination with NCDOT, timeline for strategy implementation would likely be mid-term and take 3-7 years. Project improvements are expected to require an estimated 1-3 years following receipt of project funding. Project was the second highest priority from the public feedback so will help build public trust if the project moves forward as quickly as possible given strategies limitations.
Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform a prioritized approach and schedule.

Advantages/Disadvantages	Project will help alleviate flooding on major roads and help ensure access to critical infrastructure in the region. Project is also a high priority for the community, so implementation of the project will build trust within the community in regards to the RCCP program. Culvert resizing can be time consuming and expensive projects depending on the scope of the project. These efforts will help alleviate the impacts due to coastal hazards, but larger culverts will be needed to address the increasing frequency and intensity of flooding events that the region is expected to experience, increasing the up-front construction costs of the projects.
Similar Project Examples	Swansboro Resilience Strategy Document RCCP 22; Resizing NC 24 Culvert
Priority Rating	**High**

Culvert Construction

Source: Adobe Stock Photo

Project Name	**Tide Gates**
Project Description	Install tide gates at ditches to prevent backflow onto roadway infrastructure.
Location	Utilize input from drainage inventory and assessment to determine priority locations. Locations identified in RCCP analysis include the ditch east of East Carteret High School drive which would facilitate continued access to shelter (Goal would be to facilitate continued access to shelter and US 70 bridge approach).
Hazard(s) addressed by project	Tidal flooding
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	No.
Project Estimated Cost	Expected to be medium to high cost, dependent on size of ditch/waterway selected for tide gates. **Cost Level: $$$**
Potential Implementation Funding Sources	Federal source: FEMA Flood Mitigation Assistance Grant Program State sources: LASII Program (currently not funded but NCDEQ may bring back in the future).
Project Estimated Timeline	The project would be performed in the near-term, following the completion of the groundwater monitoring. The timeline of the construction can vary depending on the size and scope of the project. Construction of project can take from 6 months to 4 years depending on size of ditches or streams where tide gates are installed.
Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform a prioritized approach and schedule.
Advantages/Disadvantages	Tide gates will help to prevent flooding of key infrastructure, particularly critical infrastructure like roadways. Installation of tide gates will help prevent the flooding that has become a common occurrence in Down East. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need

	to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.
Similar Project Examples	Wynne's Gut Pump and Tidal Gate System; https://www.fema.gov/grants/mitigation/learn/flood-mitigation-assistance/after-you-apply/fy-2023-status#summary
Priority Rating	**Low**

Revere, MA Tidal Gate

Source: EPA (https://www.epa.gov/system/files/documents/2024-02/final_tidal-res-protocol_february-2024.pdf)

Project Name	**Detention Pond Construction**
Project Description	Construct detention pond to capture excess runoff during heavy rainfall events.
Location	Utilize input from drainage inventory and assessment to determine potential locations. RCCP analysis and community feedback indicated East Carteret High School (west of ball field) as a potential location.
Hazard(s) addressed by project	Flooding (all types)
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity? 	**Yes**, if combined with plantings or other nature-based design elements.
Project Estimated Cost	Low cost expected. Typical project costs between $25,000 and $100,000 per site. **Cost Level: $**
Potential Implementation Funding Sources	State funding: NCDEQ'S Water Resource Development Grant (WRDG), NFWF- 5 Star and Urban Water Restoration Grant Program
Project Estimated Timeline	Project is expected to be done in the near-term, following the completion of groundwater monitoring. Project is not considered an urgent need by the public, but the construction would protect critical infrastructure (Regional High School) in the region. Project is expected to take between 1 and 2 years.
Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform a prioritized approach and schedule.
Advantages/Disadvantages	Project would help protect critical infrastructure in the area. The implementation of NNBS would help projects utilizing this strategy qualify for more grant funding. Project would benefit with public outreach effort regarding NBBS. However, the project did rank low during public outreach events.
Similar Project Examples	Durant Nature Preserve Stream & Stormwater Improvements (City of Raleigh); https://raleighnc.gov/projects/durant-nature-preserve-stream-stormwater-improvements

Priority Rating	Low

Detention Pond

Source: CDENR Stormwater Design Manual (https://www.deq.nc.gov/energy-mineral-and-land-resources/stormwater/bmp-manual/c-12-dry-pond-11-20-2020/download)

Project Name	**Pump System**
Project Description	Install pump system to help water flow at ditches during heavy rainfall events.
Location	Utilize input from drainage inventory and assessment to determine priority locations. RCCP analysis identified several potential locations, including: - Ditch east of East Carteret High School drive to facilitate continued access to shelter (Goal would be to facilitate continued access to shelter and US 70 bridge approach). - Southern intersection of Shell Hill Road and Nelson Neck Road in Sea Level.
Hazard(s) addressed by project	Flooding (all types)
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Expected to be medium cost, dependent on number of locations and sizing. Cost can vary from $100,000 to $300,000 per site. **Cost Level: $$$**
Potential Implementation Funding Sources	State sources: Water and Waste Disposal Loan and Grant Program. Federal sources: FEMA Flood Mitigation Assistance Grant Program.
Project Estimated Timeline	Project is considered to have a mid-term timeline and would follow the completion of the groundwater monitoring. Project/strategy is considered a low priority.
Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform a prioritized approach and schedule.
Advantages/Disadvantages	The installation of a pump system will help alleviate the worst flooding that occurs during extreme weather events and other events that cause excess flooding.

	This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with this locality and its risks.
Similar Project Examples	Cape Canaveral, Florida Street Pump Station Activated; https://www.cityofcapecanaveral.org/news_detail_T9_R339.php
Priority Rating	**Low**

Cape Canaveral Center Street Pump Station

Source: City of Cape Canaveral, Fl Twitter/X – (https://x.com/CapeCanaveralFL/status/1826288676957040832/photo/2)

Project Name	Roadway Protection Measures
Project Description	Additional roadway protections are needed for the section of the NC 12 roadway leading to and within Cedar Island. A complete feasibility analysis is necessary, followed by the design and construction of an infrastructure solution. The three roadway protection measures be evaluated are below: **Offshore Barrier:** Construct offshore breakwater to reduce wave energy within Cedar Island Bay that may impact NC 12 roadway **Living Shoreline:** Construct living shoreline to enhance the existing marsh system east of the NC 12 roadway and provide protection for public and private infrastructure leading to and within the Cedar Island community. **Roadway Elevation:** Elevate NC 12 roadway within Cedar Island, using combination of roadway fill and bridging over existing ditches as appropriate. Proposed elevation approximately 18", pending further engineering review and current 100-year storm analysis.
Location	Cedar Island, within community limits
Hazard(s) addressed by project	Flooding (all types); Storm Surge
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	**Yes,** particularly if a living shoreline is the measure selected.
Project Estimated Cost	Project cost will be dependent on a number of factors including strategy selected for roadway protection, scope of project, and associated roadway design and implementation. No detailed project cost has been estimated. All options, particularly if done in tandem, will have a high cost. **Cost Level: $$-$$$$**

Potential Implementation Funding Sources	Facility is state-maintained roadway; funding for road elevation would likely be through NCDOT STIP funds, with potential contributions from federal (USDOT) grant sources. Federal Grant Sources: FEMA – BRIC & Flood Mitigation Assistance Program, EDA - Investment for Public Works and Economic Development Facilities, National Fish and Wildlife Federation: National Coastal Resilience Fund & 5 Star and Urban Water Restoration; NOAA - Coastal & Estuarine Land Conservation Program & National Coastal Resilience Fund, State Grant Sources: Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, Z. Smith Reynolds Foundation, and NCDWR Water Resources Development Project Grants.
Project Estimated Timeline	Project is predicted to have a mid-term timeline, taking somewhere between 5-10 years. Roadway improvements are likely to take 1-3 years upon receipt of funding and the solutions identified.
Preliminary Tasks/ Data Required	Preliminary task would be determined by which and how many roadway protection measures are implemented. The first step would be the completion of the feasibility analysis.
Advantages/Disadvantages	Projects would protect critical infrastructure and the only transportation route in and out of Cedar Island. Project would benefit with public outreach effort regarding NBBS. The roadway protection measures outlined here are expensive and construction can be time consuming. Also, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.
Similar Project Examples	Town of Duck Living Shoreline and Resiliency Project; https://ducknc.gov/living-shoreline-and-resiliency-project/
Priority Rating	**Medium**

Town of Duck Living Shoreline and Resiliency Project

Source: Town of Duck Living Shoreline Project- (https://ducknc.gov/living-shoreline-and-resiliency-project/)

Project Name	**Danger Tree Clearing Program**
Project Description	Identify and remove trees that could impact emergency facilities, community resources, or other infrastructure during high wind or other storm events. Identify potential funding sources for private property owners to remove dead trees that could impact infrastructure.
Location	Program should be conducted across the entire Down East region.
Hazard(s) addressed by project	All
Type of Solution	Emergency preparedness
Natural and Nature Based Solution Opportunity?	No.
Project Estimated Cost	Expected to be medium cost, dependent on the number of trees identified. Similar projects in other parts of the state cost $600,000 to $1,000,000. These programs though also contain tree planting and pruning so cost may be significantly lower for just dangerous tree removal **Cost Level: $$$**
Potential Implementation Funding Sources	Federal sources: FEMA BRIC program State sources: NCFS Urban and Community Forestry Financial Assistance Program
Project Estimated Timeline	The project could be completed in the near-term.
Preliminary Tasks/ Data Required	Will need to gather information from the public, CAT and other stakeholders on areas of concern.
Advantages/Disadvantages	The establishment of a danger tree clearing program will help mitigate the amount of damage that coastal hazards, particularly hurricanes and other tropical storms, unleash on the Down East community. The project also looks to form a solution before additional damage occurs to infrastructure in the region.

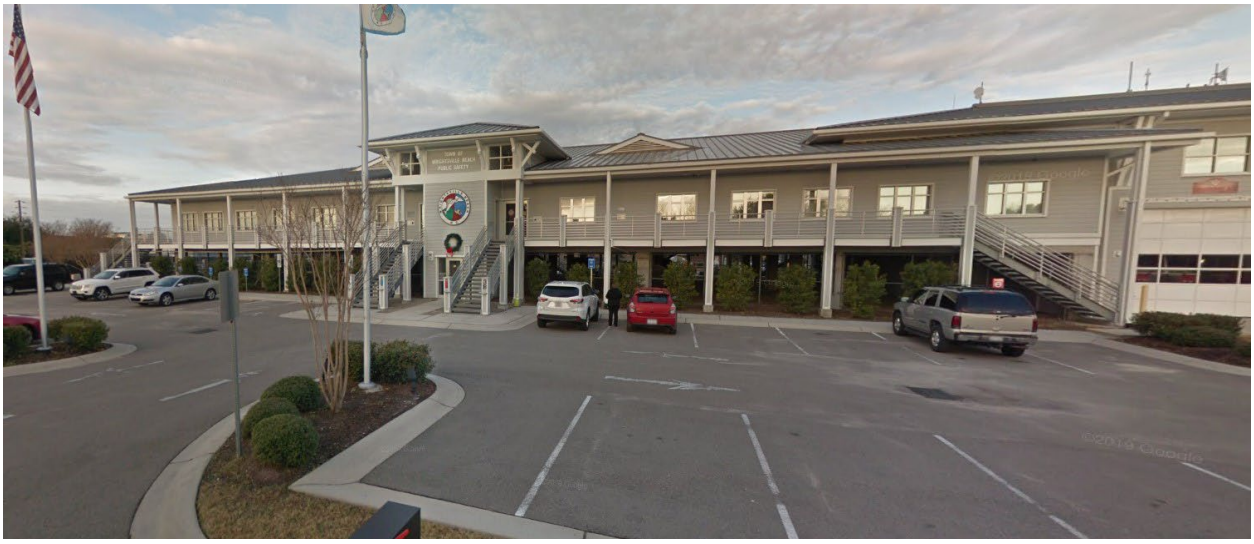
	This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.
Similar Project Examples	City of Charlotte Tree Maintenance Program; https://www.fs.usda.gov/managing-land/urban-forests/ucf/2023-grant-funding#:~:text=City%20of%20Corona%20Urban%20and,and%20maintained%20by%20the%20City.
Priority Rating	**Medium**

City of Wilmington Danger Tree Removal

Source: StarNews Online (https://www.starnewsonline.com/picture-gallery/news/local/2024/06/12/tree-removal-work-on-market-street-in-wilmington-nc/74075118007/)

Project Name	**Emergency Facilities Condition Assessment**
Project Description	Complete an assessment of all Fire Departments and other emergency facilities within the Down East region to determine if further protection or mitigation measures (building elevation, flood gates, facility relocation, etc.) are needed, and identify specific mitigation strategies for each facility. Following completion of the assessment, fund and implement the identified measures.
Location	Emergency facilities across the Down East region. It would be beneficial to utilize input from the drainage inventory and assessment and the groundwater table investigation to determine priority locations.
Hazard(s) addressed by project	Flooding (all types); storm surge
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Assessment of the emergency facilities is expected to be a low cost. Estimates per project are between $50,000 and $150,000. Cost of implementation of strategies identified in assessment vary but are expected to be medium cost, dependent on scope of protection measures. The typical cost to elevate a small structure using piers or pilings in the case of flooding ranges from $20,000 to $80,000. Installation of an operation gate to prevent flooding ranges between $15,000 and $70,000. These would be the cost per project. **Cost Level: $$**
Potential Implementation Funding Sources	Federal sources: FEMA BRIC Program State sources: Volunteer Fire Department Fund, OSFM FEMA 2022 Supplemental Grant
Project Estimated Timeline	Timeline varies depending on which measures are pursued but overall project could be completed in the mid-term (5-10 years) based off of need and scope.

Preliminary Tasks/ Data Required	Drainage inventory and assessment will inform scale of needed protection measures.
Advantages/Disadvantages	Emergency facilities condition assessment will help identify what critical infrastructure is in the most need of additional resources and strategies for protection. Doing this will ensure that the critical infrastructure is protected, and the equipment housed at the emergency facilities are not damaged due to flooding or storm surge. Improvements to the emergency facilities will ensure that residents of Down East have access to these vital services during and after extreme weather events. This strategy will help alleviate hazards associated with extreme weather. However, over time this strategy will need to be paired with other strategies to mitigate hazards associated with the continued increases in extreme weather events and flooding that are anticipated at this locality.
Similar Project Examples	Olympia Volunteer Fire Department-Pamlico County Firehouse Rehabilitation project; https://goldenleaf.org/news/n-c-fire-stations-receive-needed-funds-to-recover-from-natural-disasters/
Priority Rating	**Medium**



Wrightsville Beach FD (Raised Structure)

Source: Google Maps- Wrightsville Beach, NC

Project Name	**High Water Rescue Vehicles**
Project Description	Purchase high water rescue vehicle to be based at Sea Level or adjacent Fire and Rescue Department.
Location	Emergency facilities across the Down East region. It would be beneficial to utilize input from drainage inventory and assessment and the groundwater table investigation to determine priority locations.
Hazard(s) addressed by project	Flooding (all types); storm surge
Type of Solution	Equipment purchase
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Expected to be medium cost, dependent on vehicle selected. Similar projects have cost between $100,000 and $300,000 per vehicle. **Cost Level: $$**
Potential Implementation Funding Sources	Federal sources: FEMA BRIC program. State sources: Volunteer Fire Department Fund, OSFM FEMA 2022 Supplemental Grant.
Project Estimated Timeline	Project could be completed in the near-term. Once project receives necessary funding, procurement of vehicles would be relatively quick. Acquisition of high-water vehicles is estimated to take between 1 and 6 months.
Preliminary Tasks/ Data Required	Recommended to have emergency facility/facilities have additional flood protection measures in place to ensure protection of equipment.
Advantages/Disadvantages	Project would ensure that during extreme weather events and times of coastal hazards that emergency personnel are able to come and rescue residents. Project is reactive to the coastal hazards and does not work to mitigate the issues involved with the coastal hazards.

Similar Project Examples	Seminole County FL acquires two high water/flood rescue vehicles: https://www.firehouse.com/apparatus/type/hazmat-specialty/article/53081962/acela-truck-company-seminole-county-fl-fire-department-acquires-two-highwaterflood-rescue-vehicles
Priority Rating	**Medium**

Seminole County, FL High Water Vehicles

Source firehouse news (https://www.firehouse.com/apparatus/type/hazmat-specialty/article/53081962/acela-truck-company-seminole-county-fl-fire-department-acquires-two-highwaterflood-rescue-vehicles)

Project Name	**Emergency Storage Facility**
Project Description	Construct storm-resilient structure to be used for emergency supply storage; include raised area to allow for resident parking.
Location	To be determined but would serve entire Down East community.
Hazard(s) addressed by project	All
Type of Solution	Facility construction/maintenance
Natural and Nature Based Solution Opportunity?	No
Project Estimated Cost	Expected to be medium to high cost, dependent on size and material used during construction. Costs are expected to be between $100,000 and $500,000 but larger facilities have price ranges in the millions of dollars. **Cost Level: $$**
Potential Implementation Funding Sources	Emergency storage facilities may qualify for federal hazard mitigation funding. FEMA has multiple funding opportunities, including Shelter and Services Program and Building Resilient Infrastructure Communities (BRIC).
Project Estimated Timeline	It is estimated that the timeline for the project would be mid-term (between 5-10 years). Timeline depends on the scope of construction and the determination of the new shelter site.
Preliminary Tasks/ Data Required	Community feedback will be needed to understand which area of Down East is in most need of this resource. Social Vulnerability data from the RVA should be used to help in the determination.
Advantages/Disadvantages	The construction of a storm resilient facility/facilities will ensure that emergency supplies are available for residents after extreme weather events. The project makes the locality more prepared for extreme weather and more adept and ready for emergency response. With this project being rated as a low priority and no funds currently identified, it may be some time before this project

	comes to fruition. The creation of adequate emergency storage facilities does not influence the locality's ability to address hazards associated with extreme weather like flooding. To make the strategy as effective as possible, it will need to be paired with infrastructure projects.
Similar Project Examples	Newark, New Jersey Ironbound Resilience Hub; https://www.njit.edu/tarp/sites/njit.edu.tarp/files/NJIT%20Hazard%20Mitigation%20Workshop_Newark%20Ironbound%20Resilience%20Hub_2023%20%281%29.pdf.
Priority Rating	**Low**

Project Name	**Community Liaison**
Project Description	Hire a paid staff member who would be a trusted local resident to serve as a conduit between government resilient programming, such as the RCCP program, and the community. The community liaison would help ensure that unincorporated towns, which make up the bulk of the communities Down East, are well represented in resilience efforts. The liaison role could be filled by a local resident, regional non-profit organization, or other entity with established community trust.
Location	Community Liaisons would be beneficial community wide. Unincorporated communities would benefit the most from community liaisons and having multiple different liaisons representing localities would help best represent these unique communities.
Hazard(s) addressed by project	All
Type of Solution	Emergency preparedness/ Public outreach
Natural and Nature Based Solution Opportunity?	No. However, may be crucial in teaching the community about natural and nature-based solutions (NBBS) to the community.
Project Estimated Cost	Expected to be low cost. Cost are expected to be between $60,000 and $100,000 annually depending upon the level of effort and number of individuals employed. **Cost Level: $**
Potential Implementation Funding Sources	Potential funding sources: Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.
Project Estimated Timeline	This strategy could be implemented in the near-term. The hiring of a community liaison would be beneficial for all projects and would help build trust with Down East communities. It is recommended that the search and hiring of a community liaison begin shortly after funding is secure.
Preliminary Tasks/ Data Required	Would be beneficial to hear which communities would benefit the most from a community liaison from the Down

	East community as a whole. Would be beneficial to look at RVA regarding social vulnerability of communities.
Advantages/Disadvantages	The hiring of a community liaison would help build trust with the Down East communities that are being served and help ensure they are knowledgeable on the projects. The project would also ensure better communication from the communities. The project is also a low-cost solution. The community liaison would also be able to help with the education of NBBS and help garner buy-in from the community.
Similar Project Examples	FEMA hiring Liaisons in wake of Hurricane Helene; https://www.fema.gov/blog/fema-hiring-community-liaisons-north-carolina.
Priority Rating	**High**

Project Name	Community Outreach Campaigns
Project Description	Conduct public outreach campaigns on any of the topics listed below (individually or in combination). The goal of the strategy/project would be to promote community conversations on these issues and provide greater awareness of available resources. These campaigns could be led by local government, a community liaison, regional non-profit organization or members of the community. Description of public outreach campaign topics can be found below: **Emergency Preparedness:** Develop emergency preparedness materials to distribute pre-storm, such as door hangers, for each community to know understand evacuation procedures and shelter options, emergency preparedness awareness, and emergency contact information. Redistribute annually in conjunction with community outreach sessions. **Natural and Nature-Based Solution Awareness:** Identify and provide resources to residents on the potential scope and uses of NNBS projects, including the protection of public infrastructure and private property. Utilize resources from federal and state agencies along with regional non-profit organizations to aid this public outreach. **Transportation/ Infrastructure Planning Awareness:** Connect Down East residents to agencies and resources pertaining to the planning and construction process for transportation facilities and other public infrastructure, to help residents understand the process and their role in the development of infrastructure projects.
Location	Public outreach should be conducted across the Down East region.
Hazard(s) addressed by project	All
Type of Solution	Emergency preparedness/ Public outreach
Natural and Nature Based Solution Opportunity?	No, but can discuss NBBS with community which should help with community buy-in down the road.
Project Estimated Cost	Expected to be low cost. Cost are expected to be between $10,000 and $50,000 annually depending upon the level of effort.

	Cost Level: $
Potential Implementation Funding Sources	Potential funding sources: Partnerships with non-governmental organizations may provide opportunities to fund the targeted education effort. The NC Office of Environmental Education website provides information on potential education grants.
Project Estimated Timeline	This project would be ongoing and should start in the near-term. Public outreach pertaining to emergency preparedness should occur in preparation of extreme weather events such as hurricanes, tropical storms, and Nor'easters and/or at the beginning of hurricane season.
Preliminary Tasks/ Data Required	Information would be needed on areas to distribute the material. For emergency preparedness community outreach, it would be important to have a system in place for quick distribution in the face of an impending storm.
Advantages/Disadvantages	Performing public outreach will help to create a more informed community and help with buy-in for other resilience projects. The project is also one of the lowest costs of any of the resilience projects listed in the report. Public outreach has no effect on the infrastructure and natural resources found in the community and will need to be paired with infrastructure projects to bring physical change to the community.
Similar Project Examples	Cape Carteret Low-Impact Development Education Campaign and Manual; https://www.townofcapecarteret.org/development-services/page/low-impact-development-information
Priority Rating	**Low**