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Draft Neuse River Basin Flood Resiliency Action Strategy

North Carolina Flood Resiliency Blueprint

Prepared for the North Carolina Department of Environmental Quality by ESP Associates and AECOM

September 2024

Definitions

A comprehensive list of definitions applicable to multiple Flood Resiliency Blueprint documents is provided in a separate document[1]. For the purposes of this action strategy document, several key definitions are included here.

Actions: in the Blueprint, "actions" denote specific flood resilience measures identified and ranked at the basin scale. NCDEQ, in collaboration with communities, utilizes the Flood Resiliency Blueprint Tool to assess and prioritize these actions based on a variety of parameters.

Flood Resilience: the capacity of individuals, a community, business, or natural environment to reduce, withstand, respond to, and recover from flooding by positively mitigating the impacts of changing conditions and challenges including climate change, increasing rain fall, and sea level rise, and adapting to those conditions.

Flood Risk: combination of the likelihood of a flood hazard, the physical exposure of people and assets to that flood hazard, and the vulnerability of people and assets to suffer loss and damage during and after a flooding event.

Flood Vulnerability: the extent to which environmental, physical, social, and economic systems are susceptible to floods due to exposure, in conjunction with its ability (or inability) to reduce, withstand, respond to, and recover from a flood hazard.

Mitigation: any effort that reduces the overall risk and severity of flood-related loss and damage to life and property.

Nature-Based Solutions (NBS): sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience and provide multi-benefit solutions. These solutions use natural features and processes to combat climate change, reduce flood risk, improve water quality, protect coastal property, restore, and protect wetlands, stabilize shorelines, etc.

North Carolina Flood Resiliency Blueprint (Blueprint): the North Carolina Flood Resiliency Blueprint is a statewide initiative designed to bring together and build upon all relevant existing resources and knowledge in the state to create one unified effort to increase community resiliency to flooding. The Blueprint includes a statewide flood planning framework and decision-support tool that enables state, tribal, regional, and local entities, and their stakeholders to identify, prioritize, and direct resources to implement effective flood resiliency strategies based on the best available science and understanding of likely future conditions. The Blueprint will serve as the backbone of North Carolina's flood planning process through the development and implementation of river basin strategies.

[1] Appendix A, Draft North Carolina Flood Resiliency Blueprint

Recommendations: strategic guidelines to facilitate the development, maintenance, and effective utilization of flood risk and vulnerability measures in the basin and aim to create a cohesive and replicable framework to enhance flood resilience at the local, regional, and basin levels.

Resilience Actions: implementable projects identified using the Blueprint Decision Support Tool, specifically designed to enhance flood resilience across the basin.

River Basin: the largest category of surface water drainage (i.e., an area of the landscape that is drained by a river and its tributaries); there are 17 river basins in North Carolina.

River Basin Flood Resiliency Action Strategy: a "River Basin Action Strategy" is a strategic plan tailored to an individual river basin developed with the assistance of the Flood Resiliency Blueprint Tool and informed by community and stakeholder input. This strategy outlines specific actions for increasing flood resilience, which are accompanied by various considerations.

Common Acronyms

2-D	Two-Dimensional	**NCDA&CS**	North Carolina Department of Agriculture & Consumer Services
ADCIRC	Advanced CIRCulation	**NCDOT**	North Carolina Department of Transportation
BFE	Base Flood Elevation	**NCEM**	North Carolina Emergency Management
CAMA	Coastal Area Management Act	**NCFMP**	North Carolina Floodplain Mapping Program
CMIP	Coupled Model Intercomparison Project	**NCORR**	North Carolina Office of Recovery and Resiliency
COG	Councils of Government	**NFIP**	National Flood Insurance Program
CRS	Community Rating System	**NGO**	Non-Governmental Organization
NCDEQ	North Carolina Department of Environmental Quality	**NI**	Natural Infrastructure
DMS	Division of Mitigation Services within NCDEQ	**NOAA**	National Oceanic and Atmospheric Administration
DFE	Design Flood Elevation	**PAC**	Percent Annual Exceedance Chance
FEMA	Federal Emergency Management Agency	**PAG**	Principal Advisory Group
FIMAN	Flood Inundation Mapping and Alert Network	**PMF**	Probable Maximum Flood
FIRMs	Flood Insurance Rate Maps	**PMP**	Probable Maximum Precipitation
GIS	Geographic Information Systems	**RAS**	River Analysis System
HEC-RAS	Hydrologic Engineering Center's River Analysis System	**RISE**	Regions Innovating for Strong Economies and Environment
H&H	Hydrological and Hydraulic	**RL**	Repetitive Loss
HMP	Hazard Mitigation Plan	**SFHA**	Special Flood Hazard Area
HUC	Hydrologic Unit Code	**SVI**	Social Vulnerability Index
IPCC	Intergovernmental Panel on Climate Change	**TAG**	Technical Advisory Group
LMI	Low to Moderate Income	**TBD**	To Be Determined
LUP	Land Use Plan	**US**	United States
NBS	Nature-based Solutions	**USACE**	United States Army Corps of Engineers

Executive Summary

Introduction

The Draft Neuse River Basin Flood Resiliency Action Strategy (Draft Neuse Action Strategy) is a deliverable scoped within Phase I of the North Carolina Flood Resiliency Blueprint (Blueprint). The Blueprint is a first-of-its-kind program in the country and the largest statewide flood mitigation investment in the history of North Carolina. Funded through the North Carolina General Assembly to combat the heightened flood risk that threatens communities across the state, the Blueprint will form the backbone of a statewide flood planning framework to bolster resilience against flooding considering future flood hazards and climate projections. Key deliverables to be completed as part of the North Carolina Flood Resiliency Blueprint include:

1. Draft North Carolina Flood Resiliency Blueprint (Phase I, March 2024)
2. Draft Neuse River Basin Flood Resiliency Action Strategy (Phase I, September 2024)
3. Flood Resiliency Blueprint Tool (Phase II, March 2025)

The Neuse River Basin was selected as the pilot by the North Carolina Department of Environmental Quality (NC DEQ) to inform the development of the statewide planning framework and online decision-support tool and vice versa. The multiple deliverables associated with Blueprint were developed to inform, align, and complement one another to achieve a comprehensive, standardized approach that can be replicated across the state's 17 river basins over time. This comprehensive, standardized approach will support informed decision-making and strategic investment for flood resilience actions.

Recommendations

The recommendations can be used to develop, maintain, and utilize the action strategy to address flood risk and vulnerability within the Neuse River Basin. By aligning with other key Blueprint deliverables, such as the Draft North Carolina Flood Resiliency Blueprint and the forthcoming Flood Resiliency Blueprint Tool, the recommendations offer a cohesive and practical approach to bolster flood resilience at the local, regional, and basin levels. Recommendations are separated into four categories integral to the planning and implementation of effective flood resilience actions:

1. Action Strategy Development – These recommendations outline necessary measures to develop an accurate and representative action strategy.
2. Understanding Flooding – These recommendations rely on the mapping and modeling functions available in the Blueprint Tool to assess risk and vulnerability, identify hot spots, and determine vulnerable populations.
3. Action Strategy Implementation – These recommendations focus on continual maintenance of the data and information used to inform the action strategy to ensure the document remains relevant.
4. Action Implementation – These recommendations include tangible steps to facilitate and

guide implementation of priority resilience actions.

The recommendation categories are intricately aligned with the Blueprint Workflow to demonstrate the progression from strategic planning to actionable implementation. This alignment ensures a structured and cohesive path to transform the conceptual Blueprint Workflow into tangible, on-the-ground measures that support and address the specific needs and priorities of communities in the Neuse River Basin. The recommendations are summarized below.

ES-Table 1: Draft Neuse Action Strategy Recommendations

Category	Recommendation	Blueprint Workflow
Action Strategy Development	Integrate Existing Flood Resiliency Efforts	Step #1
	Create River Basin Advisory Group	Step #1
	Incorporate Equity and Social Vulnerability	Step #1
	Conduct Robust Stakeholder Engagement	Step #2
	Conduct Basin Capacity Needs Assessment	Step #2
	Utilize Data-Driven Approaches to Assess Risk	Step #3
	Identify and Assess New Actions for Inclusion	Step #3
	Ensure Long-Term Sustainability	Step #3
	Integrate Lessons Learned	ALL
Understand Flooding	Capitalize on Comprehensive Flood Mapping	Step #3
	Use a Two-Tiered Approach to Flood Modeling	Steps #1, 2
	Include Community Experience and Local Knowledge	Steps #2, 3
Action Strategy Implementation	Perform Data Quality Review	Steps #1
	Update the Action Strategy on a 5-Year Cycle	ALL
Action Implementation	Identify and Pursue Diverse Funding Sources	Step #6
	Develop Implementation Pathways	Step #7
	Monitor, Evaluate, and Track Progress	Step #8

Many recommendations included in the Draft Neuse River Basin Flood Resiliency Action Strategy are contingent upon completion and use of the Blueprint Tool (currently in development) and remain incomplete in their current form. The iterative nature of this action strategy acknowledges the data and information gaps and includes placeholders for each recommendation. The placeholders describe anticipated changes to this action strategy based on the new information presented and how that information will be used to inform any subsequent steps. Additional recommendations may be incorporated into the Finalized Action Strategy based on new findings.

In addition to placeholders, each recommendation incorporates a narrative to describe measures taken or work products completed for the Neuse River Basin ("Neuse River Basin Approach") that support specific recommendations. As the pilot basin, the Draft Neuse River Basin Flood Resiliency Action Strategy was developed in parallel with the Draft North Carolina Flood Resiliency Blueprint and the Blueprint Tool, both intended to inform the individual river basin action strategies. Released in March 2024, the Draft North Carolina Flood Resiliency Blueprint, specifically the recommendations on "Workflow Implementation and River Basin Strategy Development," were referenced to develop the Draft Neuse River Basin Flood Resiliency Action Strategy. Unable to reference or use the Flood Resiliency Blueprint Tool, innovative approaches and methods were employed to temporarily fulfill some of the recommendations outlined for the Neuse and reflect the unique circumstances of the pilot basin.

Concluding Remarks

The Draft Neuse Action Strategy, as a pivotal component of the broader North Carolina Flood Resiliency Blueprint, marks a significant milestone in advancing basin-specific and statewide flood resilience. This action strategy uses a targeted and proactive approach to mitigate flood risk and enhance community resilience. The development of the Draft Neuse Action Strategy underscores the unified commitment to address the growing threat of flood hazards, protect vulnerable communities, and safeguard the natural resources that define the basin and the state. The pilot basin sets a precedent for collaborative, science-based, and forward-thinking flood resilience strategies that can be replicated by other basins well into the future.

1 Introduction

As one of the largest river basins in North Carolina, the Neuse River Basin (Figure 1.1) encompasses diverse ecosystems, supports local economies, and serves as a source of water for communities found across the basin. Historically, the basin has faced recurring challenges from flood events, putting infrastructure, ecosystems, and the general welfare of its communities at risk. The frequency and extent of these events have increased in recent years resulting in multiple flood disasters for some counties.

In response to these challenges, the North Carolina General Assembly passed Session Law 2021-180 Sec. 5.9(c) to fund the development of the North Carolina Flood Resiliency Blueprint (Blueprint) including the creation of the pilot Neuse River Basin Flood Resiliency Action Strategy (selected by NCDEQ). Additional guidance was provided for the Blueprint's development through the passing of Session Law 2022-75 Sec. 22.

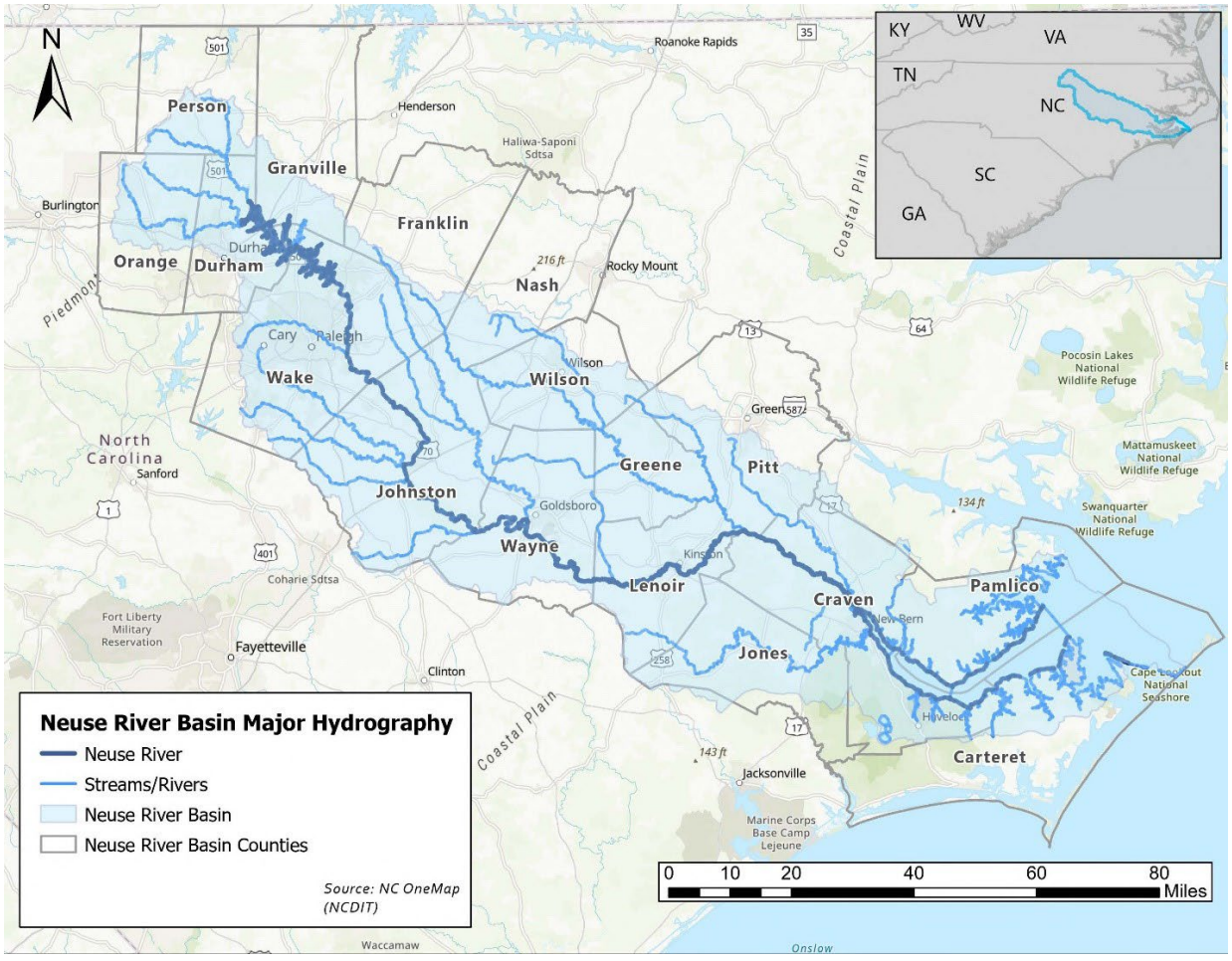

Figure 1.1: Neuse River Basin Major Hydrography

1.1 Document Structure and Rationale

The Draft Neuse Action Strategy is a comprehensive document structured into three main sections:

1. Introduction – This section provides a detailed overview of the Neuse River Basin, highlighting its significance, challenges, and opportunities, current conditions, and selection of the Neuse as a pilot basin. The introduction establishes the purpose of the action strategy, describes the iterative process, and identifies other Blueprint related components.
2. Recommendations - This section offers a strategic roadmap to inform the development and implementation of the action strategy. This section provides targeted and practical measures that are further supported by research and data. Focus should be placed on the recommendations, which guide (1) Action Strategy Development, (2) Understanding Flooding, (3) Action Strategy Implementation, and (4) Action Implementation.
3. Concluding Remarks – This section draws on key insights and takeaways from previous sections and highlights anticipated next steps to turn recommendations into actionable plans.

The structure is designed to guide interested stakeholders through a cohesive and logical progression from understanding flood risk and vulnerability to implementing resilience actions. By focusing on recommendations presented in this document, Neuse River Basin communities can work to develop a robust action plan that leads to action implementation.

1.2 Draft Neuse River Basin Flood Resiliency Action Strategy Purpose

The Draft Neuse Action Strategy was developed for two purposes: (1) Evaluate flood risk and vulnerability using best available data in the Neuse River Basin to inform an effective and comprehensive action strategy to enhance flood resilience in the basin and (2) Demonstrate best practices, effective approaches, and integrated water resource management that can be replicated and implemented in diverse geographical contexts.

This document summarizes the history of work completed to date relative to action strategy development, addresses each of the requirements as identified in the original Scope of Work developed by the North Carolina Department of Environmental Quality (NCDEQ) that are specific to the Neuse River Basin, provides recommendations, and proposes next steps. The recommendations, specifically the Action Strategy Development Recommendations, incorporate work products developed statewide and those specific to the pilot basin to illustrate the measures taken thus far to support and achieve flood resilience.

1.2.1 Action Strategy Iterations

The Draft Neuse Action Strategy, like much of the work related to Blueprint, is intended to be an iterative document to reflect the changing needs and priorities of the basin. Document iterations are summarized below:

1. Neuse River Basin Flood Resiliency Action Strategy – Referred to as the Neuse Action Strategy or action strategy throughout the document, this is used as a general reference to the action strategy and is not associated with a specific iteration.
2. Preliminary Draft Neuse River Basin Flood Resiliency Action Strategy – Referred to as Preliminary Draft Action Strategy throughout the document, this was the first iteration of the action strategy and was delivered in December 2024. This document was reviewed by the Neuse Regional Advisory Group and the principal advisory group (PAG) and was delivered prior to the Neuse Workshops.
3. Draft Neuse River Basin Flood Resiliency Action Strategy – Referred to as Draft Neuse Action Strategy throughout the document, this current iteration of the action strategy (July 2024) addresses initial comments received and incorporates input collected during the Neuse Workshops conducted in Spring 2024.
4. Finalized Neuse River Basin Flood Resiliency Action Strategy – Referred to as the Finalized Neuse Action Strategy throughout the document, this future iteration is anticipated to be delivered in late 2024 and will integrate vulnerability and risk findings from the Blueprint Tool and enhanced 2D modeling (currently in development). This iteration will also include a list of prioritized resilience actions that will be collaboratively selected to achieve the greatest impact across the basin.

The ongoing refinement of the action strategy represents a dynamic approach that will result in an adaptively managed plan. Taking an iterative approach enhances the quality and accuracy of the Neuse Action Strategy through regular plan updates and content revisions. Beyond the document itself, refinement also streamlines the resilience-building process through incorporating lessons learned, capitalizing on emerging technologies, and employing innovative methodologies. The Neuse River Basin Recommendations reinforce continual improvements to the Draft Neuse Action Strategy to support its continued use and relevancy.

1.2.2 Relationship with Blueprint Components

The Neuse Action Strategy represents one of the several components necessary to accomplish the goals and objectives of Blueprint. The Draft Neuse Action Strategy was revised to clearly establish the interdependent relationship between the action strategy and other key Blueprint components. These relationships are summarized below:

1. Draft North Carolina Flood Resiliency Blueprint - Referred to as the Draft Blueprint throughout the document, this outlines a process for conducting flood resiliency planning at multiple scales that can be applied anywhere in the state and was released in March 2024. This document was developed to guide the creation of river basin action strategies statewide that are science-based, cost-effective, and lead to the enhancement of community flood resilience using a watershed approach. Neuse River Basin Recommendations were redrafted to align with those laid out in the Draft Blueprint for language consistency and plan linkage.
2. Blueprint Planning Workflow - Referred to as the Blueprint Workflow throughout the

document, this workflow was developed as part of the Draft Blueprint (March 2024) to create a structured and systematic approach to develop river basin action strategies that support effective implementation of resiliency actions and support the goals of Blueprint. Neuse River Basin Recommendations explicitly reference steps within the Blueprint Workflow to indicate when, where, and how recommendations fit into the process.

   a. Step 1: Actionable Data Collection, Modeling, and Analysis
   b. Step 2: Initiate Community Engagement and Discovery
   c. Step 3: Flood Risk Planning and Analysis
   d. Step 4: Resiliency Action Review and Adjustment
   e. Step 5: Basin-Wide Action Analysis and Ranking
   f. Step 6: Flood Resiliency River Basin Action Strategy
   g. Step 7: Resiliency Action Implementation
   h. Step 8: Program and Project Accountability

3. Flood Resiliency Blueprint Tool - Referred to as the Blueprint Tool throughout the document, the tool will be used to enhance the Draft Blueprint and Draft Neuse Action Strategy providing best available data, multi-scale flood modeling, flood solution selection and scenario exploration capabilities, guidance documents, and interactive planning tools to increase the ability to identify, prioritize, and implement flood resiliency actions.

The interdependent nature of the Draft Neuse Action Strategy, the Draft Blueprint, and the Blueprint Tool requires that the goals, methodologies, and outcomes must be complementary and mutually supportive leaving minimal room for contradictions or inconsistencies. Any changes or updates to one component may necessitate synchronized adjustments to others to maintain harmony and effectiveness across the entire framework. This interdependency underscores the complexity of integrated flood resilience in the Neuse River Basin and highlights the importance of robust collaboration and adaptive decision-making.

The Preliminary Draft Action Strategy was developed in parallel with the Draft Blueprint and Blueprint Tool presenting both unique opportunities and challenges. Simultaneous development fostered a synergistic relationship where insights, data, and recommendations align, inform, and complement each other. However, the inability to reference the Draft Blueprint or use the Blueprint Tool during the development of the Preliminary Draft Action Strategy posed significant challenges. The Draft Blueprint was a valuable resource used to inform and develop the Draft Neuse Action Strategy (current iteration). Upon completion in March 2025, the Blueprint Tool will be used to address the missing information and process gaps called out in the Draft Neuse Action Strategy. Outputs from the Blueprint Tool are essential for Blueprint Workflow Step 3: Flood Risk Planning and Analysis, Step 4: Resiliency Action Review and Adjustment, and Step 5: Basin-Wide Action Analysis and Ranking all of which will inform the Finalized Neuse Action Strategy.

1.3 Selection of the Neuse River Basin as the Pilot Basin Action Strategy

The Neuse River Basin was selected by NCDEQ as the pilot basin for the Blueprint for the following reasons:

- The North Carolina General Assembly passed Session Law 2021-180 Sec 5.9(c) which provided funding and requirements for the development of the North Carolina Flood Resiliency Blueprint (Blueprint) along with the creation of a pilot River Basin Flood Resiliency Action Strategy within the Neuse River Basin
- The basin is vulnerable to multiple types of flooding and has been significantly impacted by recent catastrophic flood events.
- Some cities and counties within the basin have seen a substantial population increase over the last two decades while others have seen their population and financial capacity decrease.
- The basin contains significant natural resources and natural assets that mitigate flooding.
- The basin benefits from having robust data from years of studies and projects.
- The basin benefits from robust existing stakeholder efforts and organizations
- There is high potential to make changes and adapt to flooding for enhanced resilience within the basin.

These topics are discussed in greater detail below.

1.3.1 Changing Conditions

Several key factors, primarily related to changes in climate and development, have contributed to the evolving flood dynamics in the basin. According to the North Carolina Climate Science Report (2020), the Neuse River Basin has experienced notable changes in flood patterns and risk due to climate change. Climate change can alter precipitation patterns, sea levels, weather systems, infrastructure integrity, and ecosystems.

It should be noted that lesser events can also be impacted by climate change[2]. These storms are characterized by their limited spatial extent and relatively low impact compared to severe or catastrophic events. The implications of climate change on local and regional weather patterns, such as changes in precipitation, and increased likelihood of severe weather within these events, should be assessed when developing action strategies to adequately address changing flood dynamics and future conditions.

Changes in land use and land cover can also impact flooding by altering surface runoff, soil permeability, water storage capacity, and the availability of natural flood mitigation features. More specifically, the increase in impervious surfaces associated with population growth can prevent water

[2] A lesser storm event refers to a category of weather phenomena that involves milder or less extreme storms, such as isolated thunderstorms, localized rain showers, and other non-severe weather events.

from infiltrating the soil and lead to increased surface runoff during rainfall events. These factors have collectively influenced the frequency, intensity, and spatial distribution of flooding events within the Neuse River Basin. Accounting for future conditions has been a key component in the development of the Blueprint and ensures wise investments in solutions that can provide benefits in the context of a changing climate.

1.3.2 Recent Catastrophic Flood Events

The Neuse River Basin and the communities throughout its reaches have been impacted by recent, major flood events. Such events are often a result of hurricanes, tropical storms, or other severe weather systems according to the Neuse River Basin Flood Analysis and Mitigation Strategies Study[3]. Most recently, these have included Hurricane Matthew (2016) and Hurricane Florence (2018). Hurricanes Fran (1996) and Floyd (1999) also caused significant damage within the basin. More details about these severe hurricanes are provided below.

The residual social, environmental, and economic impacts caused by these catastrophic flood events are felt across many areas of North Carolina (Figure 1.2 from NCORR), including distinct sections of the Neuse River Basin. Severe flooding brought on by intense rainfall during events is attributed to much of the damage that was experienced in the aftermath of the storms[4]. Major hurricane flooding events of the late 1990s (e.g., Hurricanes Fran and Floyd) demonstrated a need for sweeping improvements in hazard mitigation planning, floodplain management, and community preparedness measures across the basin. However, the hurricane flooding events in more recent years (e.g., Hurricanes Matthew and Florence) further emphasized the importance of proactive mitigation and resilience measures that effectively consider future climate projections and flood conditions to contribute to long-term solutions.

[3] NCEM & NCDOT. (2018). https://www.rebuild.nc.gov/documents/files/neuse-mitigation-report/open
[4] NCEM & NCDOT. (2018). https://www.rebuild.nc.gov/documents/files/neuse-mitigation-report/open

Figure 1.2: NC Flooding Damage

Hurricanes Fran, Floyd, Matthew, and Florence were deadly and economically costly. Table 1.1 below provides summary statistics for these hurricanes.

Table 1.1: Hurricanes that Impacted the Neuse River Basin (1996-2018)

Catastrophic Flood Event	Year	Damages	Deaths	Highest Rainfall Total
Hurricane Florence	2018	$22B+	~40 statewide	Elizabethtown, 35.93 in.
Hurricane Matthew	2016	$1.5B+	~25 statewide	Evergreen, 18.95 in.
Hurricane Floyd	1999	$6.5B+	~52 statewide	Southport, 24.06 in.
Hurricane Fran	1996	$4.1B+	~24 statewide	Hofmann Forest, 13.27 in.

Source: NOAA, National Centers for Environmental Information

1.3.3 Neuse River Basin Flood Risk and Vulnerability Profile

Concerns surrounding the costs of flooding in the Neuse River Basin are not limited to only those events recognized as catastrophic. The North Carolina Floodplain Mapping Program (NCFMP) and the Federal Emergency Management Agency (FEMA) have conducted assessments to determine findings related to flood hazard losses estimated for counties throughout the basin. The following language from the 2023 North Carolina Enhanced State Hazard Mitigation Plan underscores the importance for considering climate change when considering flood risk in the Neuse River Basin.

> "*Empirical evidence strongly supports the conclusion that North Carolina's climate has changed in recent decades and the State can anticipate sometimes dramatic*

changes in the future if current trends persist. The North Carolina Climate Science Report is a comprehensive report on the state of climate change science updated by the NC Department of Environmental Quality released in September 2020 and forms the basis of analysis for the impact of climate change on the natural and man-made hazards threatening the state. The projected changes with the highest level of confidence include increases in temperature, summer humidity, sea level, extreme precipitation, and intensity of storms including Hurricanes and Nor'easters."

Increased extreme precipitation events and greater intensity hurricanes and nor'easters, combined with the increased number of people, houses, businesses, critical facilities, and infrastructure in the Neuse River Basin contributes to greater risk and vulnerability in the basin and further demonstrates the need for enhanced flood resiliency in all forms. Hazard mitigation plans and resilience portfolios include risk and vulnerability assessments that provide additional information related to areas of severe flood hazards within the Neuse River Basin. Similar findings demonstrating flood risk and vulnerability are summarized in the figures below.

1.3.3.1 FEMA National Risk Index

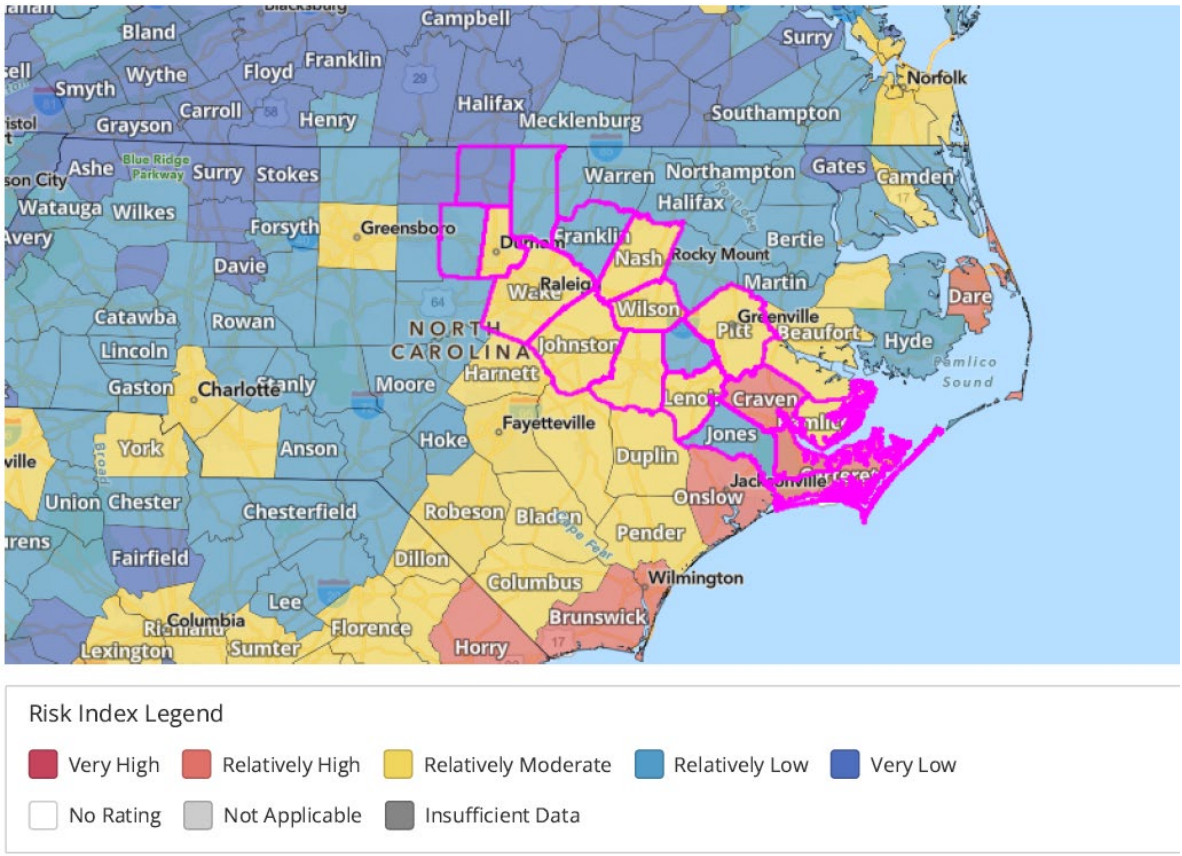

Figure 1.3: Neuse River Basin Risk Index by County

According to the FEMA National Risk Index (NRI) as of 2024, many counties within the Neuse River Basin marked with a pink outline in Figure 1.3 above have a relatively moderate to high base risk index rating and score, with Carteret County and Craven County ranked at the highest risk, compared to national percentiles. All counties have a base risk index score of 60 or higher on a scale of 100 possible points except for Person County (34.2). The NRI data also ranks a variety of individual hazards including coastal flooding (highest county: Pamlico) and riverine flooding (highest county: Wayne) as seen in Table 1.2 below. Additional information related to the specifications of the risk index methodologies can be found on the NRI home page[5].

Table 1.2: National Risk Index Results for Neuse River Basin Counties (2024)

County	Base Risk Index	Coastal Flooding Risk Index	Riverine Flooding Risk Index
Carteret County	**97.1**	49.5	85.71
Craven County	96.4	28.57	57.84
Wayne County	94.43	-	**98.47**
Pitt County	94.24	47.08	52.56
Wake County	93.64	-	96.34
Lenoir County	91.79	37.22	90.42
Johnston County	86.86	-	88.16
Durham County	86.73	-	83.52
Nash County	86.29	-	96.18
Wilson County	85.05	-	88.77
Pamlico County	84.79	**58.95**	34.74
Jones County	79.99	20.93	39.04
Greene County	79.73	24.14	41.01
Orange County	72.96	-	79.1
Granville County	62.93	-	11.04
Franklin County	60.13	-	39.99
Person County	34.2	-	16

Source: FEMA, National Risk Index

1.3.3.2 NFIP Policies and Losses

The National Flood Insurance Program (NFIP) has been in place since 1968 to help address the extensive damage caused by flooding, which is recognized as both the most common and destructive hazard in the nation[6]. The NFIP, managed by FEMA, maintains a large database related to flood insurance policies and reported losses. As of May 31, 2024, the total number of policies in force

[5] FEMA National Risk Index. (2024). https://hazards.fema.gov/nri/
[6] FEMA National Flood Insurance Program. (2024). https://www.floodsmart.gov/

reported across all NFIP communities in North Carolina is over 130,000 with total coverage exceeding $36.1 billion[7]. For the counties in the Neuse River Basin, the total number of policies in force reported across all NFIP communities is 33,835 with total coverage exceeding $8.9 billion.

Another indicator of vulnerability for the Neuse River Basin is the number of structures repetitively damaged by flooding, otherwise known as a repetitive loss (RL) property. FEMA defines an RL property as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978." An RL property may or may not be currently insured by the NFIP. FEMA has previously reported over 122,000 repetitive loss properties nationwide in recent years, with the current figure likely higher. Figure 1.4 provides total costs of RL damage for counties in the Neuse River Basin and Figure 1.5 provides the total number of RL properties by county based on best available FEMA records as of Fall 2022 in the current State of North Carolina Hazard Mitigation Plan.

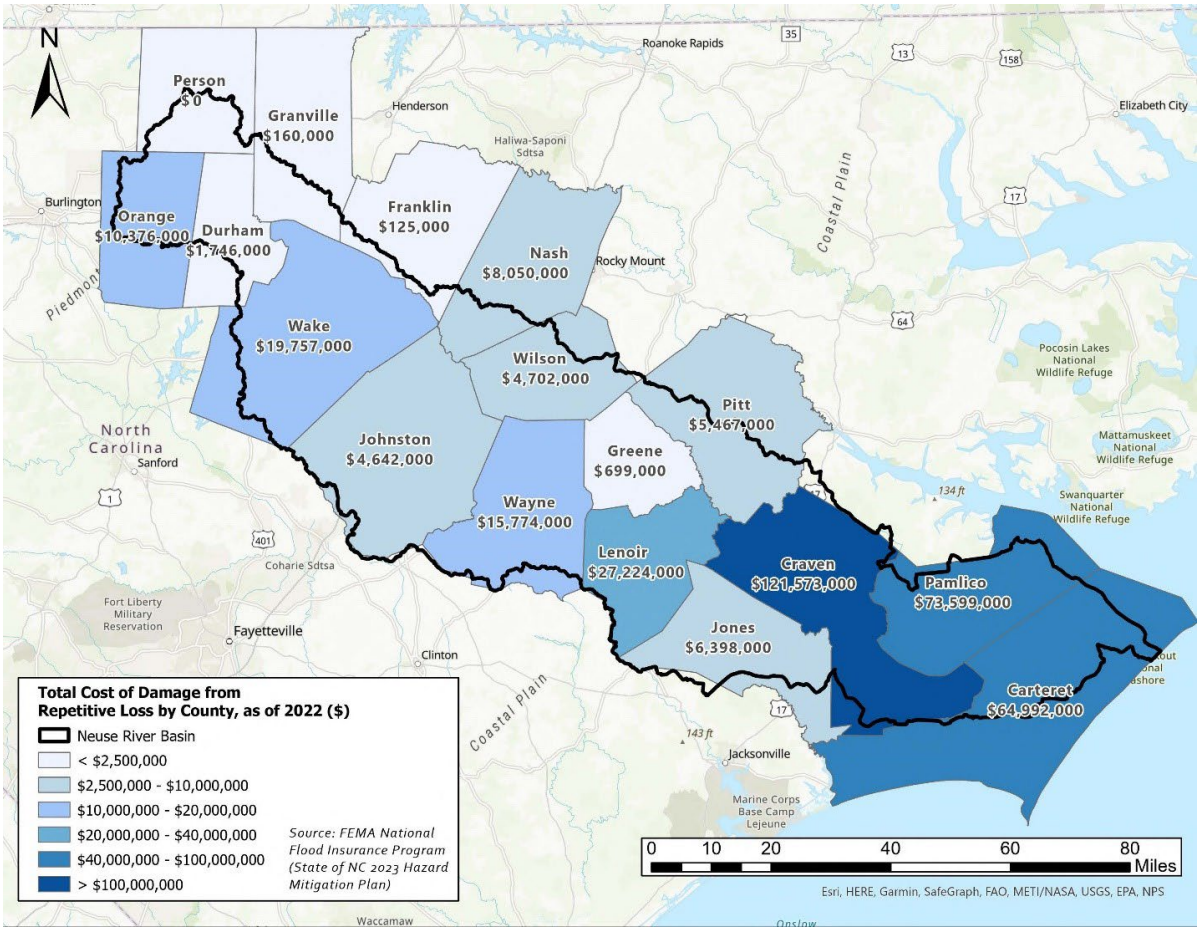

Figure 1.4: Repetitive Loss Damages by County

[7] FEMA National Flood Insurance Program. (2024). https://nfipservices.floodsmart.gov/reports-flood-insurance-data

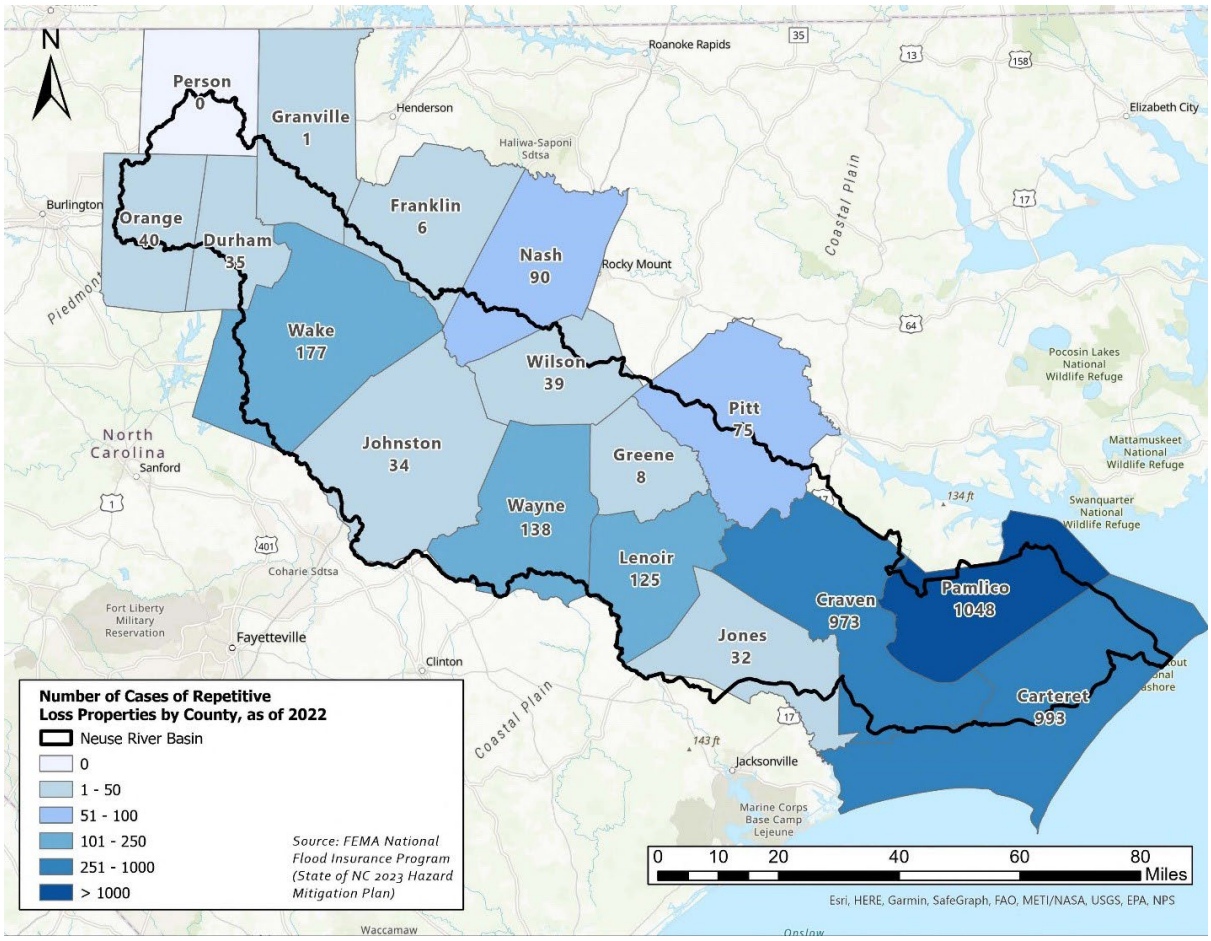

Figure 1.5: Repetitive Loss Properties by County

1.3.3.3 Social Vulnerability

FEMA defines social vulnerability as the "susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.[8]" Social vulnerability is a key component to considering community resiliency, where resiliency is defined by the Draft Blueprint as " the capacity of individuals, a community, business, or natural environment to reduce, withstand, respond to, and recover from flooding by positively adapting and mitigating the impacts of changing conditions and challenges, including flooding and climate change."

Different systems can be used to evaluate social vulnerability. Figure 1.6 provides an overview of the Centers for Disease Control and Prevention's Social Vulnerability Index (SVI) using 2020 reported data for the counties in the Neuse River Basin. In this map, SVI scores are depicted at the county level. The data can be further refined down to the census tract level within each county. The key takeaway from evaluating this data is that social vulnerability across the basin varies widely. Areas closer to the Raleigh metropolitan area are generally less socially vulnerable than most other areas within the basin, and there are pockets of very high social vulnerability in the basin. Section 2.1.3 of this

[8] FEMA. (2024). https://hazards.fema.gov/nri/social-vulnerability

document provides a closer look at social vulnerability in the basin and pinpoints specific areas of social vulnerability.

Additionally, Figure 1.7 provides an overview of disadvantaged census tracts, within which communities experience disproportionate burdens, in the Neuse River Basin as of 2023 using the Climate and Economic Justice Screening Tool (CEJST) published by the U.S. Council on Environmental Quality. Figure 1.8 indicates environmental justice indexes over the 80th percentile by census tract mapped by the Environmental Protection Agency (EPA) as of 2023 using its EJScreen tool.

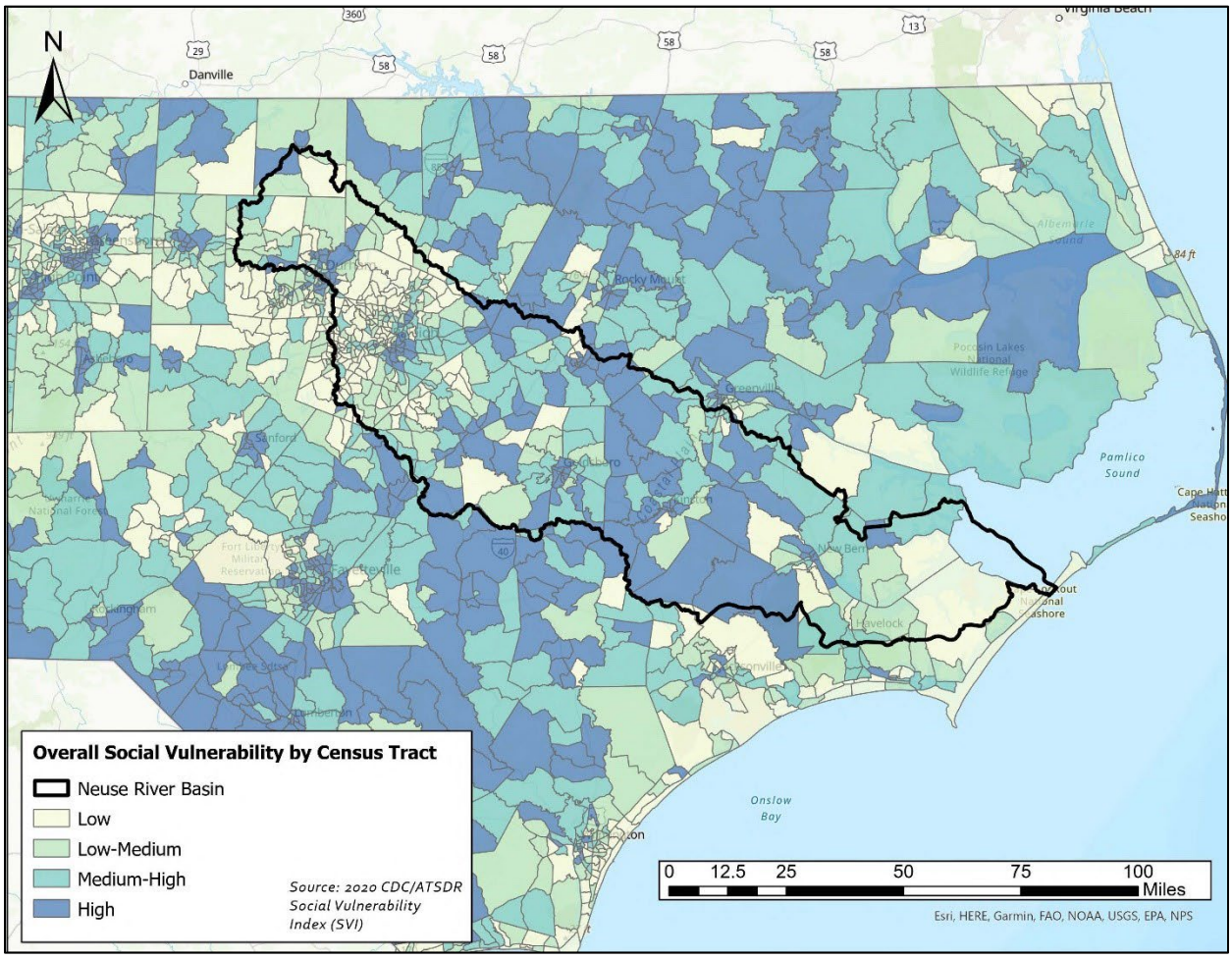

Figure 1.6: Neuse River Basin Social Vulnerability Index (2020)

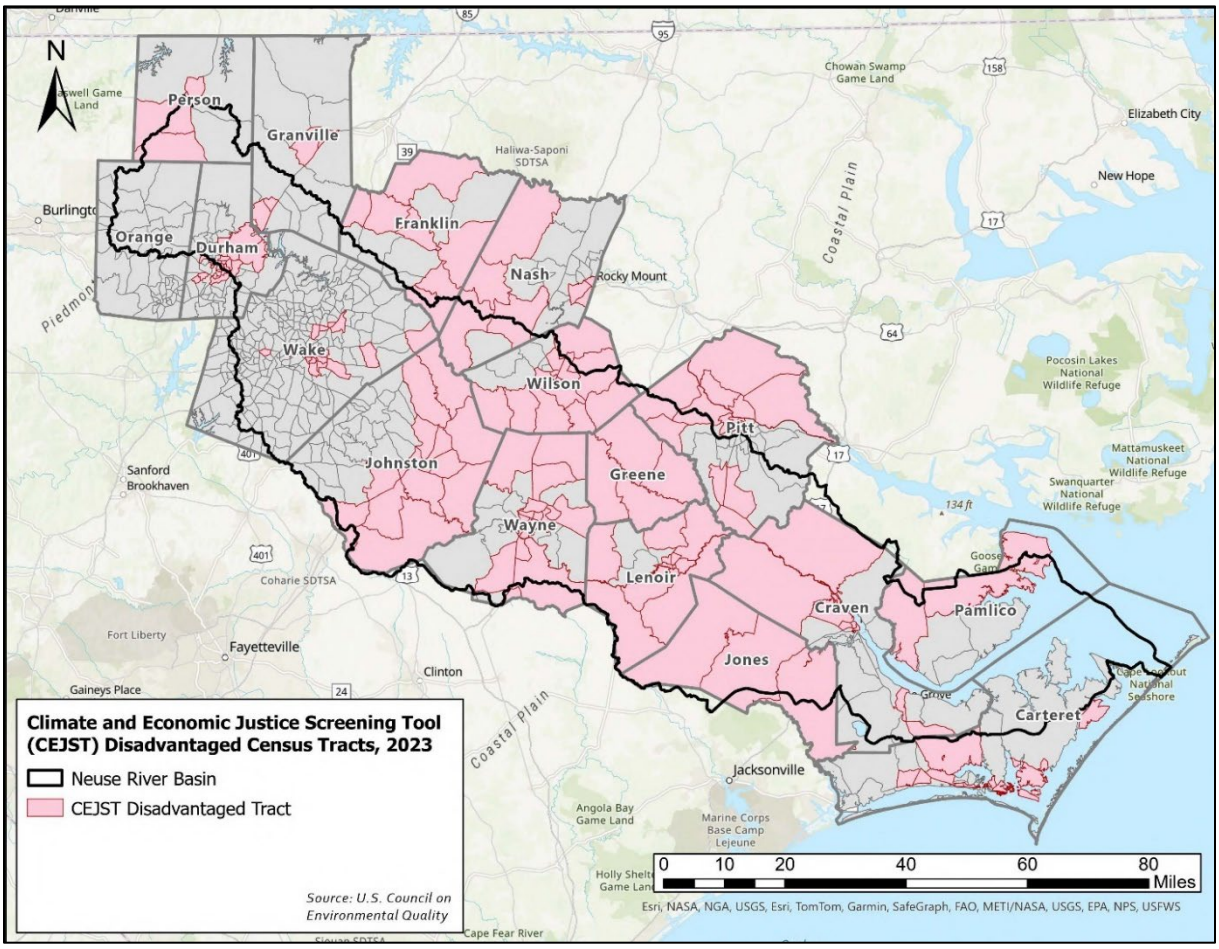

Figure 1.7: Neuse River Basin Disadvantaged Census Tracts

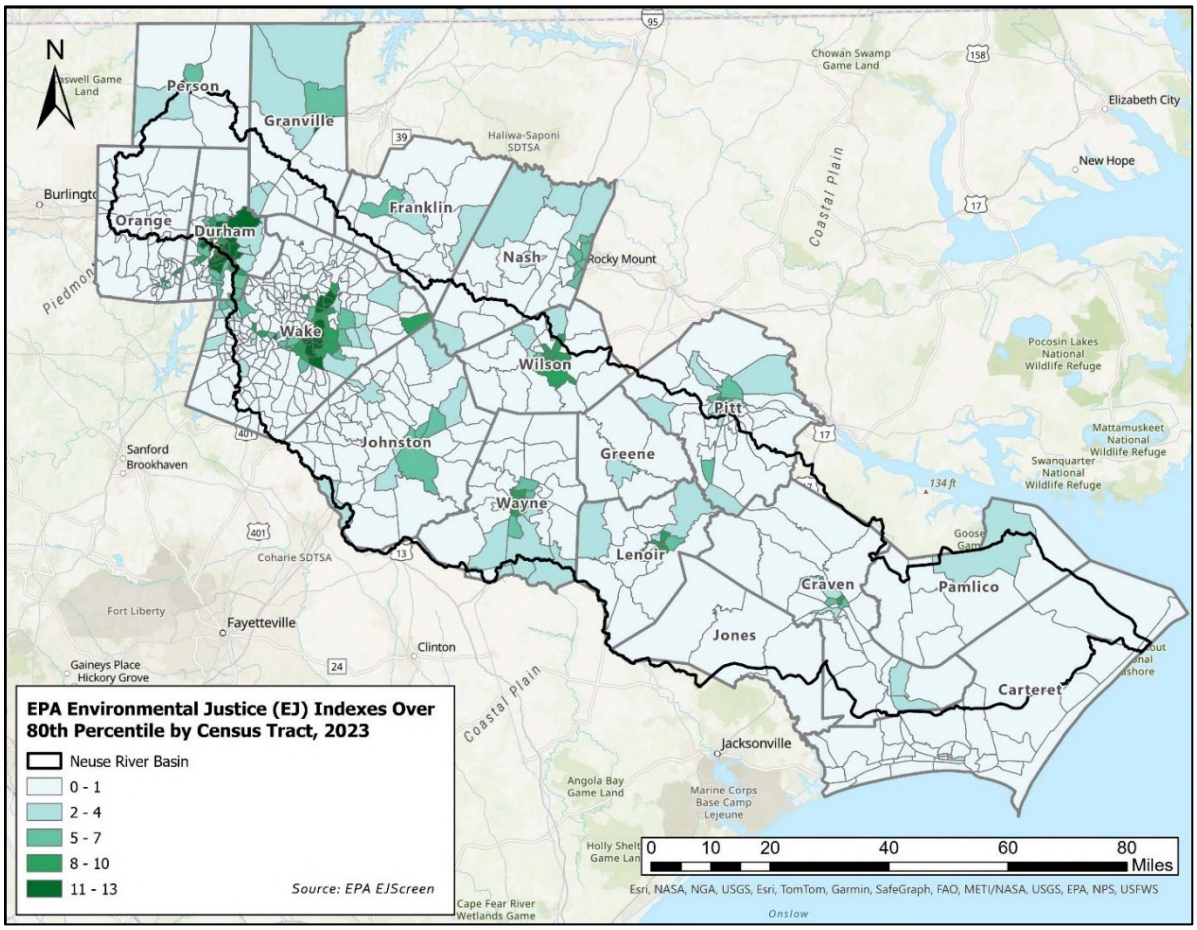

Figure 1.8: Total EJScreen Indexes Over the 80th Percentile by Census Tract

The NRI also rates counties by approximate levels of social vulnerability and community resilience to compute all the hazard risk index scores listed above. Community resilience refers to a community's ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand recover rapidly from disruptions.[9] Social vulnerability is the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.[10] Social vulnerability and community resilience ratings are further combined to form a Community Risk Factor (CRF) as a numeric ratio between the two variables. Higher social vulnerability results in a higher Risk Index value while higher community resilience results in a lower Risk Index value. Results for the counties in the Neuse River Basin are shown in Table 1.3 below.

Table 1.3: Social Vulnerability and Community Resilience of Neuse Basin Counties (2024)

County	Social Vulnerability	Community Resilience	CRF
Carteret County	Relatively Moderate	Very High	1.03

[9] Community Resilience | National Risk Index (fema.gov)
[10] The National Risk Index (geoplatform.gov)

Craven County	Very High	Relatively High	1.22
Wayne County	Very High	Relatively Moderate	1.38
Pitt County	Very High	Relatively High	1.28
Wake County	Relatively Low	Relatively High	1.01
Lenoir County	Very High	Relatively Moderate	1.44
Johnston County	Relatively High	Relatively Moderate	1.21
Durham County	Relatively High	Relatively High	1.16
Nash County	Very High	Relatively Moderate	1.32
Wilson County	Very High	Relatively Moderate	1.38
Pamlico County	Relatively High	Relatively High	1.14
Jones County	Very High	Relatively Low	1.58
Greene County	Very High	Very Low	1.67
Orange County	Relatively Low	Relatively High	1.03
Granville County	Relatively High	Relatively Moderate	1.26
Franklin County	Relatively High	Relatively Low	1.33
Person County	Relatively Moderate	Relatively Moderate	1.3

Source: FEMA, National Risk Index

1.3.4 Substantial Population Increase in the Last Two Decades

Population growth can have significant implications for flooding through a combination of urbanization, changes in land use, increased demand for water and energy resources, and the expansion of development into flood-prone areas. The total population of Neuse River Basin communities has experienced substantial growth over the last several decades. At around 2.7 million residents, the Neuse River Basin population now represents nearly 25% of the total population in North Carolina which is indicative of the potential impact on the basin and the state as a whole[11].

Increasing development and economic investment concentrated near rapidly urbanizing areas of the basin mirrors trends of a larger scale that may be observed across the state. Measures taken throughout the Neuse River Basin may be replicable to a certain extent within other river basins. As the population grows, urbanization and infrastructure development often follow suit to meet demands. These changes can lead to alterations in the natural landscape and an increase in the amount of impervious surface area, reducing the land's natural ability to absorb and retain water and negative impacts on water quality. According to the North Carolina Natural and Working Lands Dashboard, between 2001 and 2019, the total developed land cover in the basin grew by nearly 85,300 acres, while there were decreases of forested area with a reduction of approximately 37,730 acres of non-urban forest and 26,507 acres of urban forest[12].

[11] Wake County. (2022). https://www.wake.gov/news/critical-wake-county-waterway-named-river-year
[12] Duke University, Nicholas Institute for Energy, Environment, and Sustainability. (2020). https://nicholasinstitute.duke.edu/project/north-carolina-natural-and-working-lands-dashboards

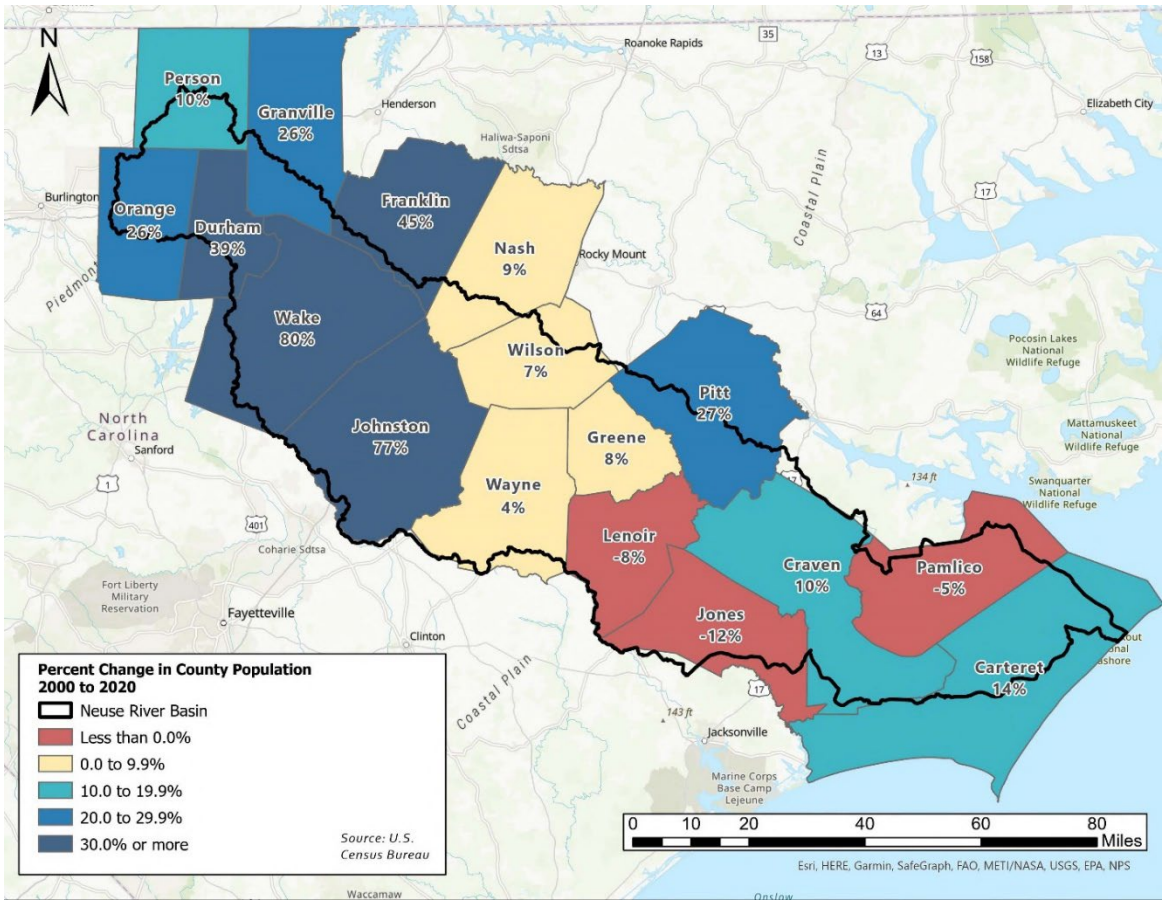

Figure 1.9: Percent Change in County Populations, 2000 to 2020

By contrast, some communities in the Neuse River Basin have not experienced similar rates of growth aligned with the predominant trends described above. Changes in all the county populations are identified in both Figure 1.9 and Table 1.4 based on data from the U.S. Census Bureau. Under-resourced, shrinking communities can face new consequences directly associated with shrinking capacity. It is important to recognize that capacities, resources, opportunities, and needs among the basin's population will vary widely by location. These conditions inherently demand a more contextualized and responsive approach from the current strategy related to the different community changes of the Neuse River Basin expected in future years.

Table 1.4: Population Growth of Neuse River Basin Counties

County	Census 2000 Population	Census 2010 Population	Census 2020 Population	% Change (2000-2020)	Projected 2030 Population	Projected 2040 Population	Projected 2050 Population
Carteret	59,383	66,469	67,686	14%	73,690	78,307	82,921

Craven	91,436	103,505	100,720	10%	107,357	107,924	107,971
Durham	233,314	267,587	324,833	39%	365,528	410,030	454,749
Franklin	47,260	60,619	68,573	45%	95,631	116,044	134,008
Granville	48,498	57,538	60,992	26%	66,816	73,369	79,925
Greene	18,974	21,362	20,451	8%	19,940	19,939	19,938
Johnston	121,965	168,878	215,999	77%	287,852	337,223	385,056
Jones	10,381	10,153	9,172	-12%	9,100	9,101	9,100
Lenoir	59,648	59,495	55,122	-8%	51,729	48,761	45,794
Nash	87,420	95,840	94,970	9%	99,437	100,185	100,322
Orange	118,227	133,801	148,696	26%	160,411	175,040	189,672
Pamlico	12,934	13,144	12,276	-5%	11,904	11,513	11,122
Person	35,623	39,464	39,097	10%	39,466	39,633	39,703
Pitt	133,798	168,148	170,243	27%	187,465	206,957	226,562
Wake	627,846	900,993	1,129,410	80%	1,363,836	1,615,386	1,866,937
Wayne	113,329	122,623	117,333	4%	117,494	117,524	117,524
Wilson	73,814	81,234	78,784	7%	79,321	81,804	84,336
TOTALS	1,893,850	2,370,853	2,714,357	43%	3,136,977	3,548,740	3,955,640

Source: U.S. Census Bureau and North Carolina OSBM, Standard Population Estimates, Vintage 2022 and Population Projections, Vintage 2023

1.3.5 Significant Natural Resources that Mitigate Flooding

The unique natural resources that contribute to the basin's flood mitigation potential make the Neuse River Basin an ideal candidate for the pilot Action Strategy. Forests, agricultural land, wetlands, and similar types of land all provide important natural hydrological functions that mitigate different types of flooding. The following information summarizes some of the key natural resources in the Neuse River Basin that assist in flood impact mitigation:

- As of 2016, forests represented nearly a third (29.5%) of all land cover in the Neuse River Basin[13]. Forest cover provides flood mitigation services by absorbing incoming rainfall so that less water becomes surface runoff and contributes to flooding.
- As of 2016, agricultural land represented nearly another third (31.8%) of all land cover types in the Neuse River Basin. Agriculture may play a significant role in affecting flooding patterns depending on the crop(s) being grown, existing land management practices, and methods of irrigation and drainage. New opportunities for potential flood mitigation (e.g., structural water farming) may exist in the agricultural industry as well.
- As of 2016, wetlands represent roughly another fifth (17%) of land cover in the Neuse River Basin. Key wetland resources of the Neuse River Basin include the Cedar Island Marshes,

[13] NCDOT. (2020). Flood Abatement Assessment for the Neuse River Basin. https://connect.ncdot.gov/projects/research/RNAProjDocs/Final%20Report%20RP2018-32.pdf

Cherry Point Piney Island, Jones Island, Pamlico Point Marshes, Sweetwater Creek Natural Area, Trent River/Brice Creek Marshes, Neuse River Floodplain and Bluffs, Cliffs of the Neuse State Park, Neuse River/Brogden Bottomlands, and the Sage Pond/Neuse River Floodplain[14]. Depending on their existing conditions, wetlands can help slow down, trap, and store water from a flood event to potentially buffer some of its impacts.

1.3.6 Robust Data from Prior Studies and Projects

Another reason the Neuse is an ideal pilot basin is the extensive amount of research and data. Many studies and reports have assessed areas of significant flood risk, indicating a growing need for flood resilience. This wide body of literature supports a strong foundation for future analyses to build upon in favor of greater basin-level resilience. The literature review will help Blueprint identify and address gaps using innovative solutions while leveraging key findings and best practices of existing planning efforts.

The Wilmington District of the United States Army Corps of Engineers (USACE) has previously released several reports on the subject, such as the Adkin Branch Detailed Project Report and Environmental Assessment (1995), Neuse River Basin Integrated Feasibility Report and Environmental Assessment (2012), and Neuse River Basin Flood Risk Management Technical Report (2023)[15]. Additional publications of key relevance include the Neuse River Basin Flood Analysis and Mitigation Strategies Study (NCEM & NCDOT, 2018), Flood Abatement Assessment for the Neuse River Basin (NCDOT, 2020), and the Collaboratory Flood Resiliency Study (North Carolina Collaboratory, 2021). These sources among others provide thorough data-driven analysis related to the existing conditions, current and future flood risks, and anticipated planning outcomes throughout the Neuse River Basin.

Hazard mitigation plans and resilience portfolios are also in place for counties and municipalities in the Neuse River Basin. Hazard mitigation plans are required by FEMA for communities to remain eligible for certain types of federal hazard mitigation funding sources. Hazard mitigation planning efforts in the basin began in the late 1990's and continues through plan updates that are required by FEMA every 5 years. Figure 1.10 below shows the current hazard mitigation plans in place for the counties in the Neuse River Basin.

[14] NCDEQ. (2009). Neuse River Basinwide Water Quality Plan. https://www.deq.nc.gov/water-quality/planning/bpu/neuse/neuse-plans/2009-plan/nr-basinwide-plan-2009-final/download

[15] USACE. (2023). https://www.saw.usace.army.mil/Missions/Flood-Risk-Management/Neuse-River-Basin/

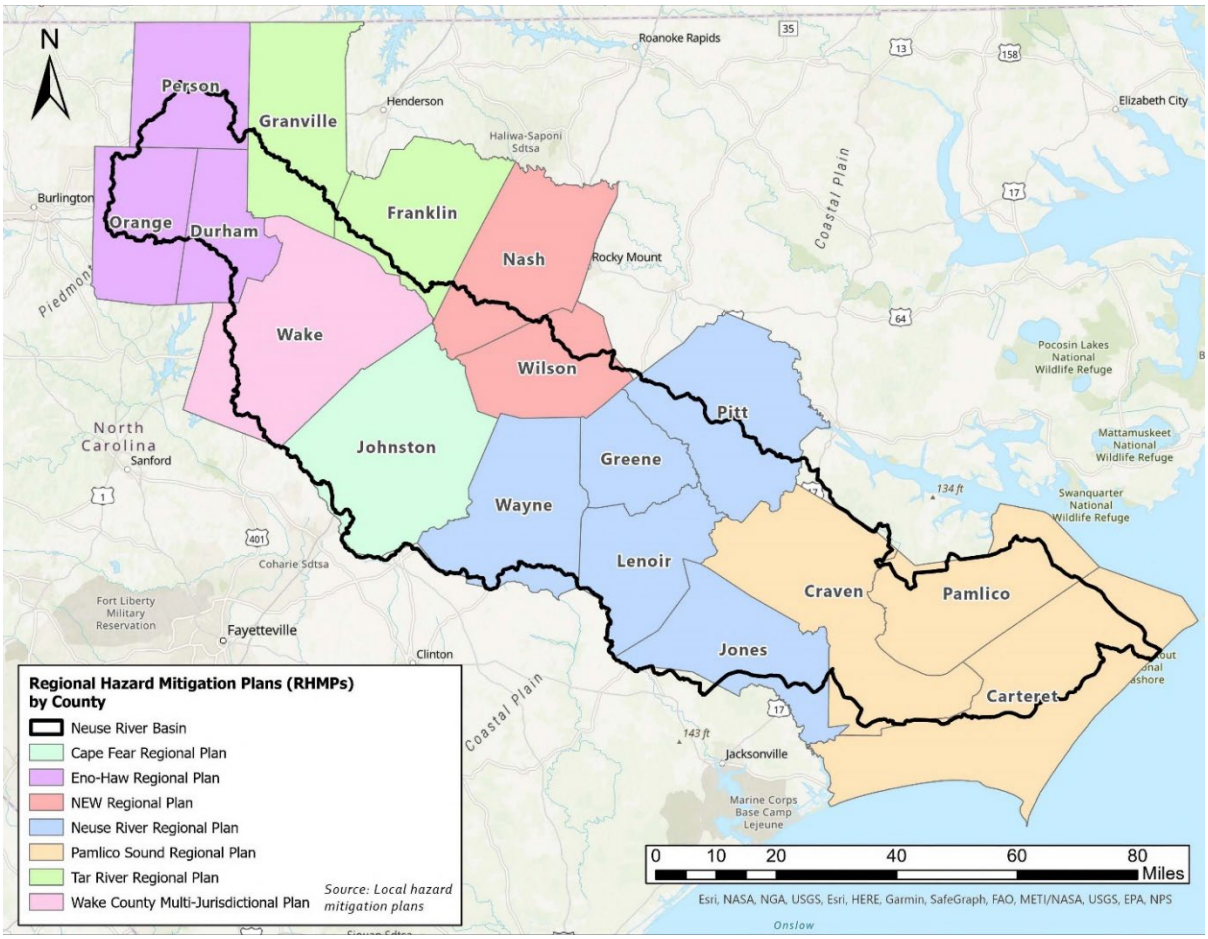

Figure 1.10: Regional Hazard Mitigation Plans by County

The Regions Innovating for Strong Economies and Environment (RISE) program is a partnership between the North Carolina Office of Recovery and Resiliency (NCORR) and the North Carolina Rural Center. The program supports resilience planning efforts in portions of eastern North Carolina by providing coaching and technical assistance to regional partners to support community vulnerability assessments, identify priority actions to reduce risk and enhance resilience in their region, and develop paths to implementation. Figure 1.11 displays the RISE Regional Resilience Portfolios (RRPs) for Neuse River Basin counties based on information from NCORR.

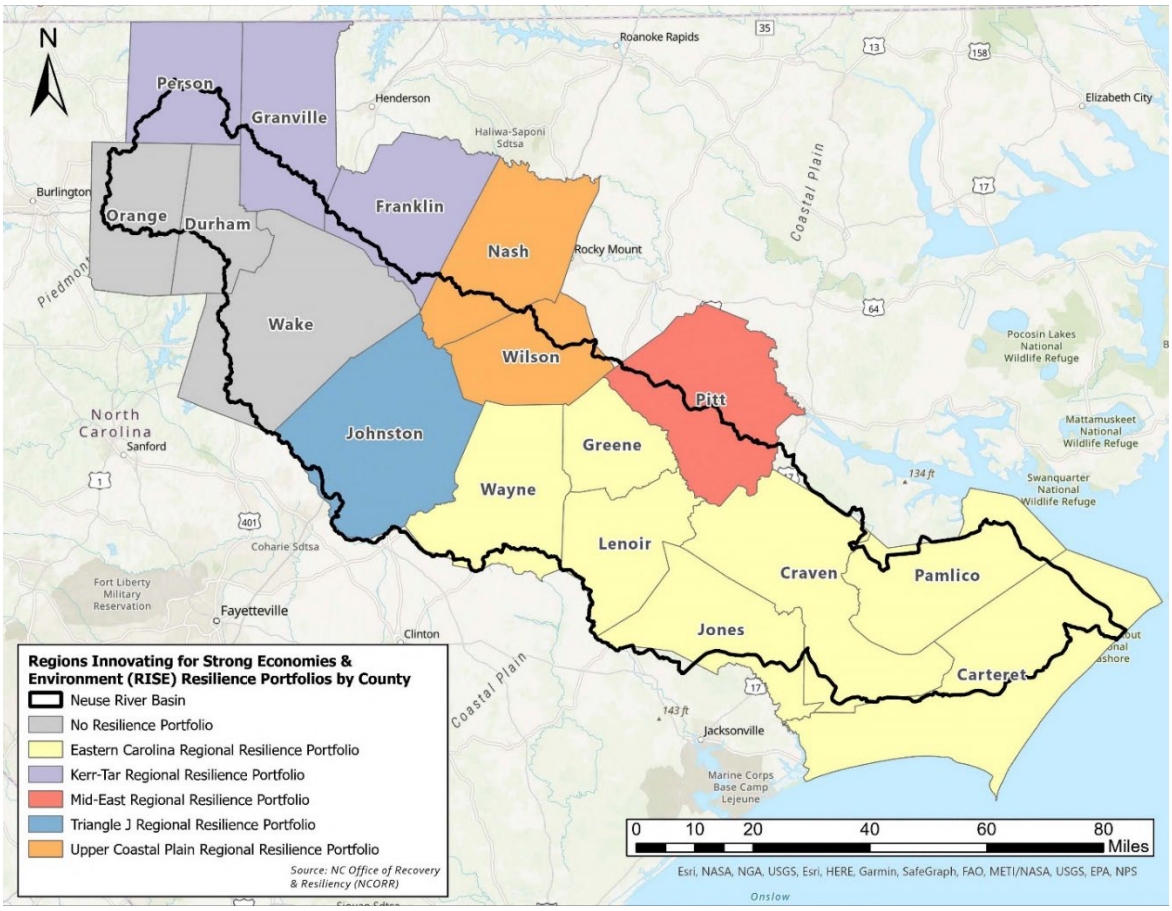

Figure 1.11: RISE Regional Resilience Portfolios by County[16]

Additionally, the municipalities of Aurora, Cedar Island, Vandemere, and Carteret, Craven and Pamlico Counties in the Neuse Basin have participated in the Resilient Coastal Communities Program (RCCP). The RCCP is overseen by the North Carolina Department of Environmental Quality Division of Coastal Management and aims to facilitate a community-driven process for setting coastal resilience goals, assessing existing and necessary local capacity, and identifying and prioritizing projects to enhance community resilience to coastal hazards. Participating communities walk through a framework leading to the development of "shovel-ready" projects. Local governments throughout North Carolina's 20 coastal counties are eligible to apply for direct technical assistance to complete a community engagement process, risk, and vulnerability assessment, and develop a resilience project portfolio. Projects identified through the RCCP have been evaluated and included in this action strategy for their relevance to the Blueprint.

1.3.7 Robust Existing Stakeholder Efforts and Organizations

Water resources of the Neuse River Basin have continued to benefit from a wide range of active stakeholder groups and coordinated efforts to build resilience, indicating strong local and regional

[16] NOTE: The Triangle J Council of Governments is now known as Central Pines Regional Council.

capacity. Historic issues with both flooding and nutrient contamination in the basin's waterways have consistently spurred new agreements, partnerships, and actions across many levels of decision-making authority[17]. These coordinated responses help set a valuable example for other river basins of North Carolina to follow when planning for similar issues of population growth, pollution, and increasingly challenging issues tied to flooding. The diverse stakeholder groups supporting resilience-building activities throughout the Neuse River Basin include:

- Tribal communities – Two recognized tribes were identified, the Saponi and the Occaneechi Band of the Saponi Nation. Both North Carolina staff involved in partnering with American Indian tribes and the North Carolina Commission of Indian Affairs Board were invited to participate in a Technical Advisory Group (TAG) for the statewide effort.
- Regional stakeholders – These include the Neuse Regional Water and Sewer Authority, North Carolina Environmental Justice Network, Neuse River Basin Compliance Association, and Upper and Lower Neuse River Basin Associations.
- County and municipal governments – With over 17 counties and 75 municipalities in this group, many opportunities for intergovernmental collaboration exist for the collective benefit of the Neuse River Basin.
- Non-governmental organizations (NGOs) – A total of 13 NGOs were identified based on their previous and ongoing work in the Neuse River Basin. Each organization brings a unique skillset, knowledge base, and perspective to the resilience opportunities present in the basin.
- Academic and research institutions – Academic and research institutions actively working to address flood resilience in the Neuse River Basin include Duke University, East Carolina University, North Carolina Central University, North Carolina State University, and the University of North Carolina at Chapel Hill.
- Councils of Government (COGs) – The five COGs include the Central Pines, Eastern Carolina, Kerr-Tar, Mid-East Commission, and Upper Coastal Plain groups, all of which recently developed a Regional Resilience Portfolio under NCORR's RISE Program.
- State agencies – State agencies include NCDEQ, Natural and Cultural Resources, Public Safety, Agriculture, and Transportation as well as the State Climate Office.
- Federal agencies – Federal agencies include the USACE, FEMA, United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), United States Environmental Protection Agency (EPA), and United States Department of Housing and Urban Development (HUD).
- Military – The Neuse River Basin is home to various military installations, facilities, and infrastructure features that are susceptible to flood hazards. Some of these key installations include Marine Corps Air Station Cherry Point, Seymour Johnson Air Force Base, and the North Carolina National Guard Headquarters. The inclusion of the military as a stakeholder is crucial for identifying and addressing vulnerabilities, protecting assets, and ensuring continuity of military operations.

[17] NCDEQ. (2013). https://files.nc.gov/deqee/documents/files/neuse.pdf

1.3.8 Adaptive Capacity and Capability

In local hazard mitigation plans, which include all counties and municipalities in the Neuse River Basin, local capability assessments are included. As part of the hazard mitigation planning process, the purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. While specific to hazard mitigation plans, many of the same capabilities assessed apply to resilience as well.

In the capability assessments for local hazard mitigation plans, each participating county and municipality provide a self-assessment of overall capability to implement a mitigation strategy. Table 1.5 below provides a tabulation of how overall capabilities for Neuse River Basin jurisdictions were assessed by (1) consultants preparing local hazard mitigation plans, listed as "CALC" and (2) jurisdictions conducting their own self-assessment, listed as "SELF." Self-assessed capabilities are also shown by county in Figure 1.12. These capabilities were considered during the development of recommendations within this action strategy. Increasing the resilience capability of all local governments in the basin is a key focus of the action strategy.

Table 1.5: Capability Ratings for Neuse River Basin Jurisdictions

Hazard Mitigation Plan (for Neuse Basin Counties and Jurisdictions)	# of Low Ratings (CALC)	# of Moderate Ratings (CALC)	# of High Ratings (CALC)	# of Limited Ratings (SELF)	# of Moderate Ratings (SELF)	# of High Ratings (SELF)
Cape Fear Regional Plan	1	10	1	N/A	N/A	N/A
Eno-Haw Regional Plan	0	3	5	0	8	0
N.E.W. Regional Plan	14	3	2	14	3	3
Neuse River Regional Plan	17	11	3	10	7	14
Pamlico Sound Regional Plan	16	14	1	8	10	13
Tar River Regional Plan	0	8	3	0	10	1
Wake County Multi-Jurisdictional Plan	0	8	5	1	6	6
ALL NEUSE BASIN PLANS	**48**	**57**	**20**	**33**	**44**	**37**

Source: Local hazard mitigation plans

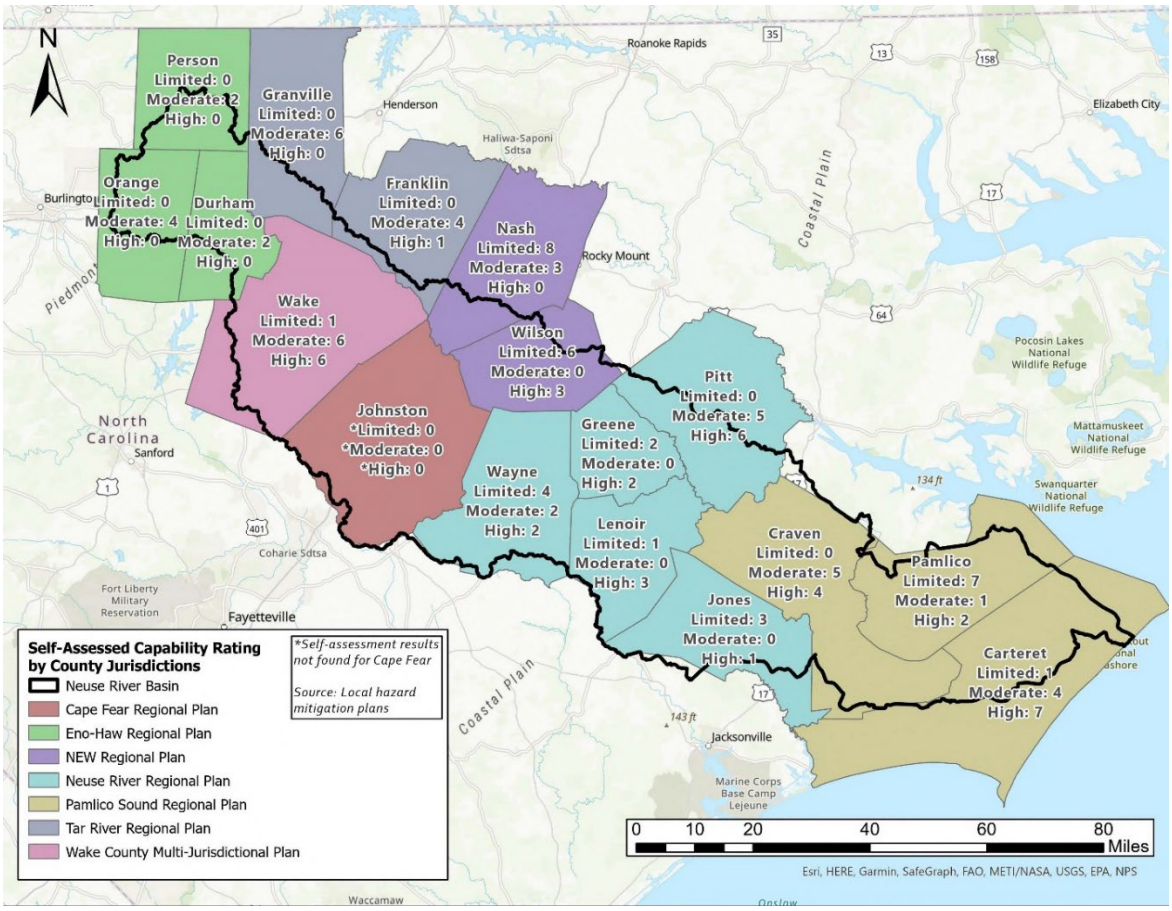

Figure 1.12: Self-Assessed Capability Rating by County Jurisdictions

2 Recommendations

Purpose of Recommendations

The Neuse Action Strategy Recommendations are intended to guide the development, maintenance, and continued use of the action strategy to better understand and address flood risk and vulnerability in the basin. These recommendations were developed in alignment with the Draft Blueprint, the Blueprint Workflow, and the anticipated Blueprint Tool to provide a cohesive and replicable approach to enhance flood resilience at the local, regional, and basin level.

In addition to guiding Neuse Action Strategy development, the recommendations were thoughtfully crafted to support smart investment and lead to action implementation. Once fully developed, the Blueprint Tool will be used to score, rank, and compare proposed actions (local, regional, and basin-wide) offering a standardized, data-driven approach to supporting funding priorities. Based on the tool's output, a list of priority resilience actions will be established, incorporated into the action strategy, and considered for funding. While the innovative Blueprint Tool plays a significant role in action strategy development and funding considerations, the value and use of its unique functionalities is contingent upon the accuracy and consistency of:

1. Approaches and methodologies employed.
2. Data, modeling, and information collected or developed.
3. Stakeholder engagement conducted.
4. Flood risks and vulnerabilities assessed.

Outlined below is a series of measures that support consistency and accuracy at every stage of the action strategy. Successful execution of the recommendations allows for optimal use and functionality of the Blueprint Tool heightening the relevancy and efficiency of the action strategy. The recommendations represent a concerted effort to ensure the Neuse Action Strategy accurately depicts and addresses flood vulnerability in the basin.

Intended Audience

The Neuse Action Strategy Recommendations are tailored to a wide-ranging audience, including local government authorities, community groups, other state agencies, and individuals and organizations involved or interested in flood resiliency. These recommendations were drafted with the specific needs and challenges of this diverse audience in mind. They are designed to offer practical and actionable guidance, considering the varying capacities and resources of local stakeholders, to empower them to make informed decisions and implement effective actions that enhance flood resilience in the basin.

Recommendation Components

Each recommendation is broken down into four subsections comprised of a Description, Justification, Neuse River Basin Approach, and Future Iterations Placeholder. These subsections are intended to

provide clarity, establish a connection to flood resilience, describe measures taken in the Neuse thus far, and explain anticipated or unexpected changes in the future. As an iterative document, this information is subject to change and reflects the evolving needs, priorities, and capacities of the basin. More notably, the parallel development of the Neuse Action Strategy with the Draft Blueprint and the Blueprint Tool will require additional outreach and refinement in Fall-Winter 2024.

- Description - Provides a clear overview of the proposed recommendation. It outlines the specifics of the recommendation, highlighting key elements entailed.
- Justification - Establishes the recommendation's purpose by summarizing underlying reasons and goals it seeks to address. It demonstrates how the recommendation directly (or indirectly) contributes to flood resilience.
- Neuse River Basin Approach - Summarizes measures taken in the Neuse River Basin to achieve the recommendation. It notes the distinct and inventive methods employed based on the circumstances of the Pilot Basin.
- Future Iterations Placeholder – Explains how certain methods will change as the Blueprint Tool and 2D modeling become available. It describes how new functionalities will be incorporated into the process and the role of that functionality moving forward.

2.1 Action Strategy Development

2.1.1 Integrate Existing Flood Resiliency Efforts

This recommendation aligns with Step #1 within the Blueprint Workflow: Actionable Data Collection, Modeling, and Analysis.

Description

Identify and integrate previous and ongoing flood resilience efforts to inform the Neuse Action Strategy. The action strategy can leverage existing resources and expertise to effectively address flood risks and vulnerabilities in the Neuse River Basin. This includes state and federal datasets, existing flood-related modeling, previous resilience planning efforts within the basin, relevant locally derived data and modeling, current resilience actions (existing and proposed), and completed resilience actions. Collaboration is a critical element for successful integration as it involves compiling existing and relevant information from federal, tribal, state, and local agencies and other stakeholders.

Justification

An inventory of existing efforts in the basin can help identify areas where interventions are already in place, areas that require enhancement, and potential gaps in coverage or effectiveness. This promotes constructive collaboration, avoids duplication of efforts, and maximizes impact of the creation of a comprehensive and coordinated approach to flood resilience planning across the basin and state.

Neuse River Basin Approach

The literature review and collection of existing data (conducted at the state and basin level) provided a foundational understanding and historical perspective of flood resilience in the state and basin. The information captured past approaches and strategies, relevant government and organizations, specific programs or funds that could be leveraged in the future, and preexisting resilience actions proposed. The extensive inventory completed on existing data and modeling supported the development of evidence-based decisions and recommendations within the Draft Neuse Action Strategy.

2.1.1.1 Statewide Existing Efforts

Alignment with existing statewide efforts is a primary Blueprint objective. Existing statewide efforts were a preliminary step taken to develop an understanding of completed, ongoing, or proposed watershed and resiliency planning across North Carolina. This contributes to the data collection, modeling, and analysis necessary to establish a statewide baseline and assist in the Blueprint Tool development. Integration or, at minimum, consideration of this information into the Draft Neuse Action Strategy is advantageous as it feeds into other recommendations and creates opportunities to leverage existing state resources.

2.1.1.1.1 STATEWIDE LITERATURE REVIEW AND DATA COLLECTION INVENTORY

A literature review and data inventory were developed to document the most current statewide data, planning efforts, research projects, studies, and regional scale modeling that correspond with watershed and flood resilience planning. The report analyzed 25 credible statewide planning efforts summarizing efforts, lessons learned, key components of existing work, and an index linked to all resources reviewed. The statewide literature review may serve as a valuable resource used to cross-reference contents in the basin action strategy. Alignment with existing statewide efforts heightens the action strategy's credibility and likelihood of securing funding from state agencies or programs.

2.1.1.1.2 STATEWIDE EXISTING MITIGATION PROJECTS

The statewide literature review and data collection inventory and statewide planning efforts with flood resilience recommendations were expanded upon to identify specific flood mitigation projects referenced in relevant planning documents. These planning documents include Hurricane Matthew Resilient Redevelopment Plans, Regional Hazard Mitigation Plans, Regional Resilience Portfolios, and others. Over 250 existing projects from statewide planning efforts were determined to correspond with flood resilience. The statewide existing mitigation projects may serve as a valuable resource as additional information was created for each existing project explaining how work completed can be leveraged.

2.1.1.1.3 FINDINGS FROM EXISTING STATEWIDE PLANNING EFFORTS AND MITIGATION PROJECTS AND CONNECTION TO THE NEUSE RIVER BASIN ACTION STRATEGY

Statewide existing efforts provide a framework for integrated planning and coordination across multiple jurisdictions within the Neuse River Basin. The Draft Neuse Action Strategy was developed

with acknowledgement of key state-wide plans, policies, and other efforts related to flood resilience, listed below:

- North Carolina Climate Risk Assessment and Resilience Plan (2020)
- State of North Carolina 2023 Hazard Mitigation Plan (2023)
- NCDOT Resilience Strategy Report (2021; 2022)
- North Carolina Natural and Working Lands Action Plan (2020)
- North Carolina Coastal Habitat Protection Plan (2016); and 2021 Amendment
- 2022 Climate Strategy Report (for 11 State Agencies) (2022)
- Hurricane Matthew Resilient Redevelopment Plans (2017) (Regional; County)
- North Carolina Climate Science Report (2020)
- Executive Order 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy (2018)
- Executive Order 246: North Carolina's Transformation to a Clean, Equitable Economy (2022)
- 2021 NCDOT Resilience Policy (2021)
- Collaboratory Flood Resilience Study (2021)
- Growing Safely or Building Risk? Floodplain Management in North Carolina (2023)
- Regions Innovating for Strong Economies and Environment Programs (RISE; 2022)
- North Carolina Resilient Coastal Communities Program (2020)

By aligning with statewide efforts, the Neuse can leverage shared resources, data, and expertise. The intent is not to alter existing recommendations, but to strengthen the legitimacy of existing recommendations for further development and implementation. These planning efforts serve as repositories of best practices, lessons learned, and innovative resilience actions that have been proposed or successfully implemented to reduce flood risk and vulnerability in the Neuse River Basin and other parts of the state. Inventories are dynamic documents that are anticipated and encouraged to change and grow over time.

2.1.1.2 Neuse River Basin Existing Efforts

Building from the statewide inventories developed, existing watershed and resiliency planning efforts in the Neuse River Basin were inventoried to provide local and regional context. Government entities and organizations involved in flood resiliency in the Neuse were catalogued and a literature review of current basin-specific, credible sources was developed. Additional sources were suggested during the Neuse Workshops including watershed management plans and farmland preservation plans.

The refinement from statewide efforts to Neuse River Basin existing watershed and resiliency planning efforts emulates a fundamental practice that supports a comprehensive and accurate analysis using the best available data. A comprehensive and accurate analysis is critical for developing the basin action strategy and selecting appropriate resilience actions within.

2.1.1.2.1 CATALOGUE OF ORGANIZATIONS INVOLVED IN WATERSHED AND RESILIENCY PLANNING IN THE NEUSE

A catalogue of local, regional, and state organizations engaged in watershed planning in the Neuse River Basin was created to identify relevant stakeholders and complement existing efforts, personnel, and skills. With more than 60 organizations referenced, stakeholder categories were established to document the wide-ranging stakeholders involved in a succinct, digestible format. Stakeholder categories include academic and research institutions, county governments, municipal governments, state and federal government agencies, tribes, NGOs, and regional stakeholders. The catalogue may serve as a valuable resource when considering potential partnerships for project planning and implementation in the Neuse River Basin.

2.1.1.2.2 NEUSE RIVER BASIN LITERATURE REVIEW EXPANSION

Expanding upon the statewide literature review and Neuse-specific stakeholder catalogue (referenced above), the Neuse River Basin literature review was conducted to analyze the most current local and regional flood resiliency efforts. This involved a robust inventory of existing and proposed flood mitigation and resilience efforts from 32 current, basin-specific, credible sources. Over 980 preexisting flood resiliency actions were identified, intended to be implemented basin-wide or at a smaller geographic scale (regional, county, local) within the basin. The Neuse River Basin literature review may serve as a valuable resource when reviewing and considering the incorporation of preexisting resilience actions into the Finalized Neuse Action Strategy (anticipated in late 2024).

2.1.1.2.3 FINDINGS FROM LITERATURE REVIEW AND CATALOGUE OF GOVERNMENT AND ORGANIZATIONS INVOLVED IN WATERSHED AND RESILIENCY EFFORTS IN THE NEUSE

More than 60 organizations are referenced in the catalogue, reiterating the basin's capacity and longstanding dedication to flood resilience. Capacity and activity in flood resilience related efforts varies significantly based on organization size and resources available. This notion corresponds with the broad list of stakeholders included in the catalogue, which range from grassroot organizations to federal government agencies.

Efforts in the Neuse River Basin supported by state programs are wide-ranging and involve various degrees of funding opportunities, plan development, modeling and engineering analyses, regulatory enforcement, training and exercises, and technical assistance. Whereas other key stakeholders offer targeted support that strongly aligns with the organization's mission. For example, the academic institutions identified in the catalogue champion collaborative research, outreach, and education with a focus on community resilience, coastal flooding, and estuary conditions. Most of the efforts put forth by regional stakeholders and non-government organizations deal with environmental concerns advocating for natural resource protection, environmental justice, and sustainable solutions.

From its inception, the Blueprint Program has acknowledged the vast amount of flood mitigation and resilience work completed in the state. Notably, the proactive state government agencies' robust programs and innovative approaches have provided a strong foundation for the Draft Neuse Action Strategy, the Draft Blueprint, and the Blueprint Tool to leverage and enhance. From a basin-level

perspective, the local and regional efforts identified in the catalogue are necessary to build upon the strong foundation established by statewide efforts. In addition to leveraging existing local and regional efforts, basin-specific information can be used to identify and address unique circumstances such as flooding hot spots, vulnerable populations, or capacity to implement.

The Neuse River Basin literature review inventoried nearly 1,000 preexisting flood resilience actions, which derived from the efforts summarized in the Neuse stakeholder catalogue. Action and community specific information from the original documents were incorporated into the review to provide additional context and support future endeavors. The extensive inventory of preexisting resilience actions proposed for the Neuse informed development of the basin action strategy and Blueprint Tool. However, the accuracy of action information (i.e., implementation status, management and/or owners, and future maintenance costs) is unknown for several plans due to irregular update cycles or vague language.

The initial inventory of preexisting actions was further refined and categorized by geographic region (Upper, Middle, and Lower Neuse) and scale (basin-wide, region, county, or local). A large share of these actions was then vetted by key stakeholders and organizations during the Neuse Workshops. The vetting process was primarily intended to determine the status and relevancy of the approximately 400 preidentified actions. The action status helps to understand completed or ongoing efforts and identify any gaps or challenges that may exist. More information pertaining to the Neuse Workshops and the vetting of preidentified actions can be found in subsequent sections.

Future Iterations Placeholder

In future iterations, much of the information referenced within, particularly state and federal existing efforts, will be compiled prior to any community and local government engagement. This information will be incorporated into the Blueprint Tool to provide a standardized baseline for statewide data and modeling, including enhanced large-scale 2D modeling. This information should be reviewed annually to reflect updated or new data. The standardized baseline is intended to help bridge capacity gaps, but, when possible, locally generated data should be incorporated to provide additional context. The plans and efforts noted during the Neuse Workshops will be reviewed for incorporation into the Finalized Action Strategy.

2.1.2 Create River Basin Advisory Group

This recommendation aligns with Step #1 within the Blueprint Workflow: Actionable Data Collection, Modeling, and Analysis.

Description

Establish a River Basin Advisory Group of informed stakeholders to provide technical and non-technical information specific to the Neuse River Basin. In collaboration with NCDEQ, this group will help develop the Neuse Action Strategy by sharing local knowledge of flooding and flood resilience

efforts and needs. The action strategy will include priority resilience actions at both the community and regional level.

Justification

Members of the advisory group possess diverse perspectives and valuable knowledge about the basin, including its hydrology, ecology, infrastructure, and community dynamics. This understanding of the basin's unique characteristics, vulnerabilities, and resilience needs will help tailor the action strategy and resilience actions to the specific context of the basin. Local knowledge and technical expertise paired with the Blueprint Tool and modeling functions will allow members to assess the effectiveness of different flood reduction measures, prioritize interventions based on scientific evidence and community need, and suggest actions that are informed by best practices and innovative research.

Neuse River Basin Approach

Multiple advisory groups were established and involved in the development of the Draft Neuse Action Strategy. These groups were selected to include subject matter experts and other key interests in the basin. Members were selected from state agency staff, federal partners, local floodplain administrators and engineers, non-profit organizations, business sectors, and academic experts in climate, flooding, hazards, and modeling. The selected advisory group members were encouraged to identify any additional stakeholders for inclusion at the first several group meetings. This opportunity was provided to promote equitable participation and understanding of as many unique stakeholder perspectives as possible.

2.1.2.1 Principal and Technical Advisory Groups

Six Technical Advisory Groups (TAGs) were established and comprised over 120 members. The TAGs were divided by subject matter for targeted discussion and feedback to address the multi-disciplinary needs and components required for the Draft Neuse Action Strategy. The subject matter groups largely correspond with the Blueprint Workflow and strategically involve technical experts at every phase of action strategy development and implementation. The groups include:

- Governance
- Hazard Identification
- Partnership and Funding
- Resilience, Mitigation, and Reduction
- Tool Development and Acceptance
- Vulnerability, Risk, and Impact

The Principal Advisory Group (PAG) was established and involved 30 subject matter experts from various sectors and state program representatives. Unlike the TAGs, the PAG was created to provide advisory input and feedback on overarching programmatic concerns. More specifically, the PAG provided input and feedback on the Blueprint Tool regarding the policy, process, engagement,

modeling, tools, and support for implementing the decision-support tool and the Blueprint at large. Although not directly tied to the Draft Neuse Action Strategy (current version), the Blueprint Tool will become an essential tool for future iterations of the action strategy.

2.1.2.2 Neuse Regional Advisory Group

In addition to the six core TAGs, the Neuse Regional Advisory Group was created to advise NCDEQ during the development of the Neuse Action Strategy. The group, listed in Table 2.1, is comprised of subject matter experts from local, regional, and state agencies, academia, and NGOs.

Table 2.1: Neuse Regional Advisory Group Members

Name	Organization
Keith Larick – CHAIR	NC Farm Bureau
Anjie Ackerman	NCDEQ/Division of Mitigation Services (NCDEQ DMS)
Ben Farmer	Upper Coastal Plain COG
Bryan Evans	NC Association of Soil and Water Conservation Districts
Carlton Gideon	Eastern Carolina COG (in Neuse)
Charlie Colie	Neuse Regional Sewer and Water Authority
Chris Seaberg	City of New Bern
Diane Cox	Kerr-Tar COG (in Neuse)
Haley Hogg	Mid-Carolina COG (in Neuse)
Jamille Robbins	NCDOT/Public Involvement
Jonathan Hinkle	Greenman-Pedersen, Inc. (GPI)
Kendall Paramore	Southeast Drainage District
Nancy Daly	Wake County
Rachel Love-Adrick	NCDEQ/Division of Coastal Management
Samantha Krop	Sound Rivers, Inc.
Steve Miller	City of Kinston/Public Services
Thomas Caggiano	The Nature Conservancy
Yesenia Cuello	NC Inclusive Disaster Recovery Network/NC FIELD

The group members were selected following the same protocol as other TAGs and recommendations for additional personnel were highly encouraged.

2.1.2.2.1 DELIVERABLES REVIEWED BY THE NEUSE ADVISORY GROUP

Like the six core TAGs, the subject matter experts of the Neuse Regional Advisory Group reviewed key deliverables that would guide the development of the basin action strategy. There were six deliverables assigned to the Neuse Regional Advisory Group meaning this group was the designated lead review. Deliverables were developed and shared in chronological order as they were strategically designed to build off one another (i.e., the Neuse literature review expands on the information presented in the stakeholder catalogue). On separate occasions, each of the six deliverables were released for review, revisions, and additional input. The Neuse Regional Advisory Group was tasked as lead review for the following five documents:

- Outreach and Engagement Plan for the North Carolina Flood Resiliency Blueprint
- Catalogue of Government and Organizations Involved in Watershed and Resiliency Planning
- Nature-Based Solutions Existing Opportunities Gap Analysis in the Neuse River Basin
- Identification of Vulnerable, Underserved, and Under-Resourced Communities in the Neuse River Basin
- Neuse River Basin Flood Resiliency Action Strategy

The deliverables listed above are included in subsequent sections (except for the stakeholder catalogue referenced above) with the corresponding recommendation. Neuse Advisory Group meetings and meeting purpose are briefly summarized below.

2.1.2.2.2 SUMMARY OF NEUSE ADVISORY GROUP MEETINGS

Eight meetings for the Neuse Regional Advisory Group were held between March 2023 and June 2024. Each meeting was allotted a two-hour window to ensure ample time to cover meeting topics and materials. The topics covered during these meetings varied based on timeline and deliverables due or forthcoming. These meetings were held to stimulate thinking, share ideas, foster impactful discussion, and pose and answer questions. A summary of each meeting's purpose is provided below, but meeting minutes can be obtained by contacting NCDEQ's Division of Mitigation Services.

March 15, 2023 – Neuse Regional Advisory Group Meeting 1: Blueprint Tag Kick-Off

Initiated the Blueprint project, introduced TAG members to the project and the group, and discussed their role in the project. Within this meeting participants were asked a series of questions to solicit initial feedback on the Blueprint project.

May 5, 2023 – Neuse Regional Advisory Group Meeting 2

Discussed deliverables and elicited comments about subtasks assigned to TAG members for review, familiarized them with materials and their whereabouts, and discussed specific topics pertaining to TAG needs.

June 1, 2023 – Neuse Regional Advisory Group Meeting 3

Informed the Neuse Regional Advisory Group of the discussion held earlier in the day with the invited local leaders of the Neuse River Basin, discussed the status of project deliverables, and reviewed initial findings of existing resiliency actions in the Neuse River Basin.

June 30, 2023 – Neuse Regional Advisory Group Meeting 4

Reviewed information for the Blueprint, began looking at the design for the Blueprint Tool, reviewed the proposed Blueprint Workflow, and considered the forthcoming recommendations. A summary of community engagement was provided for recent meetings held in New Bern, Lumberton, Wilmington, and Haywood County, North Carolina.

July 25, 2023 – Neuse Regional Advisory Group Meeting 5

Focused on discussing the proposed Blueprint Workflow. Updates were also provided on Blueprint documents that were in review or that had recently completed review. In addition, the planned Neuse Workshops were discussed.

November 2, 2023 – Neuse Regional Advisory Group Meeting 6

Provided an opportunity for input and discussion about the recommendations recently released for review. This was the final meeting of the Neuse Regional Advisory Group before the release of the Preliminary Draft Neuse Action Strategy.

December 19, 2023 – Neuse Regional Advisory Group Meeting 7

Reviewed the Blueprint Tool and Preliminary Draft Neuse Action Strategy. Storyboards were developed and shared with the group to visualize the information, user interactions, and design elements proposed for the Blueprint Tool. Recommendations from the Preliminary Draft Neuse Action Strategy were discussed in great depth and members were asked to provide input on the planned Neuse Workshops.

June 6, 2024 – Neuse Regional Advisory Group Meeting 8

Provided status updates and sought feedback on the Blueprint Tool and the refinement of the Preliminary Draft Action Strategy. The group was briefed on the tool's functions differentiating datasets and methodologies that stem from existing efforts and those that are unique to Blueprint. The actions strategy refinement process was summarized noting significant changes to the document including the integration of Neuse Workshop findings.

Future Iterations Placeholder

The Neuse Regional Advisory Group will remain engaged after the delivery of the Draft Neuse Action Strategy. The group will reconvene in late 2024 once the proposed resilience actions are scored, ranked, and prioritized using the Blueprint Tool. This will involve one or two meetings to discuss the Blueprint Tool and integration of updated information into the Finalized Neuse Action Strategy. This group will be engaged to minimize upstream and downstream conflicts, observe how communities

use the Blueprint Tool to rank actions, and identify actions that best work together to achieve the greatest impact in the Neuse River Basin.

2.1.3 Incorporate Equity and Social Vulnerability

This recommendation aligns with Step #1 within the Blueprint Workflow: Actionable Data Collection, Modeling and Analysis.

Description

Assess and integrate equity and social vulnerability findings to create an action strategy that addresses the needs of all community members. Factors such as income, accessibility, and language help depict the unique challenges faced by vulnerable populations. Analysis of vulnerable, underserved, and under-resourced communities in the basin that experience or will experience flooding should be conducted at the beginning of the planning process.

Justification

An equity lens can help identify and prioritize interventions that reduce existing disparities and increase resilience for marginalized populations. More specifically, the basin analysis of vulnerable, underserved, and under-resourced communities will guide future steps taken within the Blueprint Workflow. The information presented in the analysis will be used to develop the stakeholder engagement plan, conduct basin needs assessments, and include resilience actions centered around those most vulnerable to flooding.

Neuse River Basin Approach

The analysis of vulnerable, underserved, and under-resourced communities was conducted as part of the Draft Neuse Action Strategy. This report identified areas in the basin that are disproportionately impacted by flooding. The analysis was also used to guide stakeholder engagement. The Neuse Workshop Strategy Approach document referenced and reflected findings and was then used to plan the Neuse Workshops. In addition to evidence-based findings, stakeholder feedback was sought and applied to the action strategy. Engagement efforts provided a platform for community members, organizations, and agencies to share perspectives and concerns. The engagement process leveraged local knowledge pertaining to community needs, vulnerabilities, and priorities that may not have been captured in the initial analysis.

2.1.3.1 Vulnerable Communities

Vulnerable communities prone to flooding have been identified in the Draft Neuse Action Strategy to determine necessary assistance where it is most needed to promote equitable outcomes. Flood impacts are typically exacerbated in these communities due to various socioeconomic factors, limited resources, and historical disparities. By specifically targeting vulnerable areas, the action strategy aims to address inequalities, reduce risk, and enhance the overall resilience of the basin implementing resilience actions with the greatest impact.

2.1.3.1.1 IDENTIFICATION OF VULNERABLE, UNDERSERVED, AND UNDER-RESOURCED COMMUNITIES IN THE NEUSE RIVER BASIN

This document identifies vulnerable, underserved, and under-resourced communities in the Neuse River Basin that experience or will experience flooding. The communities were determined by evaluating and cross-referencing flood, environmental, and social vulnerability datasets to consider cumulative impacts of these various types of vulnerabilities and risks. The data sources used include the FEMA National Risk Index (NRI), Climate and Economic Justice Screening Tool (CEJST), and CDC ATSDR Social Vulnerability Index (SVI).

The information was then used to inform stakeholder engagement efforts for the Draft Neuse Action Strategy, specifically the locations of the Neuse Workshops, to ensure the strategy is an accessible and beneficial resource to all communities in the basin. It is possible that further evaluation of data and discussion with stakeholder engagement specialists will identify additional areas of vulnerable, under-served, and under-resourced communities. The analysis of vulnerable, underserved, and under-resourced communities can yield valuable insights as it provides specific recommendations to engage with the identified communities to best address their needs.

2.1.3.1.2 FINDINGS FROM THE ANALYSIS OF VULNERABLE, UNDERSERVED, UNDER-RESOURCED COMMUNITIES

The analysis resulted in the identification of seven distinct areas within vulnerable, under-served, and under-resourced communities in the Neuse River Basin. These areas may require further engagement to collect input and feedback on the community's unique needs and issues related to flooding. The seven identified communities, containing areas of significantly high vulnerability, are listed below, and shown in Figure 2.1:

- City of New Bern, Craven County (northeast portions of the city)
- Towns of Selma and Smithfield, Johnston County (southern portions of the Towns of Selma and Smithfield and unincorporated areas south of Smithfield)
- Jones County
- City of Kinston, Lenoir County
- City of Goldsboro, Wayne County (central portions of the city)
- City of Wilson, Wilson County (southern half of the city)

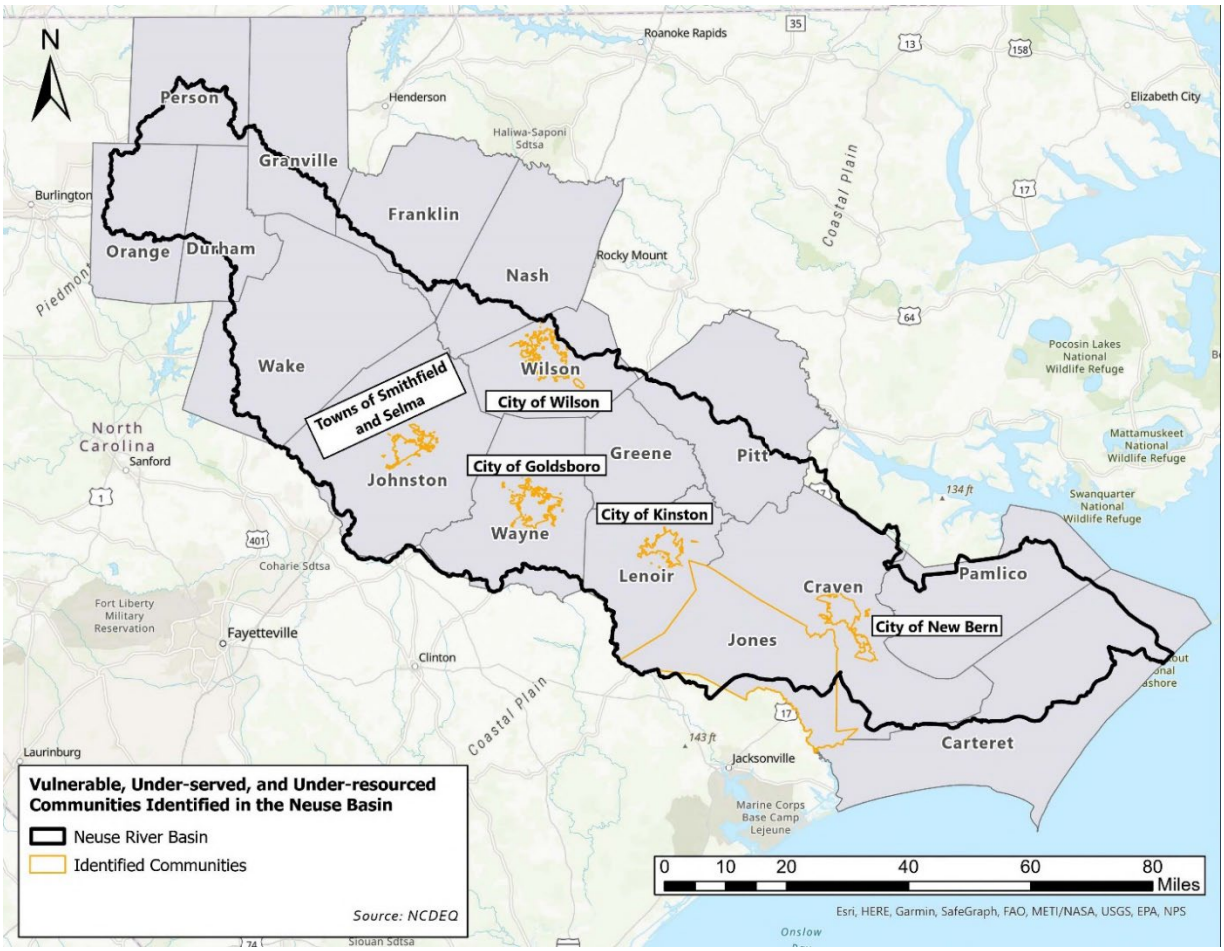

Figure 2.1: Vulnerable, Underserved, and Under-resourced Communities.

The information presented in this analysis was referenced when planning the Neuse Workshops. More specifically, the outreach and engagement considerations outlined in the Neuse Workshop Strategy Approach document were developed to promote inclusive and accessible workshops. The findings from the analysis can be used to better understand the specific needs or challenges faced by the identified communities. This heightened understanding allows stakeholders to tailor outreach methods to effectively engage and support these communities, which leads to more equitable outcomes in the Neuse River Basin.

Future Iterations Placeholder

For 5-year action strategy updates, this analysis should be conducted and incorporated into the initial data collection, modeling, and analysis. Any new or updated datasets should be considered annually to enhance the accuracy and effectiveness of the analysis. For the first iteration of the action strategy, this analysis was conducted after the Outreach and Engagement Plan was developed. In future iterations of this document, it will be necessary to review and revise the Outreach and Engagement Plan to reflect the specific needs of the basin's vulnerable communities. Once updated, the Outreach and Engagement Plan should be referenced when planning future outreach and engagement efforts

to ensure historically underserved and under-represented populations are involved in the planning process.

2.1.4 Conduct Robust Stakeholder Engagement

This recommendation aligns with Step #2 within the Blueprint Workflow: Initiate Community Engagement and Discovery.

Description

Conduct robust stakeholder engagement in the development of the Neuse Action Strategy by actively involving a diverse range of stakeholders, including local communities, governmental agencies, non-profit organizations, businesses, and academic institutions. Although stakeholder engagement largely aligns with Step #2 in the Blueprint Workflow, engagement occurs during every step of the process. These efforts should coincide with the Outreach and Engagement Plan for the North Carolina Flood Resiliency Blueprint (summarized below).

Justification

Inclusive participation and feedback inform the action strategy and capture varied perspectives, priorities, and expertise to inform decision-making and reflect priorities of all stakeholders. The Blueprint calls for extensive outreach to: (1) Raise awareness and education regarding the Blueprint to heighten its use and overall long-term success; (2) Ensure all communities and populations are well-represented within a basin-specific action strategy; and (3) Gain insight and gather information that is not captured within existing resources and documentation.

Neuse River Basin Approach

Stakeholder engagement was an essential component, which offered an opportunity to educate relevant stakeholders on the Blueprint and gather valuable input to shape the Draft Neuse Action Strategy. Several engagement efforts were conducted at key touchpoints to engage different audiences and perspectives. While some outreach was geared toward soliciting feedback, others provided education on Blueprint and key deliverables. This effort involved establishing the Neuse Regional Advisory Group and conducting local leaders' meetings, public workshops, and the Neuse Workshops. Engagement fostered meaningful dialogue, knowledge sharing, and consensus-building among diverse groups. Stakeholder involvement throughout the planning process ultimately led to a more inclusive and informed Draft Neuse Action Strategy.

2.1.4.1 Planning for Stakeholder Engagement

To promote inclusivity and enhance the effectiveness of outreach and engagement efforts, an Outreach and Engagement Plan and Neuse Workshop Strategy Approach Document were developed. These guiding documents describe approaches to reach a diverse range of stakeholders and outline specific methods, timelines, and communication strategies to foster meaningful participation, gather valuable feedback, and ensure all voices are heard and considered in the decision-making process.

2.1.4.1.1 OUTREACH AND ENGAGEMENT PLAN FOR THE NORTH CAROLINA FLOOD RESILIENCY BLUEPRINT

The Outreach and Engagement Plan was developed following the NCDEQ Public Participation Plan and was intended to guide stakeholder participation and public outreach. This is to ensure a diverse range of stakeholders and governments were provided an opportunity to participate as well as to provide audience-appropriate communication, approaches, or tools to meet the needs of all North Carolina in development of the tool. The plan was informed by, and reflects, past experiences with multiple state initiatives, feedback from the Neuse Regional Advisory Group, knowledge and skills of staff, and research into stakeholder engagement best practices.

A succinct six-step process for outreach and engagement was created that outlines the chronological order of actions necessary for each basin to pursue and achieve an adequate level of engagement. These steps include:

1. Understand the scope of the project.
2. Identify outreach and engagement groups.
3. Conduct engagement and associated activities.
4. Determine strategies and tools.
5. Analyze responses.
6. Solicit and incorporate stakeholder and government feedback.
7. Follow up with respondents to share key takeaways and action steps.

The guiding principles of the project were highlighted in the Stakeholder Outreach and Engagement Plan. Guiding principles are particularly important for large-scale actions as they help solidify the long-term vision, provide criteria for quality of work to be completed, and support ethical practices throughout the entire process. The three guiding principles include:

1. Collaboration and engagement
2. Holistic and forward-thinking
3. Action and outcome-oriented

The Outreach and Engagement Plan was developed for the Blueprint from a statewide perspective but will guide basin-level activities and engagement. The process and principles in the plan have guided the Draft Neuse Action Strategy thus far and will continue as the action strategy is further refined in late 2024 into early 2025. More specifically, this plan was referenced for the Neuse Workshop Strategy Approach (summarized below) to ensure effective outreach and optimal input. The Outreach and Engagement Plan may further serve as a valuable resource when conducting future outreach efforts for more community-focused engagement at the county, municipal, and other local partner level. This outreach is intended to support stakeholders with Blueprint Tool training, use of the Blueprint Tool, local action strategy development, grant and funding opportunities, and project management efforts moving forward.

2.1.4.1.2 NEUSE WORKSHOP STRATEGY APPROACH DOCUMENT

The Neuse Workshop Strategy Approach Document was developed to guide the Neuse Workshops, which would inform the Neuse Action Strategy. The document was used as a pre-planning tool that detailed the overall strategy, goals, and anticipated outcomes of the workshops outlining the desired participant engagement, facilitation techniques, and methods to achieve workshop objectives. The Neuse Workshop Strategy Approach aims to guide organizers and facilitators in effectively planning and executing the workshops to achieve their intended purpose. The Neuse Workshop Strategy Approach may serve as a valuable resource if/when additional workshops are scheduled.

2.1.4.2 Stakeholder Engagement Conducted

While the Neuse Regional Advisory Group was engaged regularly, the other primary stakeholder engagement efforts were conducted nearly a year apart. As a result, these efforts captured input at the initial stages and towards the end of the planning process. The solicitation of input from stakeholders early on captured diverse perspectives and priorities from the outset. Engagement toward the end of the planning process allowed for feedback on the evolving action strategy for greater accuracy and effectiveness.

2.1.4.2.1 LOCAL LEADER MEETINGS AND PUBLIC WORKSHOPS SUMMARY

In June of 2023, a series of initial local leader meetings (Figure 2.2) and public workshops were organized to “roll out” Blueprint. Meetings and workshops were held in four strategic locations to heighten awareness and collect input.

Figure 2.2: Local Leader Meeting in New Bern, NC on June 1, 2023

New Bern, Lumberton, Wilmington, and Waynesville, North Carolina were carefully selected as the locations to be inclusive and convenient with the understanding that these only accounted for a fraction of the planned outreach. The local leader meetings were informative sessions with an overview of the legislation, timeline, Phase I tasks, deliverable status, and findings. The public workshops offered an opportunity for the public to learn about Blueprint, discover flood resilience/mitigation measures, and share lived-in experiences related to flooding.

2.1.4.2.2 NEUSE WORKSHOPS SUMMARY

The Neuse Workshops were conducted in April-May 2024 and were a critical component to the Draft Neuse Action Strategy. Similar to the June 2023 local leader meetings and public workshops, the Neuse Workshops were conducted in three strategic locations and were divided into the appropriate geographic region (Upper, Middle, and Lower Neuse River Basin). The Upper Neuse Workshop was held in Durham, the Middle Neuse Workshop in La Grange, and the Lower Neuse Workshop in New Bern.

The purpose of the Neuse Workshops was to:

1. Update stakeholders on Blueprint and Draft Neuse Action Strategy
2. Review and vet the preexisting resilience actions included in the Draft Neuse Action Strategy through facilitated small group discussions.
3. Gather feedback on new ideas and opportunities to further refine the Draft Neuse Action Strategy

The Neuse Workshops engaged a new audience with representation from local and county governments, land trusts, community-based organizations, small business owners, and soil and water districts. These stakeholders were engaged because of their distinct understanding of the flooding within their community. Stakeholders were invited to the relevant workshop based on their role and organization (i.e., Wake County representatives were invited to the Upper Neuse Workshop).

Those who attended in person were seated by associated county. If they were not directly connected to a county, participants were given the option to sit at any of the county tables or visit multiple tables. Much of the workshops were mostly spent in small groups, involving county-specific discussions. The list of preexisting actions (identified from the Neuse literature review) was further categorized by action type (project, plan, program, policy) and action location/scale (region, county, local). Based on this categorization, a list of local and county-specific preexisting actions was created for each county table to support targeted feedback.

Each county table reviewed a list of (1) Policy, Plans, and Programs and (2) Project Actions. Participants were asked to review the preexisting actions using the table templates provided. These large templates were placed on each table and participants were asked to write input directly onto the template using the materials provided (markers, pens, sticky notes). The table templates included a series of questions to guide discussion and promote feedback consistency. The questions posed were strategically selected to "vet" preexisting actions, which included:

- "Is this action still relevant?"
- "Has any progress been made? Are there any roadblocks?"
- "Are there any potential downstream impacts?"

This information was collected for more than 400 preexisting resilience actions in the Neuse River Basin. In addition to these standardized questions, participants were asked to provide additional

information or note if anything was missing from the list. These prompted the identification or exploration of new actions not included on the initial list. New actions include projects underway, planned, or proposed.

Although in-person participation was highly encouraged for a collaborative process, a virtual option was provided. Online surveys were developed for each county to mimic the county-table format and discussion of the in-person workshop. These surveys included the same list of local and county-specific preexisting actions along with the same question checklist. The intent was to collect feedback consistently to quantify the workshop findings.

2.1.4.2.3 FINDINGS FROM NEUSE WORKSHOPS

Fountainworks provided professional facilitation at all three of the Neuse Workshops. As part of their contracted work, Fountainworks provided a Neuse Workshop Summary document that compiled all of this information collected and shared from the table templates. This summary document was then used to conduct qualitative and quantitative analysis. The quantitative analysis (Table 2.2) summarizes the relevancy and status of the actions while the qualitative analysis captures other relevant, in-depth information.

Table 2.2: Initial Quantitative Analysis Findings*

Category	Middle Neuse	Upper Neuse	Lower Neuse	Neuse Total
Total # of Actions	154	105	144	403
Still Relevant	88 (57%)	73 (70%)	102 (71%)	263 (65%)
Completed	17 (11%)	8 (8%)	15 (10%)	40 (10%)
Made Progress	45 (29%)	43 (41%)	56 (39%)	144 (36%)
Ongoing Effort	11 (7%)	10 (10%)	10 (7%)	31 (8%)
Funding/Cost Roadblock	16 (10%)	n/a	14 (10%)	30 (7%)
Staffing/Capacity Roadblock	4 (3%)	1 (1%)	1 (<1%)	6 (2%)
ROW/Access Roadblock	3 (2%)	n/a	3 (2%)	6 (2%)
Downstream Impacts	9 (6%)	16 (15%)	13 (9%)	38 (9%)
Not Sure/No Feedback	41 (27%)	21 (20%)	25 (17%)	87 (22%)
New Actions	17 NEW	29 NEW	23 NEW	69 NEW

*Note: These percentages are approximate/have been rounded to the nearest whole number.

The quantitative analysis provides a snapshot of primary information needed to vet the preexisting actions. This information can be used to address the information gap originally called out in the Neuse literature review. The accuracy of preexisting action information such as implementation

status or action ownership/management was questioned due to irregular plan updating and vague language.

The quantitative analysis provides additional and supplemental information to the quantitative component. The analysis captured new actions, suggested local plans to review, identified problem areas, and noted other vulnerabilities or needs unique to each county or community. This information can be used to inform future resilience actions.

Future Iterations Placeholder

Additional outreach will be conducted during initial solution development to collaboratively select resilience actions for inclusion into the Finalized Neuse Action Strategy. Once actions have been collaboratively selected, the Blueprint Tool will be used to review, score, and rank actions outputting a list of priority resilience actions. NCDEQ will work with relevant stakeholders to provide Blueprint Tool trainings to support accurate findings and meaningful outcomes. Findings from this scoring and ranking will be shared with the public where feedback on the Finalized Neuse Action Strategy will be collected. Feedback collected will be integrated into the action strategy before initiating the 5-year length cycle. This outreach will be conducted in Fall 2024 and will likely entail two meetings. Details are yet to be determined.

2.1.5 Conduct Basin Capacity Needs Assessment

This recommendation aligns with Step #2 within the Blueprint Workflow: Initiate Community Engagement and Discovery.

Description

Conduct a capacity needs assessment, in collaboration with NCDEQ, to better understand community capacity across the basin. This information will be collected during initial community engagement efforts, so it is imperative for stakeholders to vocalize needs, identify those at greater risk of flooding, and actively engage under-resourced communities. Stakeholders should identify and request additional modeling or data needs (if known).

Justification

Assessment findings will be used to determine resource allocation, assistance, and staffing needs for communities interested in the Blueprint but lack the technical and financial capacity to effectively participate. Assistance may be needed at any or all phases of the project including planning process, design services, and project implementation. NCDEQ will partner with other entities, such as the leading regional organizations and COGs, or contract with private companies to help bridge the capacity gap.

Neuse River Basin Approach

A community needs assessment was not conducted as part of the Draft Neuse Action Strategy. While a community needs assessment was not conducted, measures were taken to gather information to identify community needs and inform the action strategy. These actions included:

- Collection of geospatial data for preexisting actions to demonstrate the spatial distribution of ongoing flood resiliency efforts in the basin (Neuse literature review)
- Collection of geospatial data for capability self-assessments (included in Regional Hazard Mitigation Plans) to demonstrate the spatial distribution of capacity (Neuse literature review)
- Identification of challenges or roadblocks to preexisting actions reviewed (Neuse Workshops)

This information was collected and will be used to identify and support communities in the basin with proportionally lower amounts of flood resiliency actions and lower capacities to implement those actions.

Future Iterations Placeholder

The Blueprint Tool will leverage the capabilities of the North Carolina Emergency Management Resource Management Tool (NCEM RMT), which can be used to rank community capacity. Key capabilities of the NCEM RMT used to evaluate resilience and response effectiveness include Community Asset Mapping (emergency services, infrastructure, healthcare facilities), Resource Inventory (manpower, equipment, supplies), Capability Assessment (communication systems, evacuation plans, coordination mechanisms), and Performance Metrics (performance of preparedness, response, and recovery). The Blueprint Tool, along with the information previously collected pertaining to capacity, will inform resource allocation, assistance, and staffing needs for communities.

2.1.6 Utilize Data-Driven Approaches to Assess Risk

This recommendation aligns with Step #3 within the Blueprint Workflow: Flood Risk Planning and Analysis.

Description

Utilize a data-driven approach, specifically leveraging the Blueprint Decision Support Tool, to develop a vulnerability assessment to inform the action strategy. . The advanced analytical capabilities of the Blueprint Decision Support Tool include comprehensive data sets, mapping features, and modeling capabilities, allowing stakeholder to assess flood risk, identify vulnerable areas, prioritize interventions, and simulate the impact of various resilience actions based on outcome.

Justification

The data-driven approach enables a proactive and targeted strategy development process where resources are allocated efficiently and effectively to identify gaps and enhance flood resilience in the Neuse River Basin.

Neuse River Basin Approach

A vulnerability assessment was not conducted as part of the Draft Neuse Action Strategy, which was determined to be a notable gap in the draft version. In lieu of a vulnerability assessment, data from the North Carolina Coordinated Needs Management Strategy (CNMS) and the NC Floodplain Mapping Program was used to create a map shown in Figure 2.3 highlighting existing flood studies and modeling data across the Neuse River Basin.

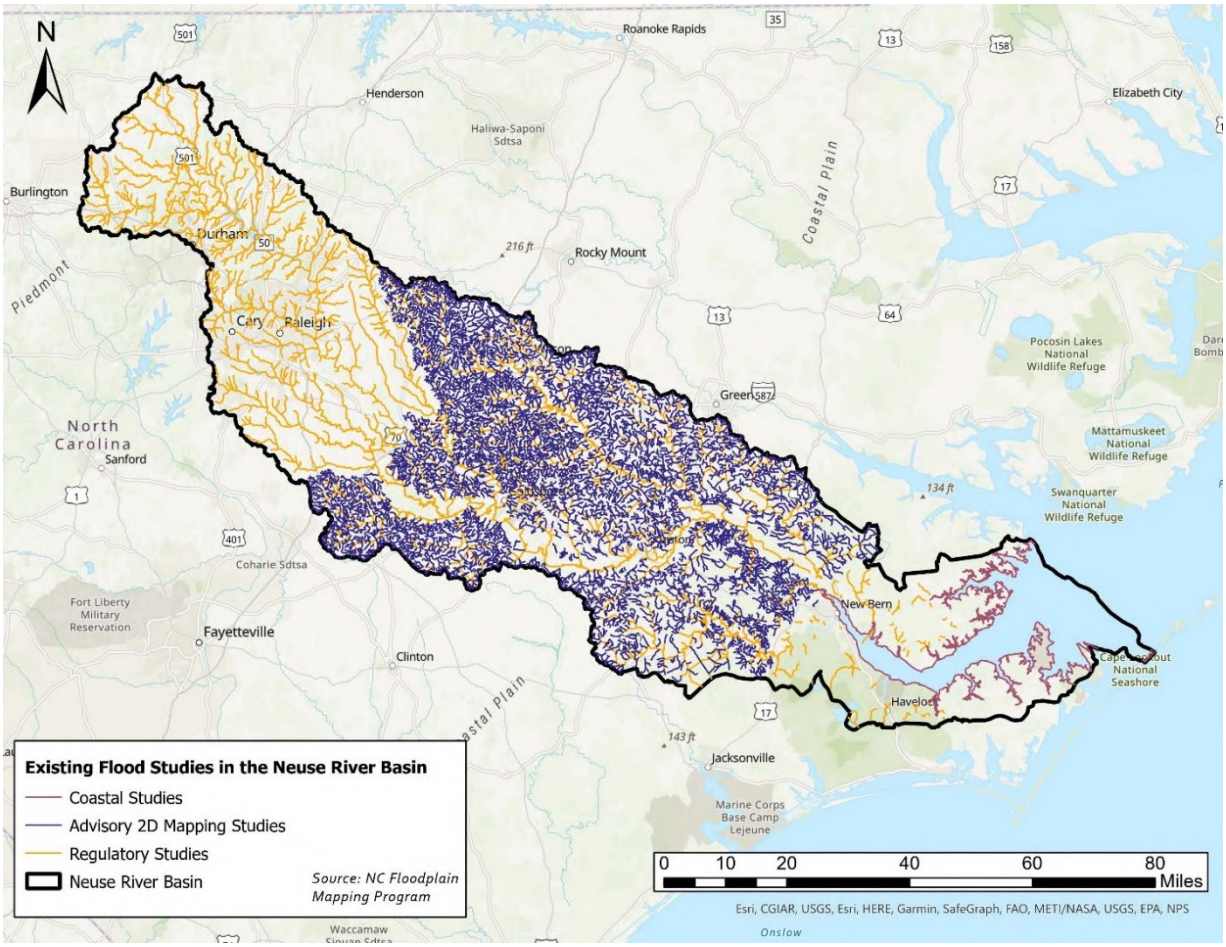

Figure 2.3: Existing Flood Studies in the Neuse River Basin

This consolidated information serves as a preliminary resource to better understand the historical context and current flood risk in the basin. The map can be used to help identify areas prone to flooding, assess the accuracy and completeness of existing studies, and pinpoint gaps in vulnerability knowledge. Future iterations of the strategy will utilize the Blueprint Tool and large-to assess vulnerability and risk in the basin.

2.1.6.1 Data Inventory and Analysis

A statewide data inventory was created to capture the types and sources of flooding that create negative impacts along with frequency and spatial extent. The inventory identifies and measures existing and future flood risk as it relates to people, infrastructure, and ecosystems, as well as data used to assess risk and any existing programs that assess risk.

The inventory and analysis provide critical insights into the nature and scope of flood events impacting the state and the basin. The identification of various types of flooding, understanding their sources, patterns, and spatial distribution allows stakeholders to assess the magnitude of flood risks and vulnerabilities. Moreover, the analysis of event frequency and spatial extent can help prioritize areas more susceptible to flooding.

2.1.6.1.1 FLOOD RISK RESILIENCY TYPES AND SOURCES OF FLOODING INVENTORY

Over 120 datasets were identified that contain critical components of successful flood resiliency efforts such as probability of hazard occurrence, risk assessments, flood modeling, estimated damages enabling the evaluation of the effectiveness of mitigation, and resiliency projects. These resources cover several categories related to flood resiliency including hazards and engineering studies, foundational, natural environmental, built environment, demographic, and mitigation support datasets. Data inventory and analysis efforts provide useful context for targeted resilience actions to address specific types of flooding and strengthen resilience in high-risk areas alike.

2.1.6.1.2 FINDINGS FROM FLOOD RISK RESILIENCY TYPES AND SOURCES OF FLOODING INVENTORY

Types and Sources of Flooding

The results of these analyses were documented in a report that identified and described six primary types of flooding: Riverine, Rain, Urban and Stormwater, Flash, Dam and Levee, and Coastal. Five less common types of flooding were also included: Frozen, Groundwater, Overland Ponding, Agricultural and Mining, and Natural Disaster Induced. Riverine Flooding and Urban and Stormwater Flooding were identified as the two most common flooding sources (Table 2.3, Figure 2.4).

Table 2.3: Datasets by Flood Source

Source of Flooding	Amount
Fluvial (Riverine) Flooding	61
Pluvial (Rain) Flooding	32
Urban and Stormwater Flooding	45
Dam and Levee Flooding	7
Flash Flooding	7
Coastal Flooding	17
Frozen Sources	3
Groundwater Flooding	5
Overland Ponding	7
Agricultural and Mining Flooding	5
Natural Disasters	6
Non-Flooding Source	26
All Flooding Sources	1

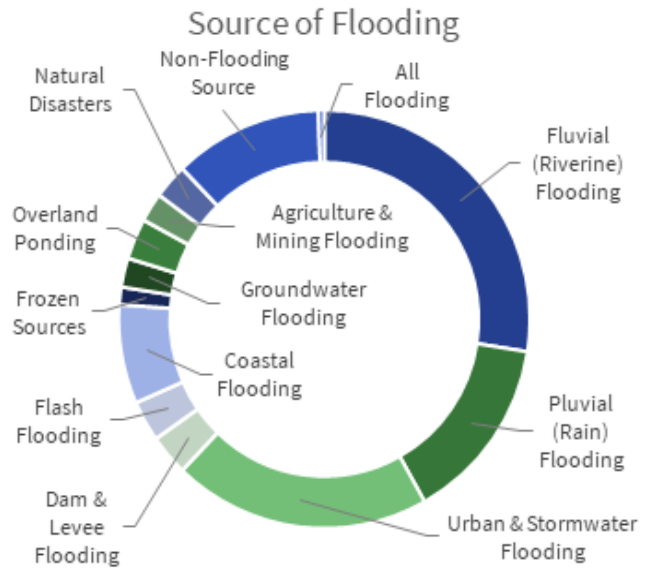

Figure 2.4: Datasets by Flood Source

Datasets Classification

The report presented the results of the selection, classification, and evaluation of 129 data sources that can be leveraged and enhanced by Blueprint. The 129 data sources are classified as one of six dataset types: Hazards and Engineering Studies, Foundational, Natural Environment, Built Environment, Demographic, or Mitigation Support (Table 2.4, Figure 2.5). Hazard and Engineering Studies make up nearly half (48%) of the datasets classified.

Table 2.4: Dataset Classification

Dataset Classification	Amount
Hazards and Engineering Studies	62
Foundational	11
Natural Environment	21
Built Environment	15
Demographic	10
Mitigation Support	10

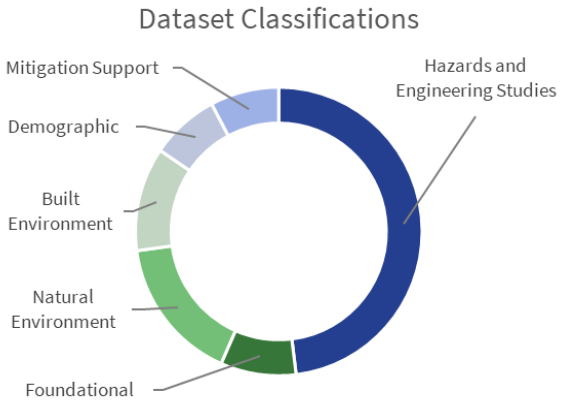

Figure 2.5: Dataset Classification

Gap Analysis Categorization

A gap analysis was performed for each dataset by scoring the dataset's applicability to Blueprint, which identified the most essential datasets for use in Blueprint. The highest score is a ten, and the lowest is a one. Some datasets receive a "TBD" (to be determined) instead of a score to mark that these datasets require further investigation. Scores were assigned for the gaps in five categories: Geospatial, Database, Specification and Quantity, Temporal, and Engineering Modeling.

Future Iteration Placeholder

Once the Blueprint Tool is complete, a comprehensive vulnerability assessment will be conducted to identify key vulnerabilities, assess risks, and prioritize resilience actions using the enhanced 2D modeling. This approach aligns with the iterative nature of the action strategy. These new findings will be incorporated into the Finalized Neuse Action Strategy.

2.1.7 Identify and Assess New Actions for Inclusion

This recommendation aligns with Step #3 within the Blueprint Workflow: Flood Risk Planning and Analysis.

Description

Identify and assess new resilience actions for inclusion into the Neuse Action Strategy. This process begins with an evaluation of current challenges and vulnerabilities within the basin including vulnerability assessment, climate change impacts and projections, and socio-economic factors. Additionally, stakeholder engagement and input can help identify emerging issues and priorities that require attention.

Justification

The incorporation of new resilience actions ensures the action strategy remains adaptive, comprehensive, and responsive to the evolving challenges and opportunities in the Neuse River Basin. While preexisting actions from existing efforts provide a strong foundation for the action strategy, new actions promote innovation, integration of the latest research and best practices, and adaptation to changing environmental and social conditions. The Neuse Action Strategy can stay ahead of emerging threats, leverage advanced resources and solutions, and address any gaps not previously considered.

Neuse River Basin Approach

New actions were identified during the Neuse Workshops. As mentioned in the Neuse Workshop Summary, participants were prompted to share information or actions not included on the initial list of preexisting actions. 69 new actions were collected and identified in the Neuse Workshop analysis including those that are underway, planned, or proposed. The action strategy intentionally includes projects underway to: (1) Acknowledge ongoing work, (2) Track all work being completed in the Neuse Basin, and (3) Support additional funding when/if needed. New actions are included in the refined list of actions.

Future Iterations Placeholder

The inventory of new actions will be referenced during initial solution development, which will reflect the flood risk and vulnerability identified using the Blueprint Tool. Many of the new actions are vaguely described and do not include supplemental information required to rank, score, or prioritize. Action profiles, at minimum, must include planning level information for accurate function and output of the Blueprint Tool.

New actions were identified during the Neuse Workshops, meaning the participants were the key contributors. It would be advantageous to send the new actions to the relevant participants to provide follow-up explanations and action descriptions (i.e., any new actions for Seven Springs should be sent to the representative(s) who attended the Neuse Workshop). Those who proposed new actions have a better understanding of their resources (or lack of), current conditions, and community needs.

2.1.8 Ensure Long-Term Sustainability

This recommendation aligns with Step #3 within the Blueprint Workflow: Flood Risk Planning and Analysis.

Description

Incorporate measures that support flood resilience over time and acknowledge the changing climate. This can include adaptive management practices, incorporating nature-based solutions, and fostering community capacity building. More specifically, inclusion of sustainable land use planning, green infrastructure, and ecosystem restoration as a critical part of the Neuse Action Strategy can enhance the resilience of the basin's natural systems and resources.

Justification

The consideration of future flood hazards promotes a forward-thinking action strategy. This consideration will also increase the basin's ability to withstand the effects of a changing climate and intensified weather events. From a long-term perspective, the ongoing implementation and maintenance of adaptive measures will help the action strategy remain effective and relevant for years to come.

Neuse River Basin Approach

As part of the development of the Neuse Action Strategy, an effort was made to help identify and evaluate nature-based solution opportunities in the Neuse River Basin, which required a gap analysis on existing datasets for North Carolina to identify spatial distribution, coverage, and potential effectiveness of nature-based projects to reduce flooding in the basin. In addition to this effort, nature-based solutions account for a portion of the preexisting actions inventoried. The Draft Action Strategy acknowledges the added value offered by nature-based solutions and will consider both large-scale projects and small-scale features to enhance flood resilience in the basin.

2.1.8.1 Future Flood Hazards

By considering the evolving needs and challenges driven by a changing climate, changes in population growth and development, and changes in socioeconomic trends, stakeholders can better anticipate risks and opportunities to develop strategies that are not only responsive to current needs but are also resilient to future conditions.

2.1.8.1.1 FUTURE FLOOD HAZARDS GAP ANALYSIS

A gap analysis was performed to identify scientifically defensible data necessary to analyze future flood hazards for North Carolina and identify potential flood modeling and mapping projects to reduce the effects of flooding. The report identifies specific resources for future flood hazards, climate projections, land use and cover sea level rise, and precipitation and discharge estimates. Gaps were noted within the datasets pertaining to age, scale, level of detail, potential use, and other shortcomings. The report on future flood hazards may serve as a valuable resource when planning and developing long-term solutions to flood hazards.

2.1.8.1.2 FINDINGS FROM FUTURE FLOOD HAZARDS GAP ANALYSIS

Consideration of future conditions when evaluating potential flood mitigation alternatives is critical and is referenced in the Blueprint legislation. It helps ensure wise investments in solutions that are robust and adaptable in the face of uncertainty. Changing conditions driven by increased temperatures are being studied and modeled globally by scientists using climate models. Both historical records and climate models indicate that increased global temperatures can lead to:

- Increased intensity and frequency of extreme precipitation events,
- Changes in patterns of snow melt, rain or snow events, and increased runoff
- Reduction of surface water drying out soils which can increase the likelihood of flash floods.
- Higher sea levels and an increase in the frequency and magnitude of coastal flooding
- More frequent windstorms
- Rising groundwater in coastal areas
- Increased probability of compound flooding due to different flood drivers (e.g., caused for example by hurricanes and tropical storms)

All previous situations can lead to increased flood hazards if proactive measures are not implemented to mitigate the associated risks. In parallel, shifts in socioeconomic conditions can influence land use patterns, potentially exacerbating flood-related problems, particularly when there is a lack of effective spatial planning or in place or overexpansion of impervious surfaces.

Many, if not all, of the future flood hazards referenced within are applicable to the Neuse River Basin. The iterative approach that involves regular updating and maintenance of the Blueprint Tool will inform resilience actions in the Neuse ensuring they reflect the information presented from best available data.

2.1.8.2 Nature Based Solutions

Nature-based flood mitigation solutions are an important component of a robust, well-planned flood resiliency strategy, along with more traditional components such as upgrading or adding infrastructure, improved policy, buyouts, and dredging of waterways.

2.1.8.2.1 IDENTIFICATION OF NATURE-BASED SOLUTIONS

This document identifies existing types and locations of natural features that are currently providing flood attenuation, with an estimate of storage (quantity and timing) for four flood return periods (including the maximum effective storage), protected/unprotected status (who owns/manages), and other ecosystem services provided by the natural features.

The evaluation identified eight nature-based solutions including wetland restoration, floodplain restoration, forest conservation, agricultural to forest, park stormwater retention, water farming, green stormwater infrastructure, and coastal specific practices such as living shorelines, coastal wetlands and marshes, dunes, and waterfront parks. The spatial coverage and effectiveness (flood storage potential) of these practices, for varying flood recurrence intervals, in the pilot Neuse River Basin were analyzed using geographic information systems (GIS). The identification of nature-based solutions may serve as a valuable resource when determining nature-based solutions compatible with the basin's natural features.

2.1.8.2.2 FINDINGS FROM LANDSCAPE ANALYSIS TYPES AND LOCATIONS OF NATURE-BASED FLOOD SOLUTIONS

Forest conservation and wetland restoration showed the largest potential area of extent over the Neuse Basin, with roughly 43% and 30% coverage respectively (Table 2.5). The other nature-based solutions were all found to have a coverage of <3%. Limitations of drawing precise geographical conclusions from the coarse scale analysis are discussed. Wetland restoration and coastal marsh migration were assessed to have the highest potential flood storage, though both methods would vary. Stormwater retention, riparian restoration, and stream restoration were all assessed to have potential medium impact.

The following analysis findings summarize the types and locations of NBS and their applicability to flood resiliency for the Neuse River Basin.

- The use of structural and natural infrastructure (NI) based actions is optimal for flood resilience due to the complementary strengths and benefits that each type of infrastructure offers. This integrated approach leverages the natural process and benefits associated with nature-based solutions alongside the engineered functionality of structural infrastructure.
- Floodplain restoration involves returning natural floodplain areas to their original state by revitalizing wetlands, establishing natural vegetation, and restoring natural stream flow. These approaches promote natural flood processes and allow for natural floodwater storage.
- The preservation of natural floodplains protects existing floodplain areas from development to maintain their critical function in absorbing floodwaters and reducing flood risk. This

approach reduces the need for costly mitigation measures and minimizes the reliance on emergency response and disaster recovery efforts to address flood-related challenges.

- The expansion of natural infrastructure has ecological, social, and economic benefits. Natural infrastructure such as wetlands, forests, and floodplains provide valuable services for flood mitigation, erosion control, and water quality improvement. Integration of these solutions leverages the inherent benefits of ecosystems to contribute to more sustainable and resilient flood management strategies.

Table 2.5: Total Percentage of Potential Area for Each NBS within the Neuse River Basin

Category	% Area of Interest
Wetland Restoration	29.8%
Floodplain Restoration	2.5%
Forest Conservation	43.2%
Agriculture to Forest	18.7% (1.1% marginal soils)
Agricultural Stormwater Retention	13.6% (0.7% marginal soils)
Park Stormwater Retention	0.3%
Green Stormwater Infrastructure	1.5%
Coastal Marsh Migration	0.2%

An analysis was performed on the Neuse River Basin to estimate the percentage of land that may be suitable for implementation (% of Area of Interest) of the nature-based solutions. Additional analysis was performed to identify and rank the categories of land (low to high) that may be suitable for conversion to or already possess the ability to store or detain stormwater (Table 2.6).

Table 2.6: Rankings of Storage Capacity for Each NBS within the Neuse River Basin

Category	
Wetland Restoration	Low-High
Riparian Restoration	Low-Medium
Stream Restoration	Low-Medium
Forest Conservation	Low
Agriculture to Forest	Low*
Agricultural Stormwater Retention	Medium*
Park Stormwater Retention	Low-Medium
Green Stormwater Infrastructure	Low

Coastal Marsh Migration	Low-High

*Categories marked with an asterisk are based on data from Doll et al. (2021). Remaining categories are extrapolated from Doll et al. (2021)'s findings as described above.

Future Iterations Placeholder

Data necessary to analyze future flood hazards, including monitoring programs, will be leveraged within the Blueprint Tool to support adaptative approaches. The Blueprint Tool will be used to score, rank, and prioritize the nature-based solutions referenced in the preexisting action inventory for inclusion into the Draft Neuse Action Strategy. Nature-based solutions range from local to basin-wide actions and the "added value" of each action will be determined by the Blueprint Tool. In addition to these standalone actions, it would be advantageous to leverage nature-based solutions or features within large-scale structural projects. The combination of approaches alleviates the stress on existing systems and supports longevity.

2.1.9 Integrate Lessons Learned

This recommendation applies to all steps outlined in the Blueprint Workflow.

Description

Use knowledge gained from previous efforts to implement effective flood risk reduction measures. This recommendation strongly aligns with the core Blueprint objective, encompassing the Draft Neuse Action Strategy, to leverage and build upon existing efforts and information available to enhance flood resilience. The information can be derived from a variety of sources including:

- Outcomes of previous flood events in the basin
- Community feedback and input
- Stakeholder engagement
- Best practices from similar efforts in the basin and peer states
- Scientific research and data analysis on flood risk and resilience measures
- Evaluation of existing flood management approaches
- Review of policy frameworks and regulatory approaches
- Assessments of infrastructure vulnerabilities
- Collaborations with experts in the field of flood resilience

These diverse sources should be used as informative references to guide every step in the Blueprint Workflow. In addition to previous efforts and outcomes, lessons learned during the process and development of the action strategy should be identified to guide future updates.

Justification

Integration of lessons learned into the Draft Neuse Action Strategy can help identify successful approaches to be replicated and best management practices. This information can guide the development of targeted interventions proven effective in similar circumstances and environments. The explicit identification and application of lessons learned demonstrates the iterative nature of the action strategy. From a long-term perspective, a systematic review of the process and outcomes of the Neuse Action Strategy will allow stakeholders to iteratively improve the document and ensure its relevance and applicability over time.

Neuse River Basin Approach

Lessons learned were essential in the development of the Draft Neuse Action Strategy. Within the action strategy itself, this information was used to adjust future engagement and refine content. Beyond the action strategy, lessons learned were incorporated into the Draft Blueprint and the Blueprint Tool, both of which inform the Draft Neuse Action Strategy.

2.1.9.1 Lessons Learned and Applied in the Neuse River Basin

Lessons learned are identified in the Draft Neuse Action Strategy to capture insights and experiences from past flood events and resilience efforts. Continuous expansion of lessons learned allows for refinement of existing efforts, introduction to new approaches, and incorporation of evolving best practices. The iterative process of reflection and improvement supports a dynamic and responsive action strategy equipped to complex and ever-changing factors influencing flood risk in the Neuse River Basin.

2.1.9.1.1 LESSONS LEARNED FROM ENGAGEMENT AND OUTREACH IN THE NEUSE

Lessons learned from outreach and engagement primarily focus on enhancing engagement experience to achieve meaningful discussions and feedback. Outreach approaches can be refined to effectively connect with stakeholders, share knowledge, and facilitate productive interactions to drive positive impact.

Professional Facilitation

All engagement efforts conducted from May to July 2023 were conducted by project team staff (NC DEQ, AECOM, ESP). This included five technical advisory group (TAG) meetings, two principal advisory groups (PAG) meetings (kick-off), the local leader meetings, and the public workshops. Professional facilitation was suggested for future meetings and workshops. In response to this suggestion, skilled facilitation was used for the final two PAG meetings conducted in November and December 2023. Similarly, TAG Chairs facilitated their group's discussion for the last two meetings of 2023 and the project team assisted as needed.

Additionally, professional facilitation was provided by Fountainworks for the Neuse Workshops. Beyond the facilitation aspect, Fountainworks was involved in the planning and organization of the Neuse Workshops. Facilitator expertise was used to determine workshop format and logistics for

optimal turnout and engagement. Fountainworks developed and provided meeting materials including the table templates used to collect stakeholder input. Following the workshops, facilitators provided the Neuse Workshop Summary document, which compiled all information collected during the three workshops.

Sharing Meeting and Outreach Materials

A primary objective of outreach and engagement is to collect feedback. During the earlier engagement efforts, stakeholders were asked to provide feedback on newly presented information. It was suggested to share information before the meetings to allow stakeholders time to review and digest. In response to this suggestion, meeting agendas and materials were shared with stakeholders at least one week before scheduled meetings. This was particularly beneficial for TAG meetings that focused on specific deliverables and the Neuse Workshops that focused on the vetting of preexisting actions.

Fostering Basin-Wide Collaboration

The Neuse Workshop discussions were separated by county to achieve targeted discussions and feedback on actions without being too overwhelming for participants. This was determined by the meeting length (two hours) and volume of information to review (Blueprint overview and preexisting actions). Although this format supported the vetting process, it did not foster cross-jurisdictional collaboration. Basin-wide actions were not reviewed during the Neuse Workshops but were shared in the meeting materials sent out before the workshops. It would be advantageous to slightly adjust the meeting length (increase by 30 minutes) and designate additional time to review and discuss basin-wide actions. This can be conducted in a large group or small group discussion where multiple counties are grouped.

Formatting Meeting Discussions

Engagement and outreach efforts were intended to be informative and inquisitive. Efforts conducted in 2023 were formatted into two key components: (1) Present overview and updated information at the front end of the meeting and (2) Pose questions toward the end of the meeting. It was suggested to include presentation and discussion components periodically throughout meetings to keep participants engaged, increase information absorption, and support targeted feedback. In response to this suggestion, the Neuse Workshops presented information in short, digestible segments that would then transition into small group discussions. Similarly, the PAG and TAG meetings hosted in June 2024 presented a specific deliverable (i.e., the Blueprint Tool), provided a status update, and then engaged participants for feedback.

2.1.9.1.2 LESSONS LEARNED FROM THE REFINEMENT PROCESS

The pilot basin has faced unique challenges because it has been developed in parallel with other key Blueprint deliverables that will be used to inform future iterations of the Neuse Action Strategy. The following lessons learned reflect some of those challenges and how they have been addressed. These

adjustments have been made to the Draft Neuse Action Strategy based on input received on the first iteration of this document (the Preliminary Draft Neuse Action Strategy).

Intended Audience

The first iteration of the action strategy provided in-depth summaries and findings of all relevant work completed to date that would be used to inform the action strategy. Feedback received indicated that the intended audience was unclear based on the document's format and content. In response to this feedback, the Draft Neuse Action Strategy was reformatted to read as a guidance document that may be used as a template for future action strategies. The content was adjusted to clearly define the action strategy's purpose and intended audience. The technical information was incorporated succinctly and explicitly states its connection to the Draft Neuse Action Strategy.

Recommendations

The first iteration of the action strategy used the preexisting actions to determine recommendations. The preexisting actions inventory was reviewed to determine themes (i.e., use of green infrastructure, stream debris removal, acquisition). These themes were then used to craft generic recommendations, which were then supported by specific preexisting recommendations. Since these actions were collected from existing efforts and different sources, it was unclear who the recommendation was proposed by and who it was for. In response to this feedback, the recommendations were re-drafted to provide clarity.

The new recommendations were developed to better align with the direction of key deliverables: the Draft Blueprint, the Blueprint Tool, and the Blueprint Workflow. Direct verbiage was pulled from the Draft Blueprint Recommendations for greater consistency between the two. While the Draft Blueprint Recommendations provide programmatic guidance, the aim of the Draft Neuse Action Strategy was to provide guidance specific to the action strategy considering planning, implementation, and maintenance requirements.

Similar to the Draft Blueprint, a description and justification are provided for further clarity. To better reflect the unique circumstances of the pilot basin, two new subsections were created ("Neuse River Basin Approach" and "Future Iterations Placeholder") for each recommendation to provide additional context. The "Neuse River Basin Approach" explains the work completed in the pilot basin to help achieve that specific recommendation while the "Future Iterations Placeholder" explains how the recommendation may fit into use of the Blueprint Tool (once complete). Each new recommendation proposed in the Draft Neuse Action Strategy is aligned with one or several steps in the Blueprint Workflow, which reinforces the dependent relationship between the two.

Future Iterations Placeholder

Lessons learned are based on available resources and existing efforts relevant to the Draft Neuse Action Strategy. This information is subject to change over time, meaning that lessons learned are a dynamic component that will require regular updating in the action strategy. In addition to best available data and best practices, lessons learned can reference other basin action strategies and

approaches as validation is increasingly scaled statewide. Ideally, lessons learned should be updated simultaneously with the data quality review (summarized below), performed annually. At minimum, this section will be updated regularly during the 5-year implementation cycle.

2.2 Understand Flooding

The following recommendations have not yet been incorporated into the Draft Neuse Action Strategy as they are contingent upon the Blueprint Tool. Additional recommendations may be added to reflect the findings.

2.2.1 Capitalize on Comprehensive Flood Mapping

This recommendation aligns with Step #3 within the Blueprint Workflow: Flood Risk Planning and Analysis.

Description

Utilize available modeling to characterize flood patterns and vulnerabilities. Advanced technology and data support the mapping of flood extents, depths, velocities, and frequencies. The 2D modeling will provide a comprehensive and data-driven approach to analyze flood scenarios, identify critical areas for intervention, assess different resiliency actions, and predict potential outcomes.

Justification

The integration of historical, real-time, and forecasted data into the mapping process enables a thorough understanding of flood dynamics and informs evidence-based decision-making. The action strategy can benefit from a more accurate and detailed flood risk assessment, which supports a deeper understanding of potential vulnerabilities and opportunities for flood resilience in the basin.

Neuse River Basin Approach

The Draft Neuse Action Strategy will incorporate large-scale 2D modeling, once complete, to enhance the effectiveness and precision of the action strategy.

Future Iterations Placeholder

Enhanced 2D modeling is being conducted across the state and will be integrated into the Blueprint Tool. The large-scale 2D modeling will be used to conduct strategic flood risk and vulnerability analysis, including scenarios such as the 1% annual change flood and various recurrence interval events. The results will be used to evaluate hazards, assess impact, and inform solution development. Initial solution development, including community-based resilience actions and prioritized actions, will reflect specific flood vulnerabilities identified by the Blueprint Tool.

2.2.2 Use a Two-Tiered Approach to Flood Modeling

This recommendation aligns with Step #1: Actionable Data Collection, Modeling, and Analysis and Step 2: Initiate Community Engagement and Discovery outlined in the Blueprint Workflow.

Description

Combine state and regional-scale hydrologic models (enhanced 2D modeling) with local-scale hydraulic models to support the comprehensive assessment of flood risk through simulation of both watershed-level processes and detailed localized impacts. The enhanced 2D statewide modeling will serve as the foundation, but locally generated data and modeling will be considered for inclusion.

Justification

State and regional modeling establishes a baseline for all communities in the basin providing a broad perspective on flood dynamics and patterns. Meanwhile, locally generated data and modeling is collected by NCDEQ and contractors from state and local partners to capture detailed information specific to individual communities that may influence flood risk at a localized level. The integration of these two levels of modeling creates a better understanding of the complex interactions between water flow, topography, and infrastructure.

Neuse River Basin Approach

The Draft Neuse Action Strategy incorporates state and regional modeling, once complete, to enhance the effectiveness and precision of the action strategy. Locally generated data and modeling requested from state and local partners for inclusion in future iterations of the action strategy.

Future Iterations Placeholder

The enhanced 2D modeling will inform the Finalized Neuse Action Strategy. Locally generated data requested from state and local partners in the basin to supplement that statewide data. For inclusion in the Finalized Action Strategy, the locally generated information must meet or exceed the criteria and standards established for data consistency. If accepted, the information will be fed back into the data collection, modeling, and analysis. Additional modeling may be requested by communities and fulfilled by NCDEQ, where feasible, or may be incorporated into the basin action strategy as a new resilience action.

2.2.3 Include Community Experience and Local Knowledge

This recommendation aligns with Step #2: Initiate Community Engagement and Discovery and Step 3: Flood Risk Planning and Analysis outlined in the Blueprint Workflow.

Description

Engage with those who have experienced flooding firsthand to understand valuable input on flood impacts, vulnerabilities, and unique local contexts that may not be captured in data and modeling

processes. Insights and observations from residents, business owners, and community organizations are essential to leverage local knowledge and community experience.

Justification

This grassroots approach enhances the effectiveness of flood mapping and modeling efforts by capturing nuanced details, historical perspectives, and cultural considerations. Incorporating local knowledge with scientific and technical assessments promotes community ownership, builds trust and transparency, and ensures resilience strategies are tailored to the specific needs and priorities of the community.

Neuse River Basin Approach

The Neuse Workshops were dependent on community and local knowledge. Participants were invited to the workshops based on their distinct understanding of floods in their community. This expertise was used to vet preexisting resilience actions and propose new actions. The information collected during the workshops was used to refine the preexisting resilience action inventory including progress notes and newly identified actions. Supplemental information was documented in the qualitative analysis capturing problem areas and community-specific vulnerabilities.

One example of the approach is community knowledge collected during the Neuse Workshops that identified the Falls Lake dam in Wake Forest as a problem area contributing to downstream flood risk. Participants shared concerns about the impact of the dam on water levels and flood patterns, highlighting the need for further assessment and collaboration to address the potential risks associated with the dam's operations. This input provides valuable perspective on the local dynamics of flood risks, including infrastructure like the Falls Lake dam, in developing flood resilience actions for the Neuse River Basin.

Future Iterations Placeholder

After the enhanced 2D modeling is complete, NCDEQ and contractors will review problem areas identified during the Neuse Workshops (conducted in April-May 2024) using the new modeling and mapping capabilities. If the mapping and modeling do not align with the feedback obtained, additional modeling and analysis may be needed. The preexisting resilience actions will be used for initial solution development and selection across the basin. NCDEQ Blueprint should engage relevant stakeholders to ensure selections reflect community needs and capacity to implement. Inclusion of local knowledge in the initial action development and selection process helps align basin-wide actions with community-based actions.

2.3 Action Strategy Implementation

The following recommendations have not yet been incorporated into the Draft Neuse Action Strategy as they are contingent upon the Blueprint Tool. Additional recommendations may be added to reflect the findings.

2.3.1 Perform Data Quality Review

This recommendation aligns with Step #1: Actionable Data Collection, Modeling outlined in the Blueprint Workflow.

Description

Identify updated and/or new data (local, regional, or statewide) for use in the Blueprint Tool. This information must undergo quality assurance/quality control review (QA/QC) to ensure the data, at minimum, meets the standard requirements established for integration into the Blueprint Tool.

Justification

There may be more up-to-date or new data, modeling, and analysis available from the initial baseline used. The Neuse Action Strategy relies on the Blueprint Tool to determine flood resilience actions with the greatest impact under the assumption that best available data is leveraged. Therefore, new data must be reflected (if it meets the standard requirements) in the Blueprint Tool for the Neuse Action Strategy to remain relevant and most effective.

Neuse River Basin Approach

Much of the information summarized under the Action Strategy Development Recommendations was leveraged in the Blueprint Tool.

Future Iterations Placeholder

Once finalized in March 2025, the Blueprint Tool will reflect the most current data, modeling, and analysis available that will then be used to develop, select, and prioritize resilience actions for inclusion in the Final Neuse Action Strategy. Moving forward, DEQ and relevant stakeholders will conduct a data quality review annually to capture new or updated information. New data may become available as a resilience action is completed, which would then be integrated into the data collection for the next round of basin needs. DEQ will seek input from local stakeholders about any efforts underway that may result in locally generated data as well as additional modeling needs to complete identified resilience actions.

2.3.2 Update the Action Strategy on a 5-Year Cycle

This recommendation applies to all steps outlined in the Blueprint Workflow.

Description

Update the Neuse Action Strategy every 5 years following the end of the previous strategy development. This 5-year timeline begins once the Neuse Action Strategy is finalized meaning the update will occur every 5 years plus the amount of time it takes to develop the strategy (development may take up to two years).

Justification

A 5-year cycle length is a reasonable timeframe to update the Neuse Action Strategy for several reasons. Firstly, many funding sources, including both government grants and aid programs, often operate on multi-year cycles. This allows communities to align their funding requests with specific grant and program cycles. Additionally, the 5-year cycle allows for the incorporation of new funding opportunities and financial adjustments based on changing priorities and resource availability. Another significant consideration when determining cycle length was the project implementation timeframe. Major flood resiliency projects typically require several years to plan, design, secure permits, obtain funding, construct, and monitor. The 5-year cycle grants enough time to assess project progress and plan for new initiatives while allowing sufficient time for the completion of ongoing projects.

Neuse River Basin Approach

The delivery of the Finalized Neuse Action Strategy will initiate the 5-year cycle length.

Future Iterations Placeholder

The Blueprint Workflow is designed to operate in a 5-year cycle in each basin. A new update will begin every five years following the end of the previous strategy development. The Finalized Neuse Action Strategy is anticipated in late 2024 meaning the next action strategy will be developed in 2029 following the five-year life cycle proposed. Annual data review and project tracking will streamline the update process.

2.4 Action Implementation

The following recommendations have not yet been incorporated into the Draft Neuse Action Strategy as they are contingent upon the Blueprint Tool. Additional recommendations may be added to reflect the findings.

2.4.1 Identify and Pursue Diverse Funding Sources

This recommendation aligns with Step #6: Flood Resiliency River Basin Action Strategy outlined in the Blueprint Workflow.

Description

Secure financial resources from a range of public and private resources. This process involves conducting thorough research to identify funding opportunities, building partnerships with potential funders, and crafting compelling proposals that align project objectives with priorities and/or eligibility criteria for funding sources.

1. **Seek Grant Opportunities** – Identify and target funding sources that align with key strategic objectives to catalyze critical and/or near-term projects. Through a systematic evaluation

process and collaboration with funding agencies, the basin can leverage external resources to implement resilience projects included in the Action Strategy.

2. **Leverage State and Federal Funded Programs** – Access and leverage available funding resources through State and Federal Programs to heighten the credibility and support the implementation of flood resilience projects. This involves actively engaging with State and Federal agencies active in flood resilience, aligning with established programs, and adhering to any regulatory requirements.
3. **Forge Public-Private Partnerships** – Cultivate collaborative relationships between public entities, private investors, and community stakeholders to leverage interests, resources, and expertise. Together, these partnerships can pool various funding sources such as local budgets, government grants, private investments, and philanthropic donations to support the implementation of flood resilience projects.

Justification

Diversification of funding streams reduces the reliance on a single funding mechanism and increases the financial sustainability of flood resilience-related projects.

1. **Prioritize Grant Opportunities** – Funds can be directed towards initiatives that yield the greatest impact on enhanced flood resilience in the basin by aligning grant opportunities with strategic objectives of the Blueprint Program. Additionally, grant opportunities support the timely implementation of resilience projects. Therefore, by identifying and seizing funding opportunities proactively, the basin can expedite project delivery.
2. **Leverage State and Federal Funded Programs** – State and Federal funded programs offer substantial financial resources that can supplement local budgets to support the execution of large-scale flood resilience projects. Additionally, the basin can benefit from technical assistance and capacity-building opportunities since many State and Federal funded programs offer access to expert advice, guidance, and resources to support the planning implementation process.
3. **Forge Public-Private Partnership** – These partnerships tap into a wider pool of financial resources, technical capabilities, and in-kind contributions. Public-private partnerships offer the opportunity to capitalize on diverse funding streams, foster innovative financing mechanisms, and mobilize additional resources that complement traditional public funding sources.

Neuse River Basin Approach

Funding opportunities and roadblocks were a key point of discussion during each session of the Neuse Workshops. Funding/financial capacity was identified as one of the major roadblocks to preventing action implementation. The technical capacity required for grant application and grant management was also identified as a barrier.

Future Iterations Placeholder

The Blueprint Tool will integrate funding needs through identification of diverse funding sources to match resilience actions with relevant funding and finance options. Users will be able to explore high-level funding information while developing the action profiles, which will help align actions with funding objectives and criteria. Where appropriate, DEQ Blueprint should work with local stakeholders and partners, using the Blueprint Tool, to identify funding needs, pursue funding opportunities, and encourage local fundraising capacity-building. Information collected during the Neuse Workshops, specifically funding roadblocks, was collected for specific resilience actions. It may be useful to review and consider this information when allocating funds.

2.4.2 Develop Implementation Pathways

This recommendation aligns with Step #7: Resiliency Action Implementation outlined in the Blueprint Workflow.

Description

Develop comprehensive implementation pathways to guide the systematic and coordinated execution of prioritized resilience projects. Establish clear project goals and set specific, measurable, achievable, relevant, and time-bound (SMART) objectives that align with Blueprint. Clear implementation goals should depict the potential impact on current conditions and the desired outcome. Pathways should include, at minimum, project lead, partnerships and roles, implementation steps and/or phases, potential cost range, known and potential funding resources.

Justification

This provides a structured approach to translating strategic goals into actionable steps and measurable outcomes. Clearly defined tangible goals can streamline project management, help identify and/or recruit project partners, and enhance coordination among stakeholders. Using the implementation pathways, stakeholders can better anticipate potential challenges and identify opportunities for collaboration/integration to make informed decisions. Formalized project partnerships demonstrate a unified front, leverage collective strengths, share responsibilities, and tap into specialized knowledge and capacities that can accelerate the implementation process and benefit the outcome of a resilience project.

Neuse River Basin Approach

NCDEQ is taking steps to begin funding allocation to implement known resilience projects in the Neuse River Basin. The initial step involves partnering with other state agencies including the North Carolina Department of Agriculture (debris removal and detention projects), North Carolina Office of Recovery and Resiliency (RISE projects), and the Land and Water Fund (flood storage and attenuation projects). The aim of these partnerships is to identify outstanding or unmet needs, leverage existing resources, and get projects on the ground. These near-term projects must be in the a six (6) identified

priority basins and must align with Blueprint goals and criteria. Other partnership opportunities are being explored such as North Carolina Emergency Management (NCEM) and Division of Costal Management.

Future Iterations Placeholder

Implementation pathways likely already exist for the near-term projects selected for implementation. These projects will not exhaust the $96 million allocated for the priority river basins. NCDEQ should develop a public solicitation process to support additional funding and partnership opportunities in 2024-25. NCDEQ should develop implementation pathways for other prioritized resilience actions in the Neuse River Basin once identified using the Blueprint Tool. Much of the information needed to develop implementation pathways is included in the action profile or may be calculated using Blueprint Tool functions. Once developed, NCDEQ can develop implementation pathways to support detailed grant applications.

2.4.3 Monitor, Evaluate, and Track Progress

This recommendation aligns with Step #8: Program and Project Accountability outlined in the Blueprint Workflow.

Description

Establish monitoring, evaluation, and tracking mechanisms to assess the progress and impact of resilience projects in the basin. Monitoring, evaluation, and tracking should occur for implemented Action Strategies, and also cumulatively at the programmatic scale. Monitoring involves the collection of data and information on funding sources and allocation, project activities, outputs, and outcomes. Evaluation entails periodic assessments to measure the effectiveness, efficiency, and relevance of resilience projects. Tracking includes maintaining a record of project progress, funding expenditures, achievements, challenges, and lessons learned.

Justification

These mechanisms are intended to ensure the successful implementation of resilience projects. At the project level, regular monitoring can identify potential bottlenecks, risks, and gaps early on, which in turn, allows for timely corrections. Evaluation provides insights into the impact and effectiveness, which is used to guide future decisions. While tracking enhances communication and trust among project partners and the community.

At the programmatic level, monitoring and tracking of Blueprint accomplishments and investments provide transparency and accountability in the use of public and private funds, which builds trust and confidence in the management of financial resources. More specifically, a monitoring and tracking system should help track the flow of funds, assess the impact of investment, identify gaps or inefficiencies in funding distribution, determine areas for improvement or reallocation of resources, and inform decisions to optimize and allocate financial resources in the basin for the next calendar

year. Progress, outcomes, and financial performance will then be shared with program leadership, policymakers, and the public. This is essential to promote the continued funding of resilience projects.

Neuse River Basin Approach

Project implementation has not yet occurred in the Neuse River Basin.

Future Iterations Placeholder

At the project scale, NCDEQ should ensure that monitoring of project implementation and effectiveness, as well as ongoing stewardship monitoring of project sustainability, are being done. In the case of projects implemented through interagency agreements, this can be accomplished by ensuring the partner agency currently has or develops the capacity to ensure monitoring and project tracking. In the case of directly funded Action Strategies, DEQ may need to develop such mechanisms.

The Action Management Module is an operational and communication tool under development that will be incorporated into the Blueprint Tool to track action implementation. The Action Management Module will be used as a dashboard to display all actions associated with flood resiliency throughout the state and through any grant mechanism. The module will include action ranking parameters, funding source(s), and implementation status. It will also track metrics on spending, risk reduction, and milestones for completion. The module will demonstrate the cumulative progress being made across the basin and the state.

3 Concluding Remarks

This Draft Neuse Action Strategy represents the culmination of many efforts and diverse expertise, which will provide a strong foundation for the Finalized Neuse Action Strategy and pave the way for a more resilient and prepared basin. While significant strides have been made and progress achieved, there is crucial work ahead to refine, finalize, and implement the resilience actions outlined in the action strategy. The proposed next steps present an opportunity to harness the momentum, address remaining gaps and challenges, and collectively steer the completion of the Finalized Neuse Action Strategy.

3.1 Proposed Next Steps

This section provides a series of strategic next steps which reflect remaining efforts and information needed to develop the Finalized Neuse Action Strategy. The Draft Neuse Action Strategy will remain a "living" document as the Blueprint process continues to evolve. Once the Finalized Neuse Action Strategy is delivered, the 5-year cycle will officially begin.

3.1.1 Flood Resiliency Blueprint Tool

The Blueprint Tool (anticipated in 2024) will be used to enhance the Draft Neuse Action Strategy. Data relevant to the Neuse River Basin and existing statewide data will be included in the initial Blueprint Tool. The mapping and modeling capabilities in the Blueprint Tool will also be used to evaluate flood risk and vulnerability in the basin. This will address the inherent gaps of the current Draft Neuse Action Strategy and will be used to guide action development and selection.

3.1.2 Initial Solution Development and Selection

The flood vulnerability and risk findings will be used to guide initial solution development across the basin. The preexisting actions inventory and other actions identified during the Neuse Workshops will be reviewed to determine if additional resilience actions are needed. Any additional resilience actions will aim to address flooding hot spots, build from previous planning efforts, or identified project proposals, and fill in gaps where possible. Higher resolution modeling and analysis may be required to support further action identification and confirmation for select areas. This additional modeling may be supported by NCDEQ or may be included as a new action for future efforts.

The information collected during initial solution development will guide future discussions with stakeholders for the collaborative selection of actions. An action profile will be created for the selected actions within the Blueprint Tool featuring the hazard, the impact, and the defined action. Other project information, when known, should be included in the action profile such as cost estimates, feasibility, and complexity. If an action was proposed in another plan or explored by another agency, that analysis and data can be used to develop the action profile (this information may require updating). Stakeholders will review the action profiles to verify information included, determine missing information, and develop a process for collecting missing data.

3.1.3 Action Refinement and Prioritization

The information included in the action profile will determine action feasibility and implementation. Consistency within the action profiles and the level of detail provided is critical for the comparative analysis and ranking of actions. The Blueprint Tool will be used to transparently review, sort, and rank the potential resiliency actions at the basin, sub-basin, regional, and/or other scales. A designated set of parameters will be used to create or update the basin action strategy. This set of parameters is yet to be determined. However, specific parameters may be selected by users to reflect preference or concern when creating or evaluating community-based resilience actions. Scenarios of ranking can be saved users to help communities and the Neuse River Basin Advisory Group review action options and identify projects that collectively achieve the greatest impact and positive outcomes for flood resilience in the basin. This information will then be used to determine a set of priority resilience actions, which will be included in the Finalized Draft Neuse Action Strategy.

3.1.4 Implementation Pathways

Once a set of priority resilience actions has been established, implementation pathways will be developed to help reach fruition. Implementation pathways help Neuse River Basin Recommendations into tangible actions, outcomes, and impacts. These are intended to provide a roadmap by defining specific steps, timelines, responsibilities, and resource requirements. This supports effective coordination and collaboration among various stakeholders involved in the implementation process. The information provided for implementation pathways requires the assessment of availability of resources, potential challenges, and technical or logistical requirements.

Defining implementation pathways supports the allocation and optimization of resources supporting informed decisions regarding budgeting and funding opportunities. Matching recommendations to funding sources will help facilitate implementation. Again, the Blueprint Tool will identify funding matches based on the information provided in the action profiles. Many of the preexisting resilience actions included in the action inventory specify potential funding sources. Matching actions to potential funding sources can demonstrate a clear understanding of the funding criteria and priorities and can be used to craft the resilience actions in alignment with the objectives and interests of the funding entities. Overall, this will increase the relevance to the proposals, which in turn will increase the likelihood of secured funds.

A responsible organization, agency, or individual will be designated as project lead for each priority action. This ensures a level of accountability and successful execution. Project lead designation establishes clear lines of responsibility, roles, and expectations to spearhead action implementation. The project lead should possess the necessary knowledge and experience to deploy specialized skills and capacities to address the many aspects of the implementation process. This designation is intended to leverage expertise, resources, and networks to effectively manage and oversee implementation in its entirety.

3.1.5 Additional Outreach and Engagement

Additional outreach and engagement will be conducted for the Finalized Neuse Action Strategy. Stakeholders will be re-engaged during the initial solution development to discuss flood vulnerability and risk in the Neuse River Basin as portrayed by the Blueprint Tool. Any additional resilience actions will be proposed and selected collaboratively. Additional outreach will occur to review the Finalized Neuse Action Strategy, including the basin's priority resilience actions. Feedback on the action strategy will be solicited and collected.

3.1.6 Finalized Neuse Action Strategy

Based on the input received during initial solution development, action profiles will be built out for the selected actions. These actions will then be reviewed, sorted, and ranked using the Blueprint Tool function and the designated set of parameters for river basin action strategies. The prioritized list will then be integrated into the Finalized Neuse Action Strategy including each action profile (project description and overview) and implementation pathway. Additional recommendations or lessons learned may be incorporated into the Finalized Draft Neuse Action Strategy based on new findings and stakeholder input.