# North Carolina Flood Resiliency Blueprint

**The Joint Appropriations Committee on Agriculture, Natural, and Economic Resources**

February 14, 2023





Michelle Ferree

# DEQ Core Blueprint Team

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# General Assembly of North Carolina Session 2021

**SESSION LAW 2021-180**
**SENATE BILL 105**

**SECTION 5.9.(c)** Flood Resiliency Blueprint. – Of the funds allocated in subdivision (a)(1) of this section, the Department of Environmental Quality, Division of Mitigation Services (DMS), shall contract with an organization to develop a statewide Flood Resiliency Blueprint for major watersheds impacted by flooding, including, among others, the Cape Fear River and the Neuse River Basins. The watershed blueprint shall form the backbone of a State flood planning process that increases community resiliency to flooding, shall be a resource for riverine and stream management to reduce flooding, and should support the establishment and furtherance of local government stormwater maintenance programs. The blueprint shall identify the major watersheds affected by flooding and direct these funds toward the activities which are central to the creation of an actionable blueprint, namely flood risk assessment, identification of data gaps, and recommendations to reduce flood risk for each target watershed. When developing the blueprint with the organization selected, DMS shall ensure the blueprint incorporates local knowledge, community goals, projections of future flood risk, and the best available science and hydrologic modeling to create a decision tool for flood mitigation investments and strategies from local watersheds up to whole river basins. A successful blueprint should ultimately lead to a prioritized set of projects and funding strategies that the State can implement. DMS and the organization selected are encouraged to examine examples from other states such as the Louisiana Coastal Master Plan or the flood resiliency planning processes in South Carolina and Virginia. The organization shall send all necessary information to DMS on the implementation of the blueprint upon request by DMS. The organization shall submit an initial draft of the blueprint to DMS no later than December 31, 2023. DMS shall report by July 1, 2022, and annually thereafter to the Joint Legislative Commission on Governmental Operations and the Fiscal Research Division on the implementation of this subsection.

# Purpose




Reduce likelihood and extent of flooding in NC

Reduce vulnerability and impact from flooding in NC

Increase community ability to maintain and quickly resume pre-storm activities following flooding in NC

# Goal

The Flood Resiliency Blueprint is designed to be an actionable, online decision-support tool for each major river basin in North Carolina. The Blueprint will allow state agencies, lawmakers, and regional and local government planners to prioritize and direct resources to implement effective flood resilience strategies.

# Goal

The Flood Resiliency Blueprint is designed to be an actionable, online decision-support tool for each major river basin in North Carolina. The Blueprint will allow state agencies, lawmakers, and regional and local government planners to prioritize and direct resources to implement effective flood resilience strategies.

## Visualize Flood Risk



# Goal

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## Visualize Flood Risk




## Select Mitigation Alternatives





# Goal

The Flood Resiliency Blueprint is designed to be an actionable, online decision-support tool for each major river basin in North Carolina. The Blueprint will allow state agencies, lawmakers, and regional and local government planners to prioritize and direct resources to implement effective flood resilience strategies.

## Visualize Flood Risk

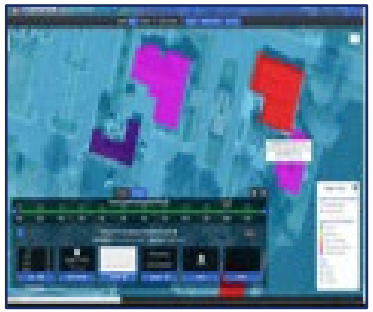


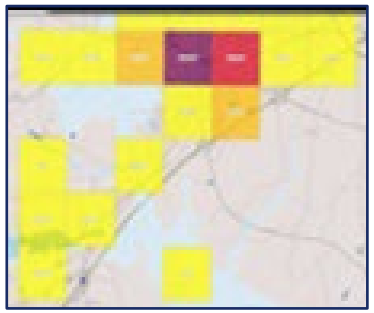

## Select Mitigation Alternatives



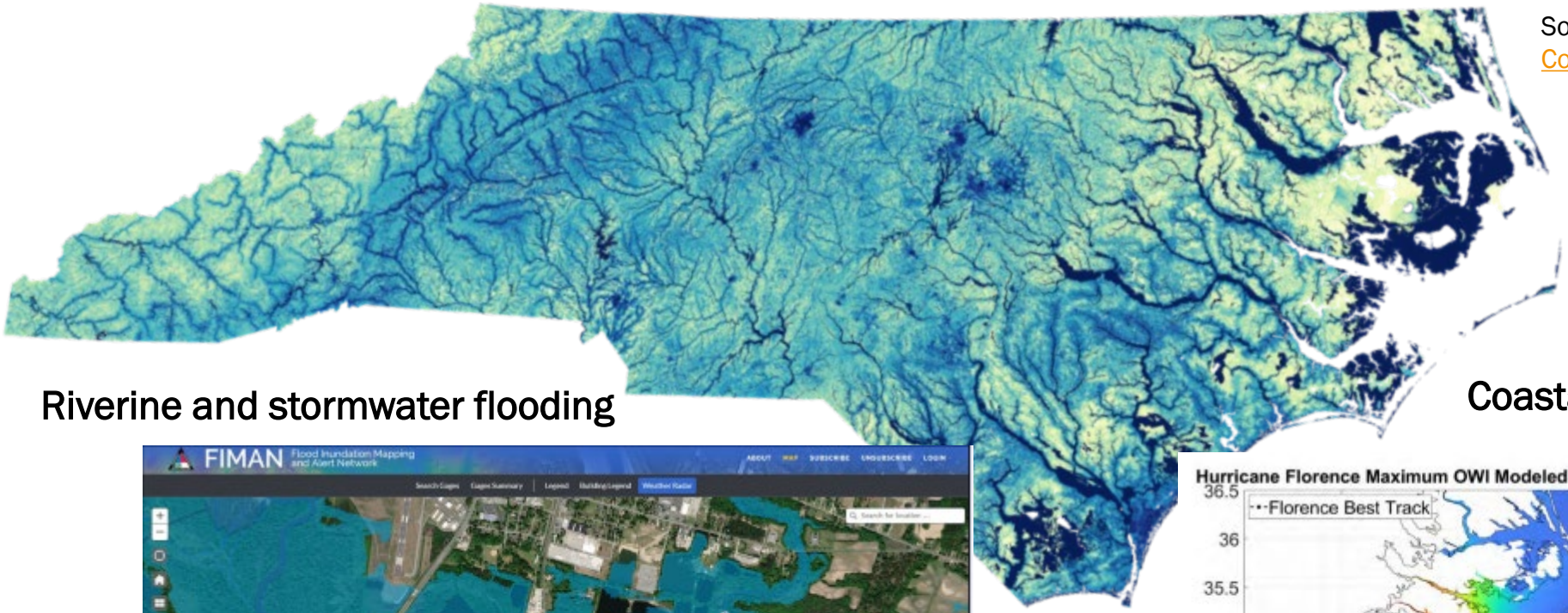


## Understand Impacts



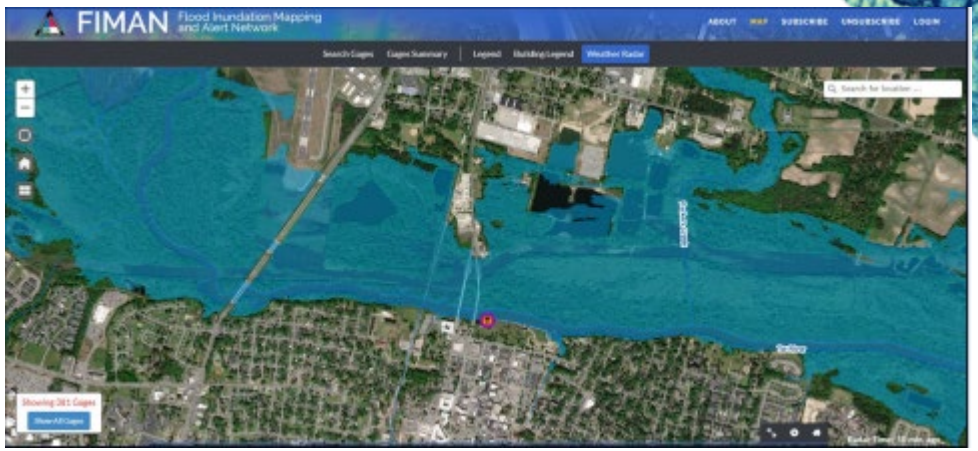


# Current & Future Flood Hazards



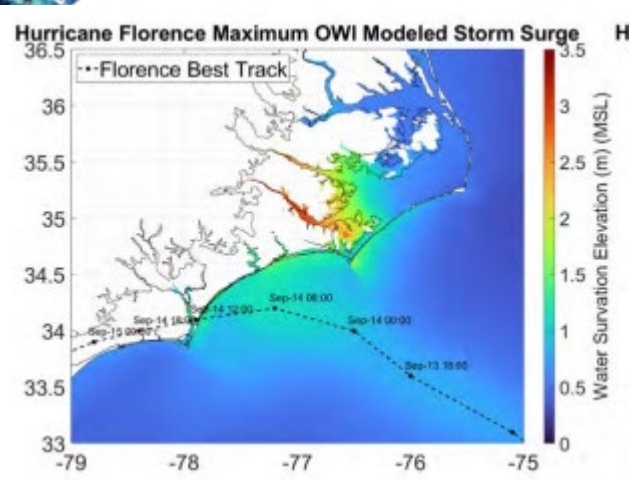
Source: Center for Geospatial Analytics, NCSU; Collins et al. 2022

## Riverine and stormwater flooding



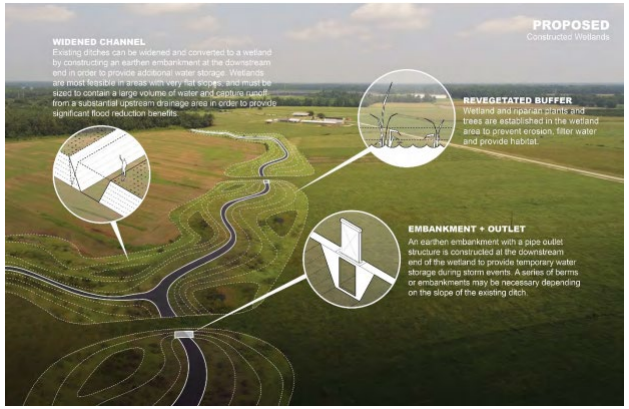

Source: Flood Inundation Mapping and Alert Network (FIMAN)

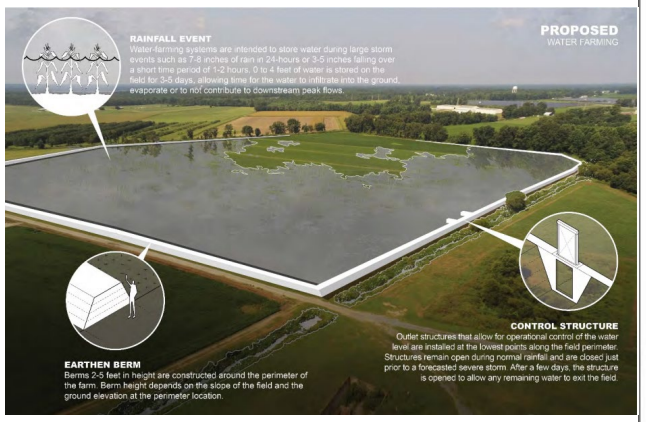
## Coastal storm surge and tidal

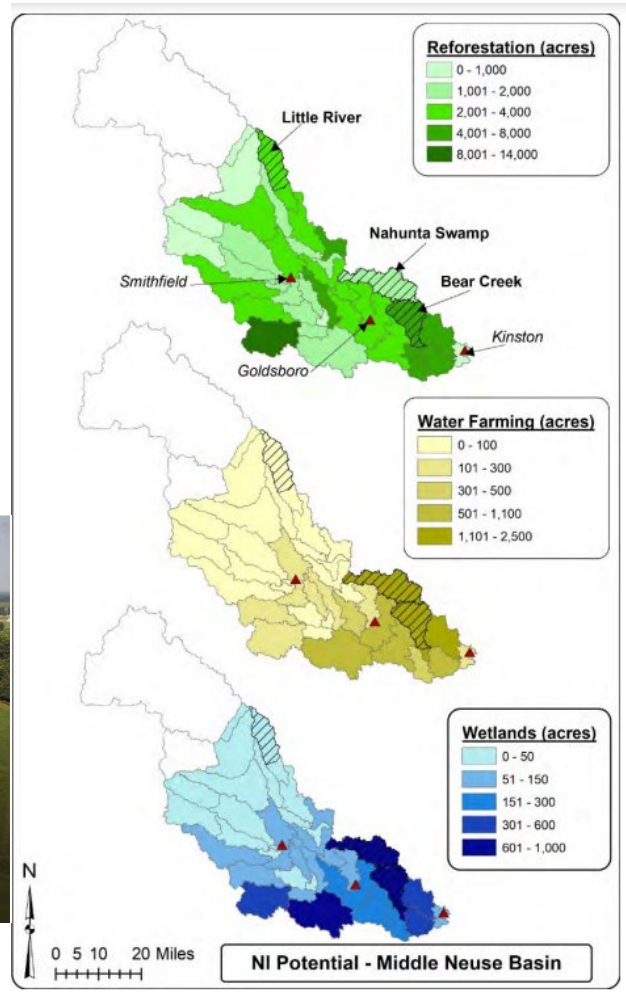



Source: Natural Systems: Compound Flooding, NC Policy Collaboratory, 2021

# Mitigation Scenarios



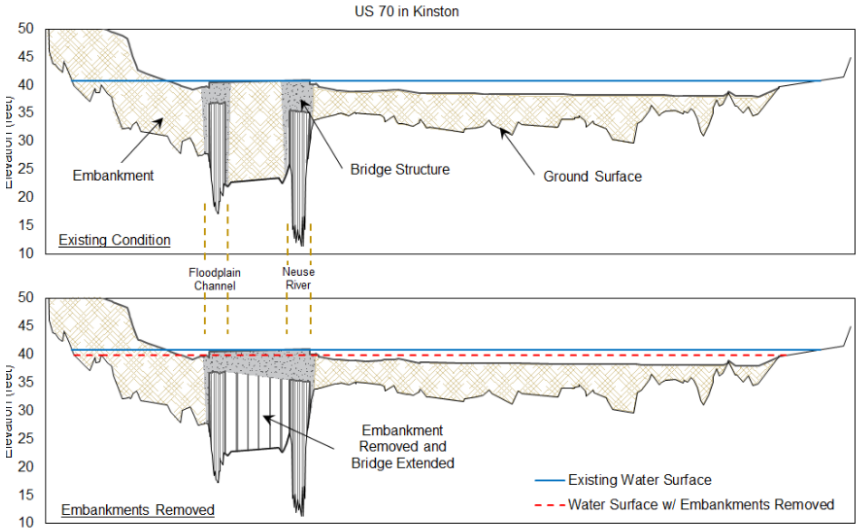




Source: [Improving North Carolina's Resilience to Coastal Riverine Flooding](), NC Policy Collaboratory, 2021.



Source: Infrastructure: Enhancing Stormwater Controls, NC Policy Collaboratory, 2021.




Source: Bridge Crossing Modeling Study – Kinston, [NC Sea Grant]()

# Stormwater flooding, Morehead City



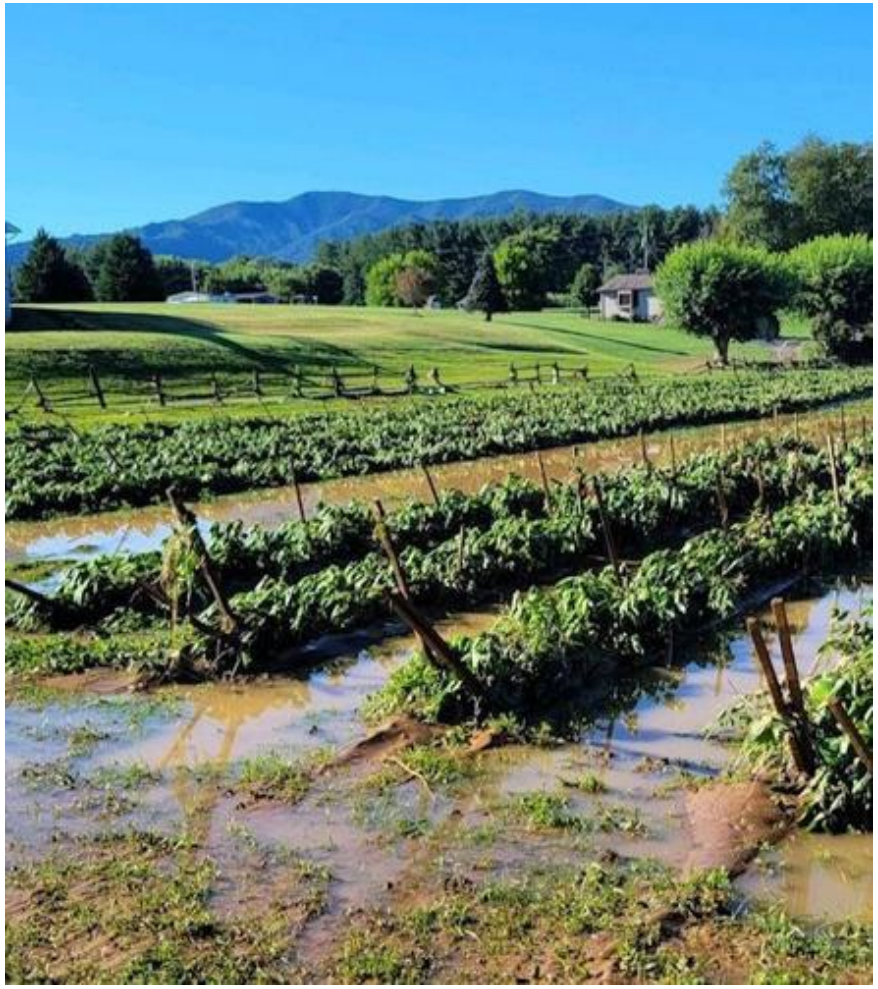
Source: Coastal review.org

# Hurricane Florence, Compound Flooding, New Bern



Source: NBC News

# Agriculture



Source: French Broad Basin, Pigeon River, The Mountaineer



Source: Hyde County, NCSU

# Energy



Source: Duke Energy

# Critical Infrastructure



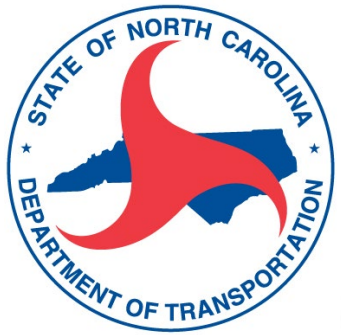
Source: News and Observer, I-40, 9/30/19

# NC Flood Resilience: Partners



































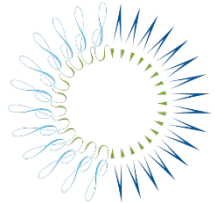






























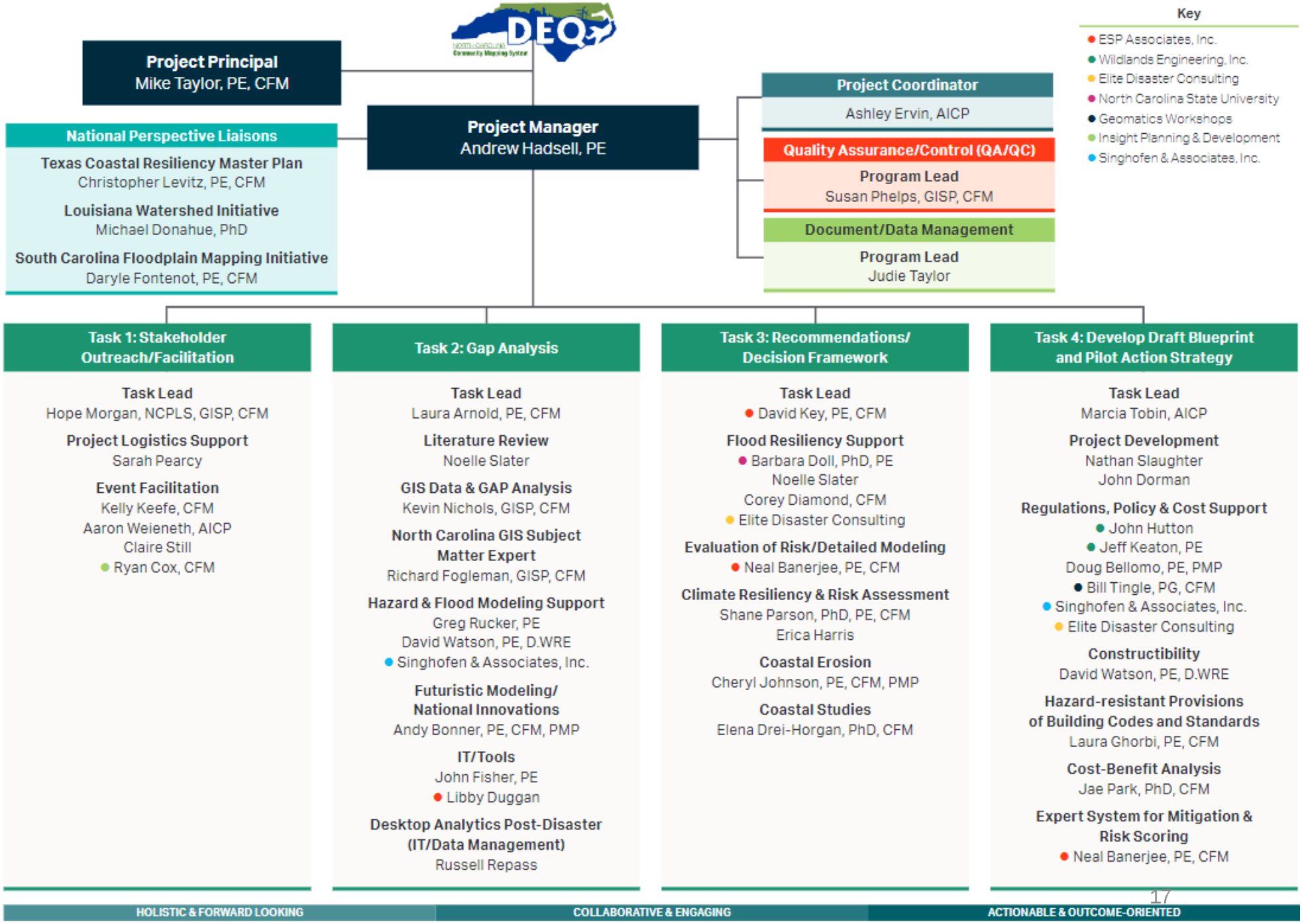








# AECOM

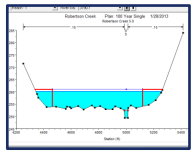

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Wildlands Engineering, Inc.
Elite Disaster Consulting
North Carolina State University
Geomatics Workshops
Insight Planning & Development
Singhofen & Associates, Inc.
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Project Manager
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Texas Coastal Resiliency Master Plan
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Louisiana Watershed Initiative
Michael Donahue, PhD
South Carolina Floodplain Mapping Initiative
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Document/Data Management
Program Lead
Judie Taylor
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Futuristic Modeling/ National Innovations
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Libby Duggan
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Coastal Studies
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Nathan Slaughter
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Elite Disaster Consulting
Constructibility
David Watson, PE, D.WRE
Hazard-resistant Provisions of Building Codes and Standards
Laura Ghorbi, PE, CFM
Cost-Benefit Analysis
Jae Park, PhD, CFM
Expert System for Mitigation & Risk Scoring
Neal Banerjee, PE, CFM
HOLISTIC & FORWARD LOOKING
COLLABORATIVE & ENGAGING
ACTIONABLE & OUTCOME-ORIENTED

# HAZARD MODELING & MAPPING

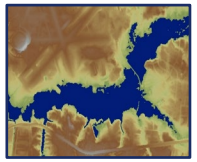
Flood BFE



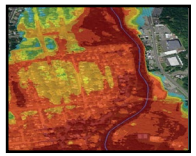
Coastal H&H



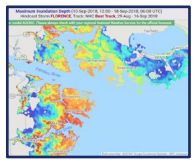
Flood Inundation Library



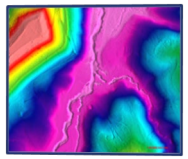
Flood Depth Grid



Coastal Inundation - ADCIRC



Topography



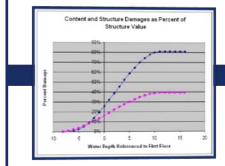




## MITIGATION STRATEGIES

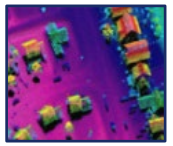
Committee and Legislative Project Approval and Funding

## IMPACT MODELs



## RECEPTORS

Structure



Infrastructure



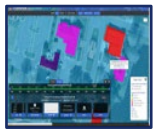
Population



## MODELED IMPACTS Present, Future, Mitigated

Structure – Specific Impact

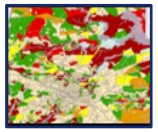
Infrastructure Impact



Demographic Impact



Hotspots by Count & Financial Loss

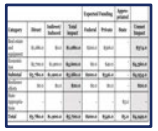


Structural Count and Financial Loss



Business Disruption/ Economic Loss





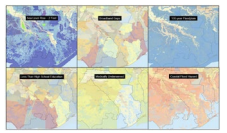
## PRIORITIZATION

Fund Navigator





Equity / Justice 40



## SCORECARD

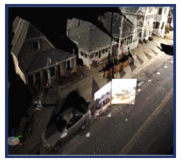


Resilience Scorecard based on Impact to:

- Residential Housing
- Commercial Facilities and Operations
- Infrastructure Population
- Life-Line Providers
- Transportation
- Economic Impact
- Mitigation Strategy

## SUPPORTING DATA

First Floor Elevations



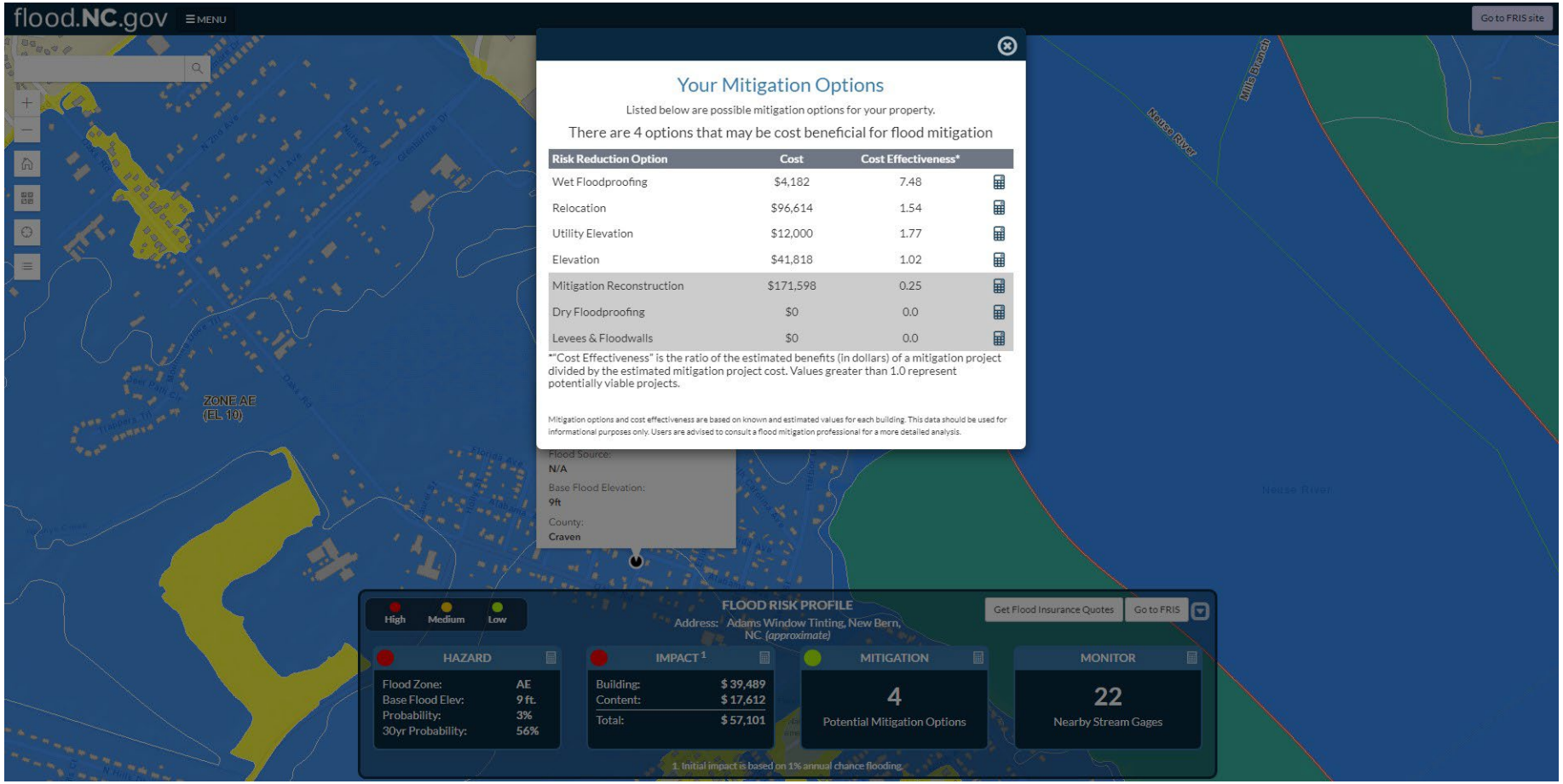
Parcel / NAICS



NFIP Data



# State of the Art Tool: Beyond Flood.nc.gov



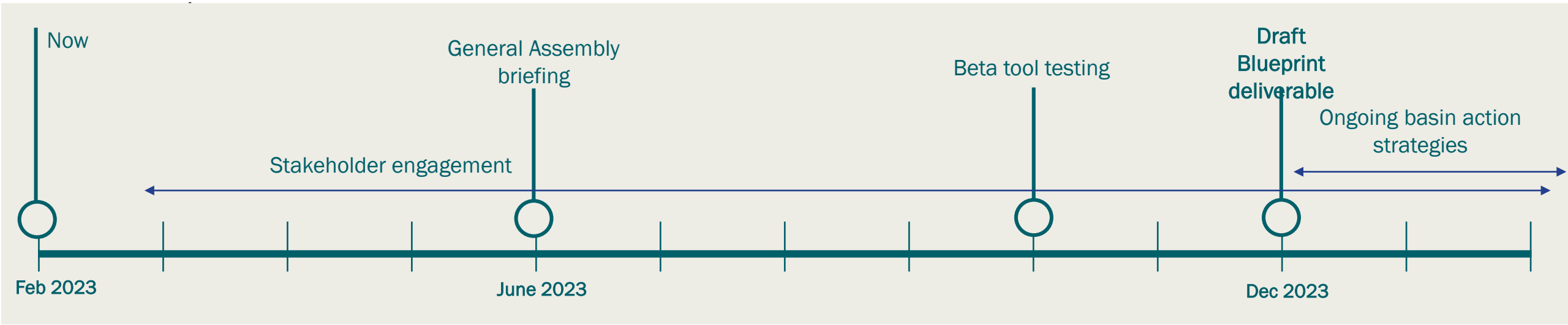
# Blueprint Timeline

**Current:**

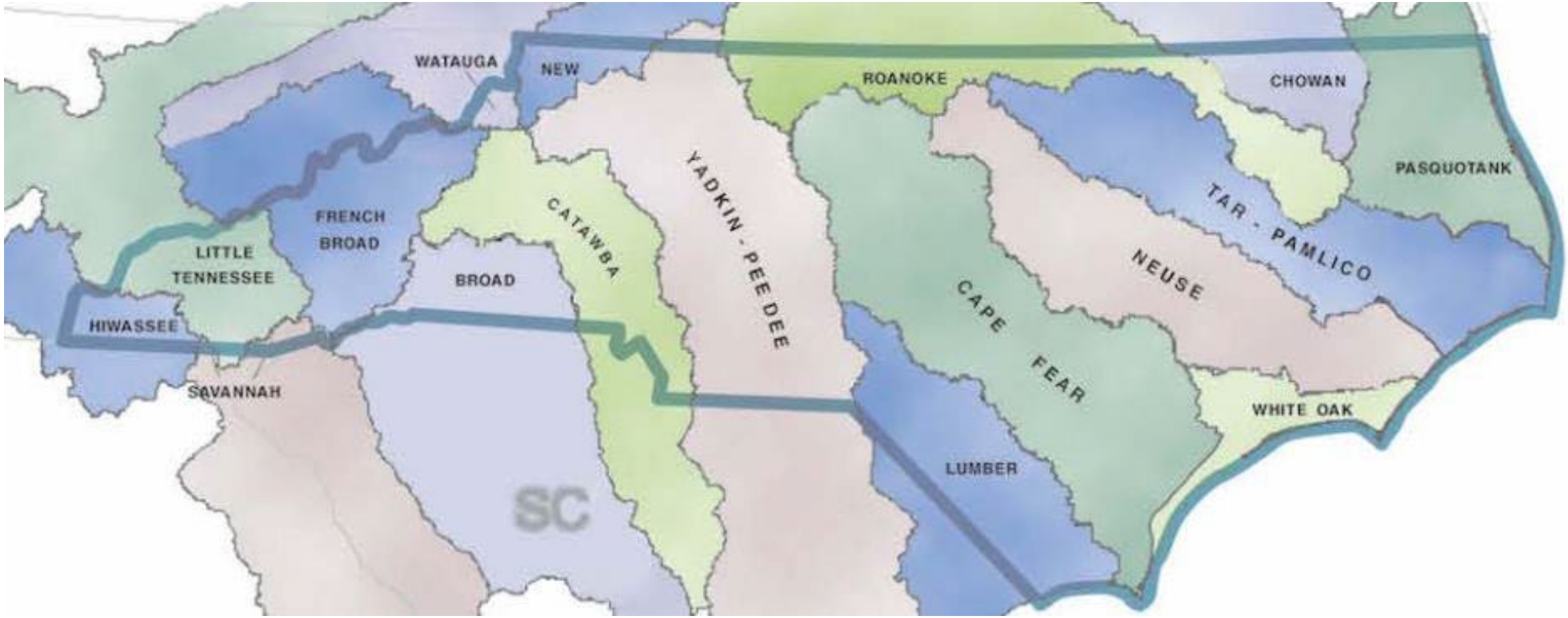
- Stakeholder Engagement and Review of Deliverables (federal, state, local, non-governmental organization, and others)
- Gap Analysis (What do we have? What don't we have?)
- Decision-Making (What are the recommendations for prioritizing flood mitigations strategies responsibly, systematically, equitably, and transparently?)

**2023:** Beta-testing, Neuse Basin Action Strategy

**2024:** Statewide validation and testing of the tool in NC basins and development of basin-specific action



# 17 River Basins




Source: NC DEQ

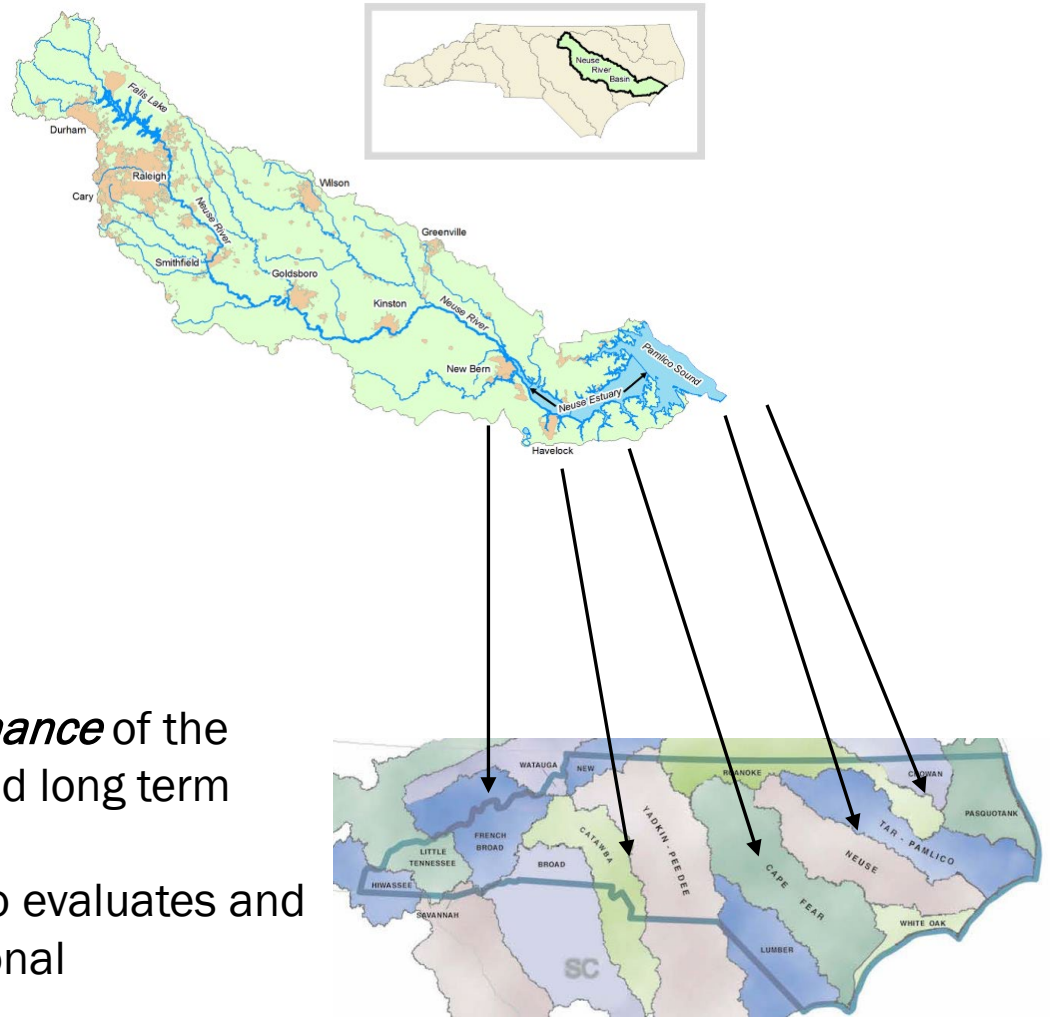
# Decisions Now & Strategic Future

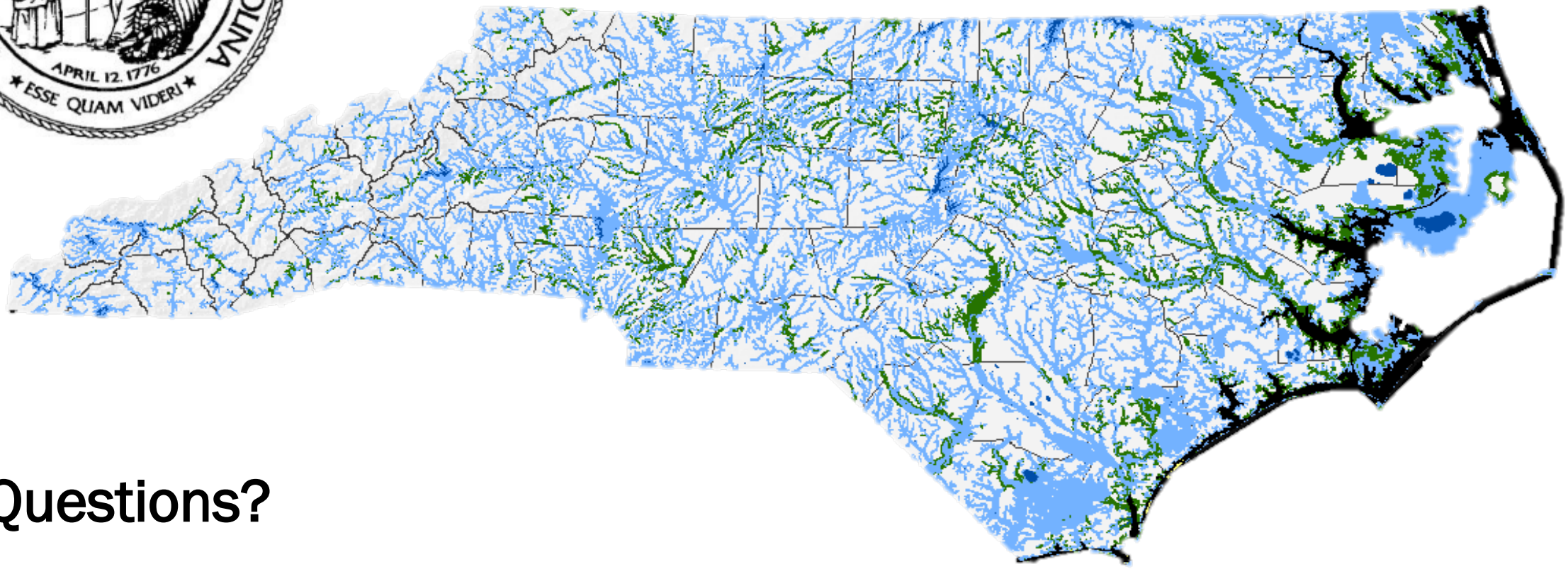
## Basin-specific action strategies

- Taking into account NC basins have different flood exposure, data and modeling needs, and/or capacity,
- Identify best flood mitigation strategies given what we know now AND identify prioritized data and modeling needs in the basin to develop holistic basin strategy

## Statewide Tool (dependent on data/models available)

- Visualize flood vulnerability for different flood risk conditions
- Choose from a suite of flood mitigation strategies
- Understand cost estimates, funding sources, costs/benefits
- Recommendations for ***long-term administration and maintenance*** of the Blueprint (such as updating key data and modeling inputs and long term basin planning)
- Recommendations for ***governance and decision making*** (who evaluates and approves flood mitigation projects or priority areas for additional modeling/data needs)





# Questions?

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