NORTH CAROLINA
RESILIENT COASTAL COMMUNITIES PROGRAM

CRAVEN COUNTY

Final Deliverable - **Resilience Strategy**

MAY 2022

Dewberry

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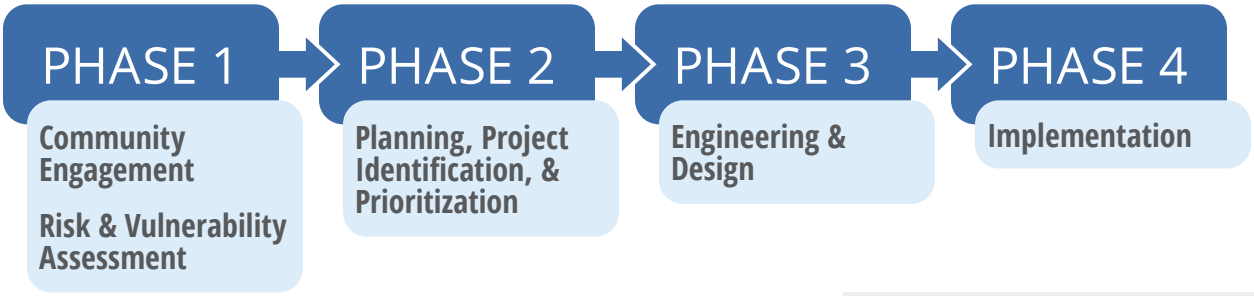
SUMMARY

The Resilient Coastal Communities Program (RCCP) is a grant program administered by the North Carolina Division of Coastal Management (NCDCM). The program objectives are to address barriers to coastal resilience in North Carolina, to assist communities in the preparation of risk and vulnerability assessments and 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. It also emphasizes the incorporation of natural or nature-based solutions (NNBS) to address community vulnerabilities. As of May 2022, the first two phases of the RCCP are underway, with two additional phases scheduled to begin later in 2022 and subsequent years. The phases of the RCCP are illustrated below.



Craven County was selected for Phase 1 and Phase 2 of the RCCP in 2021. Phases 1 and 2 of the process included the preparation of a Risk and Vulnerability Assessment, public engagement, and the development of a Project Portfolio to list opportunities to address community vulnerabilities. The entire effort was guided by the input of a Community Action Team (CAT). The RCCP effort focuses on the County area outside of the limits of the City of New Bern.

Flooding from coastal storm and heavy rainfall events was identified as the main hazard of concern to the County. Using the Risk and Vulnerability Assessment and knowledge of previous flooding events, the CAT identified areas throughout Craven County at risk for flooding. The Risk and Vulnerability Assessment process identified assets most likely at risk concentrated along the Neuse and Trent Rivers. However, numerous roadway segments further away from the rivers were identified as vulnerable to frequent flooding. Many of these segments leave residents isolated from basic services for an extended period. Therefore, the CAT emphasized raising roadway segments and resizing culverts in flood prone areas, upgrading shelters, and supporting the agricultural community. Additional strategies to address sheltering needs and infrastructure deficiencies were also cited as important to meet future resilience needs. Ultimately, the CAT identified twelve projects for the RCCP project portfolio, which may be implemented under later phases of the RCCP or under 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.

Project Portfolio Focus

- **Drainage Assessment**
- **Nature-Based Flood Reduction**
- **CAMA Land Use Plan Update**
- **Shoreline Drive Alternate Access**
- **Improve Crop Buying Facility**

I. Vision and Goals

The Neuse River and the Trent River converge in Craven County southeast of New Bern and flow into the Pamlico Sound. With the County's topography and proximity to these three major waterbodies, Craven County is vulnerable to flooding from heavy rainfall, riverine flooding (during and post-storm), and storm surge. Based on input from the Community Action Team (CAT) assembled for this effort, Craven County's vision is to improve the quality of life for its residents and to ensure their safety. To achieve this vision, the County's goals are to address impacts to roadways due to flooding that isolate communities from basic services (including severed utilities such as electricity and cellular coverage), to ensure access to tools and information to assist with timely repairs to homes, to develop strategies for moving people away from future high risk areas, and to build on the project ideas which were developed in the 2017 Hurricane Matthew Resilient Redevelopment Plan. These goals are intended to empower smaller communities within the County to recover as quickly as possible after a storm event.

Vision

To improve the quality of life for its residents and to ensure their safety by empowering the smaller communities within the County to recover quickly from major storm events.

II. Community Action Team

The Resilient Coastal Communities Program (RCCP) process requires each community to establish a multi-disciplinary CAT composed of diverse stakeholders to provide input throughout the process and to engage the community. Under-represented communities should be reflected in the CAT and in community engagement efforts. Craven County's CAT was established through input from County staff and is listed in **Table 1**.

CAT meetings were held in October 2021 and January 2022, with additional discussions in March and April 2022; a summary of each meeting is included in **Appendix A**. The CAT membership included County staff with a range of expertise along with a Township 5 community member, who provided a perspective from a historically under-represented area of the County. During initial discussions, the CAT discussed the impacts of Hurricane Matthew (2016) , which caused damage due to riverine flooding, and Hurricane Florence (2018), for which storm surge was the primary cause of damage. Craven County has been

TABLE 1: COMMUNITY ACTION TEAM

NAME	POSITION
Verdelle Godette Newby	Township 5 Community Member
Gene Hodges	Assistant County Manager
Don Baumgardner	Planning Director
Chad Strawn	Asst. Planning Director
Jason Frederick	Senior Planner
Patrick Baker	Natural Resources Conservationist II
Elliot Thomas	Water Plant Supervisor

active in seeking grants to either elevate existing structures or to buy out property owners with structures in flood prone areas; addressing generator and other shelter needs has also been a County priority. The County was interested in building on the project ideas included in the Hurricane Matthew Resilient Redevelopment Plan (2017) and potentially updating the County's existing emergency action plans.

The primary challenge noted by the CAT is the ability to maintain communications with communities that become isolated due to flooded roads after a storm; flooding also causes power and telecommunication outages that may take days or weeks to resolve due to flooded access roads. Maintaining the existing stormwater management system to reduce the roadway flooding is a priority, but continued funds are needed to address specific challenges. Utilities can be quickly restored once flooding has receded from the roadway to allow access. In addition, Craven County can experience supply chain problems for two to three weeks after a major storm, which makes community recovery difficult.

Craven County typically utilizes in-person meetings for public engagement and has social media sites to publicize events. The CAT recommended that stakeholder engagement include both a virtual and in-person option due to the COVID-19 pandemic. The public engagement effort is detailed in **Section III**.

The CAT provided recommendations on the initial draft of the Risk and Vulnerability Assessment, noting where the initial results did not include some of the historically flooded areas, possibly due to lack of local rainfall data for more frequent storms. Additional materials to consider in the assessment were provided for further analysis, as discussed in **Section V**.

Based on the information from the early risk and vulnerability modeling and the meeting discussion, the CAT provided recommendations for efforts to include in the final project portfolio. As discussed in **Section VI**, stormwater facility improvements and flood reduction efforts were prioritized in the portfolio; other projects to address sheltering and other County facility needs were also recommended for implementation.

III. Stakeholder Engagement Strategy

The public engagement strategy included an online survey and a public meeting in order to reach as much of the community; while in-person public meetings were initially recommended in order to reach more of the traditionally underserved areas of the County, the CAT recommended that a virtual public meeting be held instead due to the COVID-19 pandemic.

A virtual public meeting was held March 10, 2022, from 5:30 p.m. to 6:30 p.m. Although the County used websites, newspaper, and radio notices to publicize the meetings and online survey, there was very low public participation, with only four survey responses received; only CAT and consultant staff attended the virtual meeting. A copy of the survey and public meeting materials is included in **Appendix B**.

Although the public input was not as robust as the CAT had hoped for, those that responded echoed the concerns of the CAT regarding the efficiency of the existing stormwater management system, roads that flood frequently and isolate communities, and unreliable telecommunications due to damaged utilities. The respondents ranked elevating flood-prone roadways, repairing and resizing existing culverts, and cleaning out ditches as the most important resiliency projects to pursue.

IV. Review of Existing Local and Regional Plans

Craven County has participated in several local and regional planning efforts that were aimed at increasing resiliency for North Carolina's coastal communities. Specifically, the 2020 Pamlico Sound Hazard Mitigation Plan, the 2017 Hurricane Matthew Resilient Redevelopment Plan, and the 2009 CAMA Land Use Plan provided a starting point for the CAT and the overall RCCP effort. **Table 2** summarizes previous Craven County planning efforts.

TABLE 2: EXISTING LOCAL AND REGIONAL PLANS

YEAR	TITLE	DESCRIPTION
	Code of Ordinances – Craven County, N.C. – Chapter 18, Flood Damage Prevention	Defines building code requirements in high risk areas.
2009	CAMA Land Use Plan	The CAMA document serves as a comprehensive land use plan for Craven County. Identifies assets, including natural resources, emerging issues, and mitigation strategies.
2010	Emergency Operations Plan	Outlines actions in the event of a natural disaster – includes prevention and mitigation methods.
2012	Craven County Agricultural Development Plan	Discusses the impact natural disasters have had on agriculture, including hurricanes, drought, etc. Focuses on preserving current farmland.
2013	Comprehensive Economic Development Strategic Plan	Plan stresses establishing strong relationships with strategic partners and to create economic independence from Cherry Point in case the base is closed.
2016	Cherry Point Regional Joint Land Use Study	Collaboration between military and local governments to define building height requirements in proximity to Cherry Point.
2017	Hurricane Matthew Resilient Redevelopment Plan for Craven County	Identifies county-wide needs for recovery and redevelopment from Hurricane Matthew.
2020	Craven County Comprehensive Transportation Plan	CTP includes analysis of existing transportation system and recommendations for addressing deficiencies.
2020	Pamlico Sound Hazard Mitigation Plan	The Hazard Mitigation Plan includes hydrology data, demographics, housing characteristics, and land development trends for Beaufort, Carteret, Craven, and Pamlico Counties. It considers a risk assessment and goals and objectives for mitigation strategies.

V. Risk and Vulnerability Assessment Report

As outlined in the RCCP Handbook (June 2021), a risk and vulnerability assessment was conducted to evaluate the susceptibility of the County's critical built and natural infrastructure to coastal hazards. Previous studies dealing with risk and vulnerability and/or highlighting critical assets were used as a starting point for the assessment. Process steps included the following:

- Identify and Map Hazards
- Assess Vulnerability
- Estimate Risk

The results of the risk and vulnerability assessment are summarized on the following pages, and the full report is included in **Appendix C**.

Critical Built Infrastructure

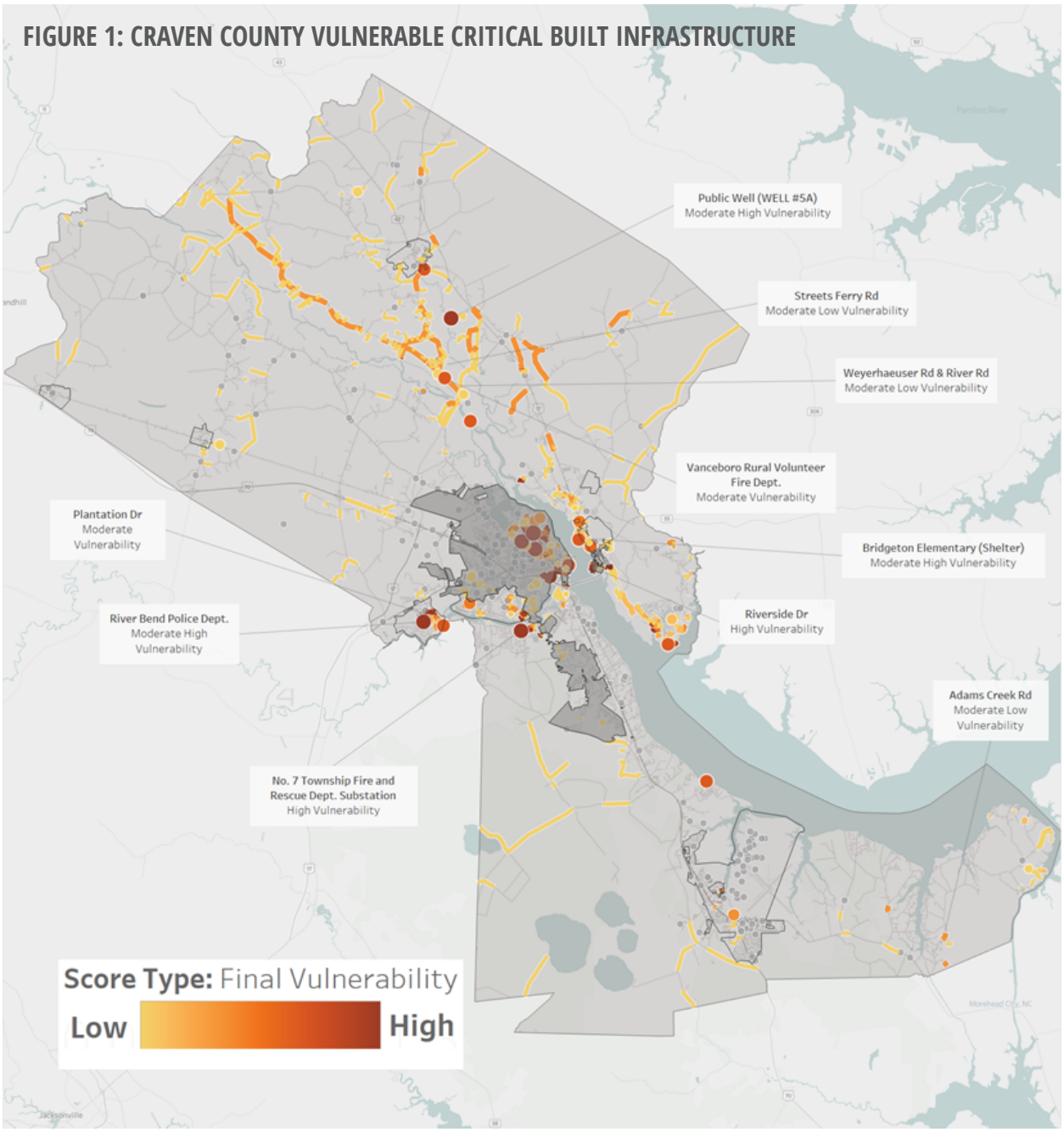
Critical built infrastructure includes the physical structures that house or perform essential functions to maintain government operations along with economic and human health and safety. The initial assessment found that approximately 18% of building-level assets and 16% of roadways are exposed to coastal or riverine flooding. Of these exposed assets, those most vulnerable to coastal hazards tend to be located near the Neuse and Trent Rivers.

Several vulnerable roadway segments are clustered either in River Bend, which has limited ingress and egress options, or are along the Neuse River. Several other areas identified by the CAT – including Streets Ferry Road, River Road, and Weyerhaeuser Road – exhibit moderate vulnerability to coastal hazards but may experience additional rainfall-driven flooding, which is not captured in this assessment due to limited data.

Road segments expected to face increased risk are clustered in River Bend, Trent Woods, and Fairfield Harbour. Among these, Adams Creek Road faces a moderate-low vulnerability to coastal and riverine flooding but may experience increased exposure in the future, leading to heightened vulnerability.

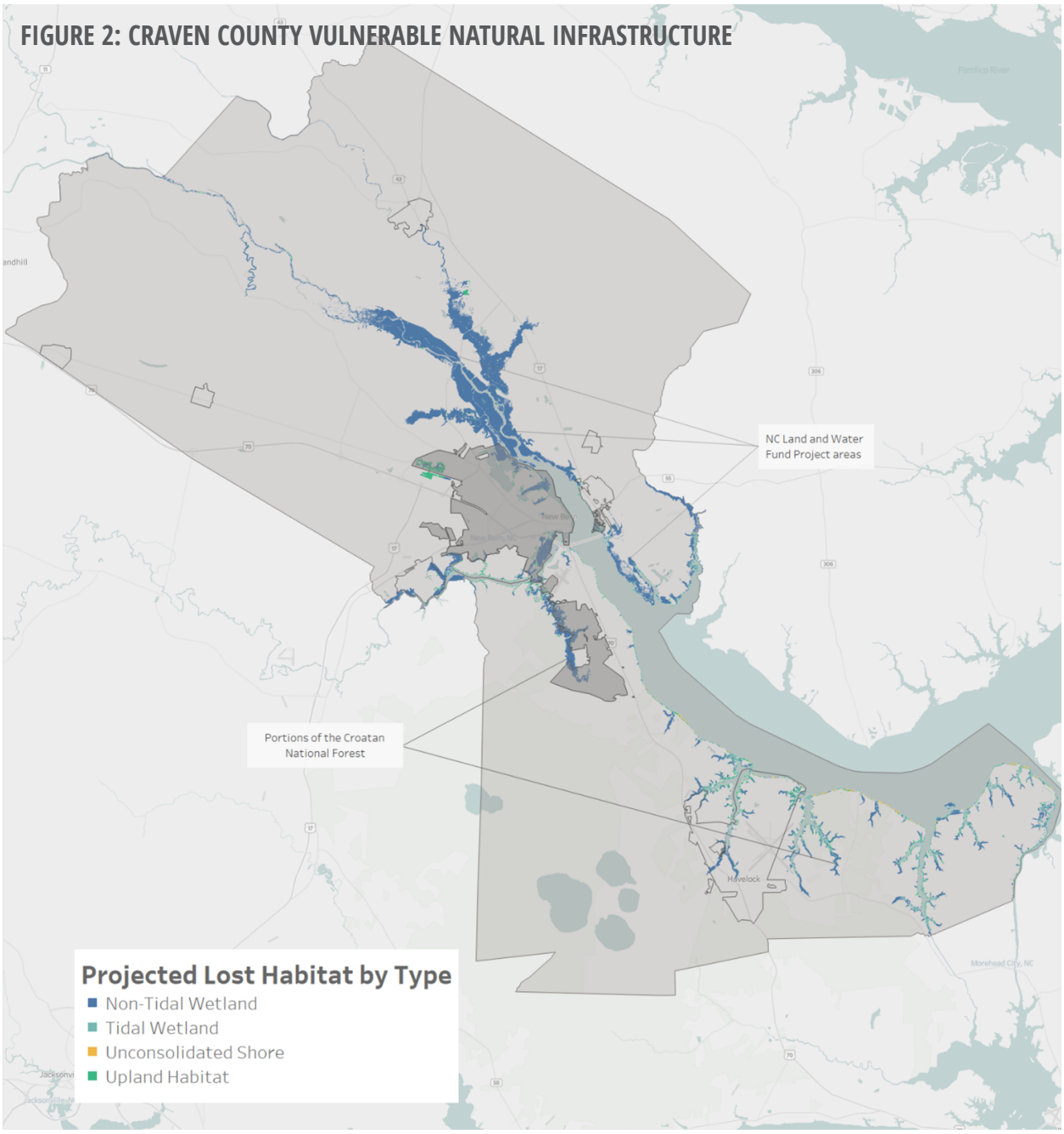
Site-level assets exhibiting the highest increases in vulnerability include a public well located in River Bend, the Tri-Community Volunteer Fire District in Bridgeton, and several private medical facilities, also located in or near Bridgeton. These assets are expected to face increased flood exposure, which may lead to increased vulnerability if no mitigating actions are taken.

FIGURE 1: CRAVEN COUNTY VULNERABLE CRITICAL BUILT INFRASTRUCTURE



Social vulnerability factors into determining an asset's risk. The road segments and site-level assets noted above as vulnerable are also located in more socially vulnerable areas of the County. Based on the CDC Social Vulnerability Index (SVI), the northwestern portions of the County (Vanceboro, Cove City, Dover) along with Trent Woods, Bridgeton, and James City exhibit higher social vulnerability and may require additional assistance or services before, during, or after a flood event that may be provided by critical assets.

FIGURE 2: CRAVEN COUNTY VULNERABLE NATURAL INFRASTRUCTURE



Natural Infrastructure

To assess the vulnerability of natural infrastructure, the assessment leveraged NOAA's Sea Level Affecting Marshes Model (SLAMM) to identify changes in marsh land cover. SLAMM effectively incorporates a habitat's exposure, sensitivity, and adaptive capacity into one metric: projected habitat loss to open water due to sea level rise. By 2050, Craven County is projected to lose more than 10,000 acres of natural infrastructure to open water based on a 1.5-foot sea level rise scenario. Approximately 630 acres of today's tidal wetlands (1,400 acres) will be lost to open water.

VI. Project Portfolio

Utilizing input from the Risk and Vulnerability Assessment, 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 for 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 remaining projects are detailed in **Appendix D**.

TABLE 3: PROJECT SUMMARY

PROJECT	DESCRIPTION
Targeted Repetitive Flooding Drainage Assessment	Conduct regular assessments and improvements of drainage infrastructure across the County, focusing on sites known to flood. Implement improvements with an emphasis placed on natural or nature-based solutions where practicable.
Stormwater Flood Reduction Projects	Implement natural/nature-based projects at select roadway/stream crossings across the County, building upon existing efforts underway through a cost-share program with the NC Coastal Federation.
Coastal Area Management Act (CAMA) Land Use Plan Update	Update the CAMA Land Use Plan (LUP) and incorporate the resiliency measures identified through the Resilient Coastal Communities Program into the LUP.
Shoreline Drive Alternate Access	Work with NCDOT to construct a new transportation facility to provide a second means of access to the Town of River Bend.
Improve Existing/Construct Alternate Crop Buying Facility	Work with NCDOT to elevate access roads to the current Crop Buying Facility; identify potential location for a new facility so harvested crops can still be stored during times of flooding.

VII. Conclusions and Lessons Learned

The RCCP process provided Craven County an opportunity to build upon previous planning efforts and establish a strategic Project Portfolio to guide the County in applying for project funding. 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 initial risk and vulnerability modeling, which used available data on storm events, sea level rise scenarios, roadway vulnerability, and asset condition, did not yield the results the CAT expected. Some of the roadway segments known to flood frequently in typical rainfall events were not determined as vulnerable in the quantitative analysis, but were instead noted in a qualitative discussion and considered in the final assessment. However, this analysis gap highlights the need for more robust localized rainfall data in order to model the impacts of these events on community assets.

The CAT felt that the most pressing need was to reduce roadway flooding that isolates communities and hampers recovery efforts after major storm events. Additionally, with agriculture a large economic driver in the County, projects that assist the agricultural community in mitigating the economic impacts from major storms need to be a part of building overall community resiliency. The Project Portfolio in **Appendix D** reflects these priorities.

Obtaining county-wide community input was difficult for Craven County. Although a host of social media outlets and County resources were used to advertise the online survey and the virtual public meeting, only four surveys were completed, and no one attended the virtual meeting. Craven County may consider creating an ongoing outreach campaign that educates residents on issues surrounding the impacts of flooding, sea level rise, and other coastal hazards in order to generate more meaningful discussions with the public on community needs and solutions.

Acknowledgments

We would like to thank Craven County for its efforts associated with the development of this report and the Project Portfolio. In particular, we would like to thank Don Baumgardner, Chad Strawn, Jason Frederick, and the rest of the Community Action Team for their honest feedback on the community's needs and the challenges that have been faced historically in addressing these needs. We also thank Mackenzie Todd of the N.C. Division of Coastal Management for the guidance and insight she provided throughout this process.

APPENDIX A

COMMUNITY ACTION TEAM MEETING SUMMARIES

MAY 2022

Dewberry

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CRAVEN COUNTY CAT MEETING #1 DISCUSSION

DATE: October 8, 2021

TIME: 10:00 a.m.

LOCATION: Craven County Planning and Inspections Dept., 2828 Neuse Blvd., New Bern

PURPOSE: Craven County Community Action Team Meeting Discussion Notes

Discussion Topics

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

   Identified during initial meeting (June 2021): *The County experienced significant flooding following Hurricanes Matthew and Florence. From Hurricane Matthew, riverine flooding was a more material issue than storm surge. For Hurricane Florence, the opposite was true. The differences between these two situations are stark, and require different approaches in different locations around the County. The County is interested in building on the project ideas which were developed in the Hurricane Matthew Resilient Redevelopment Plan. It was noted that the new projects do not necessarily need to address issues that came up from Florence, but rather can address any resiliency challenge that the County is facing. There is also interest in updating or refining the existing emergency action plans.*

   What should be added to this list?

   - Isolation of Township 5 community via Adams Creek Road, which floods from wind driven tides. Adams Creek Road is currently 4-5 feet above sea level, and NCDOT looking to raise elevation of Adams Creek Road at that point. Raising the elevation would prevent over 2000 people from losing access/isolated during/after flooding events.
     - Adams Creek Road has a lot of logging truck traffic; a “Road Subject to Flooding” sign has been removed and not yet replaced.
     - Ditches need to be cleaned out on Adams Creek Road (roads go right into yards); overall lack of maintenance of ditch system (large events deposit sediment).
   - Similar to Adams Creek Road, flooding on River Road causes loss of access and severs internet and telecommunications connections; there is no way to communicate with residents when these services are damaged. Families flooded out have to use boats to access supplies (no cell phones, power).
     - Stream debris removal, using grant funds, has helped, especially between Matthew and Florence.
   - Need ways to get establish communication to residents who can’t get information when flooding cuts off access. This can happen when cell towers are damaged (recent example). One option is to develop an action plan for NCDOT to look at these areas that frequently flood and identify areas for culvert upgrades. NCDOT recently hired NCSU to complete a hydraulics study, but the county never received a final report/presentation on the results.
   - Two-fold issue- storm events that dump water; drainage areas that have been cleared help initially, but the delayed Neuse River rising also an issue. Other sites/issues identified:
     - NC 43 bridge flooding (Highway 43 at Weyerhaeuser) blocks access.
     - Roadway deterioration due to winter events causes additional maintenance challenges.
   - Family on Hodge Road has experienced significant flooding (including during Hurricane Florence) and an elderly resident has since relocated to Jacksonville; as the house has mold/mildew (not habitable) and has been for sale since last hurricane. What can community do to help this family?

    - Can we identify families to work with NC Rebuild, for potential CDBG funds?
    - Can we address challenges in getting the money from state?
    - Project idea: Individual private housing as a priority
- Power grid damage is address pretty quickly once roads are opened, but the challenge is being able to get the roads passible quickly. Cell phone companies cite height restrictions and the Croatan National Forest as reasons for not having higher towers.

What costs have been associated with these threats? (Includes damage costs from specific weather events, costs of prior improvements to increase resilience, etc.)

- Drainage/ canal cleanouts
- Hurricane Florence- County buildings sustained damage (first example).
- FEMA debris claims- can provide FEMA PA

Of these challenges, which are the most important (or have the most impact) to the overall community?

- Need to increase broadband availability, especially to aid student internet access (some areas don't have any).
    - Cove City has spotty service.
    - Not a lot of options for providers; local governments can't provide broadband.
- Power outages lasted for weeks in western Craven County- response times can be delayed for rural areas (overall electrical grid issue- areas are within swamp).
- Howell Road area, near Lake Clermont- water was trapped in the subdivision for several weeks after Hurricane Florence. Since Florence, the County has used hazard mitigation grant funds to buy property/house that flooded (repetitive loss structure)- using the property for drainage structure. The easement will belong to the homeowner's association. Lake Clermont doesn't have an outlet. Tough to get funding for improvements within private subdivision.

Other feedback:

- Could wetland restoration projects be used for nutrient credits?
- Should we look at the security of utility infrastructure? Could be issues from either natural disasters or other attack- cybersecurity, etc.

2. Community Vision and Goals

Existing Vision Statements?

Vision:

- Quality of life, safety for citizens; citizens are priority #1.

Goals:

- Ensuring that we can get citizens back into their housing
- Access to ensure repairs- getting back to normal both for infrastructure and housing
- Getting people out of harm's way for future disasters

Other feedback:

- Different levels involved in getting a community back on its feet.
- Getting as many residential structures up to code as possible- becoming increasingly difficult to get the funding, going through the process with the federal government. Programs don't necessarily fit the needs of every community- tough to mold for each program.
    - Federal procurement vs. state procurement- once conflicts between the two processes are resolved, another requirement comes in that may throw out progress, ultimately requiring the County to pay entire project cost.
    - Citizens in rural areas who have been flooded multiple times- difficulty repairs.
- Want to see list of who people can contact after a storm to be able to find out who to contact- who can help get people back in their house?
    - After storms, better success working with non-profits.
    - Currently have materials (door hangers) at county level to talk people through what to do/not to do after a storm. These are distributed immediately after, sometimes before a storm. Also leave them at community centers.
    - Need an overall communications plan.
    - Power terminated at substantial damage properties as needed.
- Problem with getting supplies into town following events; because Kinston is flooded, drivers don't realize that there are viable alternate routes. The County can experience supply chain disruption 2-3 weeks after an event.

3. Community Engagement Strategy:

What techniques (in-person meetings, virtual options) have been the most effective at getting feedback?

- Pre-storm notifications, Know Your Zone plan
- Websites, news, radio notices
- Like in-person events, but need to have more than one, and take it to the people. Have one in every district?
    - Recommend one meeting in Vanceboro, one in Havelock.
    - Fairfield/Township 7? Hold at Ag Center?

If in-person, are drop-in events or formal presentations preferred?

- Drop-in events preferred.

What strategy do you recommend for this effort? Are there upcoming efforts/events that we can partner with on community outreach?

Other feedback:

- Talk to Chad, Jason, Brody (Ag Center)- had a meeting at the Ag Center a few days ago. (4-7pm; don't hold on a Wednesday- Tuesdays/Thursdays are the best.)

- NCDCM: Looking at an average of $40,000 for each community in phase 3. TBD on Phase 4.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Schedule Public Engagement event/prepare online survey #1	Dewberry	10/18/21	
Provide feedback on Meeting #1 discussion	CAT	10/20/21	

Dewberry

Resilient Coastal Communities Program

Craven County- Community Action Team Meeting #1

October 8, 2021

1

Agenda

- Welcome and Introductions
- Resilient Coastal Communities Program Overview
- Discussion
- Wrap-up: Action Items, Next Steps

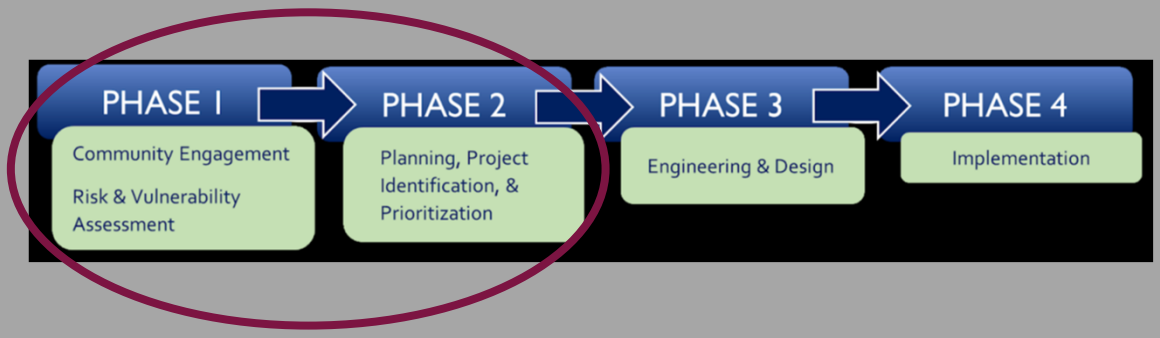
2

Program Objectives

- Address barriers to coastal resilience in North Carolina at the local level, such as limited capacity, economic constraints, and social inequities;
- Assist communities with risk and vulnerability assessments and developing a portfolio of planned and prioritized projects;
- Advance coastal resilience projects to shovel-readiness, or ready for implementation; and
- Link communities to funding streams for project implementation

3

Program Overview



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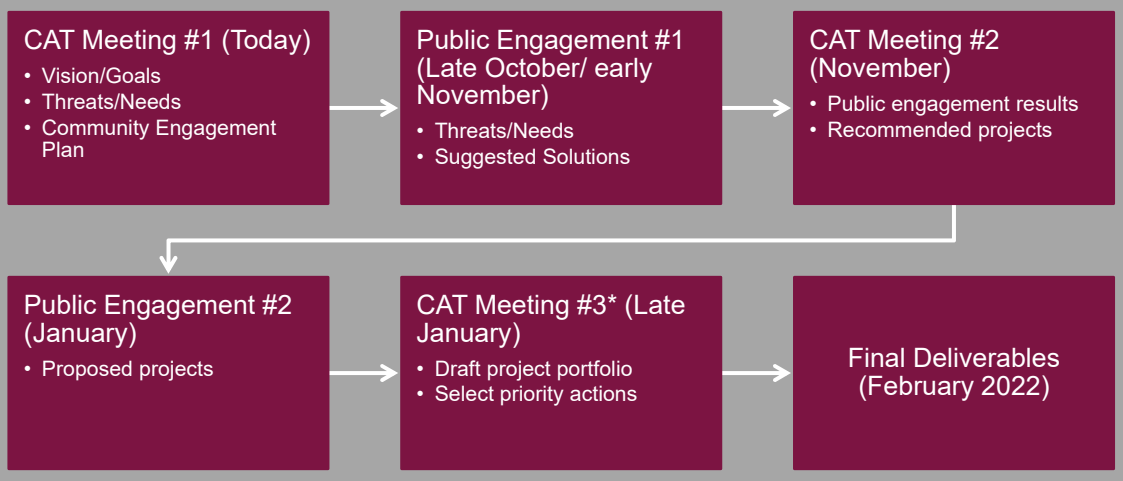
Deliverables

- Risk and Vulnerability Assessment Report
- Project Portfolio

5

Schedule



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Discussion

- Threats/Challenges to Community Resilience
- Community Vision and Goals
- Community Engagement Strategy

7

Next Steps

- Action Items
  - Dewberry/CC: Schedule Public Engagement event/survey #1
  - CAT: Provide feedback on today's discussion questions

8

Thank you!

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9

Dewberry

CRAVEN COUNTY CAT MEETING #2 DISCUSSION

DATE: January 10, 2022

TIME: 10:00 a.m.

LOCATION: Microsoft Teams Meeting

PURPOSE: Craven County Community Action Team Meeting Discussion - Summary

Discussion Topics

1. Risk and Vulnerability Assessment

Comments on the Draft Assessment:

Dewberry staff reviewed the draft Risk and Vulnerability Assessment, including the analysis parameters and the initial risk summary. The assets and roadways with higher risk scores include:

- Bridgeton Elementary
- No. 7 Township Fire & Rescue Department
- Vanceboro Rural Volunteer Fire Department
- Tri-Community Volunteer Fire Department (408 Bridge St.)
- U.S. 70
- U.S. 17
- Lima Road
- Willis Landing
- Marina Townes Drive

Attendees were asked to provide overall feedback on the draft assessment and specifically on the summary of assets list.

- Request to verify that the assessment of critical infrastructure includes a section of above ground waterline that crosses wetlands adjacent to Maple Cypress Road near the Neuse River. The waterline is supported on piles and can be flooded during heavy rainfall events. Dewberry will review the assets included in the assessment and add the waterline if it is not listed.
- Based on prior experience, Bridgeton Elementary School (included in the list of potentially vulnerable community assets) has never experienced direct damage from flooding. The County will confirm this information.
- Is the No. 7 Township Fire and Rescue Department referring to the pump station or the physical building? The pump station is subject to flooding. The actual fire and rescue building that houses staff and equipment is on high ground. Dewberry will determine the exact asset and clarify in the final assessment.
- Streets Ferry Road and River Road in the western part of the County were cited as being very susceptible to flooding. During major storm events, residents can be cut off from access and services and only reached by boat. Although these streets have low traffic volume, this area is of concern.
- County staff will perform an internal review of the summary of assets and roadways with high risk scores and identify other critical assets that might need to be reassessed.

2. Projects to Address Community Needs:

What projects do you think should be implemented to address the community's needs?

A list of projects, generated from previous studies (including the Hurricane Matthew Resilient Redevelopment Plan and the regional Pamlico Hazard Mitigation Plan), was reviewed in the context of the information presented from the draft assessment.

- The County will review the list of projects and remove projects that are no longer applicable and add new projects that are under consideration. Projects located within New Bern's and other smaller municipalities' jurisdictions should be removed from the list unless the asset is owned by the County. Completed projects also need to be removed from the list.
- The scope of the emergency shelter project at Dover probably needs to be less specific, as the County may consider constructing a larger regional shelter that will be easier to staff. The County staff will discuss further.
- Acquiring residential properties within floodplains or flood prone areas is an ongoing effort by the County.
- The projects involving floodproofing of Mills County Store and A&J Canvas need to be evaluated based on the public service they provide post storms. It was suggested that these two projects be combined into one generalized project to retrofit commercial businesses that are vulnerable and provide community services during emergencies or are vital to the economy.
- The Adams Creek Road project can be removed. It has become a part of a NCDOT project to address some of the lower areas on roads and fix culverts – due to be let in August 2022.
- The State Hazard Mitigation Office has indicated that funding is (or will be) available for generators at critical county locations. It was noted that the animal shelters have already been retrofitted with generators.
- The Town of River Bend has a project on the list to upgrade their wastewater treatment plant to make it more sustainable. The town manager has applied to the FEMA Building Resilient Infrastructure and Communities (BRIC) Program for funds to construct a secondary access to the town. Their application has made it through the first level of review. The funding may also be used to address drainage system maintenance while constructing the secondary access. Chad will send a copy of the application to Dewberry for informational purposes. Chad will also check with the Town to determine if they still have concerns regarding the wastewater treatment plant.
- Retrofitting emergency shelters is still needed. For example, bringing all of the roofing systems at these facilities up to code to ensure safety during storms. There is a nationwide push to perform these retrofits, but there is not a lot of funding available.
- The County is currently building a fuel depot. The goal is to always have a one-month supply of gasoline on hand. This depot will not store diesel fuel. It was noted that the biggest need after a major storm even is diesel fuel for generators and emergency vehicles. However, there is a problem with storing diesel fuel for long periods. The County will discuss alternatives for supplying diesel fuel after major storms, such as bringing in a supply of diesel fuel before a major storm.
- The Jack Smith Creek / Duffyfield Canal project can be removed. The City of New Bern has received funding and has taken charge of the project.

<u>Other projects not listed/new ideas</u>:

- Need to consider additional maintenance projects that address drainage and stormwater infrastructure. Drainage systems, such as swales and canals, need to be cleaned out. To date, drainage issues have been addressed on an individual level but not assessed using a County wide approach. The State is transferring responsibility of stormwater management planning to each individual county. During the update of the stormwater management plan, a County-wide assessment of the drainage systems can be conducted and with corresponding recommendations.

- Chad stated the County would like to look at projects that provide enhancements to the natural environment infrastructure. However, much of the shoreline property is privately owned. Can the County initiate a project on these privately held properties? Most likely these projects would only be allowed under this program if the County can demonstrate the project benefits the community at large and not just the individual homeowner. Are there measures that other communities are implementing under this program? Most of the communities have not gotten to this step yet. Once additional information is available, Dewberry will share potential project opportunities.
- Gene noted the County will probably have to look at how it provides shelter in a post-COVID era. Does the County need to look at more shelters to spread out evacuees? Do the shelters need to upgrade HVAC systems for better ventilation? What do we need to do to enable people to shelter in place? Chad stated there is a push to establish individual safe rooms in individual homes but, again, are there funding sources for this type of effort?
- Many citizens have asked about the option to dredge the Neuse River and some of its tributaries. Historically, it used to be much deeper and has been dredged. It was decided to add this option into the plan even though getting a permit for dredge is difficult.

Of these projects, which are the most important (or have the most impact) to the overall community?

- The County will provide this feedback after further internal review.

3. **Other Feedback:**

- Data was requested on the roadways flooded / blocked by each individual storm event (Matthew and Florence). This flood data was used in the sensitivity analysis for roadways and will be highlighted in the final report. The County would like to use for both funding discussions and use to better to prepare in advance for future storms and post-storm recovery planning.
- The group discussed the appropriate approach to public engagement, which will be used to gather feedback on the potential projects to address coastal risks and vulnerabilities. The public meeting options include in-person, a hybrid of in-person and virtual surveys, or all-virtual meeting format. Gene asked how well virtual public involvement had been received. Based on past events, virtual or hybrid approaches have worked reasonably well. Mackenzie (NCDCM) noted that Topsail Island held an in-person meeting but lived streamed it using Teams so that virtual attendees could interact directly.
- After discussion, Gene suggested we use an all-virtual format if we are still wanting to hold the meeting in early February. If the meeting could be delayed until March, then a hybrid approach would be acceptable.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Schedule Public Engagement event/prepare online survey	Dewberry	1/28/22	Open
Provide feedback on Meeting #2 discussion	CAT	1/28/22	Open

Attachments

Meeting Presentation
Draft Project List

Dewberry

Resilient Coastal Communities Program

Craven County- Community Action Team Meeting #2

January 10, 2022

1

Agenda

- Status of RCCP Phase I/II Effort
- Risk and Vulnerability Assessment
- Projects to Address Community Resilience
- Wrap-up: Action Items, Next Steps

2

Previous Meeting

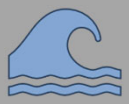
- Threats/Challenges to Community Resilience
- Community Vision and Goals
- Community Engagement Strategy

3

Risk and Vulnerability Assessment

4

Why Assess Risk & Vulnerability?



Understand how flood hazards are changing in Craven County

Determine areas and assets that are susceptible to flood damage today and in the future

Identify resilience projects based on assessment results

5

Defining Vulnerability & Risk

- **Vulnerability** – *the degree to which an asset or system is expected to experience adverse impacts due to flooding.*
- **Risk** – *the potential for adverse consequences on lives, livelihoods, health and well-being, ecosystems, economic, social and cultural assets, services, and infrastructure due to flooding.*

6

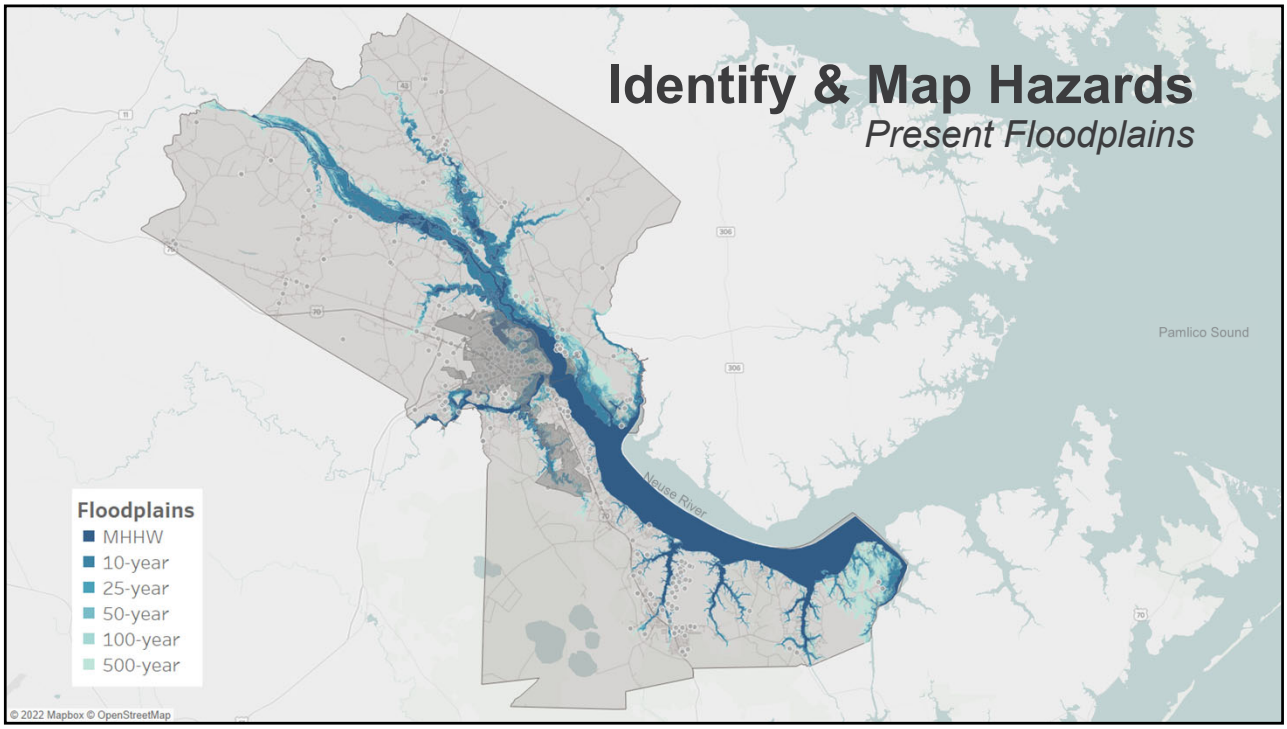
Impact Types

- **Critical Built Infrastructure** – *physical structures that house or perform functions that are essential to government and business functions, and human health and safety.*
- **Natural Infrastructure** – *naturally occurring landscapes and systems that perform ecosystem services that benefit surrounding communities.*

7

Assessment Process

8


Identify & Map Hazards
Present Floodplains
Pamlico Sound
Neuse River
Floodplains
MHHW
10-year
25-year
50-year
100-year
500-year
© 2022 Mapbox © OpenStreetMap

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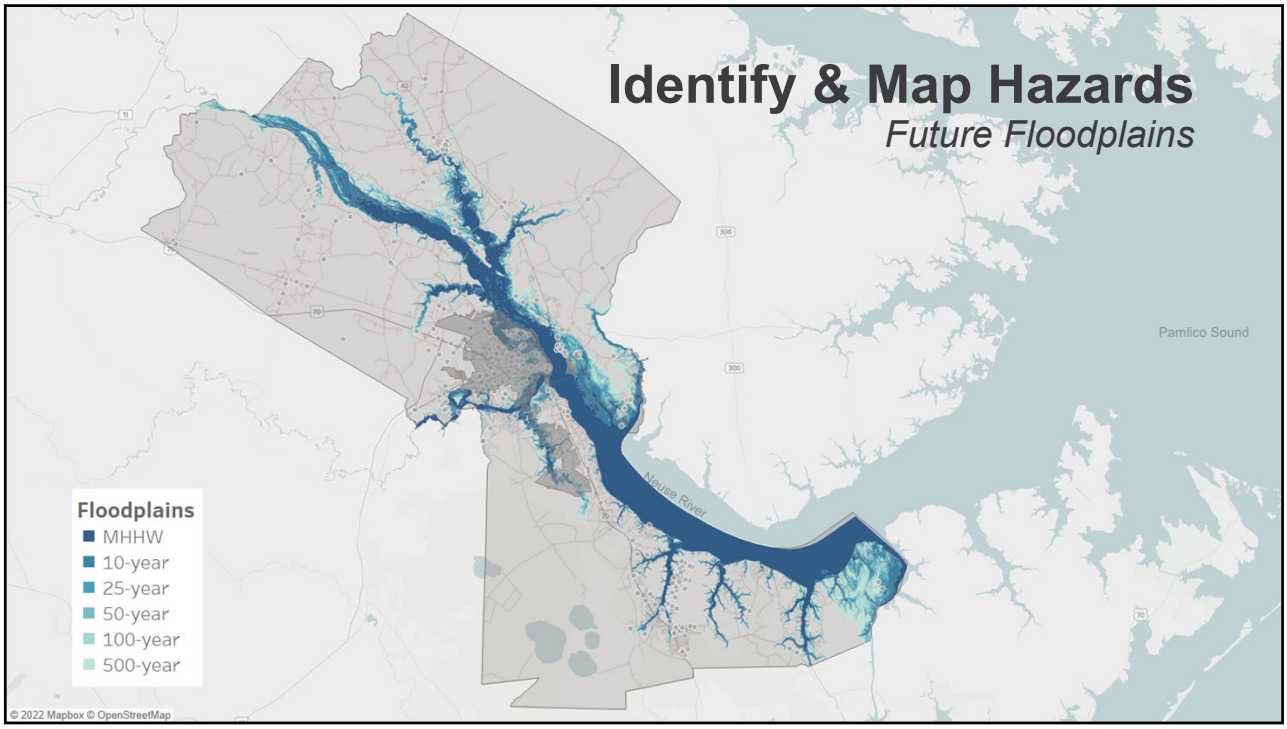

Identify & Map Hazards
Future Floodplains
Pamlico Sound
Neuse River
Floodplains
MHHW
10-year
25-year
50-year
100-year
500-year
© 2022 Mapbox © OpenStreetMap

10

Vulnerability: Critical Built Infrastructure

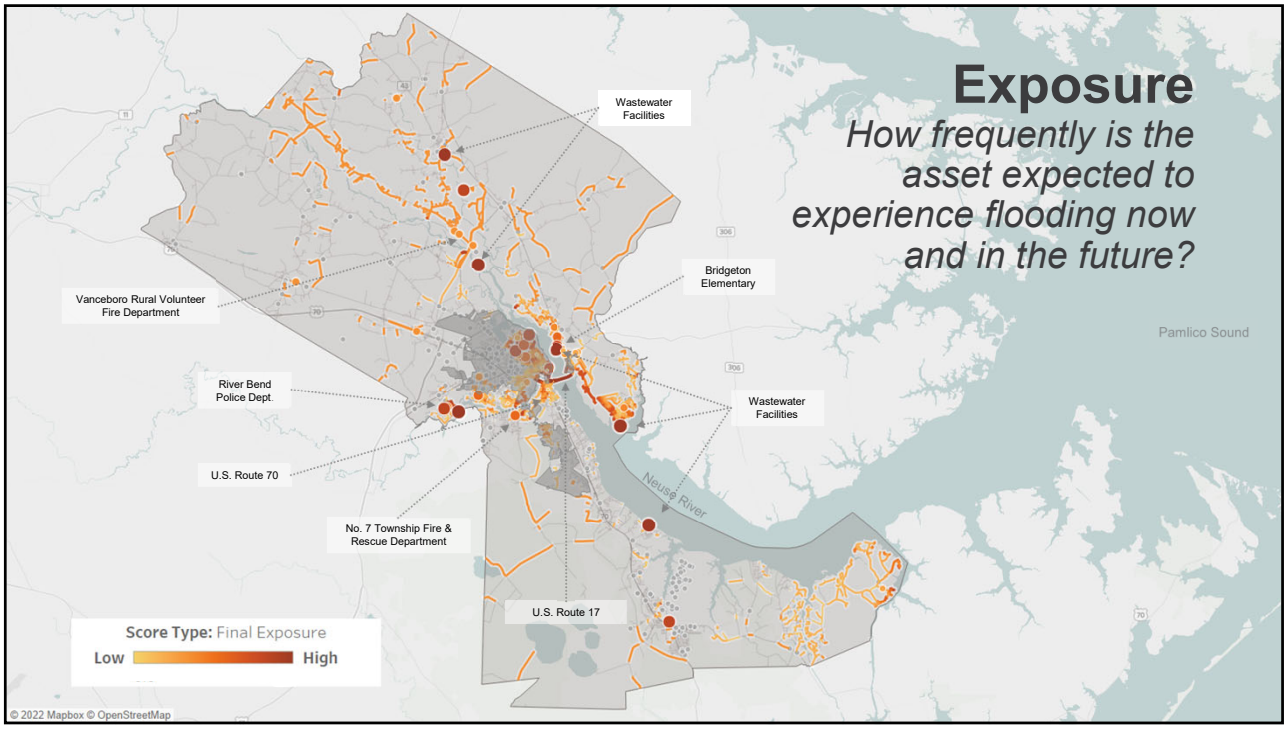
Vulnerability = Exposure + Sensitivity − Adaptive Capacity

Probability of physical contact between an asset and a hazard

Degree to which an asset may be affected by a hazard

Ability of an asset to change characteristics or behavior in response to a hazard

11



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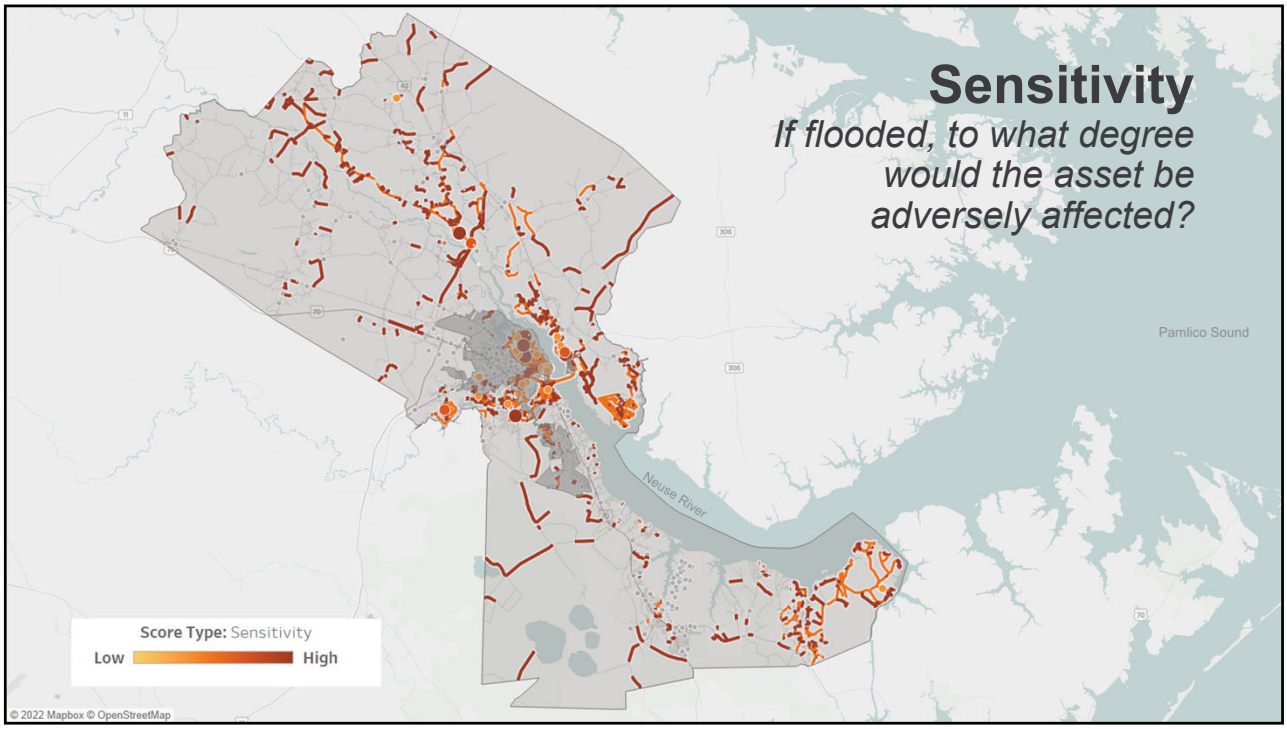
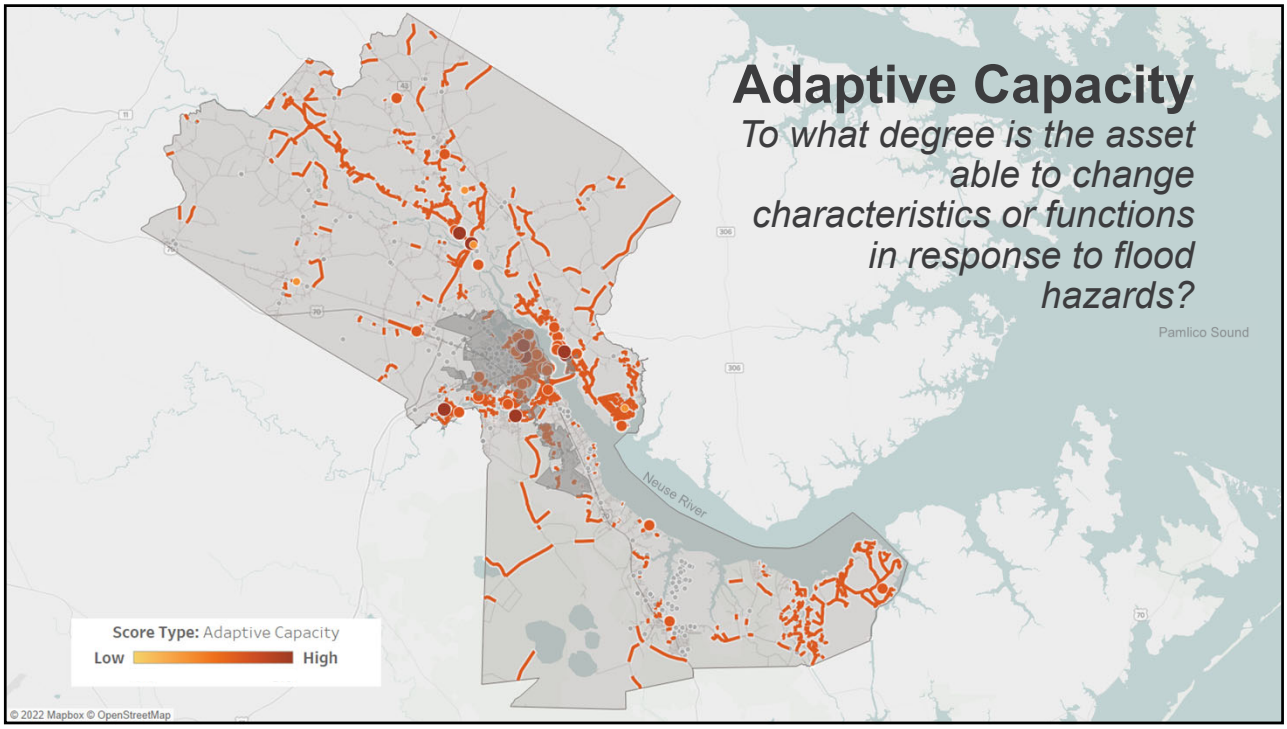
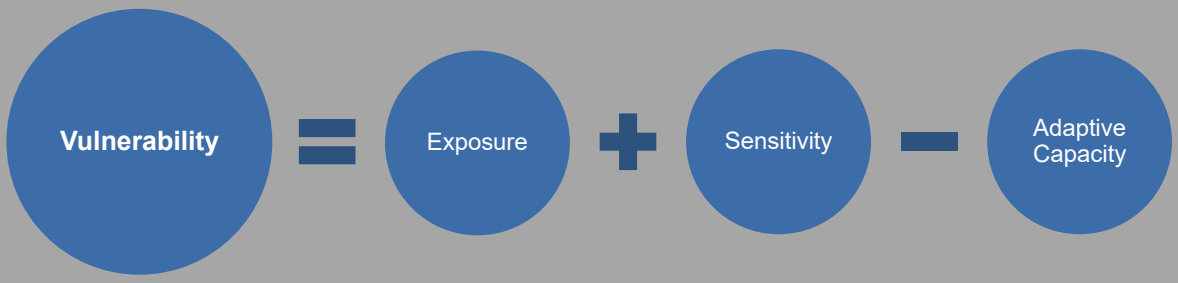

Sensitivity
If flooded, to what degree would the asset be adversely affected?
Pamlico Sound
Neuse River
Score Type: Sensitivity
Low
High
© 2022 Mapbox © OpenStreetMap

13


Adaptive Capacity
To what degree is the asset able to change characteristics or functions in response to flood hazards?
Pamlico Sound
Neuse River
Score Type: Adaptive Capacity
Low
High
© 2022 Mapbox © OpenStreetMap

14

Vulnerability: Critical Built Infrastructure



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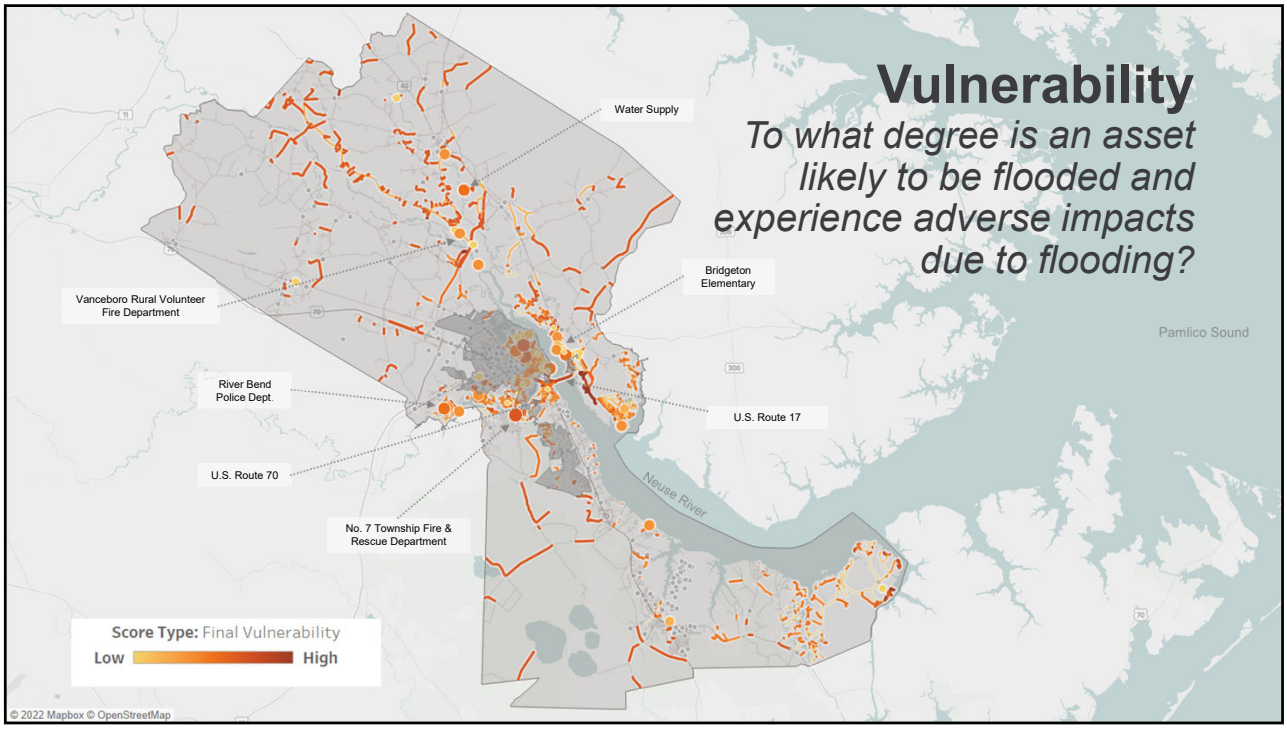

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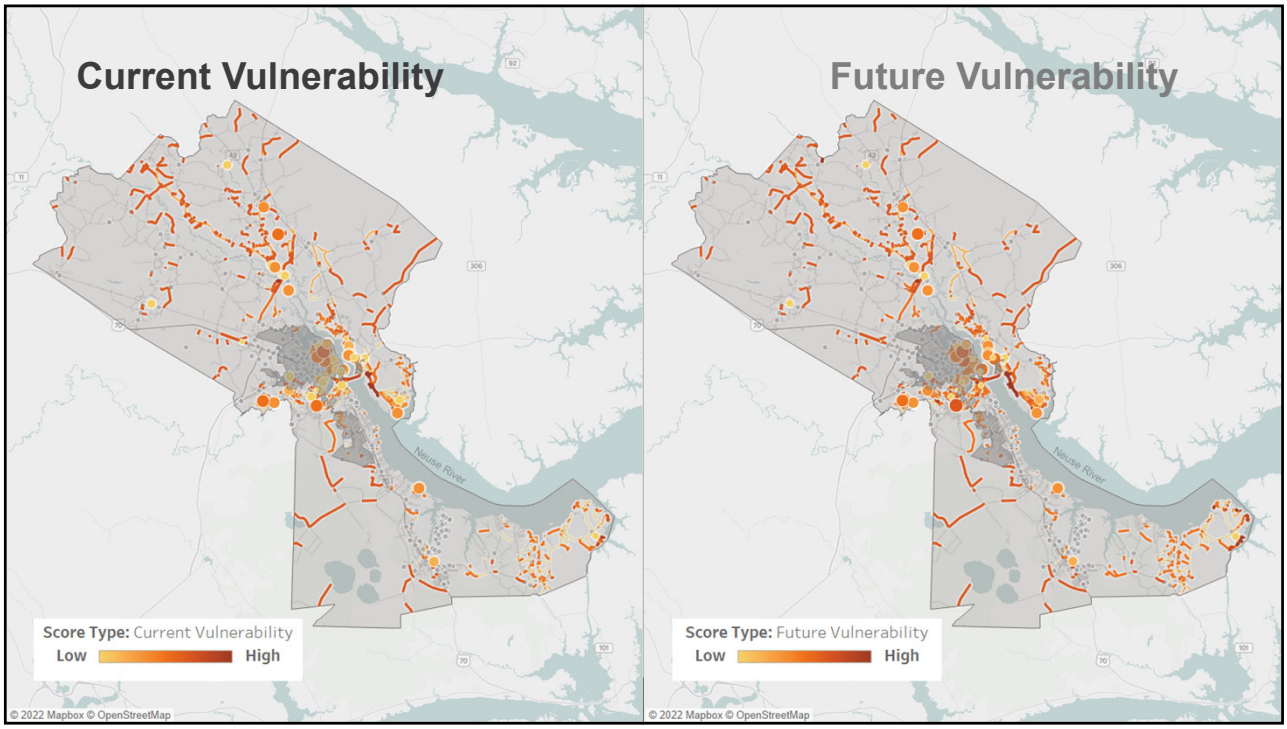

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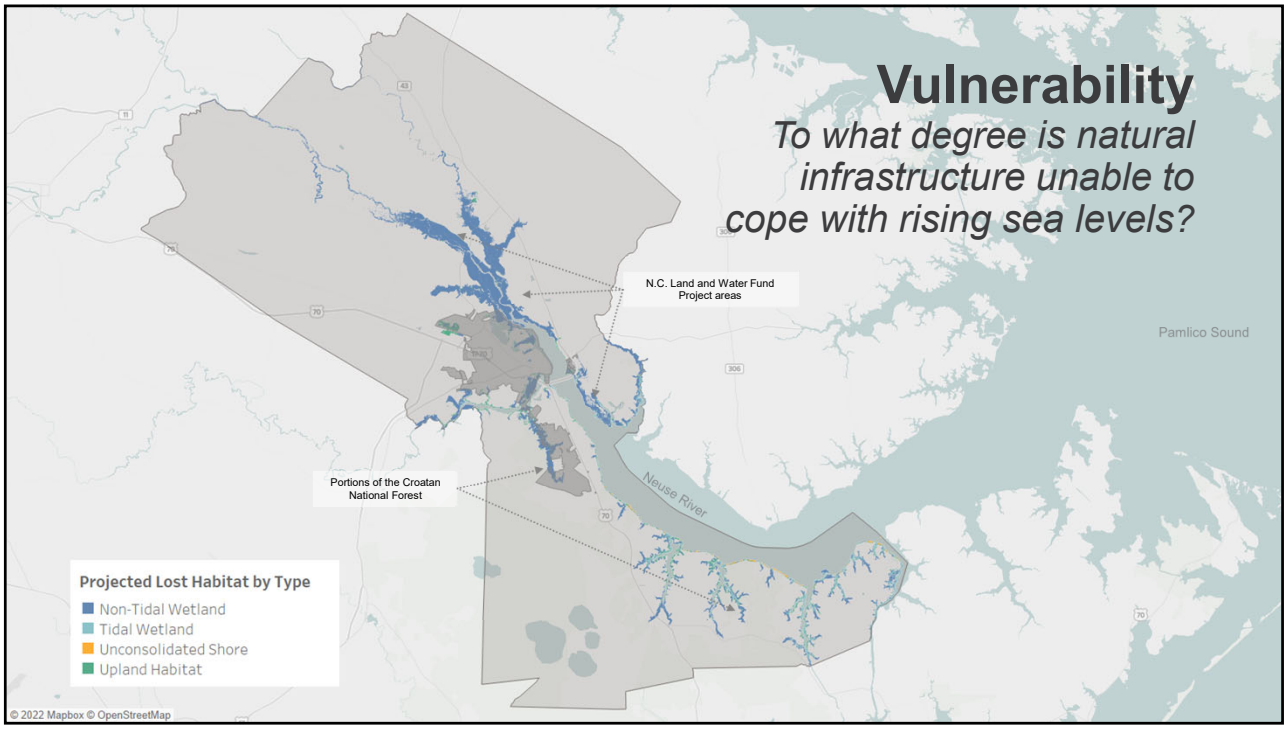
Vulnerability: Natural Infrastructure

- NOAA Sea Level Affecting Marshes Model (SLAMM)
- Provides baseline and projected marsh land cover under future conditions, based on net sea level rise
- Model effectively incorporates habitat's exposure, sensitivity, and adaptive capacity into one metric (habitat loss)

18



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Estimating Risk

Vulnerability × Consequences = **Risk**

Degree to which an asset is expected to experience adverse impacts due to flooding

Degree to which a community is adversely impacted if an asset is damaged by flooding

Overall potential for negative consequences due to flooding

20

Estimating Consequences

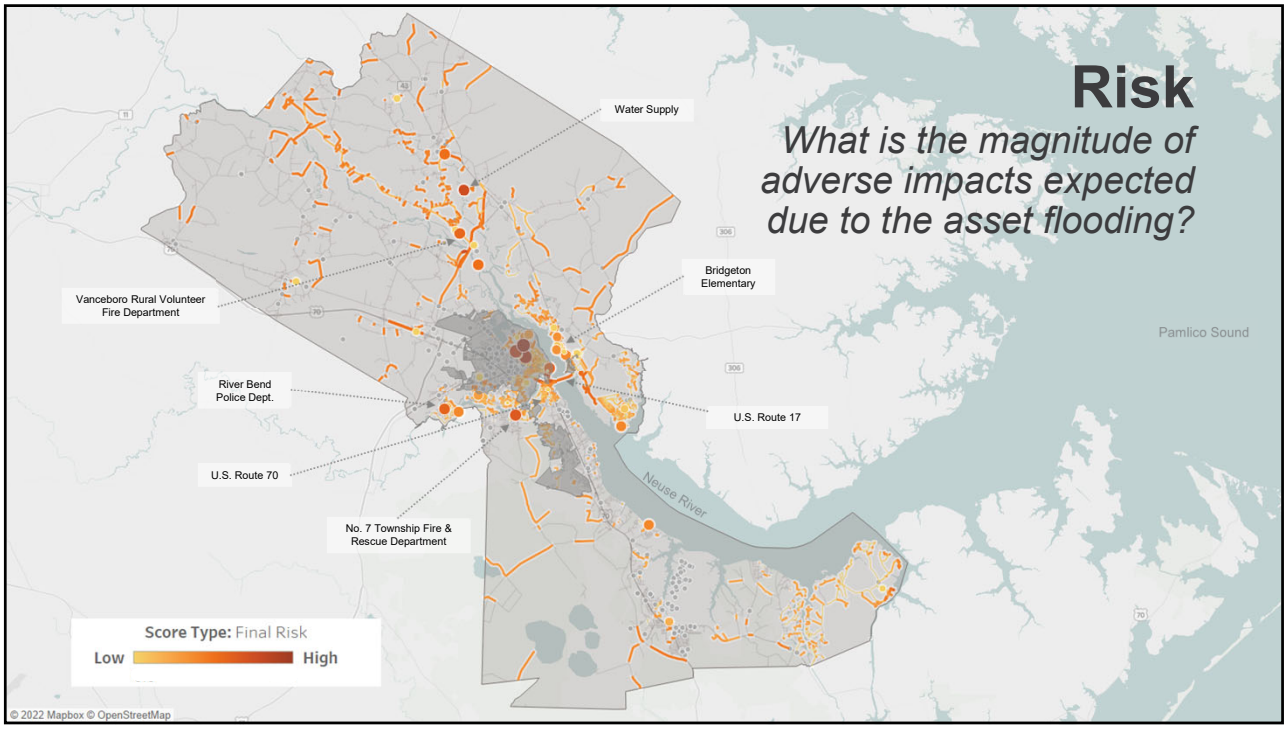
Consequences = Social Vulnerability + Criticality

Degree to which a community is adversely impacted if an asset is damaged by flooding

Susceptibility of population to experience adverse impacts due a hazard event

An asset's importance to the surrounding community

21



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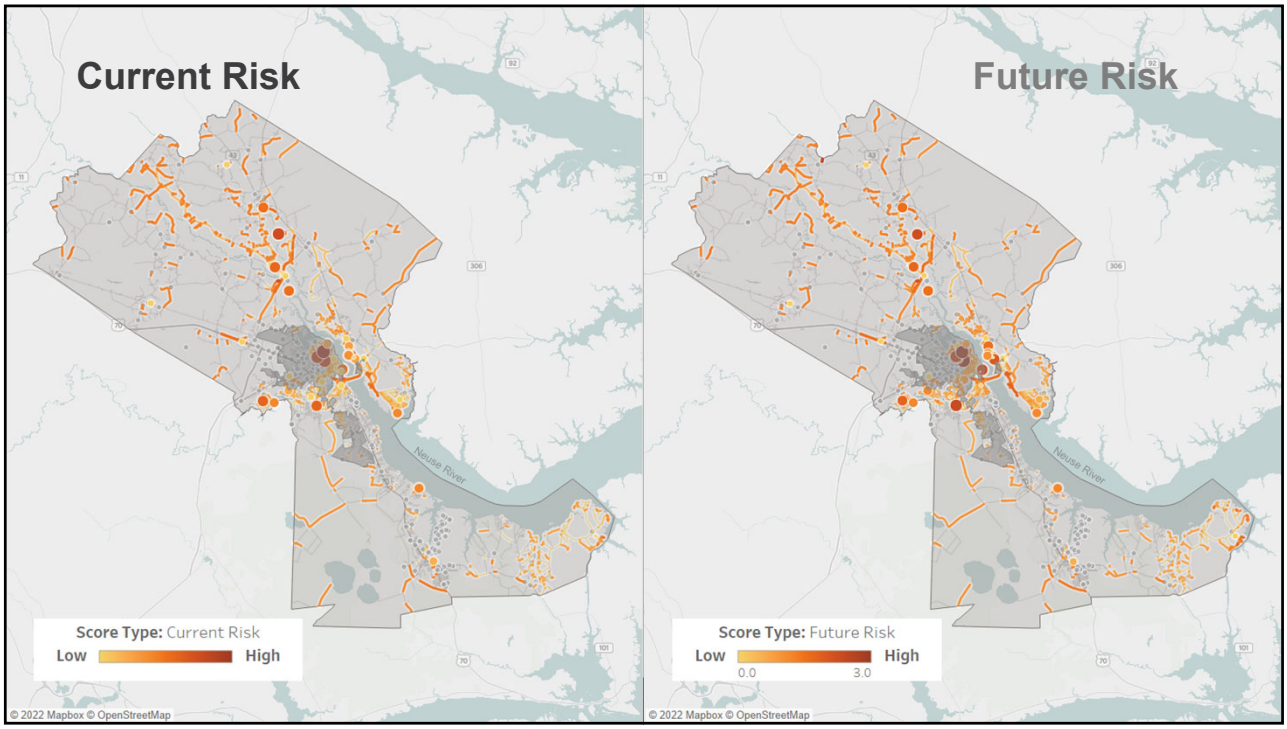

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Assessment Summary

Assets with Higher Risk Scores

- Bridgeton Elementary
- No. 7 Township Fire & Rescue Department
- Vanceboro Rural Volunteer Fire Department
- Tri-Community Volunteer Fire Department *(408 Bridge St.)*

Roadways with Higher Risk Scores

- U.S. 70
- U.S. 17
- Lima Road
- Willis Landing
- Marina Townes Drive

24

Projects to Address Community Resilience

25

Projects to Address Community Resilience

- Draft List (Based on Prior Plans)
- Additional/New Projects
- Project Priorities

26

Next Steps

- Action Items
  - Dewberry/Craven County: Schedule Public Engagement event/survey
  - CAT: Provide feedback on proposed projects

27

Thank you!

Beth Smyre, PE 919-424-3771
esmyre@dewberry.com

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Dewberry

CRAVEN COUNTY CAT MEETING #3 DISCUSSION

DATE: April 28, 2022

TIME: 10:00 a.m.

LOCATION: Microsoft Teams Meeting

PURPOSE: Craven County Community Action Team Meeting Discussion Notes

Discussion Topics

1. **Project Portfolio:**

   The CAT reviewed the current list of 10 projects.

   - **Targeted Repetitive Flood Drainage Assessment** – Add flood retention and runoff treatment into the description of the project. Use remnant properties from US 70 widening to construct these facilities if possible. Also look at this corridor to remove abandoned asphalt parking lots and other impervious surfaces as part of an existing, ongoing program. The County will also look at installing pervious pavers where feasible.
   - **Stormwater Flood Reduction Projects**. Noted that the main funding is from the Department of Agriculture, with some funding from N.C. Coastal Federation. These projects include shoreline and stream restoration. One project should be completed by June. This could compete well in Phase 3 especially if have specific location(s) identified.
   - **Shoreline Drive Alternate Access** – The proposed project is still moving through FEMA BRIC process. Remove references to NCDOT, as this is a Town-maintained facility. The County will send a copy of the latest information in the BRIC application, including cost estimates.
   - **Improve Existing/Construct Alternate Crop Buying Facility** – The County would like to continue to investigate this project. The County needs to reach out to the farming community to determine if the existing facility or a new one would (or could) be used during storm events. With world economy, domestic wheat production may be increasing. Wheat harvested at different times – so perhaps a facility could be used 6-8 months. The CAT also discussed abandoned hog lagoons and how to remediate them. It was determined to add lagoon remediation as a separate project.
   - **Remediate Abandoned Hog Lagoons** – The County has several locations where hog lagoons have been abandoned but not remediated. These pose a hazard during storm events. The County would like to properly abandon these lagoons, so they are not breached and cause environmental harm. The County is also looking at applying to the Environmental Enhancement Grants Program in June for financial assistance with the lagoons. The main issue to resolve is finding a place to apply the waste from the lagoons. Once the lagoons are empty, they can be turned into freshwater ponds.
   - **Elevation of Weyerhaeuser Road –** The focus for this project is both raising Weyerhaeuser Road and the associated railroad tracks out of the 100-year floodplan and install pipes as needed in the roadway fill so that the roadway fill will not act as a dam and flood River Road/Streets Ferry Road as well as West Craven High School. The County has been coordinating continuously with NCDOT regarding this project.
   - **Elevation of Adams Creek Road and Belangia Road Intersection –** NCDOT is supposed start work on a project on Adams Creek Road over Club Foot Creek later this year. However, this additional project on Adams Creek Road is still a priority for emergency response due to the fire station.

- **Emergency Shelter Construction and Retrofits –** The County will provide information on potential new locations for shelters. The State hazard mitigation program has told the County they are slated to get new generators, but due to escalating costs will probably only get two of the four that were requested. Therefore, the County will have to go back to FEMA for additional funds for generators. Small pets have a designated location to shelter, with large animals going to the fairgrounds.
- **Cherry Beach / Minnesott Beach Ferry Terminal –** Leave in.
- **Installation of Predictive River Gauges –** Leave in. At some locations have gauges but these gauges don't have the predictive capabilities. Is this possible to add?
- **West Craven High School Berm Construction –** Major concerns about the infrastructure needed behind the berm when it does rain. i.e., pumps, etc. Feels like there is a lot of liability. Also, it is in the floodplain and would have to deal with redirecting flood waters. Drop from list as it is not very viable.

2. **Other Feedback:**

- Would like to propose updating the CAMA LUP or find funding for updating and use this information as part of updating the CAMA LUP. The current plan is over 10 years. An updated plan would give the County the chance to include resiliency and climate change into the plan. This project should be priority #3.
- There is a large animal response plan that probably needs to be reassessed and updated. This plan will most likely be geared toward smaller farms and those individuals with large animals as pets. Major operations tend to have contingency plans. This needs to be a separate project from the other shelter needs, as it deals with logistics as well as upgrades. It can be ranked below other sheltering plan at #9. It was noted that the building at the fairgrounds is in disrepair and will need funding to be updated. The County will use the information from the Risk and Vulnerability Assessment to assist in identifying small farm or large animal locations as part of this planning effort.
- Mrs. Newby requested information on how to continue to assist families that were displaced from the last hurricane. Chad will work with Mrs. Newby to make sure they are on the list(s) to receive assistance. The County has been working with the State to address these outstanding needs.

Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Chad to send locations of potential shelters	Chad Strawn		In progress
Dewberry to resend draft report to attendees	Beth Smyre		Completed
Dewberry to clean up Project Portfolio to send for review	Beth Smyre		Completed
Dewberry to revise Project Sheets	Beth Smyre		In progress
Dewberry to send link to video on Phase 3 Webinar	Beth Smyre		Completed

APPENDIX B

PUBLIC ENGAGEMENT MATERIALS AND SUMMARY RESULTS

MAY 2022

Dewberry

Dewberry

CRAVEN COUNTY PUBLIC INVOLVEMENT SUMMARY

DATE: March 10, 2022

TIME: 5:30 – 6:30 p.m.

LOCATION: Microsoft Teams

PURPOSE: Craven County Public Meeting Summary

SUMMARY DATE: March 22, 2022

A Public Involvement opportunity for the Resilient Coastal Communities Program (RCCP) was held on February 23, 2022. The purpose of the meeting was to gather the community's feedback on the Town's perceived vulnerabilities and the proposed projects to address these concerns.

An all virtual event was scheduled, and the public could register to attend using Microsoft Teams. The meeting format consisted of a 15 minute presentation at the beginning of the meeting followed by a 45 minute question and answer session. Although the event was advertised for over a week in advance, the attendance consisted of the Community Action Team (CAT) members and two Dewberry staff.

There was a total of four (4) completed online surveys.

Meeting Results

Since the meeting was only attended by the CAT and Dewberry staff, the time was used to discuss and refine the project list for their portfolio. The discussion included the following commentary:

- Gage installation may not need to be a priority since NCDOT has been installing them
- A berm at West Craven High School may not be a great option since it could cause issues
- Alternative crop buying facilities are an interesting topic. The facilities would have to have plenty of refrigeration and double as local farmers markets.
- Elevation of Weyerhaeuser Road has been a long battle which might need to be altered to a simple drainage project.
- Possible new projects to alleviate flooding on roads that have not been addressed previously. This includes River Road, Streets Ferry Road, State Camp Road, Bay Bush Road and others.
- Keep shelter retrofits.
- Possible new project to allow for big animal shelters for when pastures are flooded.
- Possible new project which sets up a program to clean out streams after storms. This may include a stormwater fee to keep debris out. After declared disasters FEMA will provide recovery funds to clean streams out which have been established as infrastructure.
- Possible new project of a living shoreline north of Union Point Park. It is located in New Bern, so it would have to be a shared project with the City of New Bern.

Survey Results

1. Coastal hazards of concern

What type of coastal or climate hazards concern you the most in your community?

- Flooding and hurricanes and tropical storms were the main concerns, both with 75% of respondents.
- Shoreline or beach erosion and severe weather were also noted as concerns with 50% of respondents.

What kind of flooding concerns you most?

- The primary flooding concern was stormwater and rainfall flooding (3 out of 4 respondents).
- Storm surge was also highly ranked (2 out of 4 respondents).

How significant of a risk does flooding pose to your community?

- 75% of respondents indicated a risk of 4 out of 5 presently.
- 100% of respondents indicated a risk of 4 or 5 out of 5 for the future.

2. Damage and Resilience

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

- All respondents indicated they had witnessed property or infrastructure damage due to these hazards.

What type of damage did you witness?

- Property damage, transportation damage or disruption, and utility disruption were the main damage witnessed with 100% of respondents for all three.

Rank the top three challenges facing your community immediately after a storm.

- The main challenges for the community are restoring power, electricity, or other utilities and repairing or rebuilding physical infrastructure. (100% of respondents).
- Informing citizens about available assistance and resources was the second major challenge with 75% of respondents.

3. Resilience projects to be implemented

Rank the project types which would make your community more resilient to storms, floods, and other coastal hazards.

- Increasing stormwater drainage capacity was the number one project type desired by the community with 100% of respondents.
- Nature-based solutions, acquisition and conservation of flood-prone land, and elevating homes, businesses, and public infrastructure out of the floodplain were the next most desired project types with all three types at 75%.

Where do you think Craven County should implement resilience projects?

- Road bridge elevations in Vanceboro.
- Ditch cleaning, repairing and widening of roads as well as culvert upgrading in Harlowe.

Craven County is considering several projects to increase its resilience to coastal and climate hazards. Please select the three projects you think would generate the greatest benefit to the community.

Elevation of Weyerhaeuser Road	II
Emergency shelter construction and retrofits	III
Installation of predictive river gauges	II
West Craven High School berm construction	
Improve existing or construct alternate crop buying facility	
Shoreline Drive alternate access	II

Cherry Branch-Minnesott Beach Ferry terminal	I
Elevation of Adams Creek Road and Belangia Road intersection	II

- Some write in responses included:
    - Provide emergency shelters in the eastern part of the County. Provide for EMS and Rescue service. Right now, there is no coverage and they have to rely on Havelock, which is 10-25 miles away depending on the address.
    - Pave County Line Road to improve access in the event of Evans Mill bridge flooding (as this happened during Florence).

What options would you support for paying for these projects?

- Respondents were in favor of state or federal funding, local bonds, private-public partnerships, and local taxes and levies.
- 75% of respondents favored state or federal funding.

North Carolina Resilient Coastal Communities Program **March 2022**
Craven County
Public Input Questionnaire

Craven 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 community.

Thank you for your feedback!

1. What type of coastal or climate hazards concern you the most in your community? (*Select all that apply.*)

	Flooding		Severe Weather (Thunderstorm Winds, Lightning, & Hail)
	Shoreline Erosion		Wildfires
	Extreme Heat		Other:
	Hurricanes and Tropical Storms		

2. If you selected flooding, what kind of flooding concerns you the most? Rank these options from **least (1)** to **most (4)** concerning.

	Tidal (from king tides, nor'easters, etc.)		Stormwater/Rainfall
	Storm surge (from hurricanes, tropical storms, etc.)		Riverine (rising river water levels, etc.)

3. On a scale of 1 to 5, how significant of a risk do you think coastal hazards and/or flooding currently pose to your community? (Check 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 and/or flooding will pose to your community in the future? (Check one)

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

5. Have you ever witnessed property or infrastructure damage due to coastal or climate hazards in your community? (Circle one: **YES/NO**) If **Yes**, where did you witness the damage?

_____

_____

Please send your comments to:
Beth Smyre, Dewberry, 2610 Wycliff Road, Suite 410, Raleigh NC 27607
or esmyre@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 Craven 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. Please select the **top <u>five</u> project types** that you think would make your community more resilient to storms, floods, and other coastal hazards. (Check up to **5** options.)

	Nature-based solutions, such as living shorelines or habitat restoration		Elevations of 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:		

9. Where do you think Craven County should implement resilience projects to minimize future damage from storms, floods, and other coastal hazards? What type of projects should the County consider?

10. Craven County is considering several projects to increase its resilience to coastal and climate hazards. Based on this list, please rank the **three projects** you think would generate the greatest benefit to the community (1 = greatest benefit).

	Elevation of Weyerhaeuser Road: Work with NCDOT to elevate the roadway and train tracks near River Road above the floodplain to decrease the flooding risk.		**Improve Existing or Construct Alternate Crop Buying Facility**: Work with NCDOT to elevate access roads to current Crop Buying Facility; identify potential location for a new facility so harvested crops can still be stored during times of flooding.
	Emergency Shelter Construction and Retrofits: new emergency shelters would be constructed and existing shelters would be brought up to code, including the installation of generators.		**Shoreline Drive Alternate Access**: Work with NCDOT to construct a new facility to provide a second means of access to the Town of River Bend.
	West Craven High School Berm Construction: Construct a berm or bulkhead around the high school to protect the facilities, and elevate utilities above the floodplain where possible.		**Cherry Branch-Minnesott Beach Ferry Terminal**: Work with NCDOT to reconfigure the dock to ensure minimal ferry service disruption during times of high water.
	Installation of Predictive River Gauges: Install water level gauges at Weyerhaeuser Road and Maple Cypress Road, tying them into the County's *Code Red* warning system to predict riverine flooding.		**Elevation of Adams Creek Road and Belangia Road Intersection**: Work with NCDOT to elevate intersection or resize culverts to prevent flooding and to ensure the fire station remains accessible.

11. In addition to the projects previously listed, are there other resilience strategies that Craven County should consider?

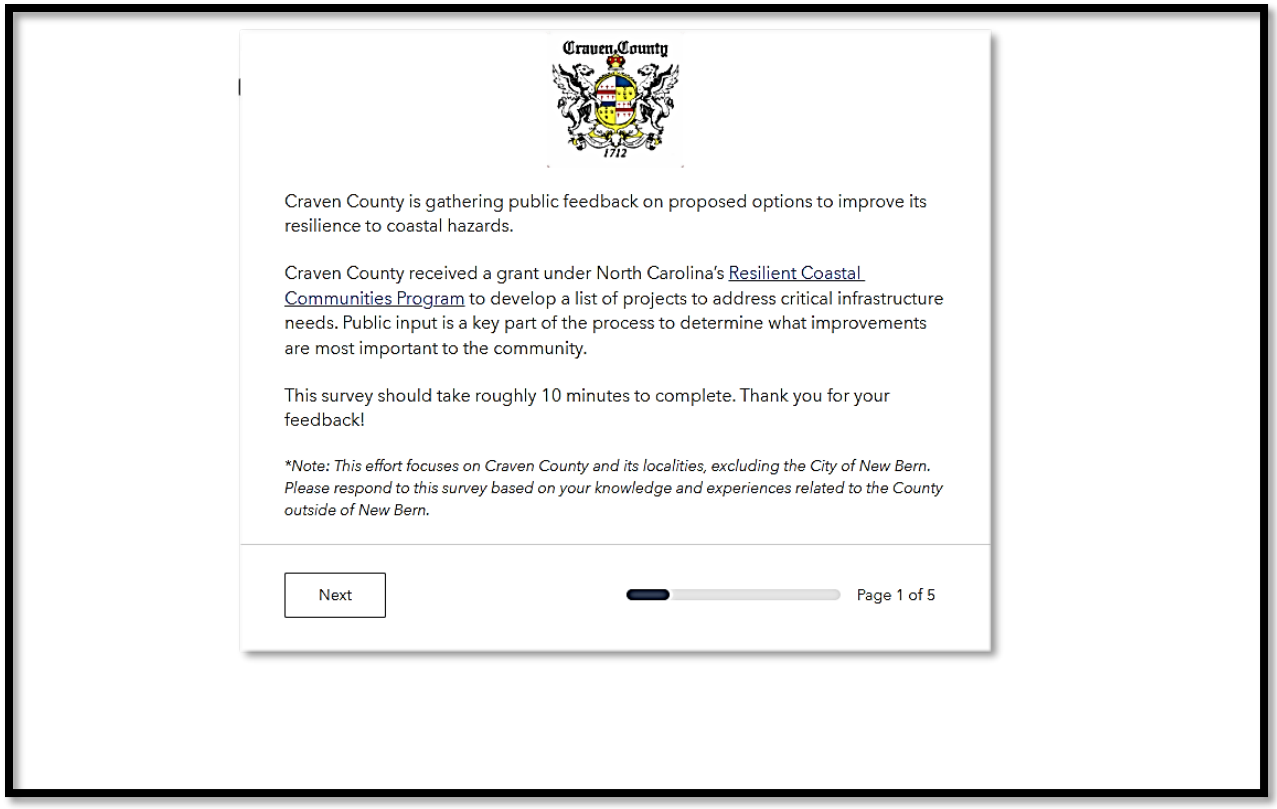
_____

_____

12. What options would you support for paying for these projects? (Select all that apply.)

	Local taxes or levies		Loans
	State or federal funding (grant funds, budget allocations, etc.		Public-private partnerships
	Local bonds		Other:

ONLINE PUBLIC ENGAGEMENT SURVEY SCREENSHOTS



Hazard Perceptions and Experiences

The following section includes questions about which hazards you believe most affect your community and your experiences with hazards in the past.

What type of coastal or climate hazards concern you the most in your community?*

Select all that apply.

- [ ] Flooding
- [ ] Shoreline or Beach Erosion
- [ ] Extreme Heat
- [ ] Hurricanes and Tropical Storms
- [ ] Severe Weather (including thunderstorm winds, lightning, & hail)
- [ ] Wildfires
- [ ] Other

What kind of flooding concerns you the most?*

Please rank these options from least (1) to most (4) concerning by dragging the boxes in order.

- Tidal (from king tides, nor'easters, etc.)
- Storm Surge (from hurricanes, tropical storms, etc.)
- Stormwater or Rainfall
- Riverine

Reset

Current Risk: On a scale of 1 to 5, how significant of a risk do you think coastal hazards and/or flooding currently pose to your community?*

1 (Not a concern) 2 3 4 5 (Extreme risk)

Future Risk: On a scale of 1 to 5, how significant of a risk do you think coastal hazards and/or flooding will pose to your community in the future?*

1 (Not a concern) 2 3 4 5 (Extreme risk)

Back Next Page 2 of 5

Locating Community Hazard Areas

The following section aims to understand what areas and assets in Craven County are vulnerable to coastal hazards and flooding to help identify potential resilience projects.

*Please respond to these questions based on your knowledge and experiences related to the County outside of New Bern.

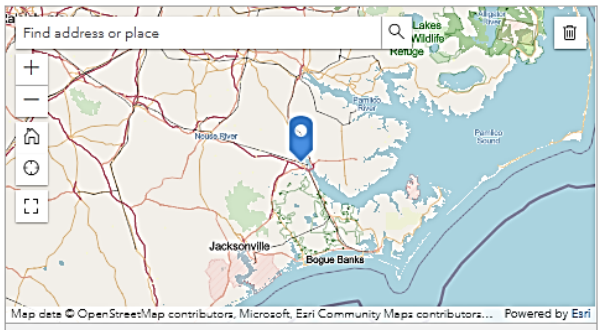
Have you ever witnessed property or infrastructure damage due to coastal or climate hazards in your community?*

- ○ Yes
- ○ No

Optional: Identify a location where you have witnessed damage from coastal or climate hazards in Craven County.

*Note: This effort focuses on Craven County and its localities, excluding the City of New Bern. Please respond to the following questions based on your knowledge and experiences related to the County outside of New Bern.

Place a point on the map by zooming and clicking on the map, or entering an address into the search bar.



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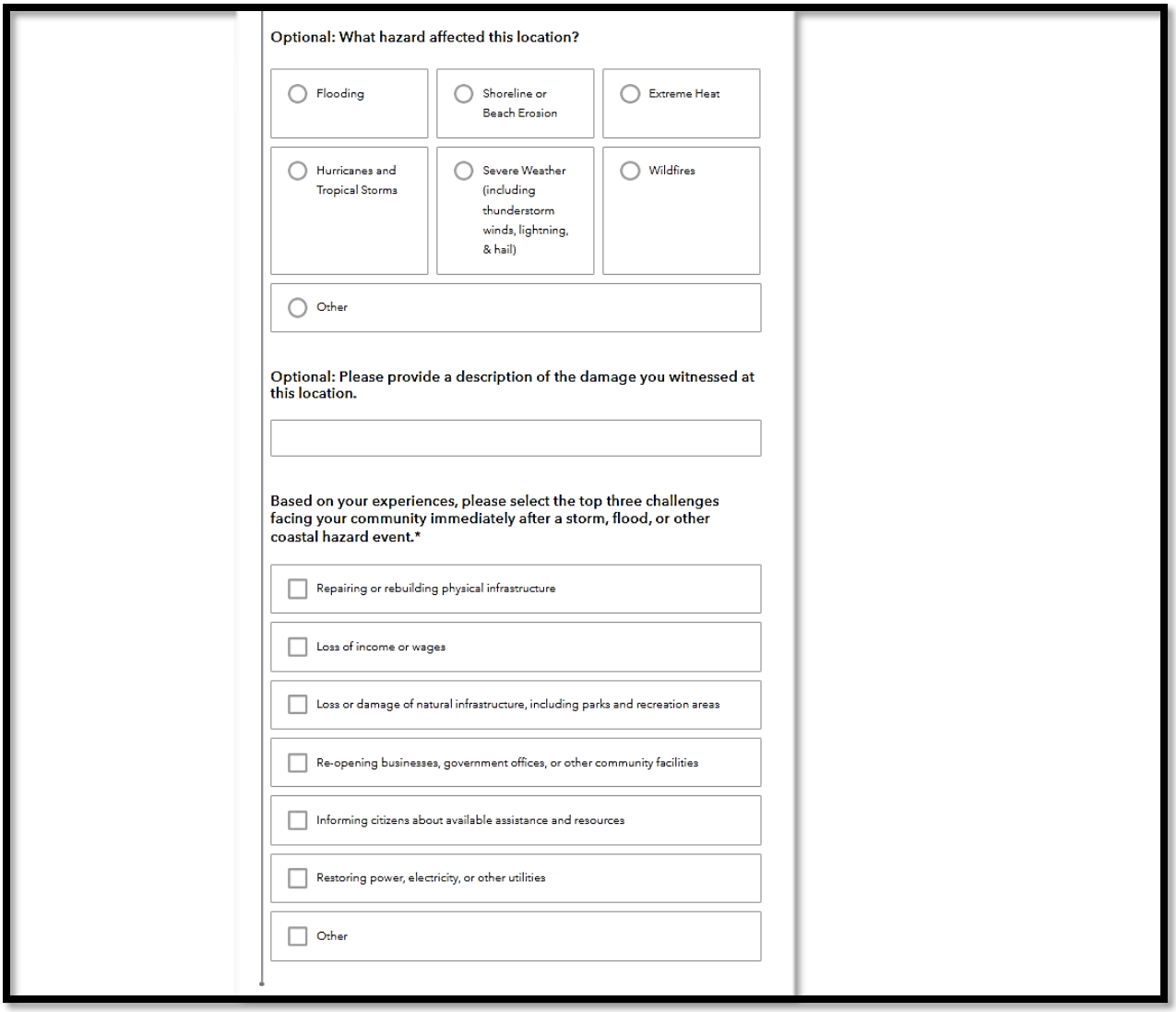


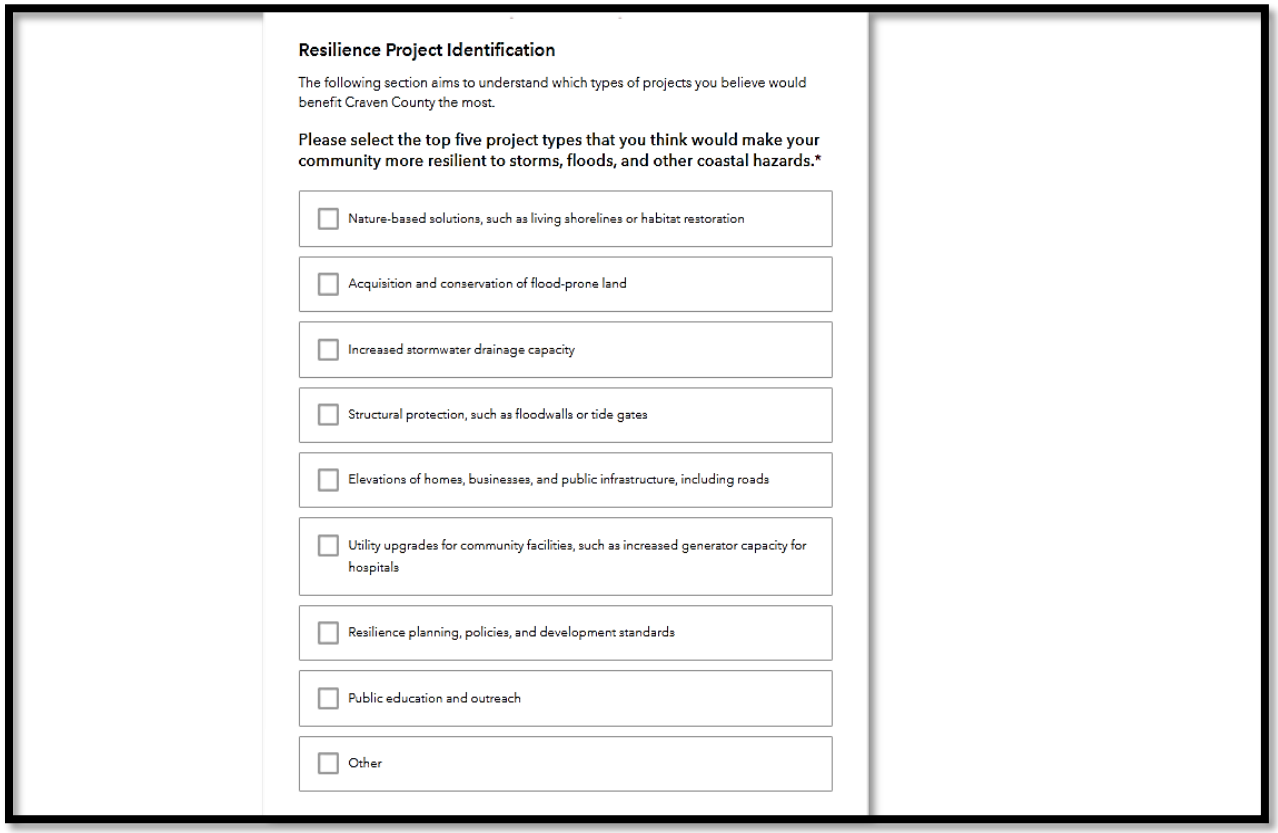
Optional: What hazard affected this location?

- ○ Flooding
- ○ Shoreline or Beach Erosion
- ○ Extreme Heat
- ○ Hurricanes and Tropical Storms
- ○ Severe Weather (including thunderstorm winds, lightning, & hail)
- ○ Wildfires
- ○ Other

Optional: Please provide a description of the damage you witnessed at this location.

Based on your experiences, please select the top three challenges facing your community immediately after a storm, flood, or other coastal hazard event.*

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

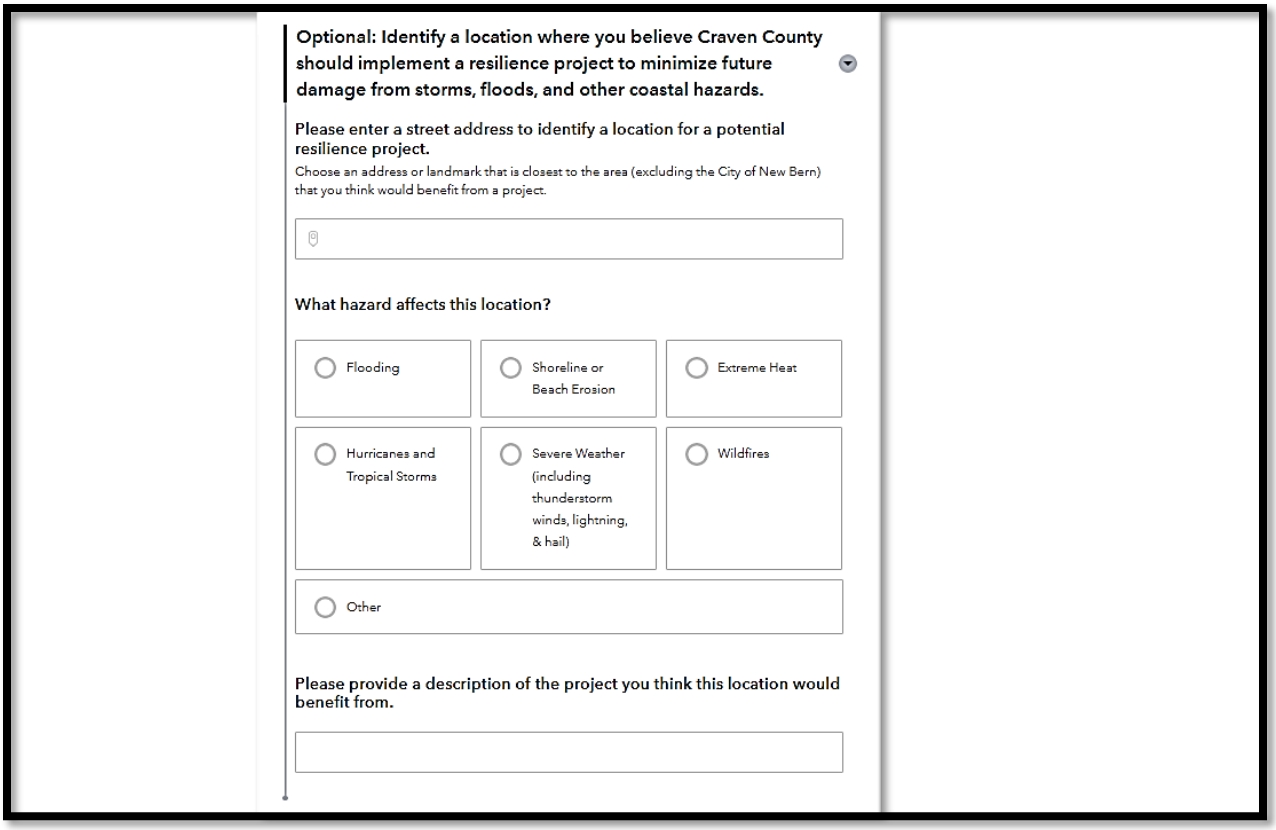


Resilience Project Identification

The following section aims to understand which types of projects you believe would benefit Craven County the most.

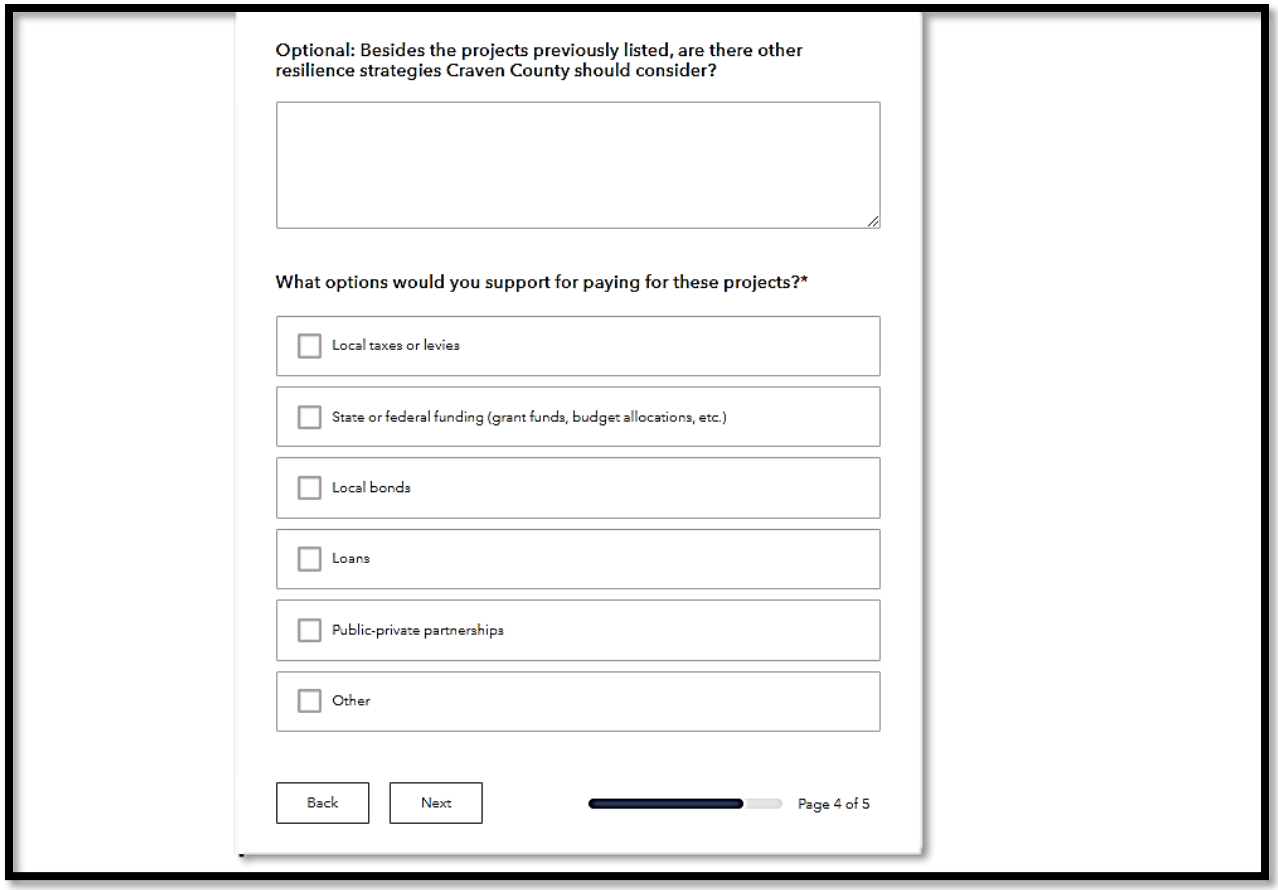
Please select the top five project types that you think would make your community more resilient to storms, floods, and other coastal hazards.*

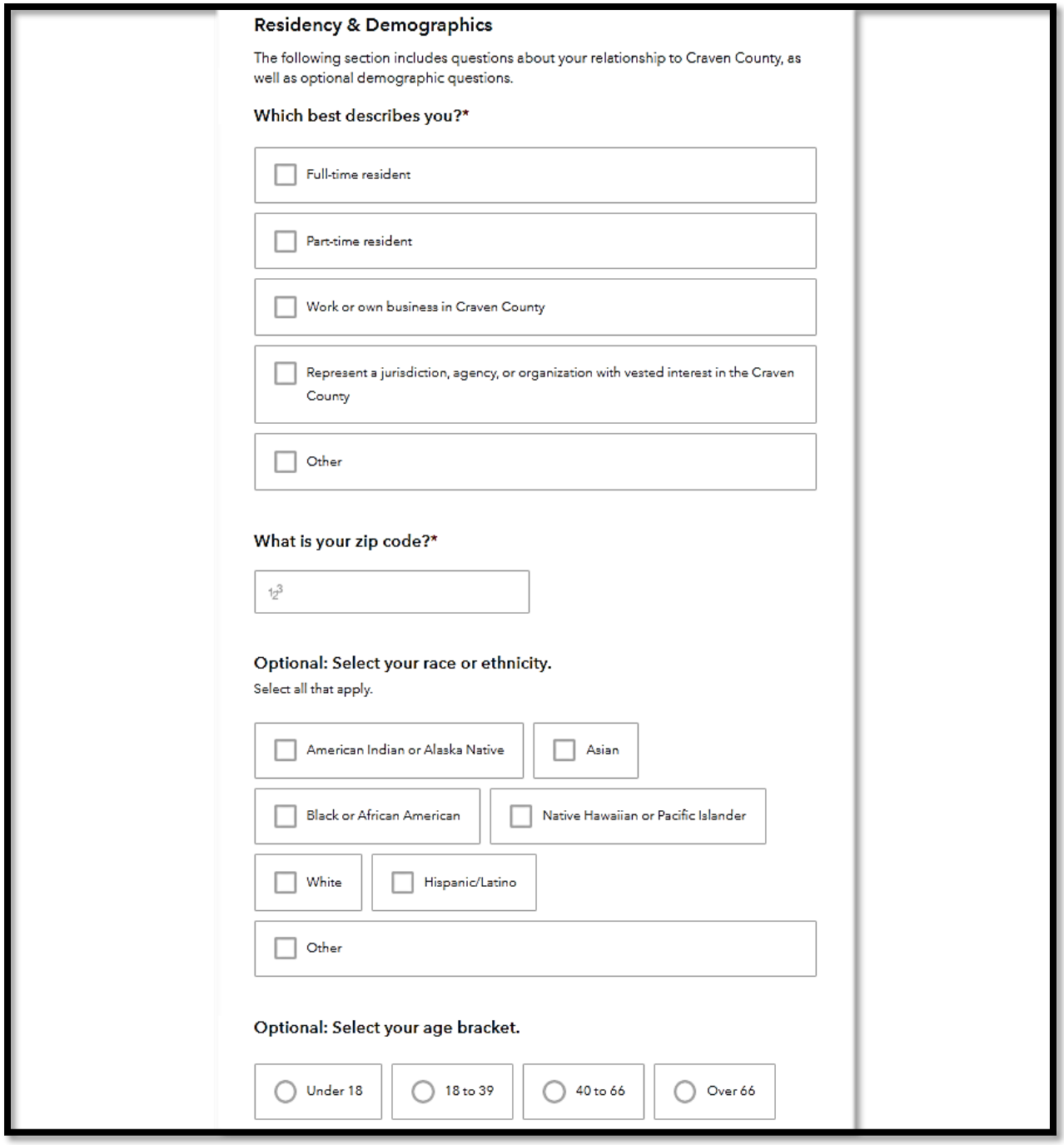
- [ ] Nature-based solutions, such as living shorelines or habitat restoration
- [ ] Acquisition and conservation of flood-prone land
- [ ] Increased stormwater drainage capacity
- [ ] Structural protection, such as floodwalls or tide gates
- [ ] Elevations of homes, businesses, and public infrastructure,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


Optional: Identify a location where you believe Craven County should implement a resilience project to minimize future damage from storms, floods, and other coastal hazards.
Please enter a street address to identify a location for a potential resilience project.
Choose an address or landmark that is closest to the area (excluding the City of New Bern) that you think would benefit from a project.
What hazard affects this location?
Flooding
Shoreline or Beach Erosion
Extreme Heat
Hurricanes and Tropical Storms
Severe Weather (including thunderstorm winds, lightning, & hail)
Wildfires
Other
Please provide a description of the project you think this location would benefit from.

Craven County is considering several projects to increase its resilience to coastal and climate hazards. Based on this list, please select the three projects you think would generate the greatest benefits to the community.*

- [ ] Elevation of Weyerhaeuser Road: Work with NCDOT to elevate the roadway and train tracks near River Road above the floodplain to decrease the flooding risk.
- [ ] Emergency Shelter Construction and Retrofits: new emergency shelters would be constructed and existing shelters would be brought up to code, including the installation of generators.
- [ ] West Craven High School Berm Construction: Construct a berm or bulkhead around the high school to protect the facilities, and elevate utilities above the floodplain where possible.
- [ ] Installation of Predictive River Gauges: Install water level gauges at Weyerhaeuser Road and Maple Cypress Road, tying them into the County's Code Red warning system to predict riverine flooding.
- [ ] Improve Existing or Construct Alternate Crop Buying Facility: Work with NCDOT to elevate access roads to current Crop
- [ ] Buying Facility; identify potential location for a new facility so harvested crops can still be stored during times of flooding.
- [ ] Shoreline Drive Alternate Access: Work with NCDOT to construct a new facility to provide a second means of access to the Town of River Bend.
- [ ] Cherry Branch-Minnesott Beach Ferry Terminal: Work with NCDOT to reconfigure the dock to ensure minimal ferry service disruption during times of high water.
- [ ] Elevation of Adams Creek Road and Belangia Road Intersection: Work with NCDOT to elevate intersection or resize culverts to prevent flooding and to ensure the fire station remains accessible.


Optional: Besides the projects previously listed, are there other resilience strategies Craven County should consider?
What options would you support for paying for these projects?*
Local taxes or levies
State or federal funding (grant funds, budget allocations, etc.)
Local bonds
Loans
Public-private partnerships
Other
Back
Next
Page 4 of 5



Residency & Demographics

The following section includes questions about your relationship to Craven County, as well as optional demographic questions.

Which best describes you?*

- [ ] Full-time resident
- [ ] Part-time resident
- [ ] Work or own business in Craven County
- [ ] Represent a jurisdiction, agency, or organization with vested interest in the Craven County
- [ ] Other

What is your zip code?*

123

Optional: Select your race or ethnicity.

Select all that apply.

- [ ] American Indian or Alaska Native
- [ ] Asian
- [ ] Black or African American
- [ ] Native Hawaiian or Pacific Islander
- [ ] White
- [ ] Hispanic/Latino
- [ ] Other

Optional: Select your age bracket.

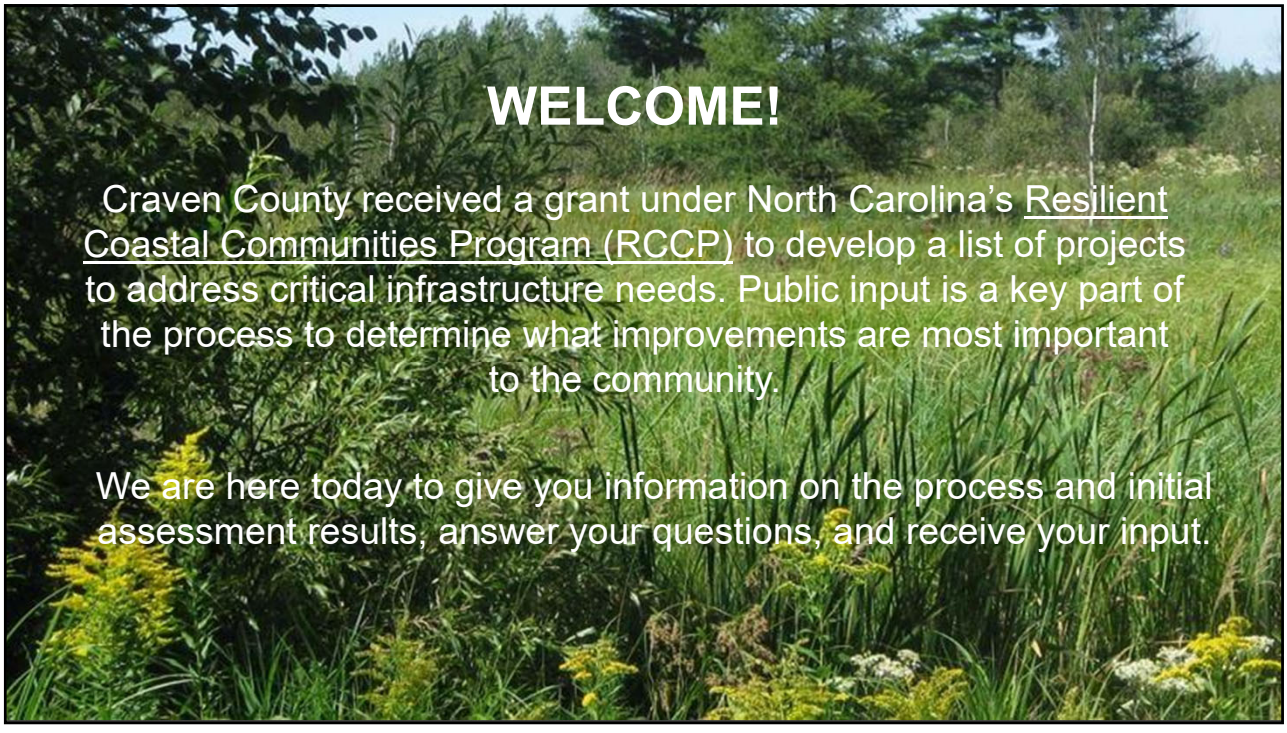
- ○ Under 18
- ○ 18 to 39
- ○ 40 to 66
- ○ Over 66

Resilient Coastal Communities Program

Public Meeting

March 10, 2022

1



2

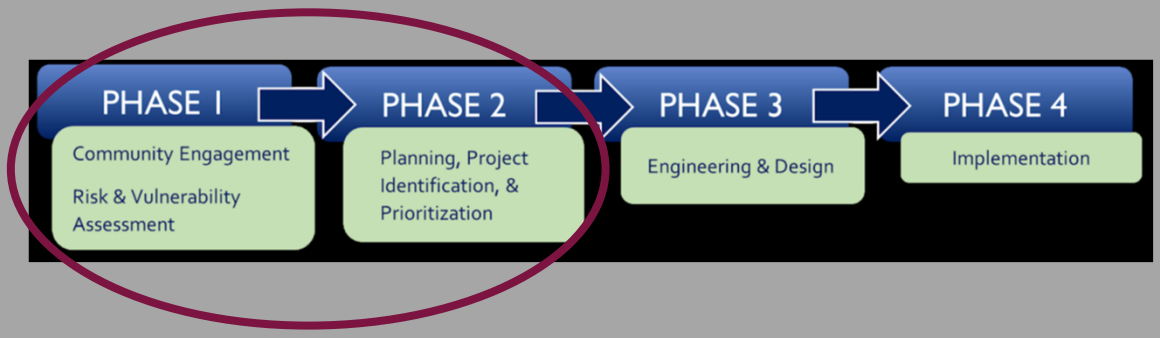
What is the Resilient Coastal Communities Program?

A grant program through the NC Division of Coastal Management (NCDCM) to help communities:

- **Address barriers to coastal resilience** in North Carolina at the local level;
- **Assist communities** with risk and vulnerability assessments;
- **Develop a portfolio** of planned and prioritized projects;
- **Advance coastal resilience projects** to shovel-readiness; and
- **Link communities to funding streams** for project implementation

3

Where are we in the process?



4

Coastal / Climate Hazards

Flooding

Severe Storms

Hurricanes / Tropical Storms

Shoreline Erosion

Wildfires

Extreme Heat

5

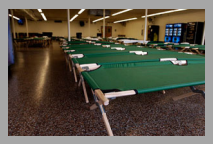
Identify Critical Assets to Evaluate

Built Infrastructure

Transportation

Schools

Water / Wastewater Facilities

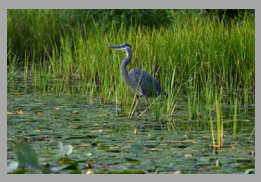


Emergency Shelters

Fire Stations

EMS / Police

Natural Infrastructure



Wetlands

Streams

Forests

Wildlife Habitat

6

Evaluate the Risk from Coastal Hazards

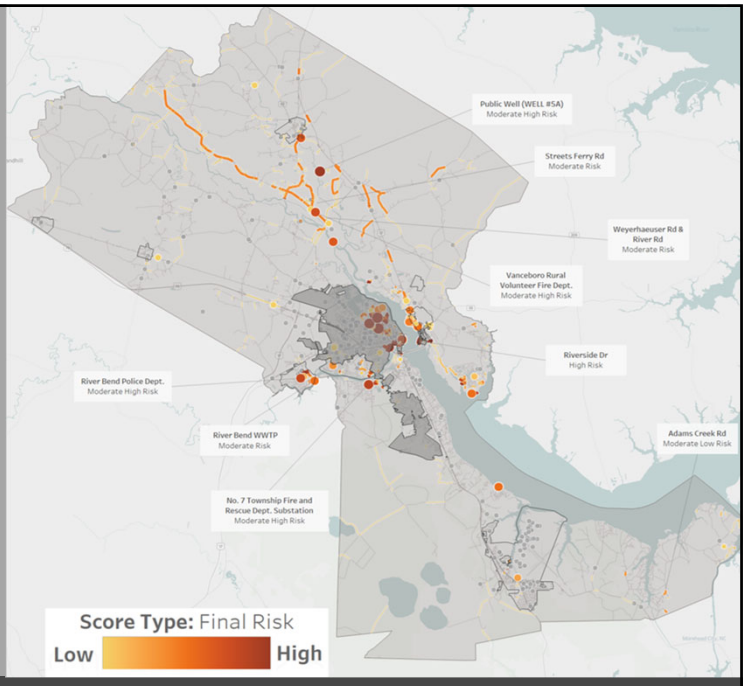
To evaluate how critical assets are impacted by coastal or climate hazards, used information from:

- Impacts on Craven County from Hurricane Florence and Hurricane Matthew
- Other recent heavy rainfall events
- Current and future flood condition datasets
- Feedback from community representatives

7

Critical "At Risk" Assets

Initial analysis identified assets throughout the County, including streets, Fire and EMS buildings, and other public facilities.



8

Potential Project Solutions

Some of the proposed projects to address resiliency include:

Elevation of Weyerhaeuser Road		Improve Existing or Construct Alternate Crop Buying Facility
Emergency Shelter Construction and Retrofits		Shoreline Drive Alternate Access
West Craven High School Berm Construction		Cherry Branch-Minnesott Beach Ferry Terminal
Installation of Predictive River Gauges		Elevation of Adams Creek Road and Belangia Road Intersection

The list of projects represents initial suggestions- this is not a final list.

9

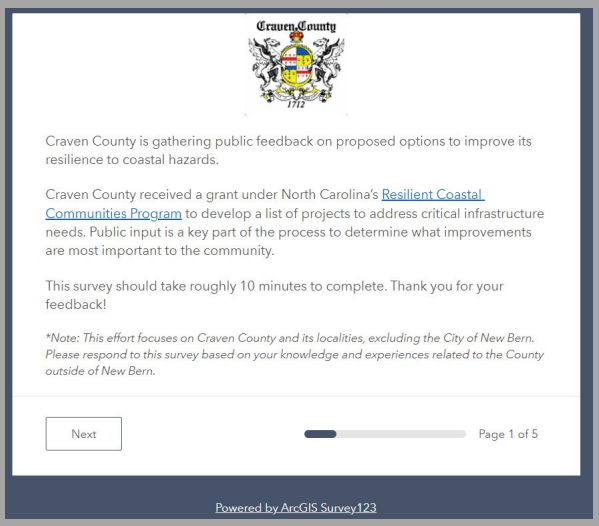
We want your input on:

- What coastal or climate hazards concern you the most in your community?
- Are there community assets (including public facilities, community centers, or transportation facilities) that you think require attention?
- Do you think the projects listed begin to address the most urgent needs in Craven County?
- What other projects or solutions would you like to see considered?

10

How to Comment

Provide your input during tonight's meeting
OR
Scan the QR code below to access the online survey on the Craven County website
OR
Type this URL in your web browser
https://arcg.is/0fiDrL



11

We need your input!

Please help us to finalize a list of priority projects that would address critical County infrastructure needs with a focus on increasing resilience to coastal risks.
An online survey has been created which can be accessed at the following link: https://arcg.is/0fiDrL or by using the QR code provided below.

Public input is a critical part of the process to determine what facility improvements are most important to the community!

Responses should be submitted by Thursday, March 24, 2022.
Thank you for your participation!

12

Thank you!

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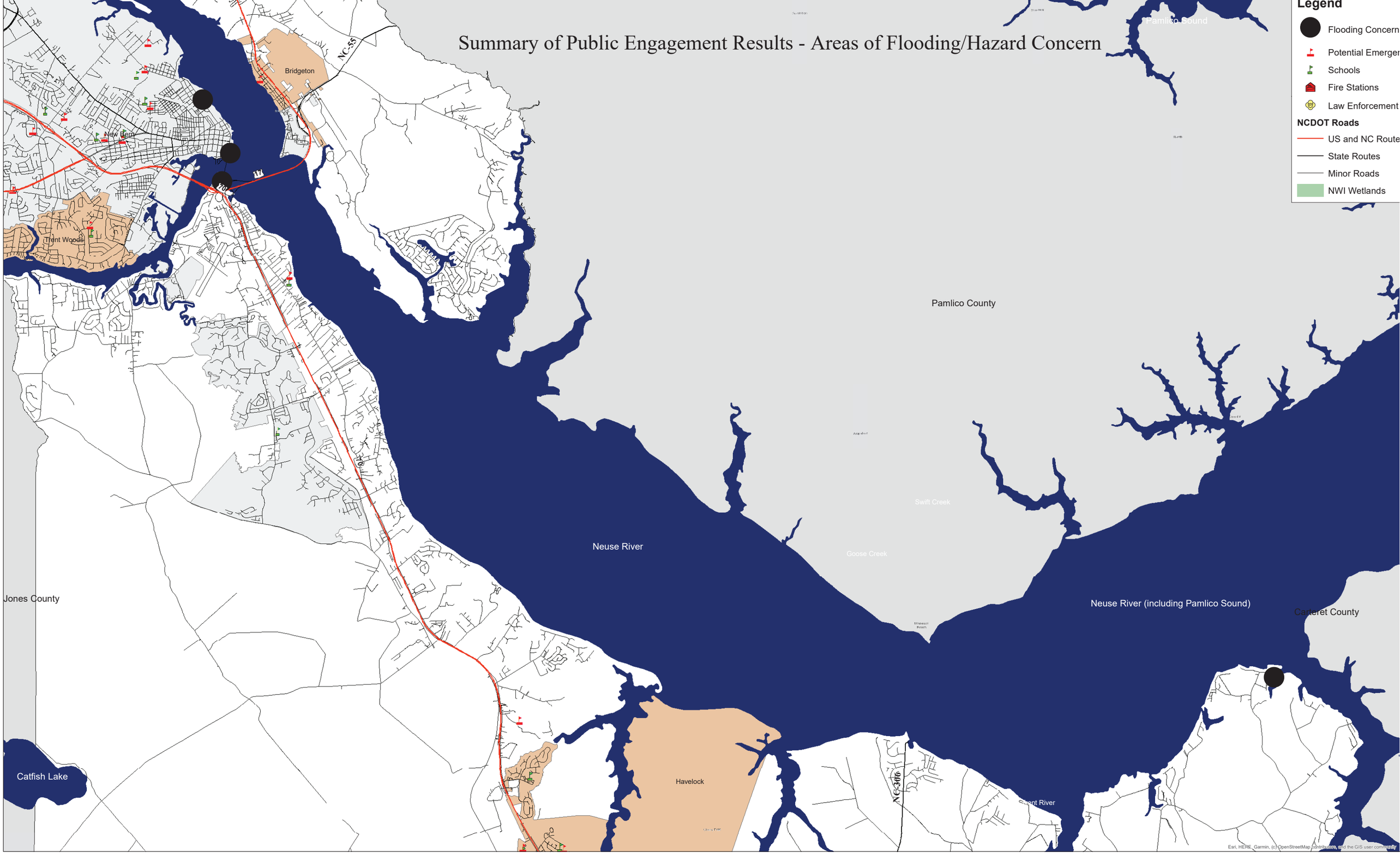
Summary of Public Engagement Results - Areas of Flooding/Hazard Concern



Prepared for Craven County

Sources: USGS, NC OneMap, Craven County

Craven County

0 1 2 4 Miles

N

APPENDIX C

RISK AND VULNERABILITY ASSESSMENT

MAY 2022

Dewberry

CRAVEN COUNTY RISK & VULNERABILITY ASSESSMENT

North Carolina Resilient Coastal Communities Program

APRIL 2022

Dewberry

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Cover Image Credit: FEMA. October 6, 2010. *Local flooding Vanceboro, North Carolina.* Retrieved from https://commons.wikimedia.org/wiki/File:FEMA_-_45590_-_Local_flooding_in_North_Carolina.jpg

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 the region's critical assets and natural infrastructure 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] This report summarizes the assessment process and results for Craven County, excluding the City of New Bern.

As part of Phase 1 of the RCCP (Figure 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 Craven County's resilience to existing and future coastal risks. ***Resilience*** refers to the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.[2]

Figure 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] Executive Order No. 13653, 78 FR (66817- 66824). 2015. https://obamawhitehouse.archives.gov/the-press-office/2015/03/19/executive-order-planning-federal-sustainability-next-decade

2.0 Assessment Framework

The RCCP Handbook (June 2021) provides the basis for this framework to assess the risk and vulnerability of Craven County's assets. 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. Augment hazard assessment based on inputs 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 the surrounding community.

This assessment focuses on coastal flooding hazards and their potential impacts on Craven County. As identified in the RCCP Handbook, this process considers the following hazards: rainfall, riverine, storm surge and tidal flooding, and sea level rise. Due to the limited available data, rainfall-driven flooding is summarized qualitatively in the results section.

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 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]

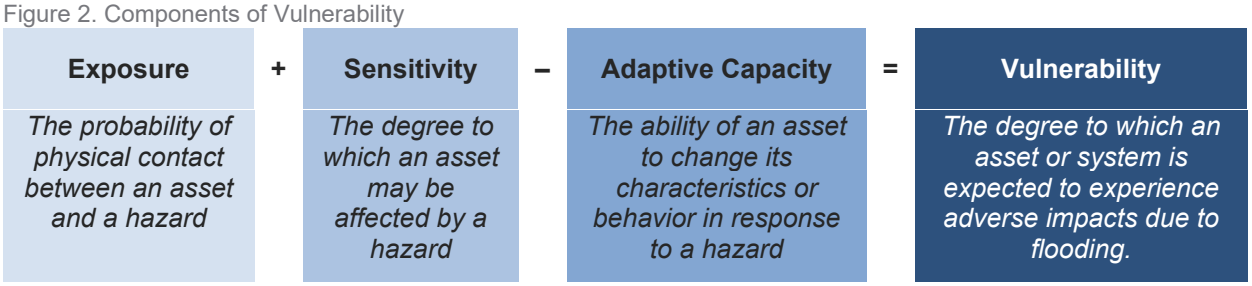
Natural Infrastructure
Naturally occurring landscapes and systems that perform ecosystem services that benefit nearby communities, like flood protection or abatement, erosion control, and water purification.

After mapping hazards, the assessment determines which critical built infrastructure and natural infrastructure assets are vulnerable – the degree to which they are expected to experience adverse impacts – to 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. 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).

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

Figure 2. Components of Vulnerability



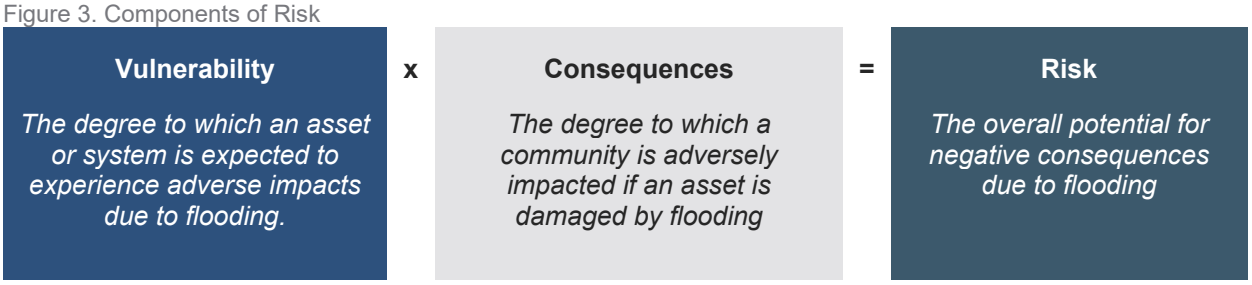
As noted in Figure 2, an asset's ***Vulnerability*** defines the degree to which coastal hazards threaten its physical structure or core function. However, interruption to services or physical damage to assets can affect entire communities, depending on the asset's importance to the region and the regional context. These consequences can amplify an asset's vulnerability to adverse impacts of flooding.

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 flooding.

The assessment examines two factors that contribute to its severity to understand the consequences of potential coastal flood 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 3). Due to limited data for natural infrastructure, this step is only applied to critical built infrastructure assets.

Figure 3. Components of Risk



This report summarizes the process and key results from Craven County's Risk and Vulnerability Assessment. This report's results and findings support the identification and prioritization of resilience projects for Craven County as part of Phase 2 of the RCCP.

3.0 Identify & Map Hazards

3.1 Hazard Identification

Based on a review of recent community plans and CAT meeting discussions, three relevant hazards were selected to examine in the assessment process: coastal (tidal and storm surge), riverine, and rainfall-driven flooding. Craven County has experienced each of these hazards, and each 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 six frequency events: mean higher high water (MHHW), 10-year, 25-year, 50-year, 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.

Riverine flooding is assessed using floodplain data from the North Carolina Floodplain Mapping Program. This data provides present conditions for the 100-year frequency event.

Rainfall-driven flooding is incorporated qualitatively in the results section due to limited spatial data. This hazard is assessed using information from Craven County's RCCP application, CAT feedback, and historical rainfall maps from Hurricanes Matthew (2016) and Florence (2018).

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 NC One Map. Assets include both individual sites – point-level data representing structures, facilities, and other buildings – and components of systems, such as roadways. The Federal Emergency Management Agency's (FEMA) Community Lifeline framework served as a starting point to identify and categorize critical built infrastructure assets.

Table 1 summarizes the individual sites examined within Craven County. For assets that perform multiple functions, such as a public school serving as an emergency shelter, the asset is evaluated separately under each category. Using NC Department of Transportation (NCDOT) data, the assessment also examined approximately 13,80 miles of road segments within Craven County, excluding the City of New Bern. These assets, floodplain extents, and all other maps can be found in Appendix B.

Table 1. Summary of Critical Built Infrastructure Sites by Type

TYPE	INCLUDES…	NO. OF ASSETS
Emergency Shelters	*Buildings identified for use as a temporary shelter during disasters or emergencies.*	15
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.*	9
Fire Stations	*Buildings that house firefighting personnel and their equipment.*	32
Law Enforcement Sites	*Buildings that house local, state, federal, and special jurisdiction law enforcement agencies, e.g., municipal police, county sheriffs, and park police.*	4
Medical Facilities	*Facilities that provide health and medical services, including hospitals, nursing homes, mental health homes, and hospices.*	46
Public Schools	*Locations of pre-kindergarten, elementary, middle, high, and early college schools.*	15
Wastewater Facilities	*Locations of wastewater discharge sites and treatment plants.*	18
Water Supplies	*Locations of public water supply sources, including both ground, spring, and surface water sources.*	71
Total		**210**

3.2.2 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.

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. In recognition of these differences, 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 (for reference only; identical to Figure 2), the Vulnerability Score equals exposure plus sensitivity minus adaptive capacity. This process makes it possible for critical built infrastructure to receive a negative Vulnerability Score, but a negative score does not indicate an asset would be unaffected or resistant to actual flood events. Instead, an asset with a negative score can be interpreted as potentially less vulnerable to coastal hazards relative to other assets examined in this assessment.

Figure 4. 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 flooding.*

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.[4] 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.

[4] 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

4.1 Critical Built Infrastructure

4.1.1 Coastal & Riverine Flood Exposure

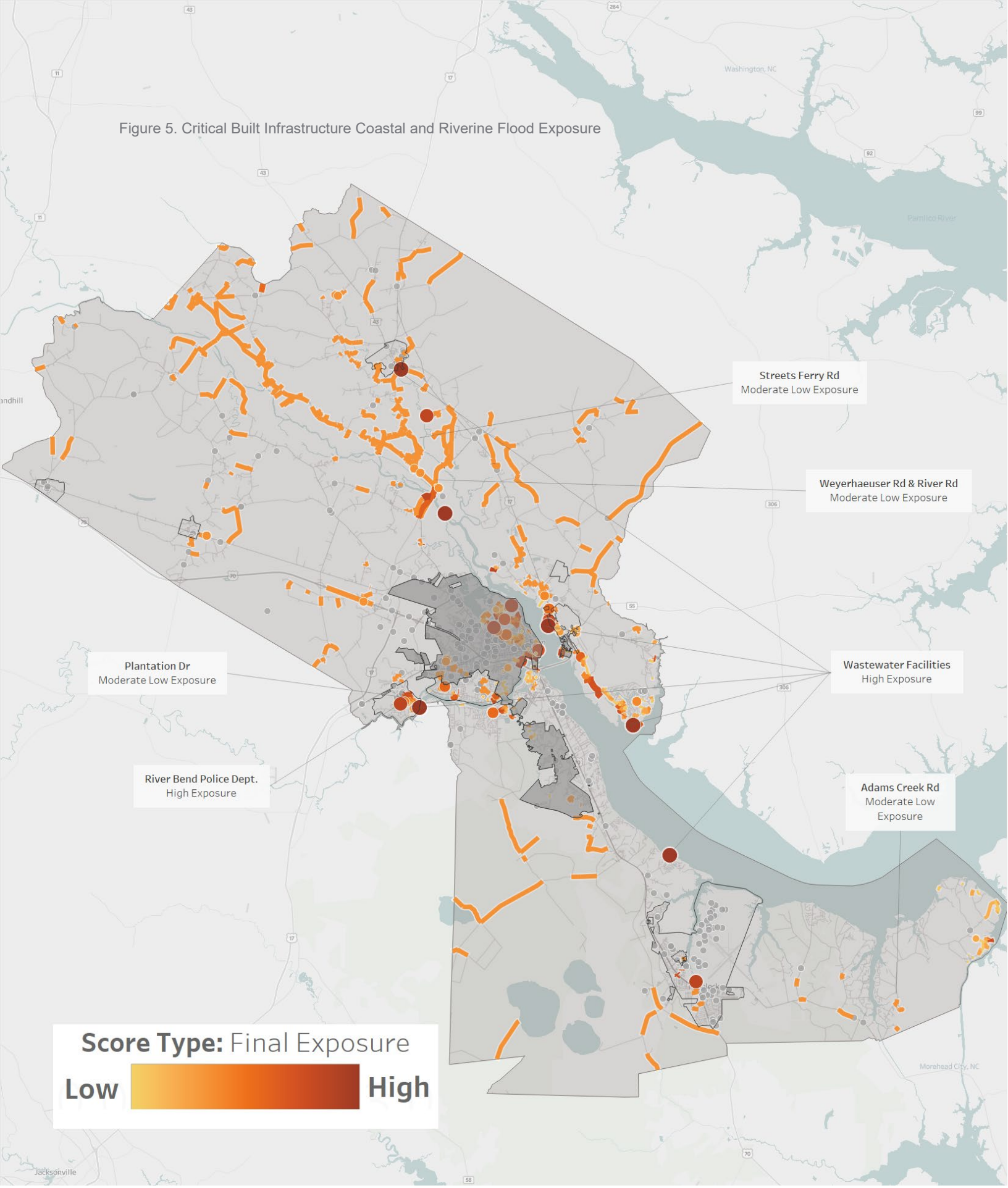
Critical Built Infrastructure assets are assigned an **Exposure Score** from zero (no flood exposure) to three (frequent flood exposure) based on whether it is expected to be exposed to flooding during flood events considered in this assessment. Exposure Scores are determined by considering both present and future flood conditions. Future flood conditions incorporate a 1.3-foot sea level rise scenario to approximate a 30-year projection for 2050.

Assets' Exposure Scores are referenced from low to high exposure, as summarized in Table 2, to facilitate the discussion of these results.

Table 2. Summary of Exposure Scores

ASSET EXPOSURE	EXPOSURE SCORE	POTENTIALLY EXPOSED TO…
High	2.5 and higher	Mean higher high water **or** 10-year flood event
Moderate-High	Between 2 and 2.5	25-year flood event
Moderate	Between 1.5 and 2	50-year flood event
Moderate-Low	Between 1 and 1.5	100-year flood event
Low	Less than 1	500-year flood event
None	Zero	No flood exposure

Figure 5. Critical Built Infrastructure Coastal and Riverine Flood Exposure



4.1.1.1 Site-Level Assets

As summarized in Table 3 below, 38 (18%) critical built infrastructure sites were exposed to coastal or riverine flooding. Of exposed assets, roughly two-thirds exhibited low or moderate-low exposure.

Nine assets face high flood exposure, including seven wastewater facilities. These assets are often located in low-lying areas adjacent to water bodies to discharge treated liquids efficiently. For example, six of the 11 exposed wastewater facilities lie within the mean higher high water (MHHW) under present conditions. The necessity of these facilities to be near water correlates with higher flood exposure but does not immediately suggest that they are vulnerable to potentially adverse impacts. Further review of wastewater facilities, such as structure age and maintenance status, may be required to characterize asset flood exposure and vulnerability.

Overall, assets facing higher exposure are concentrated along the Neuse and Trent Rivers. Among exposed assets, those with the highest overall exposure scores include River Bend Police Department, Havelock Wastewater Treatment Plant, and a public well managed by the Craven County Water Department. This ranking excludes wastewater facilities already exposed to mean higher high water under present conditions. Appendix A contains a complete list of assets and their scores.

Table 3. Summary of Critical Built Infrastructure Asset Exposure

ASSET EXPOSURE	ASSET TYPE*									
	ES	EMS	FS	LE	MD	PS	WW	WA	TOTAL	%
High	0	0	0	1	0	0	7	1	**9**	**4%**
Moderate-High	0	0	0	0	0	0	1	0	**1**	**0.5%**
Moderate	0	0	1	0	2	0	0	0	**3**	**1%**
Moderate-Low	1	0	1	0	3	1	2	4	**12**	**6%**
Low	0	2	1	0	5	0	1	4	**13**	**6%**
None	14	7	29	3	36	14	7	62	**172**	**82%**
Total Assessed	*15*	*9*	*32*	*4*	*46*	*15*	*18*	*71*	*210*	
Total Exposed	**1**	**2**	**3**	**1**	**10**	**1**	**11**	**9**	**38**	
% Exposed	**7%**	**22%**	**9%**	**25%**	**22%**	**7%**	**61%**	**13%**	**18%**	

*ES = Emergency Shelter
EMS = Emergency Medical Services
FS = Fire Station
LE = Law Enforcement
MD = Medical Facility
PS = Public School
WW = Wastewater Facilities
WA = Water Supply

4.1.1.2 Roadways

Approximately 214 miles of roadway in Craven County – approximately 16% of all roadways assessed – are exposed to flooding, as summarized in Table 4. Of exposed roads, the majority exhibited moderate-low or low flood exposure.

Road segments facing high exposure include known problem areas in Craven County, including Weyerhaeuser Road near River Road. Several roads facing high exposure include small municipal-owned roads clustered in River Bend, including Channel Run Drive and Bowline Road. County officials identified several problem areas that exhibit moderate coastal and riverine flood exposure, including the following: Streets Ferry Road, Adams Creek Road, Justin Street, Wintergreen Road, NC Highway 55, River Road, New Liberty Road, West Craven High School Road, and Piney Neck Road. These roadways also likely face rainfall-driven flood exposure that is not captured in this assessment and may require additional analysis to characterize potential hazards.

Appendix A contains a complete list of roadways and their scores organized by individual segments.

Table 4. Summary of Roadway Exposure

ASSET EXPOSURE	ROAD SEGMENTS	ROAD MILES	% TOTAL (MILES)
High	14	1	**0.1%**
Moderate-High	30	3	**0.2%**
Moderate	36	5	**0.4%**
Moderate-Low	726	182	**13%**
Low	228	23	**2%**
None	9753	1167	**84%**
Total Assessed	*10787*	*1381*	
Total Exposed	**1034**	**214**	
% Exposed	**10%**	**16%**	

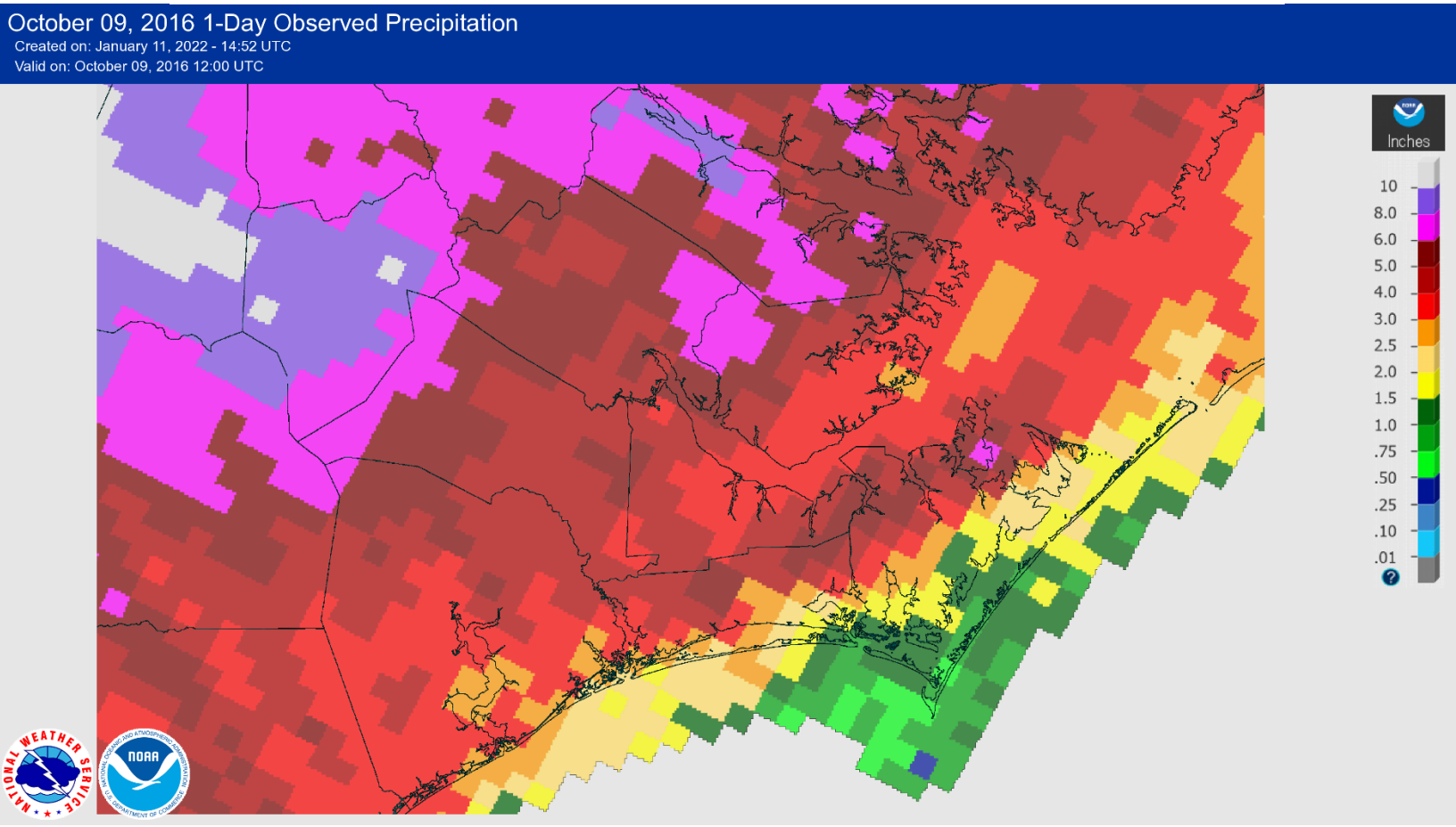
4.1.2 Rainfall-Driven Flood Exposure

Due to limited available data, rainfall-driven flood hazards were not included in the spatial exposure assessment. However, previous events in Craven County can illustrate how this type of flooding can affect the region's critical built infrastructure. In 2016 and 2018, Hurricanes Matthew and Florence produced historic precipitation in North Carolina, resulting in significant flooding.

During Hurricane Matthew, portions of Craven County received up to eight inches of precipitation (Figure 6).[5] Much of the County experienced between three and six inches of rainfall, with higher observed amounts along the Neuse River and in the northwestern portion of Craven County.

The storm led to road flooding and washouts throughout the County, primarily upstream, which prevented many residents and workers from traveling for days after the storm. County officials identified several affected roadways, including Adams Creek Road, Belangia Road, Jeremy Street and Justin Street, Wintergreen Road, NC Highway 55 at Core Creek, River Road near Streets Ferry to State Camp Roads, New Liberty Road, Broad Creek Road, Piney Neck Road near Ward Field Road, Shoreline Drive, and Weyerhaeuser Road near River Road. The County has already identified several projects to improve the drainage and stormwater capacity along these known problem areas.

Figure 6. Rainfall Amounts for Hurricane Matthew



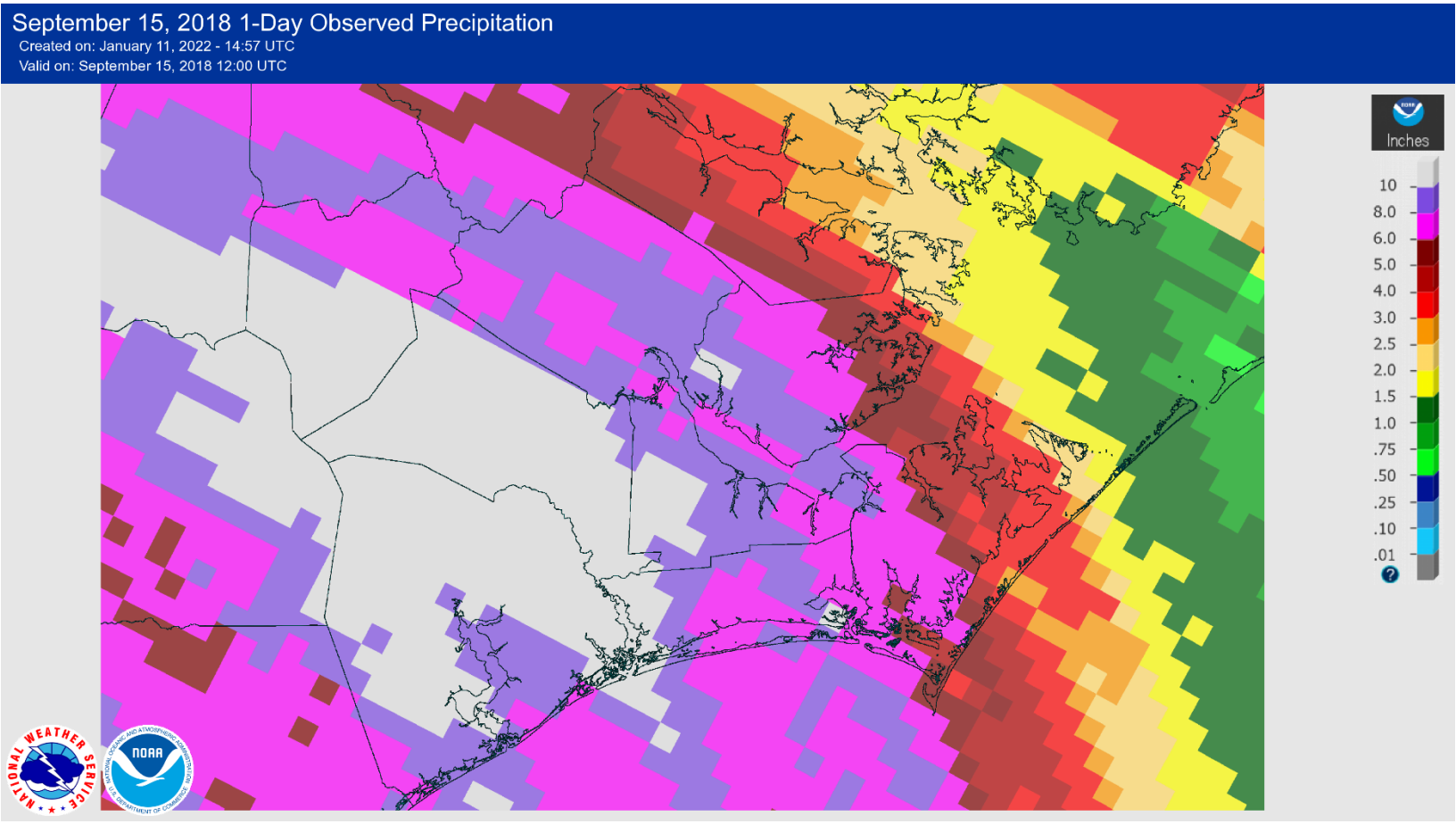
[5] NOAA. 2016. "Quantitative Precipitation Estimates: October 9, 2016 1-Day Observed Precipitation." Retrieved from https://water.weather.gov/precip/

Additionally, County officials identified the following assets as affected by Hurricane Matthew: a fire department in Havelock, the Craven County Water Treatment Plant, West Craven High School, River Bend Wastewater Treatment Plant, and other assets and private businesses not included in this assessment, such as the Cherry Branch-Minnesott Beach Ferry Terminal and the Craven Pamlico Animal Services Center.

During Hurricane Florence, the southern edge of Craven County received more than 10 inches of precipitation within a single day, and large portions of the County received between six and 10 inches (Figure 7).[6] The storm caused the inundation of homes and roadways north of New Bern on the north side of the Neuse River, producing significant damage and causing roads to become impassable.

All assets in Craven County are exposed to rainfall events. However, the vulnerability to adverse impacts depends on multiple factors, such as the event's intensity and duration and the drainage capacity of stormwater infrastructure in the surrounding area. Future assessments may consider these factors to assess individual asset exposure and vulnerability.

Figure 7. Rainfall Amounts for Hurricane Florence



[6] NOAA. 2018. "Quantitative Precipitation Estimates: September 15, 2018 1-Day Observed Precipitation." Retrieved from https://water.weather.gov/precip/

4.1.3 Sensitivity

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.

Sensitivity depends on the physical characteristics and functions of critical built infrastructure, which are shared across asset types. For sites, this metric is determined by answering three questions that illustrate an asset's sensitivity to flooding, using information from the Consequence Analysis Tables for Floods, Hurricanes, and Tropical Storm hazards in the 2020 Pamlico Sound Regional Hazard Mitigation Plan. For each "yes" response, the asset type receives one point. The final score is a sum of the responses to the following three questions:

- If flooded, is the essential service/function likely to be disrupted?
- If flooded, is the asset likely to endure physical damage?
- If flooding caused damage or disruption, would the asset likely be offline longer than 24 hours?

For roadways, sensitivity was determined using storm surge inundation data provided by the NC Department of Transportation. This dataset included road segment elevations and flood depths for multiple storm surge conditions. The assessment selected storm surge levels that align with observations recorded during Hurricanes Matthew (2016) and Florence (2018).

Based on this process, assets were assigned Sensitivity Scores from zero (low potential for damage) to three (high potential for damage), as outlined in Table 5. Many critical built infrastructure assets exhibit high sensitivity to flooding, including many smaller road segments throughout the County. If flooded, these assets may be unable to perform essential functions. For example, a flooded emergency shelter may be unsafe to occupy, or a flooded roadway may be impassable for vehicles. Some assets, like water supplies, may not experience physical damage like other critical built infrastructure and accordingly receive lower scores.

Table 5. Summary of Sensitivity Scores

ASSET SENSITIVITY	DESCRIPTION	SENSITIVITY SCORE
High	Significant potential for damage and disruption during a flood	3
Moderate-High	Some potential for damage or disruption during a flood	2
Moderate-Low	Limited potential for damage or disruption during a flood	1
Low	Unlikely to experience damage or disruption	Zero
Not Scored	Not exposed	None

4.1.4 Adaptive Capacity

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 Score** is determined by answering three questions that illustrate an asset's adaptive capacity. For each question answered "yes," the asset type receives one point. The final score is a sum of each "yes" response to the following three questions:

- Are relevant high priority mitigation strategies identified in recent community plans?
- Can the asset be relocated?
- Is the asset located in a community with at least a moderate capability to mitigate risk from and vulnerability to hazards?

Based on this assessment, assets are assigned an Adaptive Capacity from zero (low ability to change characteristics or behaviors) to three (high ability), as outlined in Table 6. Many site-level assets can technically be relocated without compromising their functions, while others, like wastewater facilities, can withstand increased water levels. Assets that cannot be easily relocated, like roads or water supplies, are assigned lower adaptive capacity scores.

Table 6. Summary of Adaptive Capacity Scores

ASSET ADAPTIVE CAPACITY	DESCRIPTION	ADAPTIVE CAPACITY SCORE
High	Asset behaviors, functions, **and** asset location can be modified to better withstand coastal hazards	3
Moderate-High	Asset behaviors, functions, **or** asset location can be modified to better withstand coastal hazards	2
Moderate-Low	Modification of asset behaviors, function, or location may be possible	1
Low	Modification of asset behaviors, function, or location is difficult or not feasible	Zero
Not Scored	Note exposed	None

4.1.5 Vulnerability Assessment Results

After assessing exposure, sensitivity, and adaptive capacity, the vulnerability of assets can be determined. Based on the framework in Figure 8 (for reference only; identical to Figure 2), assets can receive potential **Vulnerability Scores** from a high of six (high vulnerability) to a low of negative three (low vulnerability).

Figure 8. Components of Vulnerability (Identical to Figure 2)

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 flooding.*

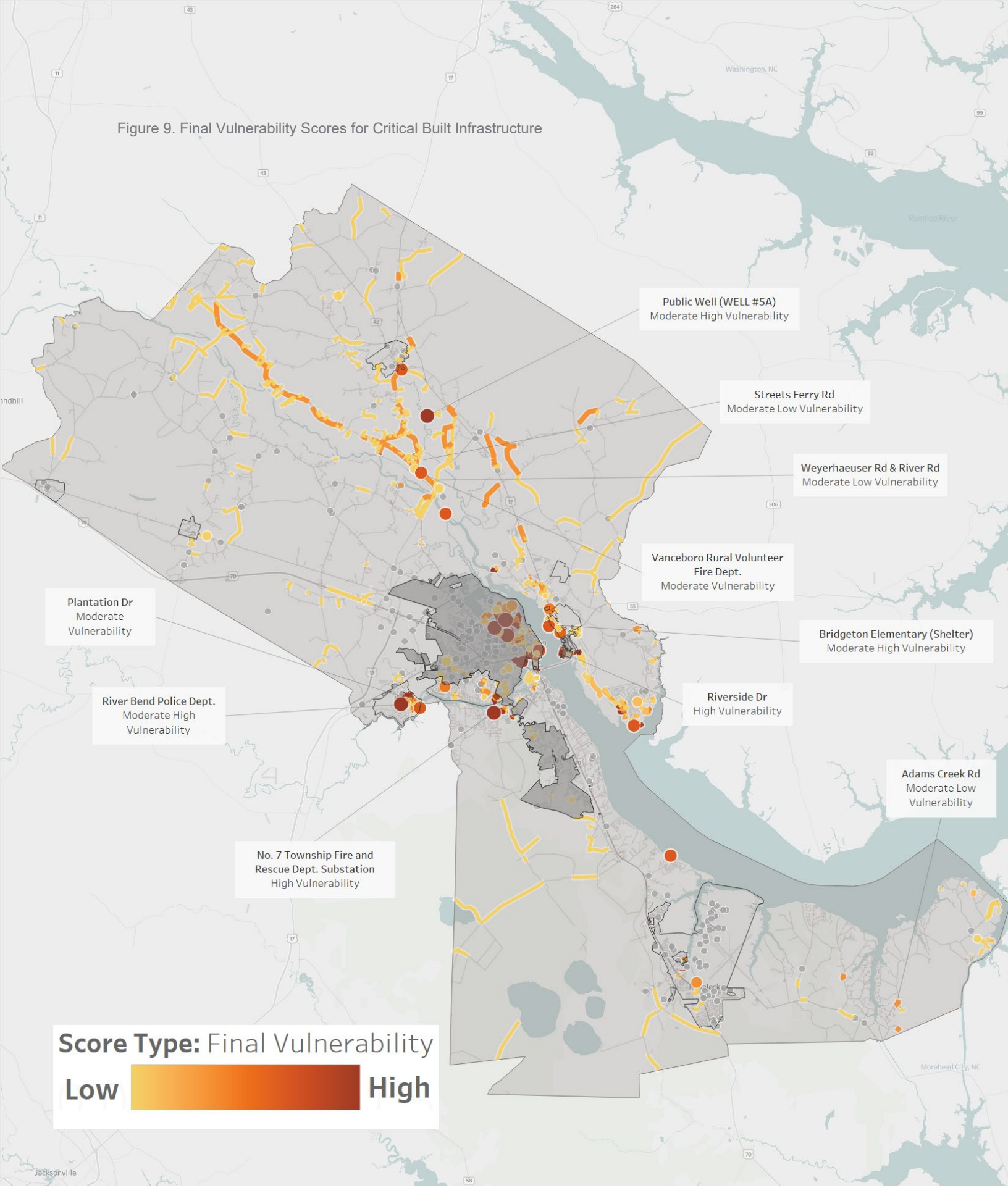
The assessment produced a range of Vulnerability Scores from a low of -1.3 to a high of 1.7 for site-level assets and -1.83 to 3.5 for roadways. To facilitate the discussion of these results, asset Vulnerability Scores are referenced from low to high vulnerability relative to the actual range of results, summarized in Table 7.

As illustrated in Figure 9, assets in Craven County with higher Vulnerability Scores tend to be clustered along the Neuse and Trent Rivers.

Table 7. Summary of Vulnerability Scores

ASSET VULNERABILITY	VULNERABILITY SCORE
High	Greater than 1.5
Moderate-High	Between 1 and 1.5
Moderate	Between 0.5 and 1
Moderate-Low	Between 0 and 0.5
Low	Less than zero
Not Scored	None (Not Exposed)

Figure 9. Final Vulnerability Scores for Critical Built Infrastructure



4.1.5.1 Site-Level Assets

As summarized in Table 8, the majority of Craven County's exposed assets exhibit low or moderate-low vulnerability to coastal hazards. Of the County's assets, one facility faces high vulnerability to flooding: the No. 7 Township Fire Department Substation, located on Brices Creek Road.

Among the three assets facing moderate-high vulnerability, Bridgeton Elementary School (in its capacity as a potential emergency shelter) is expected to face increasing flood exposure in the future. Previously, Craven County has identified needs related to constructing new shelters and upgrading existing ones to withstand future hazards. Other assets facing moderate-high vulnerability include the River Bend Police Department and a public well managed by the Craven County Water Department. Appendix A contains a complete list of assets and their scores.

Table 8. Summary of Critical Built Infrastructure Asset Vulnerability

ASSET VULNERABILITY	ASSET TYPE*									
	ES	EMS	FS	LE	MD	PS	WW	WA	TOTAL	%
High	0	0	1	0	0	0	0	0	**1**	**0.5%**
Moderate-High	1	0	0	1	0	0	0	1	**3**	**1%**
Moderate	0	0	2	0	2	0	6	0	**10**	**5%**
Moderate-Low	0	0	0	0	1	1	2	2	**6**	**3%**
Low	0	2	0	0	7	0	3	6	**18**	**9%**
Not Scored	14	7	29	3	36	14	7	62	**172**	**82%**
Total Assets	*15*	*9*	*32*	*4*	*46*	*15*	*18*	*71*	*210*	
Total Scored	**1**	**2**	**3**	**1**	**10**	**1**	**11**	**9**	**38**	

*ES = Emergency Shelter
EMS = Emergency Medical Services
FS = Fire Station
LE = Law Enforcement
MD = Medical Facility
PS = Public School
WW = Wastewater Facilities
WA = Water Supply

4.1.5.2 Roadways

Approximately seven miles of roadway in Craven County face at least moderate vulnerability to coastal hazards, as outlined in Table 9. Many roadways experiencing moderate-high and high vulnerability include municipal, private, and non-system segments clustered in River Bend or along the Neuse River. Craven County has previously identified needs related to road access in River Bend, particularly along Shoreline Drive. This road and others likely face rainfall-driven flood exposure that is not captured in this assessment and may require additional analysis to characterize potential hazards.

Appendix A contains a complete list of roadways and their scores organized by individual segments.

Table 9. Summary of Roadway Vulnerability

ASSET VULNERABILITY	ROAD SEGMENTS	ROAD MILES	% TOTAL (MILES)
High	35	3	**0.2%**
Moderate-High	27	2	**0.1%**
Moderate	19	2	**0.1%**
Moderate-Low	245	42	**3%**
Low	708	166	**12%**
None	9753	1167	**84%**
Total Assessed	*10787*	*1381*	
Total Scored	**1034**	**215**	

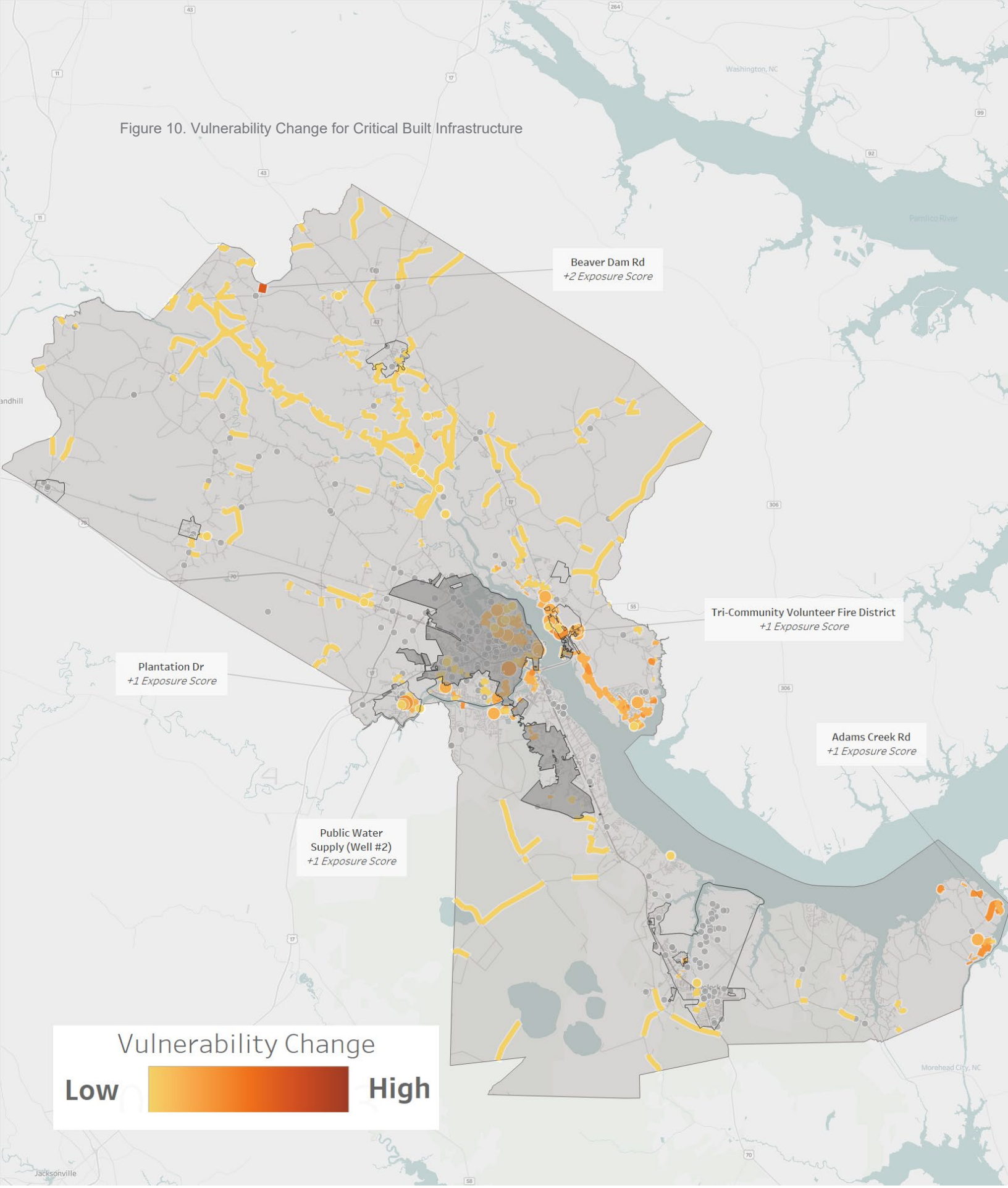
4.1.5.3 Vulnerability Change Over Time

The assessment of both present and future flood conditions allows Vulnerability Scores to be calculated under both present and future conditions. Future flood conditions are approximated by using floodplain data that incorporates a 1.3-foot (40 centimeters) sea level rise scenario to estimate coastal flood hazards for 2050.

By comparing present and future Vulnerability Scores, Craven County can identify assets and areas expected to face growing vulnerabilities to coastal hazards in the coming decades. Figure 10 depicts the change in Vulnerability Scores by subtracting the Present Vulnerability Score from the Future Vulnerability Score. Assets with a higher resultant number are expected to face increased vulnerability to coastal hazards.

Of exposed site-level assets, those exhibiting the highest increases in vulnerability include a public well located in River Bend, the Tri-Community Volunteer Fire District in Bridgeton, and several private medical facilities, also located in or near Bridgeton. Roadways facing increased vulnerability are clustered in River Bend, Trent Woods, and Fairfield Harbour. Among these, Adams Creek Road faces moderate-low vulnerability to coastal and riverine flooding but may face increasing vulnerability in the future. This roadway flooded during Hurricane Matthew and likely faces additional rainfall-driven flood exposure not captured in this assessment.

Figure 10. Vulnerability Change for Critical Built Infrastructure



4.2 Natural Infrastructure

4.2.1 Exposure, Sensitivity, and Adaptive Capacity

An ecosystem's vulnerability to flooding depends on the type of ecosystem and its surrounding landscapes. Some natural infrastructure can dynamically respond to rising salinity and sea levels to a certain extent. Evaluating the vulnerability of these systems requires complex models that consider multiple factors which affect an ecosystem's ability to adapt to changing conditions. This assessment aims to measure the vulnerability of natural infrastructure by estimating the potential land loss due to rising sea levels between now and future conditions.

This assessment leverages NOAA's SLAMM to identify changes in marsh land cover. This model provided baseline land cover and projected land cover for multiple future conditions based on net sea level rise. As sea levels rise, higher elevations will face more frequent flooding, allowing some marshes to migrate landward. Meanwhile, lower elevations will face such frequent inundation that marshes will no longer thrive, becoming lost to open water.

SLAMM effectively incorporates a habitat's exposure, sensitivity, and adaptive capacity into one metric: projected habitat loss to open water due to sea level rise. The Vulnerability Score for Natural Infrastructure represents the percentage of existing habitat lost to open water under future conditions. The 1.5-foot increment was selected for this assessment because it most closely aligns with the sea level rise projection to assess the future vulnerability of critical built infrastructure. This 1.5-foot increment approximates a 30-year projection for roughly 2050.

4.2.2 Vulnerability Results

Existing natural infrastructure in Craven County consists of primary non-tidal wetlands along the upper Neuse River and its tributaries and upland habitats in inland areas. Tidal wetlands and unconsolidated shores lie south of New Bern, where the Neuse River turns from brackish to a tidal estuary.

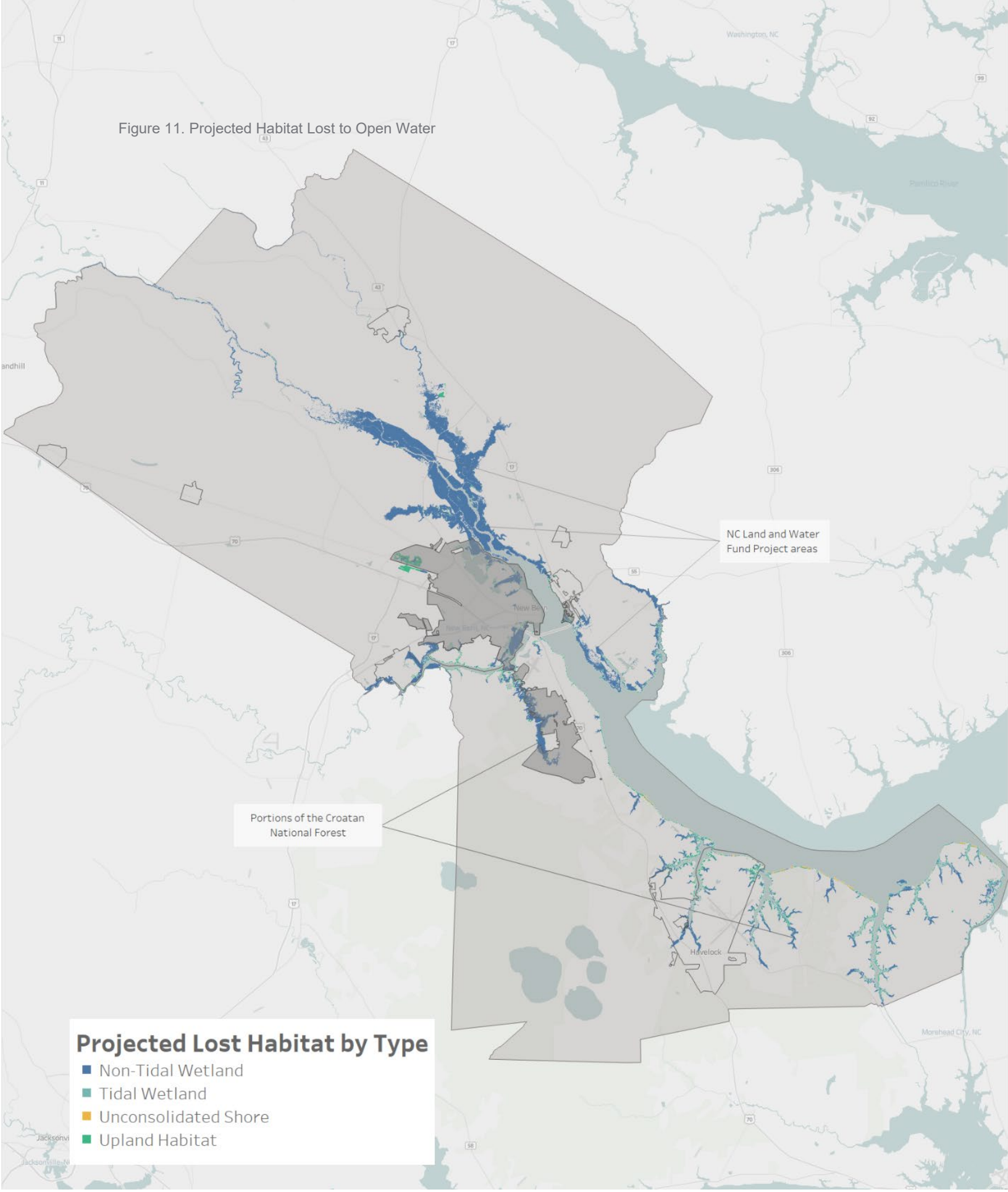
By 2050, Craven County is projected to lose more than 10,000 acres of natural infrastructure to open water. Of affected habitats, tidal wetlands and unconsolidated shores are projected to experience the most dramatic impacts (Figure 11). Roughly 630 of the existing 1,400 acres of tidal wetlands are expected to be lost to open water, a habitat loss of nearly 46%. Craven County contains just 38 acres of unconsolidated shores, which include sandy beaches and tidal mud flats. Nearly all of the County's unconsolidated shore habitat is expected to be lost to open water under future conditions. Overall, projected habitat loss is more concentrated along the upper reaches of the Neuse River, where there are extensive non-tidal wetlands. The total land loss represents approximately 2% of Craven County's total habitat acres.

Table 10. Habitat Loss by Type

HABITAT TYPE	STARTING ACREAGE	ACREAGE LOST	% LOST	VULNERABILITY
Non-Tidal Wetland	176,494	8,702	5%	Low
Tidal Wetland	1,378	631	46%	Moderate
Unconsolidated Shore	38	38*	98%*	High
Upland Habitat	235,357	730	< 1%	Moderate
Total Habitat Acres	413,265	**10,100**	2%	

*The acreage loss of unconsolidated shore was roughly 37.5 acres, rounded to 38 acres. The percent loss reflects habitat loss using raw numbers.

Figure 11. Projected Habitat Lost to Open Water



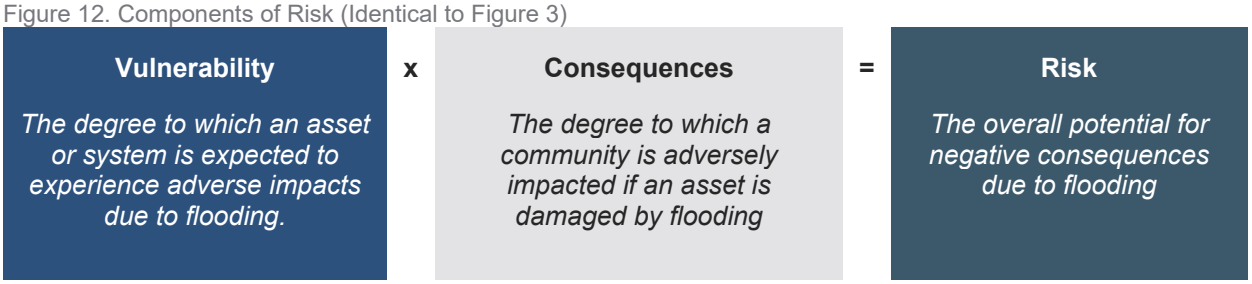
5.0 Estimate Risk

5.1 Critical Built Infrastructure

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. These metrics are converted into scores ranging from zero to three that are 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 12 (for reference only; identical to Figure 3).

Figure 12. Components of Risk (Identical to Figure 3)



5.1.1 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.[7] 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.

Based on the CDC SVI, the northwestern portions of the County, which includes Vanceboro, Cove City, and Dover, exhibit higher social vulnerability. Other areas exhibiting higher social vulnerability include Trent Woods, Bridgeton, James City to the east of US Route 70, and south of Havelock. These communities may require additional assistance or services, potentially provided by critical assets, before, during, or after a flood event.

Table 11. Summary of Social Vulnerability Scores

SOCIAL VULNERABILITY	INCLUDES…	SOCIAL VULNERABILITY SCORE
High	75th percentile and higher	3
Moderate-High	Between 50th and 75th percentile	2
Moderate-Low	Between 25th and 50th percentile	1
Low	Less than 25th percentile	Zero

[7] 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

5.1.2 Criticality

5.1.2.1 Site-Level Assets

For site-level assets, criticality is determined by sourcing the structure value from building footprint data. Some assets, like water supplies and wastewater treatment facilities, could not be assigned to a building footprint. This metric assumes that structures with higher values are more critical to the surrounding community. Additionally, an asset's value can illustrate the scale of potential costs required to repair or replace the structure if damaged in a flood.

Table 12 summarizes structure values across asset types, noting how many assets those values could be determined. The total value of critical built infrastructure sites at risk of potential coastal hazards exceeds $3.7 million. This figure likely underestimates the total value of assets, including the services provided to the surrounding community. To produce a Risk Score for each asset, these values were converted into scores from zero (low) to three (high) to produce an **Asset Criticality Score**. Assets for which a value could not be determined received a score of zero, as outlined in Table 13.

Table 12. Summary of Exposed Assets and Values

TYPE	NUMBER EXPOSED	VALUE DETERMINED*	TOTAL VALUE*
Emergency Shelter	1	1	$361,104
EMS	2	2	$950,725
Fire Station	3	3	$392,782
Law Enforcement	1	1	$116,625
Medical Facility	10	9	$1,528,120
Public School	1	1	$361,104
Wastewater Facilities	11	0	*
Water Supply	9	0	*
Total	**38**	**17**	**$3,710,460**

* Structure values could not be determined for 21 exposed assets. Specifically, the location of wastewater facilities and water supplies could not be applied to specific structures. Further review of these assets may be required to determine asset value and potential economic risk.

Table 13. Summary of Asset Value (Criticality) Scores

CRITICALITY	INCLUDES…	CRITICALITY SCORE
High	Greater than $500,000	3
Moderate-High	Between $250,000 and $500,000	2
Moderate-Low	Less than $250,000	1
Low	No value determined	Zero

5.1.2.2 Roadways

For roadways, criticality is determined by the road segment's functional classification, 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 14.

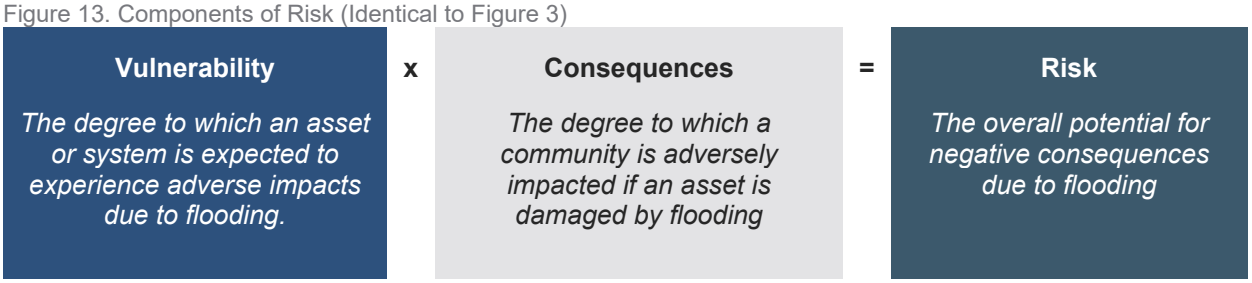
Table 14. Summary of Road Criticality Scores

CRITICALITY	INCLUDES…	CRITICALITY SCORE
High	Interstates, highways	3
Moderate	Minor arterials, major collectors	2
Low	Local roads	1

5.1.3 Risk Assessment Results

After assessing vulnerability and consequences, assets are assigned **Risk Scores** that characterize the potential for adverse consequences if the asset were flooded. Based on the equation presented in Figure 13 (for reference only; identical to Figure 3), assets can receive potential Risk Scores from a high of 12 (high risk) to a low of negative three (low risk). Because a negative Vulnerability Score is possible, negative Risk Scores are also possible. However, a negative score does not indicate an asset would be unaffected or resistant to actual flood events. Instead, an asset with a negative score can be interpreted as facing lesser coastal hazards risks than other assets examined in this assessment.

Figure 13. Components of Risk (Identical to Figure 3)



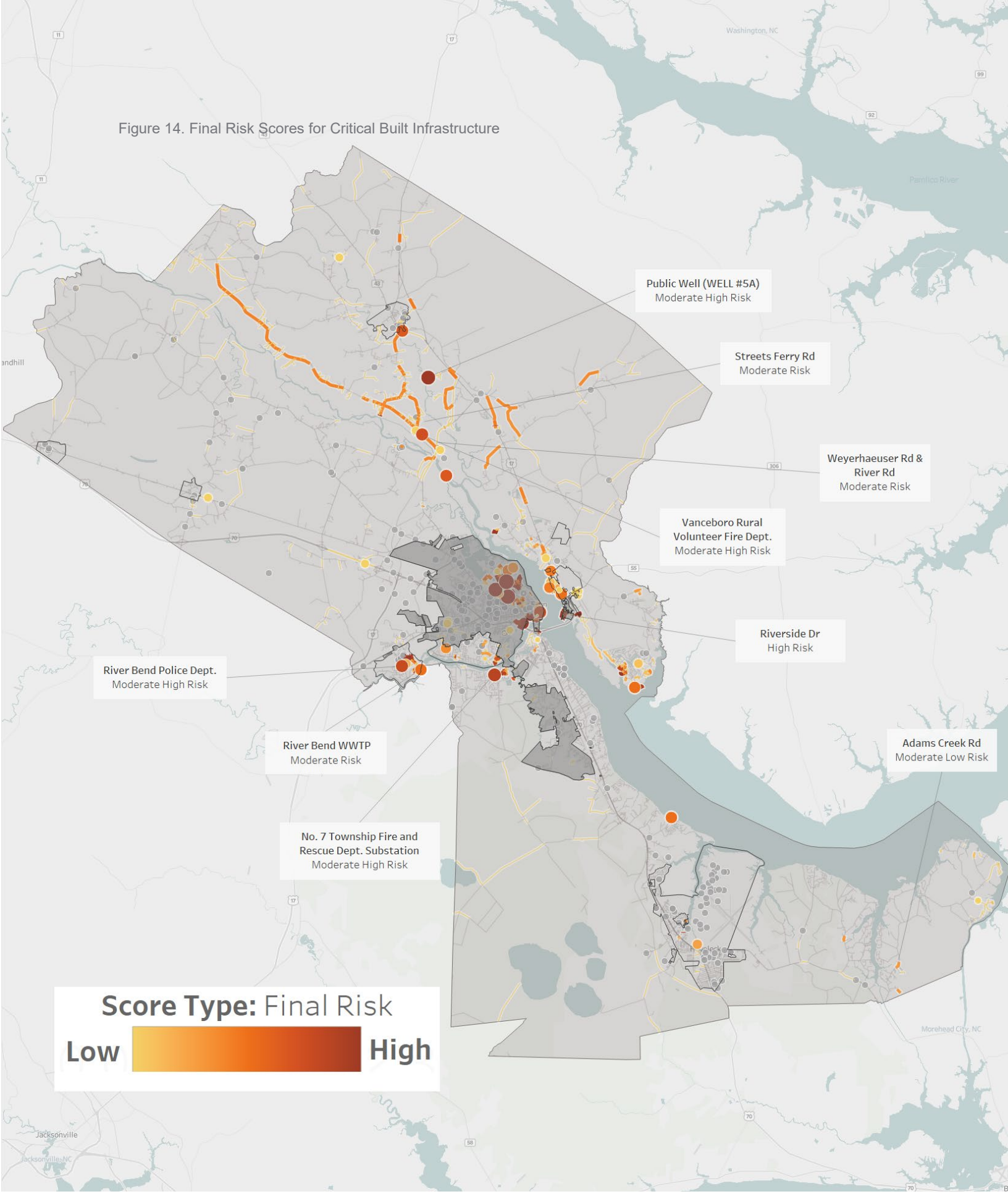
The actual assessment produced a range of Risk Scores from a low of -1.25 to a high of 2.25 for site-level assets and a range of zero to 4.7 for roadways. To facilitate the discussion of these results, assets' Risk Scores are referenced from low to high risk relative to the actual range of results, summarized in Table 15.

As depicted in Figure 14, assets in Craven County with higher Risk Scores are concentrated along the Neuse and Trent Rivers. This pattern is consistent with previous results showing that these assets exhibit higher exposure and vulnerability to coastal hazards.

Table 15. Summary of Risk Scores

ASSET RISK	RISK SCORE
High	Greater than 2.25
Moderate-High	Between 1.5 and 2.25
Moderate	Between 0.75 and 1.5
Moderate-Low	Between 0 and 0.75
Low	Less than zero
Not Scored	None (Not Exposed)

Figure 14. Final Risk Scores for Critical Built Infrastructure



5.1.3.1 Site-Level Assets

As summarized in Table 16, the majority of Craven County's exposed assets exhibit low or moderate-low risk to coastal hazards. No facilities face high risk.

Five assets exhibit moderate-high risk, including the River Bend Police Department, a substation for the No. 7 Township Fire and Rescue Department, Vanceboro Rural Volunteer Fire Department, Bridgeton Elementary (in its capacity as a potential emergency shelter), and a public well managed by the Craven County Water Department. Previously, Craven County has identified needs related to accessing critical facilities, particularly fire departments, and ensuring backup power during floods and other hazard events. Appendix A contains a complete list of assets and their scores.

Table 16. Summary of Critical Built Infrastructure Asset Risk

ASSET RISK	ASSET TYPE*									
	ES	EMS	FS	LE	MD	PS	WW	WA	TOTAL	%
High	0	0	0	0	0	0	0	0	0	**0%**
Moderate-High	1	0	2	1	0	0	0	1	**5**	**2%**
Moderate	0	0	1	0	2	0	6	0	**9**	**4%**
Moderate-Low	0	0	0	0	1	1	2	2	**6**	**3%**
Low	0	2	0	0	7	0	3	6	**18**	**9%**
Not Scored	14	7	29	3	36	14	7	62	**172**	**82%**
Total Assessed	*15*	*9*	*32*	*4*	*46*	*15*	*18*	*71*	*210*	
Total Scored	**1**	**2**	**3**	**1**	**10**	**1**	**11**	**9**	**38**	

*ES = Emergency Shelter
EMS = Emergency Medical Services
FS = Fire Station
LE = Law Enforcement
MD = Medical Facility
PS = Public School
WW = Wastewater Facilities
WA = Water Supply

5.1.3.2 Roadways

As outlined in Table 17, approximately five miles of roadways within Craven County exhibit moderate-high or high risk of coastal or riverine flood hazards. Many roadways experiencing moderate-high and high risk include municipal, private, and non-system segments clustered in River Bend or along the Neuse River. Craven County officials have noted that River Bend has limited ingress and egress, and ensuring continuous road accessibility in this area is crucial, particularly for Shoreline Drive.

Several identified problem areas for the County – including Streets Ferry Road, River Road, and Weyerhaeuser Road – exhibit moderate risk to coastal hazards and may likely experience additional rainfall-driven flooding that is not captured in this assessment. Appendix A contains a complete list of roadways and their scores organized by individual segments.

Table 17. Summary of Roadway Risk

ASSET RISK	ROAD SEGMENTS	ROAD MILES	% TOTAL (MILES)
High	20	2	**0.1%**
Moderate-High	42	3	**0.2%**
Moderate	164	31	**2%**
Moderate-Low	100	13	**1%**
Low	708	166	**12%**
None	9753	1167	**84%**
Total Assessed	*10787*	*1381*	
Total Scored	**1034**	**215**	

5.1.3.3 Risk Change Over Time

The assessment of present and future flood conditions allows Risk Scores to be calculated under present and future scenarios. Future flood conditions are approximated using floodplain data that incorporates a 1.3-foot (40 centimeters) sea level rise scenario to estimate coastal flood hazards for 2050.

The comparison of present and future Risk Scores can support the identification of assets and areas that are expected to face increased risk. Figure 15 illustrates the change in Risk Scores by subtracting the Present Risk Score from the Future Risk Score. Assets with a higher resultant number are expected to face an increased risk of coastal hazards.

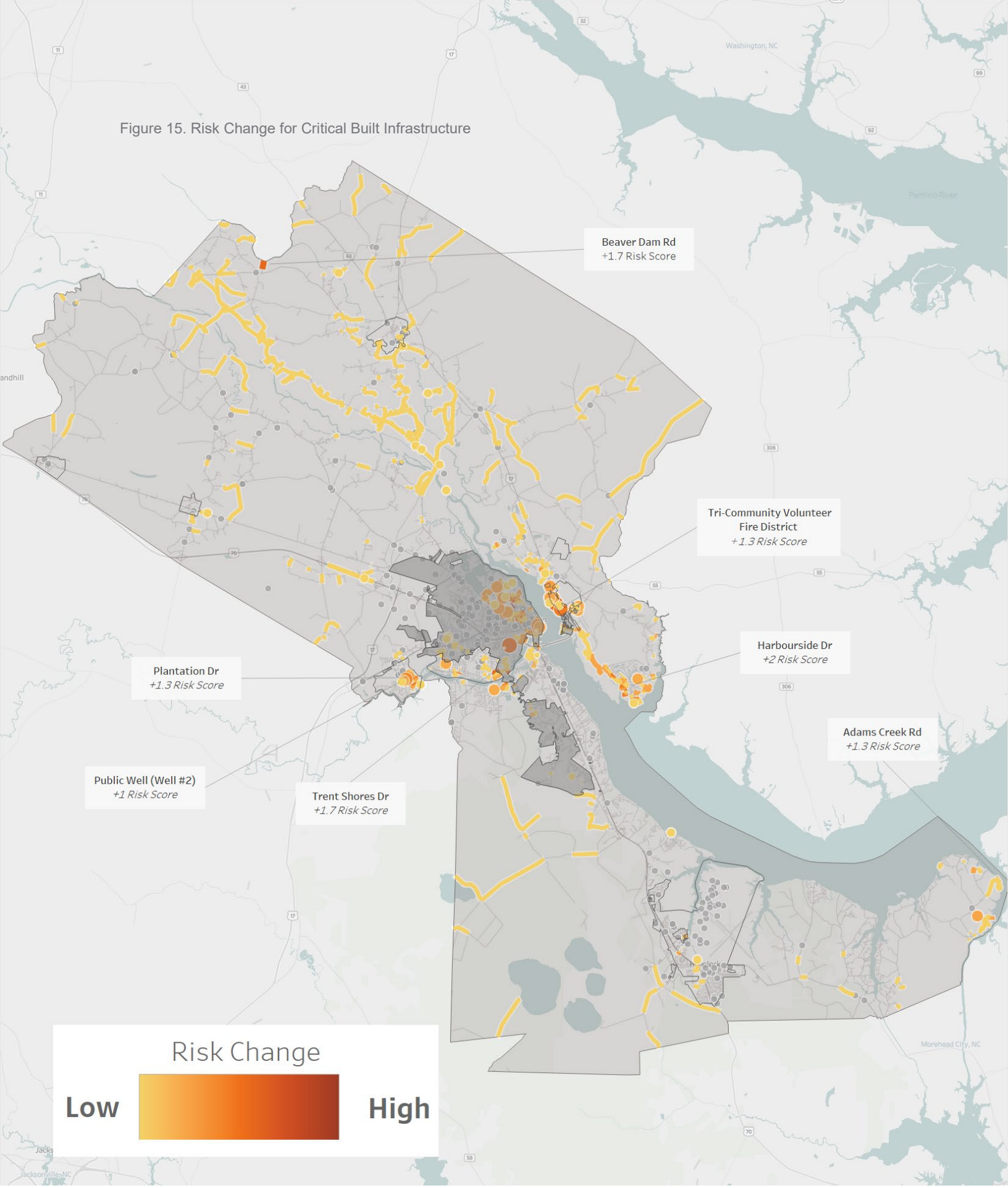
Site-level assets exhibiting the highest increases in risk include a private medical facility near New Bern, the Tri-Community Volunteer Fire District in Bridgeton, a public well in River Bend, and Bridgeton Elementary School (in its capacity as a potential emergency shelter). These assets are expected to face increased flood exposure, which may lead to increased risk if no mitigating actions are taken.

Road segments expected to face increased risk are clustered in River Bend, Trent Woods, and Fairfield Harbour. Among these, Adams Creek Road faces a moderate-low risk of coastal and riverine flooding but may experience increased exposure in the future, leading to heightened risk. This roadway flooded during Hurricane Matthew and likely faces additional rainfall-driven flood exposure not captured in this assessment.

5.2 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.

Figure 15. Risk Change for Critical Built Infrastructure



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:

- **Building Characteristics** – Refine the vulnerability assessment to incorporate more specific building characteristics, such as base floor elevation, or site-specific information, such as the existence of mitigation projects.
- **Natural Infrastructure** – Incorporate complex modeling of impacts to natural infrastructure, including ecosystem service valuation.
- **Rainfall-Driven Flood Hazards** – Conduct a pluvial flood analysis of Craven 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.
- **Climate-Influenced Hazards** – Consider additional climate-influenced hazards included in the 2020 Pamlico Sound Regional Hazard Mitigation Plan, such as extreme heat, and based on priorities as identified by the County.

7.0 Next Steps

The final Risk and Vulnerability Scores serve as inputs to RCCP Phase 2, through which Craven County 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 D

COMMUNITY PROJECT PORTFOLIO

MAY 2022

Dewberry

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, has been synthesized from previous local and regional planning efforts, input from the Community Action Team, and feedback from the public.

Included in this Appendix 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:

LOCATION	The geographic location and scope of the project.
HAZARD(S) ADDRESSED	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. 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 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.
ESTIMATED PROJECT TIMELINE	An estimated timeline to complete the project, including notes on any expected delays in the timeline.
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.

Each project sheet includes a proposed map of the project area and photos of potential sites to be addressed, where available.

Proposed Project Summary

CRAVEN COUNTY		RESILIENT COASTAL COMMUNITIES PROGRAM PROJECT PORTFOLIO								UPDATED MAY 2022
Project (Priority #)	Project Title	Description	Location	Anticipated Cost	Funding Status	Needs Addressed	NNBS Opportunity	Source Document	Timeline	Notes/ Project Status
1	Targeted Repetitive Flooding Drainage Assessment	Conduct regular assessments and improvements of drainage infrastructure across the County, with a focus on sites that are known to flood. Implement improvements including (but not limited to) infiltration swales, culvert and pipe replacements, retention facilities, and other options. Emphasis will be placed on natural or nature-based solutions where practicable.	County-wide	Varies based on location needs and solutions to be implemented.	Not currently funded.	Stormwater Management, Flooding	Yes	Craven County CAT.	Varies based on location needs and solutions to be implemented. Intended as ongoing program.	Initial streets identified include River Road, Streets Ferry Road, and High Bridge Road; other locations will be identified and included in the program. Program could include improvements for both stormwater treatment and floodwater retention, including identification and purchase of vacant parcels that could be used for stormwater retention.
2	Stormwater Flood Reduction Projects	Implement natural/nature-based projects at select roadway/stream crossings across the County, building upon existing efforts underway through a cost-share program with the NC Department of Agriculture.	County-wide	Varies based on location needs and solutions to be implemented.	One project funded through cost-share program (to be completed in June). Further funding TBD.	Disaster Recovery, Infrastructure Deficiency or Capacity	Yes	Craven County CAT.	Varies based on location needs and solutions to be implemented. Intended as ongoing program.	Initial locations identified include Taylor Farm Road and Smith Farm Road at Clubfoot Creek. Project is intended to address erosion control needs throughout the County.
3	CAMA Land Use Plan Update	The previous Craven County CAMA Land Use Plan (LUP) was approved in 2009. Update the CAMA LUP and incorporate the resiliency measures identified through the Resilient Coastal Communities Program into the LUP.	County-wide	Anticipated cost between $100,000 - $200,000, depending upon level of effort required.	Not currently funded.	Stormwater Management, Flooding, Infrastructure Deficiency or Capacity, Disaster Recovery		Craven County CAT.	Anticipated up to one year needed for plan completion.	The prior Land Use Plan was approved in 2009, but an update is needed to incorporate resilience measures identified under the RCCP, the 2017 Hurricane Matthew Resilient Redevelopment Plan, and other recent efforts.
4	Shoreline Drive Alternate Access	Work with the Town of River Bend to construct a new transportation facility (roadway on new location) to provide a second means of access to the town.	Shoreline Drive	Anticipated construction cost approximate $2 million, based on FEMA BRIC application.	FEMA BRIC application submitted, under consideration.	Stormwater Management, Flooding, Infrastructure Deficiency or Capacity		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 1-3 year timeline.	The Town of River Bend is accessible primarily by only one road, Shoreline Drive, which floods frequently from the overtopping of a nearby canal. Determine the feasibility of designing and constructing a new road to connect the west end of Plantation Drive to Old Pollocksville Road to provide a second means of ingress/egress to the Town of River Bend.

CRAVEN COUNTY		RESILIENT COASTAL COMMUNITIES PROGRAM PROJECT PORTFOLIO								UPDATED MAY 2022
Project (Priority #)	Project Title	Description	Location	Anticipated Cost	Funding Status	Needs Addressed	NNBS Opportunity	Source Document	Timeline	Notes/ Project Status
5	Improve Existing/ Construct Alternate Crop Buying Facility	Work with NCDOT to elevate access roads to the current Crop Buying Facility; identify potential location for a new facility so harvested crops can still be stored during times of flooding.	8542 Main Street, Vanceboro, NC	A 2017 effort estimated a cost of $1 million or higher, depending upon solution.	Not currently funded.	Stormwater Management, Flooding, Infrastructure Deficiency or Capacity, Disaster Recovery		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 1-3 year timeline.	Farmers are not able to take harvested crops to the storage facility, and the storage facility is not able to get stored crops out to distributors. Proposal is to elevate access roads leading to the facility out of the 100-year floodplain and identify a location outside of the SFHA where an alternate facility could be constructed and construct an alternate facility. Determine the feasibility of constructing on-site storage (e.g., silos) at farms and construct facilities at feasible locations. Outreach with farming community needed to determine the extent that facility would be used (both during and outside of disaster events).
6	Elevation of Weyerhaeuser Road	Work with NCDOT to elevate the roadway and train tracks near River Road above the floodplain to decrease the flooding risk.	Weyerhaeuser Road Near River Road and Elevated Train Tracks	A 2017 effort estimated a cost of $1 million or higher, depending upon solution.	Not currently funded. County has continued to advise NCDOT and regional MPO of project necessity.	Stormwater Management, Flooding, Infrastructure Deficiency or Capacity, Disaster Recovery		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 1-3 year timeline.	Requires coordination with NCDOT. Roadways and road crossings on Weyerhaeuser Road flood and act as bottlenecks for water flows, resulting in inundation of the surrounding area. Elevate the roadway and railroad tracks above the floodplain and install pipes as needed to remove the bottleneck. An H&H Study should be completed as part of the project to ensure that removing the bridges, which act as bottlenecks to Swift Creek, will not adversely impact downstream areas such as New Bern.
7	Elevation of Adams Creek Road and Belangia Road Intersection	Work with NCDOT to elevate intersection or to resize culverts to prevent flooding and to ensure the fire station remains accessible.	Fire Department on Belangia Road	A 2017 effort estimated a cost of $1 million or higher, depending upon solution.	Not currently funded.	Stormwater Management, Flooding, Infrastructure Deficiency or Capacity, Disaster Recovery		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 1-2 year timeline.	Requires coordination with NCDOT. Project is intended to alleviate flooding within area and to address emergency services response times following storm events, which can be impacted by damaged infrastructure.
8	Emergency Shelter Construction and Retrofits	New emergency shelters would be constructed and existing shelters would be brought up to code, including the installation of generators. Develop new shelter sites throughout the county to address regional needs, and consider locations for large animal sheltering needs.	Havelock High School, Creekside Elementary, Ben E. Quinn Elementary, New Bern High School, Farmlife Elementary	To be determined.	Not currently funded. State hazard mitigation funds may be used for generators.	Infrastructure Deficiency or Capacity		Combination of projects listed in the Hurricane Matthew Resilient Redevelopment Plan; Included in public survey	Dependent upon the scope of construction and the determination of new shelter sites.	The State Hazard Mitigation Program has notified the County that generators will be available, but cost increases for generators may limit the number available. When planning new shelter facilities, consideration would be given for animal and large animal sheltering needs. Uninterrupted generator service is already planned.

CRAVEN COUNTY		RESILIENT COASTAL COMMUNITIES PROGRAM PROJECT PORTFOLIO								UPDATED MAY 2022
Project (Priority #)	Project Title	Description	Location	Anticipated Cost	Funding Status	Needs Addressed	NNBS Opportunity	Source Document	Timeline	Notes/ Project Status
9	Update Large Animal Response Plan	In conjunction with the County-wide shelter updates, develop an update to the County's Large Animal Response Plan. The plan would focus on "hobby" (non-farmer) animal owners to address sheltering and evacuation needs.	County-wide	To be determined.	Not currently funded.	Disaster Recovery, Infrastructure Deficiency or Capacity		Craven County CAT.	Plan development would require 6 months- 1 year, but would need to be completed in conjunction with any updates to overall County shelter plans.	Facility accessibility during/after storms would need to be considered; address logistics of how to move animals to these locations (registration process, notifications, etc.).
10	Cherry Branch-Minnesott Beach Ferry Terminal	Work with NCDOT to reconfigure the dock to ensure minimal ferry service disruption during times of high water.	Cherry Branch-Minnesott Beach Ferry Terminal	A 2017 effort estimated a cost of $1 million or higher, depending upon solution.	Not currently funded.	Infrastructure Deficiency or Capacity		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 3-5 year timeline.	Requires coordination with NCDOT. When winds blow water into the mooring area, the water elevation rises enough to cause the angle of the automobile ramps between the ferry and the dock to become too steep to use safely. The dock should be reconfigured to allow the ramps to extend sufficiently during times of high water such that the ramp angle between the ferry and the dock accommodates vehicle entry and exit.
11	Installation of Predictive River Gauges	Install water level gauges on Swift Creek at the Weyerhaeuser Road crossing and the Neuse River at the Maple Cypress Road crossing, tying them into the County's Code Red warning system to predict riverine flooding.	Weyerhaeuser Road, Maple Cypress Road	$51K - $100K (2017 estimate)	Not currently funded.	Stormwater Management, Flooding		Hurricane Matthew Resilient Redevelopment Plan - 2017; Included in public survey	A 2017 effort estimated a 1-3 year timeline. May be implemented gradually as part of other infrastructure projects.	Identified as existing stream gages in Craven County do not predict river crest heights or timing-predictive capability is the current service gap to be addressed. The project is a lower priority as the County already has some (non-predictive) gauges available.
12	Remediation of Abandoned Hog Lagoons	Identify abandoned hog lagoons for remediation and determine most appropriate remediation strategy; where possible, convert the sites to freshwater ponds.	County-wide	Varies based on site needs.	Not currently funded.	Stormwater Management, Flooding, Disaster Recovery	Yes	Craven County CAT.	Dependent upon site needs.	Abandoned hog lagoons have the potential to be breached during hurricanes, tropical storms, and other heavy rainfall events, due to lack of maintenance activities on the pond. These breaches pose a health hazard to the community and surrounding natural environment. This effort would look at ways to identify and remediate these ponds, then turn them into freshwater ponds.

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1	TARGETED REPETITIVE FLOODING DRAINAGE ASSESSMENT
PROJECT DESCRIPTION	Conduct regular assessments and improvements of drainage infrastructure across the County, with a focus on sites that are known to flood. Implement improvements including (but not limited to) infiltration swales, culvert and pipe replacements, and other options. Emphasis will be placed on natural or nature-based solutions where practicable. Initial streets identified for this program include River Road, Streets Ferry Road, and High Bridge Road. Other locations will be identified and included in the program. Program could include improvements for both stormwater treatment and floodwater retention, including identification and purchase of vacant parcels that could be used for stormwater retention.
LOCATION	County-wide; specific locations to be determined.
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/Flooding. Existing stormwater infrastructure is impacted by coastal flooding events, including coastal storms and rainfall events.
TYPE OF SOLUTION	Infrastructure Improvements. Construction/replacement of stormwater infrastructure at key locations throughout the County. NNBS options will be implemented as practicable.
PROJECT ESTIMATED COST	Cost varies based on solution implemented and location needs. **Cost Level: $**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	These projects are not currently funded or listed on the County CIP. Project is eligible for funding under Phases 3 and 4 of the Resilient Coastal Communities Program. Other Potential funding sources: Federal sources may include EDA - Investment for Public Works and Economic Development Facilities, FEMA – BRIC, and the National Wildlife Federation. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA) Funding, NCDEQ Asset and Inventory Assessment Grants, and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	Timeline varies based on solution implemented and location needs. Design and construction timeline expected to vary between 3 months and 1 year per site. This is an ongoing program, to be implemented at individual sites as needs are identified.
PRIORITY RATING	**High**

1 TARGETED REPETITIVE FLOODING DRAINAGE ASSESSMENT

2	STORMWATER FLOOD REDUCTION PROJECTS
PROJECT DESCRIPTION	Implement natural/nature-based projects at select roadway/stream crossings across the County, building upon existing efforts underway through a cost-share program with the NC Department of Agriculture. Initial locations identified include Taylor Farm Road and Smith Farm Road at Clubfoot Creek.
LOCATION	County-wide; specific locations to be determined.
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/Flooding. Address infrastructure stability and minimize flooding damage typically caused by coastal flooding events.
TYPE OF SOLUTION 	Infrastructure Improvements. Construct improvements at locations throughout the County.
PROJECT ESTIMATED COST	Cost varies based on solution implemented and location needs. **Cost Level: $$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	These projects are not currently funded or listed on the County CIP. Project is eligible for funding under Phases 3 and 4 of the Resilient Coastal Communities Program. Other Potential funding sources: Project can build upon previous partnership with the NC Department of Agriculture for cost-sharing opportunities. Other State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA) Funding, NCDEQ Asset and Inventory Assessment Grants, and Golden Leaf Foundation Flood Mitigation Program. Federal sources may include FEMA – BRIC and the National Wildlife Federation.
PROJECT ESTIMATED TIMELINE	Timeline varies based on solution implemented and location needs. Design and construction timeline expected to vary between 3 months and 1 year per site. This is an ongoing program, to be implemented at individual sites as needs are identified. Future monitoring may be required.
PRIORITY RATING	**High**

3	CAMA LAND USE PLAN UPDATE
PROJECT DESCRIPTION	The previous Craven County CAMA Land Use Plan (LUP) was approved in 2009. Update the CAMA LUP and incorporate the resiliency measures identified through the Resilient Coastal Communities Program into the LUP.
LOCATION	County-wide
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/Flooding/Infrastructure Deficiency/Capacity/Disaster Recovery. The effort will update the CAMA LUP and incorporate the resiliency measures identified through the Resilient Coastal Communities Program (RCCP), the 2017 Hurricane Matthew Resilient Redevelopment Plan, and other recent efforts.
TYPE OF SOLUTION	Plan update.
PROJECT ESTIMATED COST	Primary costs are expected to include staff time for public engagement and events , consultant procurement and management (if consultant services are utilized), and internal plan coordination and review. **Cost Level: $**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	The CAMA LUP update is not curently funded in the CIP. Other Potential funding sources: The NCDCM Division of Coastal Management provides technical assistance to local governments to support the planning effort.
PROJECT ESTIMATED TIMELINE	Anticipated up to one year needed for plan completion.
PRIORITY RATING	**High**

4	SHORELINE DRIVE ALTERNATE ACCESS
PROJECT DESCRIPTION	Work with the Town of River Bend to construct a new transportation facility to provide a second means of access to the Town. The Town is accessible primarily by only one road, Shoreline Drive, which floods frequently from the overtopping of a nearby canal. Determine the feasibility of designing and constructing a new road to connect the west end of Plantation Drive to Old Pollocksville Road to provide a second means of ingress/egress to the Town of River Bend.
LOCATION	Shoreline Drive
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/Flooding. The project is to address flooding impacts and provide alternative community access.
TYPE OF SOLUTION	Infrastructure Improvements
PROJECT ESTIMATED COST	The FEMA – BRIC Application estimated the construction cost at $2,343,216. Final project costs will depend on several variable, including when the project is advertised for bids. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	The County applied for funding under the BRIC program; the application is under consideration. Other Potential funding sources: Federal sources may include EDA - Investment for Public Works and Economic Development Facilities, and National Wildlife Federation. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA), and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	Project development, right-of-way, and construction of the project is anticipated to take 3-5 years upon initiation. The schedule is dependent upon receipt of adequate funding and the new location route that is identified.
PRIORITY RATING	**High**

4 SHORELINE DRIVE ALTERNATE ACCESS

Images courtesy of Town of River Bend (FEMA BRIC application).

5	IMPROVE EXISTING/CONSTRUCT ALTERNATE CROP BUYING FACILITY
PROJECT DESCRIPTION	Work with NCDOT to elevate access roads to the current Crop Buying Facility; identify potential location for a new facility so harvested crops can still be stored during times of flooding. Farmers are not able to take harvested crops to the storage facility, and the storage facility is not able to get stored crops out to distributors. Proposal is to elevate access roads leading to the facility out of the 100-year floodplain, identify a location outside of the SFHA where an alternate facility could be constructed, and then design and construct an alternate facility. Determine the feasibility of constructing on-site storage (e.g., silos) at farms and construct facilities at feasible locations.
LOCATION	8542 Main Street, Vanceboro, NC
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/ Flooding, Infrastructure Capacity/ Deficiency. The project addresses flooding impacts to a facility that is key to the County's economic structure.
TYPE OF SOLUTION	Infrastructure improvements, including access roadway improvements and/or construction of a new facility.
PROJECT ESTIMATED COST	Project cost will be dependent on associated roadway design and implementation. No detailed project cost has been estimated. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	The project is not currently funded. Potential funding sources: Federal sources may include EDA - Investment for Public Works and Economic Development Facilities, and National Wildlife Federation. State sources may include the Golden Leaf Foundation Open Grants Program and NCDEQ American Rescue Plan Act (ARPA).
PROJECT ESTIMATED TIMELINE	Access road improvements are likely to take 1-3 years upon receipt of funding and the solution identified. Construction of a new facility is dependent upon site selection and the scope of the facility to be constructed.
PRIORITY RATING	**Medium**

5 IMPROVE EXISTING/CONSTRUCT ALTERNATE CROP BUYING FACILITY

Image courtesy of Craven County.

6	ELEVATION OF WEYERHAEUSER ROAD
PROJECT DESCRIPTION	Work with NCDOT to elevate the roadway and train tracks near River Road above the floodplain to decrease the flooding risk. The roadways and road crossings on Weyerhaeuser Road flood and act as bottlenecks for water flows, resulting in inundation of the surrounding area. Elevate the roadway and railroad tracks above the floodplain to remove the bottleneck. An H&H study should be completed as part of the project to ensure that removing the bridges, which act as bottlenecks to Swift Creek, will not adversely impact downstream areas such as New Bern.
LOCATION	Weyerhaeuser Road near River Road and Elevated Train Tracks
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/ Flooding. The project addresses regional flooding impacts caused by inadequate infrastructure.
TYPE OF SOLUTION	Infrastructure Improvements
PROJECT ESTIMATED COST	Project cost will be dependent on associated roadway design and implementation. No detailed project cost has been estimated. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	Infrastructure is under the jurisdiction of NCDOT. Potential funding may include funding from NCDOT as assigned through the department's prioritization process. Other Potential funding sources: Federal sources may also include FEMA – BRIC and EDA - Investment for Public Works and Economic Development Facilities, and National Wildlife Federation. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA), and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	Roadway improvements are likely to take 1-3 years upon receipt of funding and the solutions identified.
PRIORITY RATING	**Medium**

6 ELEVATION OF WEYERHAEUSER ROAD

Weyerhaeuser Road Causeway

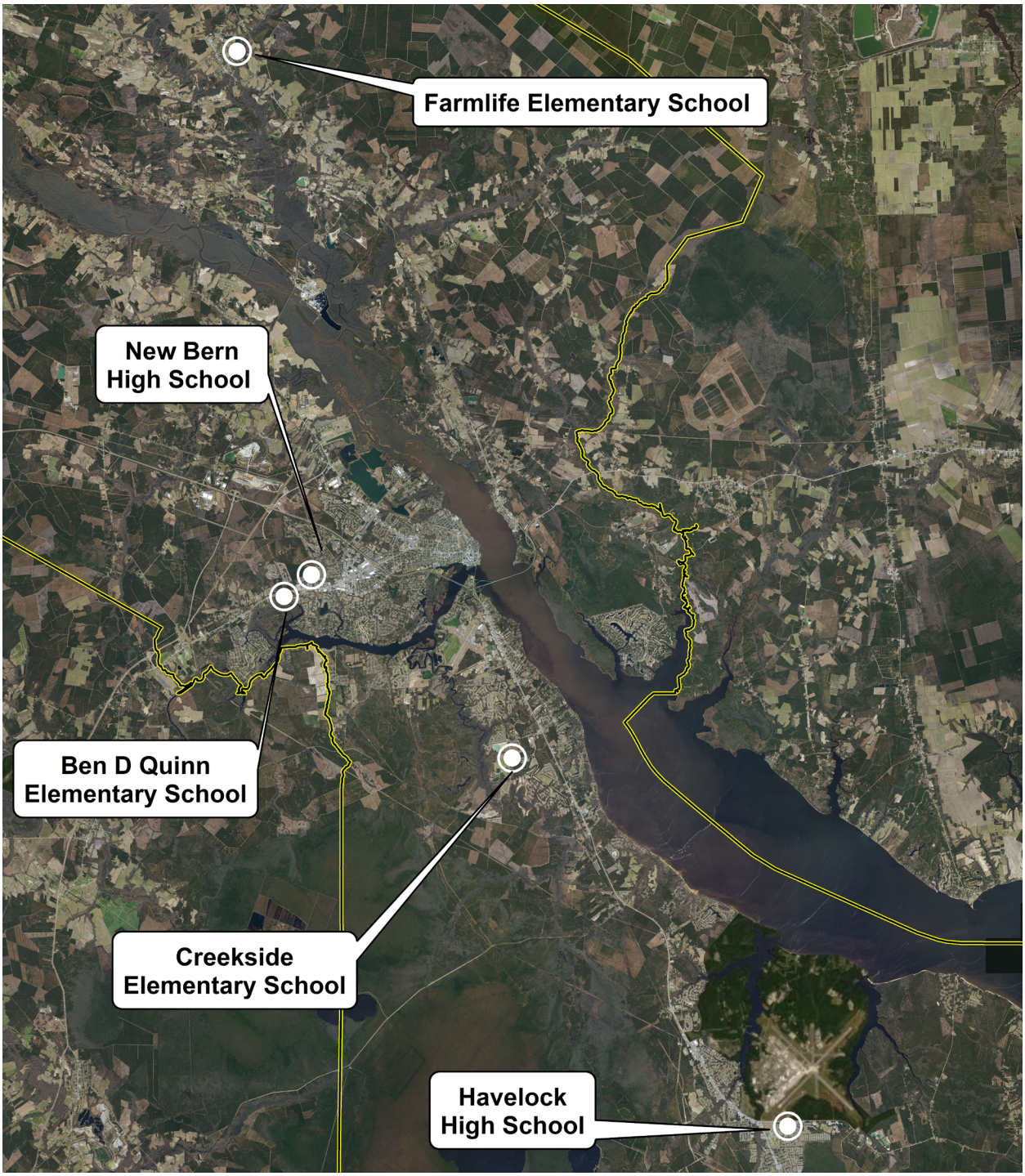
Weyerhaeuser Road over Neuse River

7	ELEVATION OF ADAMS CREEK ROAD AND BELANGIA ROAD INTERSECTION
PROJECT DESCRIPTION	Work with NCDOT to elevate intersection or to resize culverts to prevent flooding and to ensure the fire station remains accessible.
LOCATION	Fire Department on Belangia Road.
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/ Flooding. The project addresses regional flooding impacts caused by inadequate infrastructure.
TYPE OF SOLUTION	Infrastructure Improvements
PROJECT ESTIMATED COST	Project cost will be dependent on associated roadway design and implementation. No detailed project cost has been estimated. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	Infrastructure is under the jurisdiction of NCDOT. Potential funding may include funding from NCDOT as assigned through the department's prioritization process. Other Potential funding sources: Federal sources may also include FEMA – BRIC and EDA - Investment for Public Works and Economic Development Facilities, and National Wildlife Federation. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA), and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	Roadway improvements are likely to take 1-3 years upon receipt of funding and the solutions identified.
PRIORITY RATING	**Medium**

7 ELEVATION OF ADAMS CREEK ROAD AND BELANGIA ROAD INTERSECTION

8	EMERGENCY SHELTER CONSTRUCTION AND RETROFITS
PROJECT DESCRIPTION	New emergency shelters would be constructed, and existing shelters would be brought up to code, including the installation of generators. Develop new shelter sites throughout the county to address regional needs. Consideration would also be given for large animal shelters. Uninterrupted generator service is already planned.
LOCATION	Farmlife Elementary School, New Bern High School, Ben D. Quinn Elementary School, Creekside Elementary School, Havelock High School.
HAZARD(S) ADDRESSED BY PROJECT	Infrastructure Capacity/Deficiency. Address sheltering needs during storm events.
TYPE OF SOLUTION	Infrastructure Improvements
PROJECT ESTIMATED COST	Projects are not currently included on a County CIP. **Cost Level: $$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	Shelter improvement projects are not currently funded. Potential funding sources: Shelter facilities would likely qualify for federal hazard mitigation funding.
PROJECT ESTIMATED TIMELINE	Timeline for implementation dependent on the scope of improvements.
PRIORITY RATING	**Low**

8 EMERGENCY SHELTER CONSTRUCTION AND RETROFITS



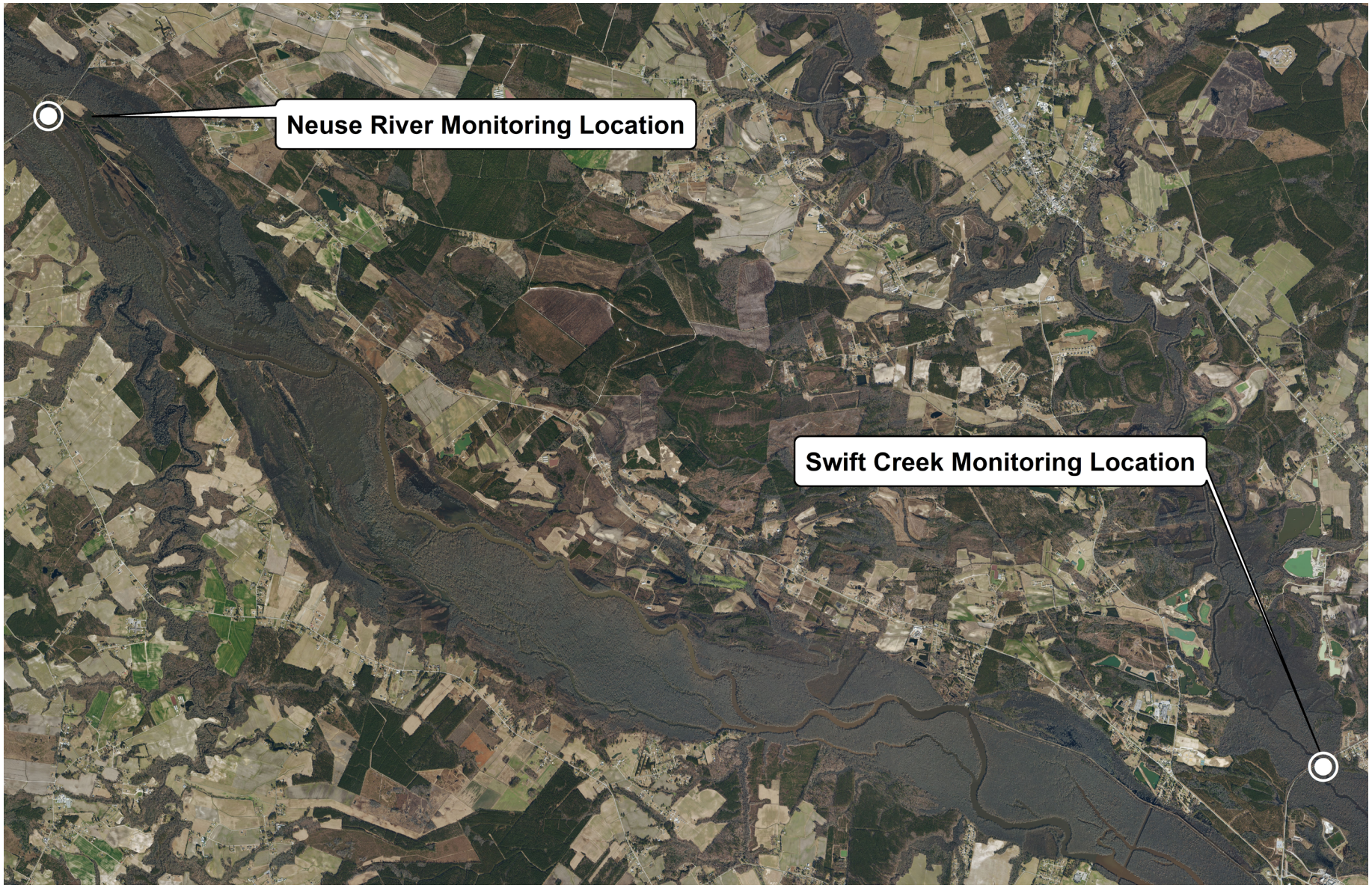
9	UPDATE LARGE ANIMAL RESPONSE PLAN
PROJECT DESCRIPTION	In conjunction with the County-wide shelter updates, develop an update to the County's Large Animal Response Plan. The plan would focus on "hobby" (non-farmer) animal owners to address sheltering and evacuation needs.
LOCATION	County-wide
HAZARD(S) ADDRESSED BY PROJECT	Disaster Recovery/Infrastructure Deficiency/Capacity. Non-farm animal owners with large pets (horses, goats, etc.) tend to not have a contingency plan for during severe weather events. The plan would assist these owners with evacuation before severe weather events and/or recovery after these events.
TYPE OF SOLUTION	Planning and Mapping
PROJECT ESTIMATED COST	Primary costs are expected to include staff time for plan development, internal review, and coordination with external stakeholders. **Cost Level: $**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	This effort is not currently funded in the County CIP. Other Potential Funding Sources: Federal sources may include EDA Investment for Public Works and Economic Development Facilities. State sources may include the Rural Grant Programs, EPA – Clean Water State Revolving Fund, and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	There is currently no timeline for this effort.
PRIORITY RATING	**Low**

10	CHERRY BRANCH-MINNESOTT BEACH FERRY TERMINAL
PROJECT DESCRIPTION	Work with NCDOT to reconfigure the dock to ensure minimal ferry service disruption during times of high water. When winds blow water into the mooring area, the water elevation rises enough to cause the angle of the automobile ramps between the ferry and the dock to become too steep to use safely. The dock should be reconfigured to allow the ramps to extend sufficiently during times of high water such that the ramp angle between the ferry and the dock accommodate vehicle entry and exit.
LOCATION	Cherry Branch-Minnesott Beach Ferry Terminal
HAZARD(S) ADDRESSED BY PROJECT	Storm Surge Flooding, Infrastructure Deficiency/Capacity. The project addresses flooding impacts to transportation infrastructure during storm events.
TYPE OF SOLUTION	Infrastructure Improvements
PROJECT ESTIMATED COST	Project cost will be dependent on associated roadway design and implementation. No detailed project cost has been estimated. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	Infrastructure is under the jurisdiction of NCDOT. Potential funding may include funding from NCDOT as assigned through the department's prioritization process. Other Potential Funding Sources: Federal sources may include FEMA – BRIC and EDA - Investment for Public Works and Economic Development Facilities. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	Project improvements are expected to require an estimated 1-2 years.
PRIORITY RATING	**Low**

10 CHERRY BRANCH-MINNESOTT BEACH FERRY TERMINAL

11	INSTALLATION OF PREDICTIVE RIVER GAUGES
PROJECT DESCRIPTION	Install water level gauges on Swift Creek at the Weyerhaeuser Road crossing and the Neuse River at the Maple Cypress Road crossing, tying them into the County's Code Red warning system to predict riverine flooding. Existing stream gauges in Craven County do not predict river crest heights or timing.
LOCATION	Weyerhaeuser Road, Maple Cypress Road
HAZARD(S) ADDRESSED BY PROJECT	Riverine/Storm Surge Flooding. The installation of gauges will enable the County to identify and warn residents of potential flooding conditions and to determine infrastructure improvements to address these issues. Previous monitoring efforts have not provided enough data to identify infrastructure needs.
TYPE OF SOLUTION	Monitoring program
PROJECT ESTIMATED COST	Cost will be dependent upon number of gauges and monitoring efforts. **Cost Level: $$$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	These projects are not currently funded or listed on a County CIP. Potential funding sources: Partnerships with non-governmental organizations or university studies may provide opportunities to fund the implementation and short-term monitoring of monitoring gauges.
PROJECT ESTIMATED TIMELINE	There is currently no proposed timeframe for the initial installation of gauges but is recommended in the next year in order to begin monitoring. Monitoring would be an ongoing effort. Some gauges are already available.
PRIORITY RATING	**Low**

11 INSTALLATION OF PREDICTIVE RIVER GAUGES



12	REMEDIATION OF ABANDONED HOG LAGOONS
PROJECT DESCRIPTION	Identify abandoned hog lagoons for remediation and determine the most appropriate remediation strategy and, where possible, convert the sites to freshwater ponds.
LOCATION	County-wide
HAZARD(S) ADDRESSED BY PROJECT	Stormwater Management/Flooding/Disaster Recovery. Hog lagoons can be breached during hurricanes, tropical storms, or heavy rainfall events which can create health hazards as well as harm natural habitats.
TYPE OF SOLUTION 	Environmental mitigation/remediation, utilizing Natural and Nature-based solutions.
PROJECT ESTIMATED COST	Cost will vary depending on the number and extent of locations identified and the remediation strategies used. **Cost Level: $$$**
POTENTIAL IMPLEMENTATION FUNDING SOURCES	The project is not currently funded in the CIP. Potential funding sources: Federal sources may include EDA - Investment for Public Works and Economic Development Facilities, and National Wildlife Federation. State sources may include the Rural Grant Programs, NCDEQ Clean Water State Revolving Fund, NCDEQ American Rescue Plan Act (ARPA), and Golden Leaf Foundation Flood Mitigation Program.
PROJECT ESTIMATED TIMELINE	There is currently no timeline for this effort but the identification of the locations of concern can start immediately. Project timelines for each location will vary depending on the level of effort.
PRIORITY RATING	**Low**