

North Carolina Flood Resiliency Blueprint

North Carolina Beach, Inlet and Waterway Association
Emerald Isle, NC
May 11, 2023





DEQ Program Overview

Elizabeth Christenson

Project Lead & Senior Policy Advisor, DEQ



DEQ Core Blueprint Team



Elizabeth Christenson, PhD
Project Lead & Senior Policy Advisor
Department of Environmental Quality



Marc Recktenwald
Director
Division of Mitigation Services



Michelle Ferree
Project Manager
Division of Mitigation Services



NC General Assembly: 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.

Goal



The Flood Resiliency Blueprint is designed to be a standardized flood resiliency approach and 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.

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Visualize Flood Risk



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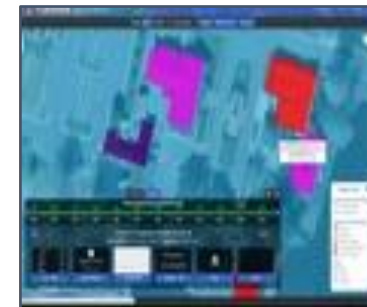
Visualize Flood Risk Select Mitigation Alternatives



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Visualize Flood Risk Select Mitigation Alternatives Understand Impacts & Vulnerability

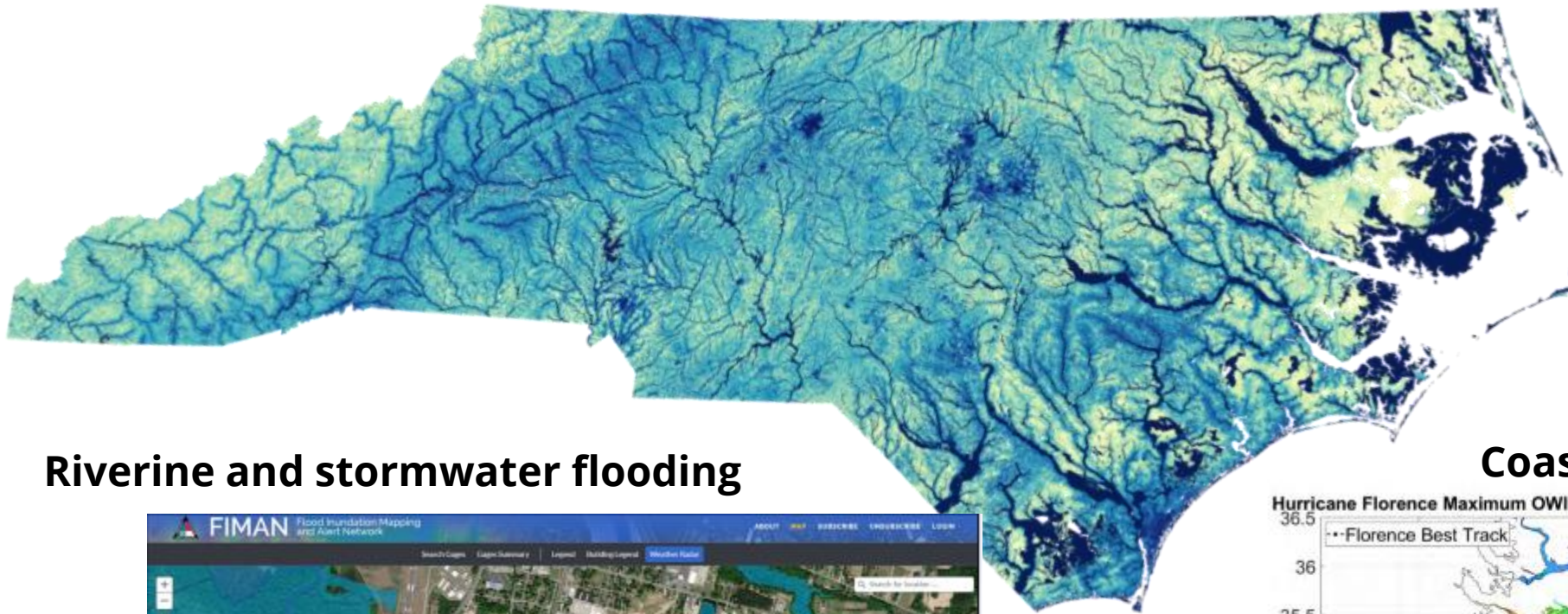


Definitions

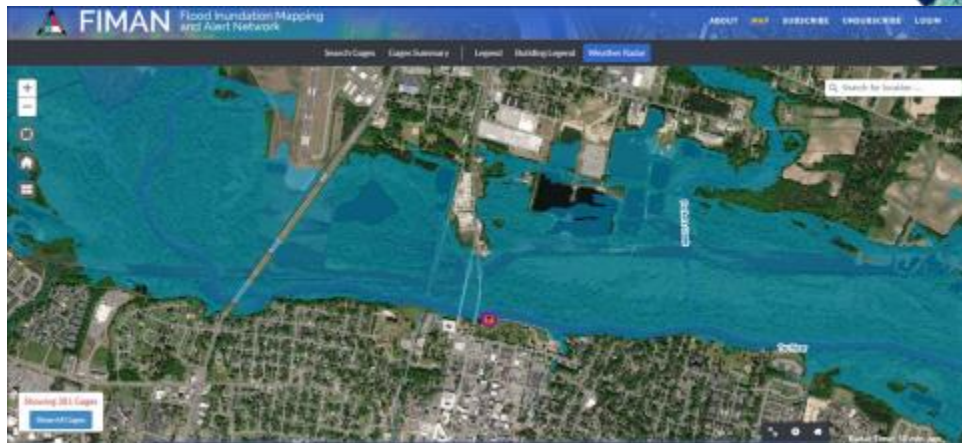


- **FLOOD HAZARD** – an event or physical condition that can cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.
- **FLOOD IMPACT** – measurable damage resulting from a flood hazard event on people and social, environmental, structural, commercial and infrastructure assets.
- **FLOOD RESILIENCE** – capacity of individuals, a community, business, or natural environment to prevent, withstand, respond to, and recover from a flood event.
- **FLOOD RISK** – the likelihood a flood event will harm individuals, communities, or assets with some severity or consequence.
- **FLOOD VULNERABILITY** – measure of someone and something's (infrastructure, economic activity) ability to prepare for, manage, survive, and recover from a flood event.

Current & Future Flood Hazards

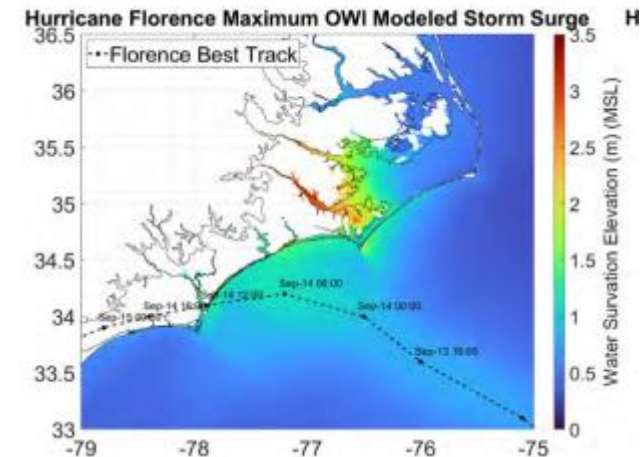


Riverine and stormwater flooding



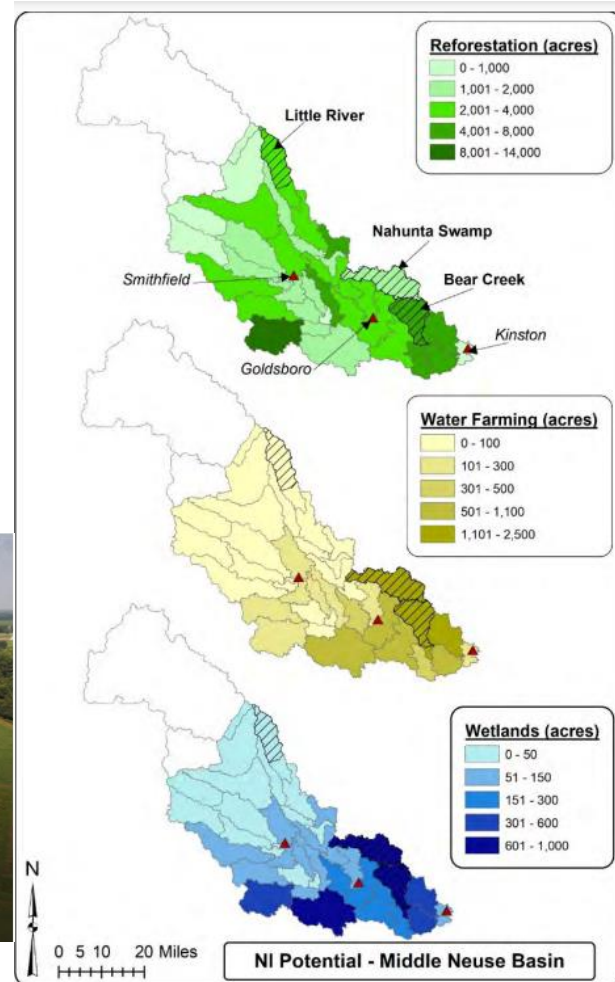
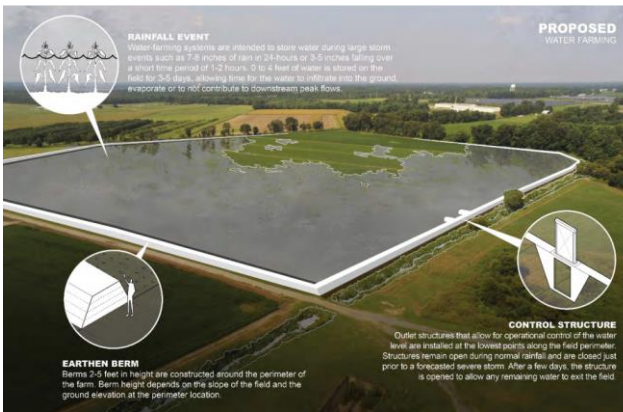
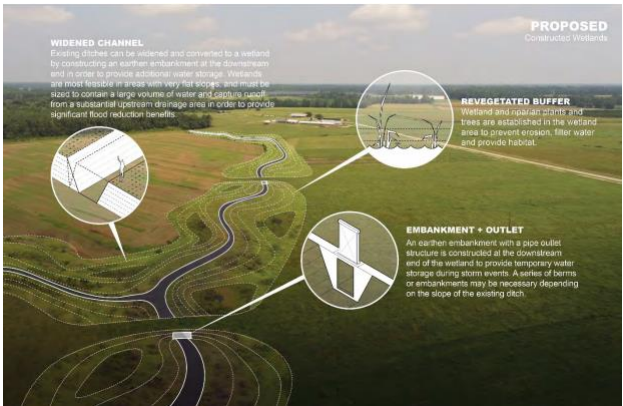
Source: Flood Inundation Mapping and Alert Network (FIMAN)

Coastal storm surge and tidal

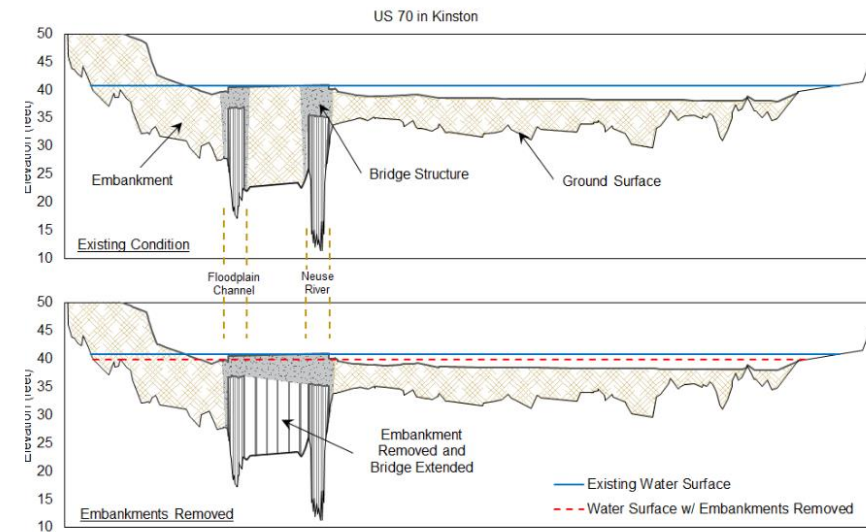


Source: Natural Systems: [Compound Flooding](#), NC Policy Collaboratory, 2021

Mitigation Scenarios



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



Source: Bridge Crossing Modeling Study – Kinston, NC Sea Grant

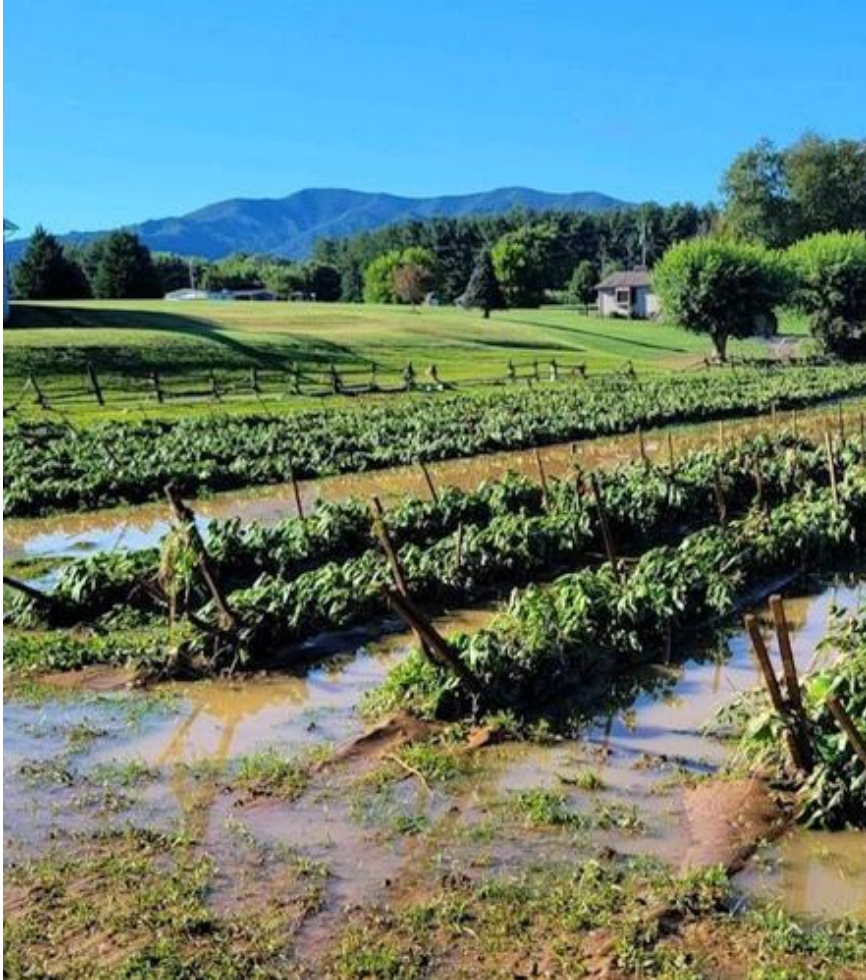
Source: [Improving North Carolina's Resilience to Coastal Riverine Flooding](#), NC Policy Collaboratory, 2021.

Stormwater Flooding, Morehead City



Source: [Coastal review.org](http://Coastalreview.org)

Agriculture



Source: French Broad Basin, Pigeon River
[The Mountaineer](#)



Source: Hyde County, [NCSU](#)

Critical Infrastructure



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

Energy



Source: [Duke Energy](#)

Hurricane Florence, Compound Flooding, New Bern



Source: [NBC News](#)

Flood Resiliency Blueprint Tentative Timeline



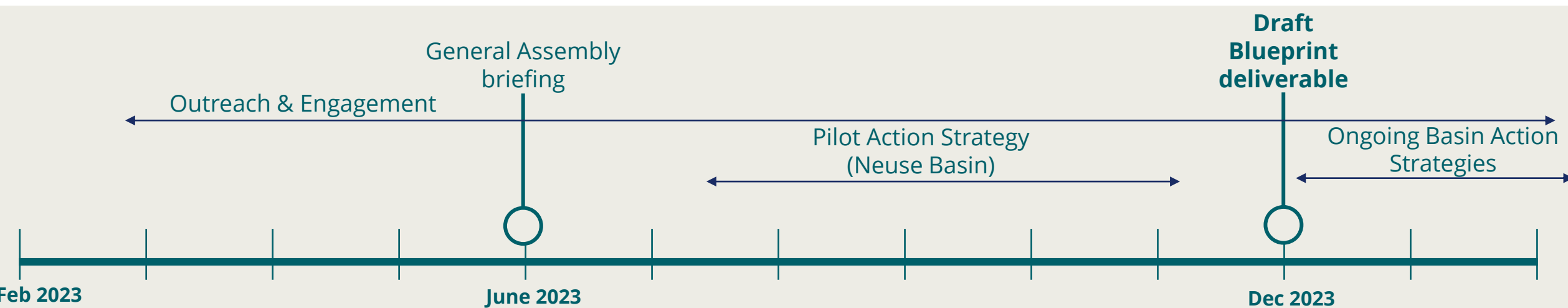
2022 Outputs: Outreach and engagement to develop scope of work; awarded Phase I contract

2023 Outputs:

- Requirements for online decision support tool
- Draft NC Flood Resiliency Blueprint
- Draft Neuse Basin Action Strategy and beta-testing tool

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

2025+: Ongoing maintenance, administration, updates, etc.





Phase I Overview

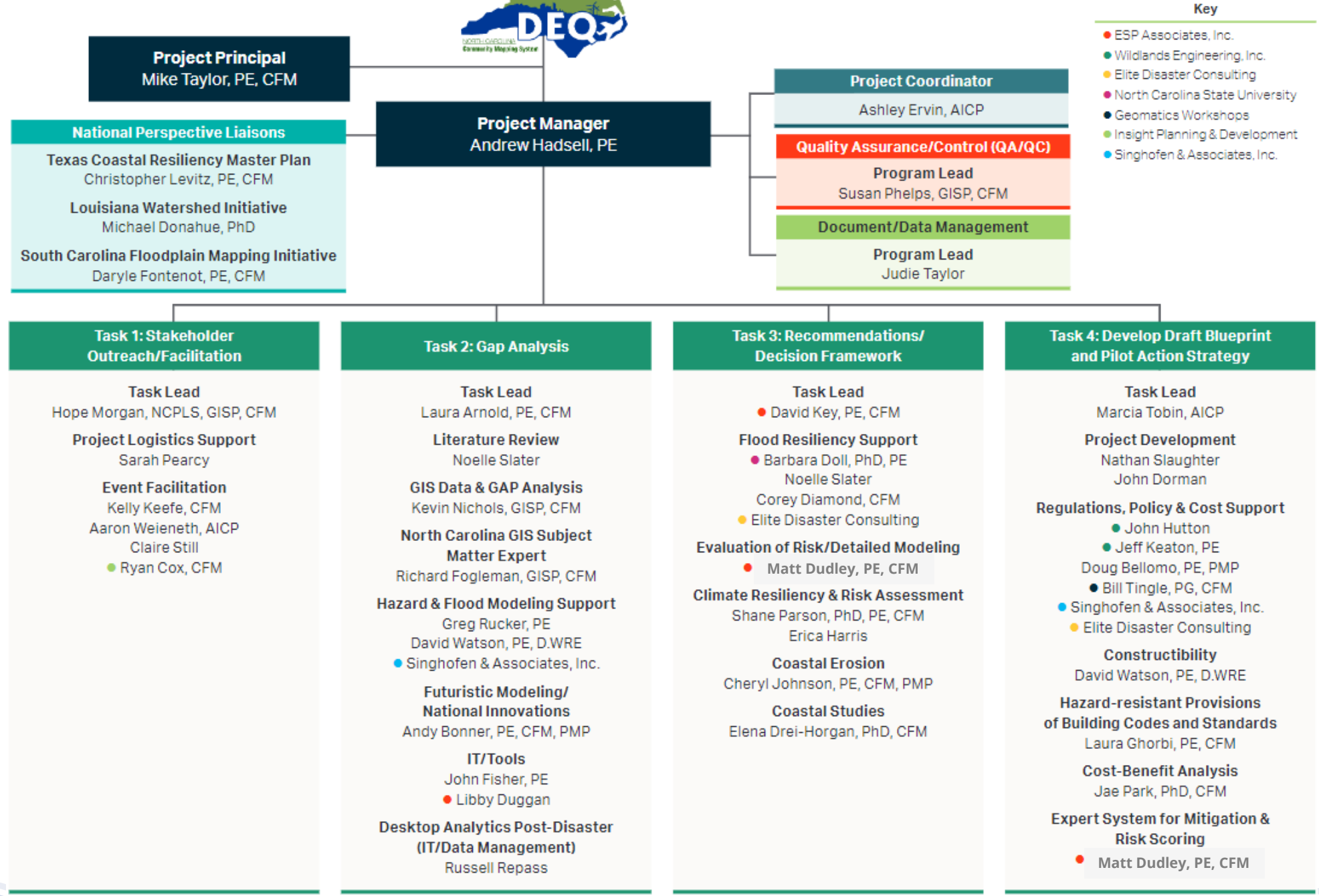
Andy Hadsell, Project Manager, AECOM





Key

- ESP Associates, Inc.
- Wildlands Engineering, Inc.
- Elite Disaster Consulting
- North Carolina State University
- Geomatics Workshops
- Insight Planning & Development
- Singhofen & Associates, Inc.



Task 1: Stakeholder Outreach/Facilitation

Task Lead
Hope Morgan, NCPLS, GISP, CFM

Project Logistics Support
Sarah Pearcy

Event Facilitation
Kelly Keefe, CFM
Aaron Weieneth, AICP
Claire Still
● Ryan Cox, CFM

Task 2: Gap Analysis

Task Lead
Laura Arnold, PE, CFM

Literature Review
Noelle Slater

GIS Data & GAP Analysis
Kevin Nichols, GISP, CFM

North Carolina GIS Subject Matter Expert
Richard Fogleman, GISP, CFM

Hazard & Flood Modeling Support
Greg Rucker, PE
David Watson, PE, D.WRE
● Singhofen & Associates, Inc.

Futuristic Modeling/National Innovations
Andy Bonner, PE, CFM, PMP

IT/Tools
John Fisher, PE
● Libby Duggan

Desktop Analytics Post-Disaster (IT/Data Management)
Russell Repass

Task 3: Recommendations/Decision Framework

Task Lead
● David Key, PE, CFM

Flood Resiliency Support
● Barbara Doll, PhD, PE
Noelle Slater
Corey Diamond, CFM
● Elite Disaster Consulting

Evaluation of Risk/Detailed Modeling
● Matt Dudley, PE, CFM

Climate Resiliency & Risk Assessment
Shane Parson, PhD, PE, CFM
Erica Harris

Coastal Erosion
Cheryl Johnson, PE, CFM, PMP

Coastal Studies
Elena Drei-Horgan, PhD, CFM

Task 4: Develop Draft Blueprint and Pilot Action Strategy

Task Lead
Marcia Tobin, AICP

Project Development
Nathan Slaughter
John Dorman

Regulations, Policy & Cost Support
● John Hutton
● Jeff Keaton, PE
Doug Bellomo, PE, PMP
● Bill Tingle, PG, CFM
● Singhofen & Associates, Inc.
● 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
● Matt Dudley, PE, CFM

Outreach and Engagement

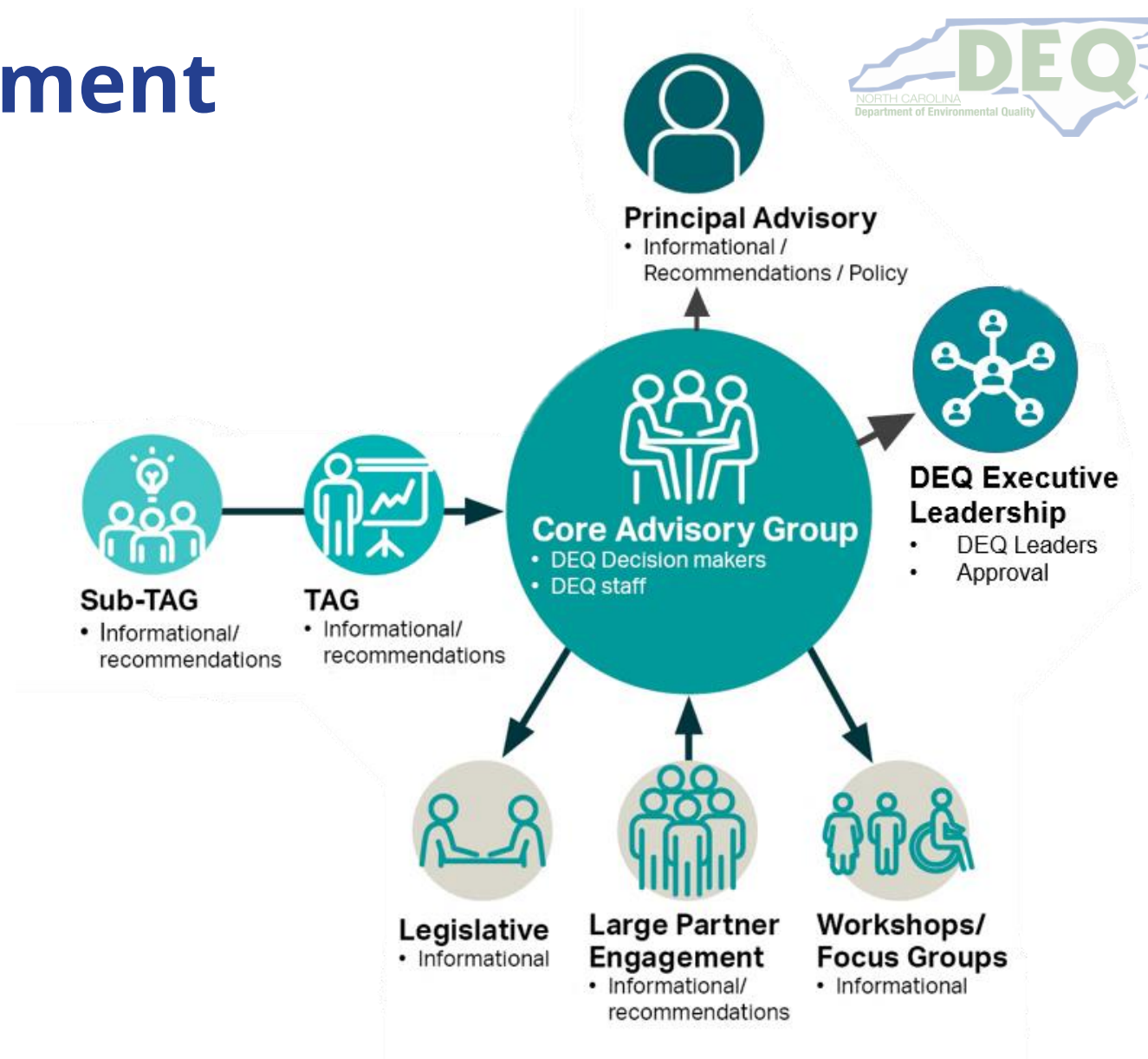


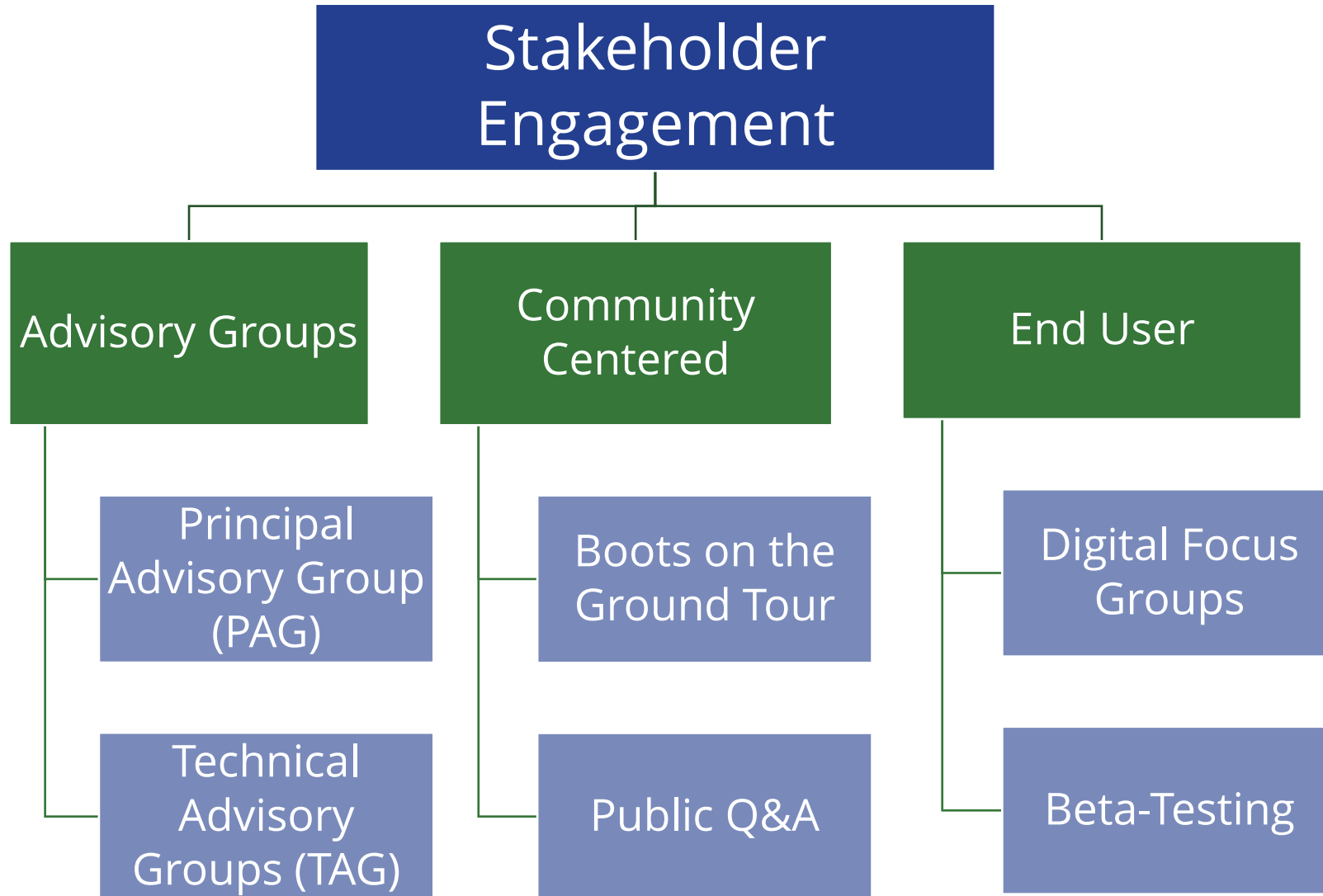
Creation of viable teams from extensive stakeholder list: state, federal, local, and county experts, Tribal, non-governmental organizations, academic, and community experts

Stakeholder Engagement Plan (draft)/ Decision Making Process

Technical Advisory Group (TAG) can create sub-TAGs for more detailed requirements

- Coordinated meeting content and review





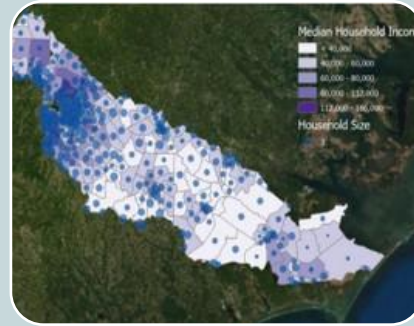
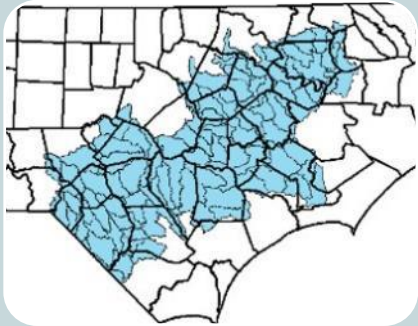
Data Collection Plan Classifications (“Profiles”)



Organizing datasets into profiles will help better identify and fill gaps for a more comprehensive Blueprint tool

RECOMMENDATIONS/DECISION FRAMEWORK

Scalability



Basin Size & Population

- **17 River Basins**
- **Varying Topography**
- Population
- Culture
- **Adjacent States Headwater**

Hydrology and Hydraulics

- Model Type
- Model Age
- **Fluvial Conditions**
- **Pluvial Conditions**

Demographics, Diversity & Social Vulnerability

- **Diverse Populations**
- Equity
- Population 10M+
- 2.2M in Neuse Basin Alone

Source Data Quality/Coverage

- Data Rich Communities
- **Underserved Communities**
- **Allow for local Datasets**
- Proxy Datasets

Mitigation Techniques

- Flooding Source
- **Assessment of Alternatives**
- Policy and Law

Key Deliverables for Phase I



Product	Key Attributes
<p>1. Requirements needed to develop the suite of online decision support tools</p>	<ul style="list-style-type: none"> ▪ Storyboards to identify functions ▪ Description of how user will interface with the tool ▪ Mockups to depict look and feel of interactive tool
<p>2. Draft Neuse Basin Flood Resiliency Action Strategy (pilot)</p>	<ul style="list-style-type: none"> ▪ Findings and recommendations for improving flood resiliency ▪ Project descriptions, recommendations on entities best suited to implement ▪ Identification of further needs for data development or modeling
<p>3. Draft North Carolina Flood Resiliency Blueprint</p>	<ul style="list-style-type: none"> ▪ Manual for conducting flood resiliency planning at the river basin level ▪ How will these plans be developed going forward (e.g., long-term maintenance and administration of Blueprint)? ▪ Framework of key decision points, actions, and outcomes for each phase

Core Outcomes

These core outcomes are the focus for decision making:

1. Reduce likelihood and extent of flooding in NC
2. Reduce vulnerability and impact from flooding in NC
3. Increase community ability to maintain and quickly resume pre-storm activities following flooding in NC





Status Update



Engagement to Date

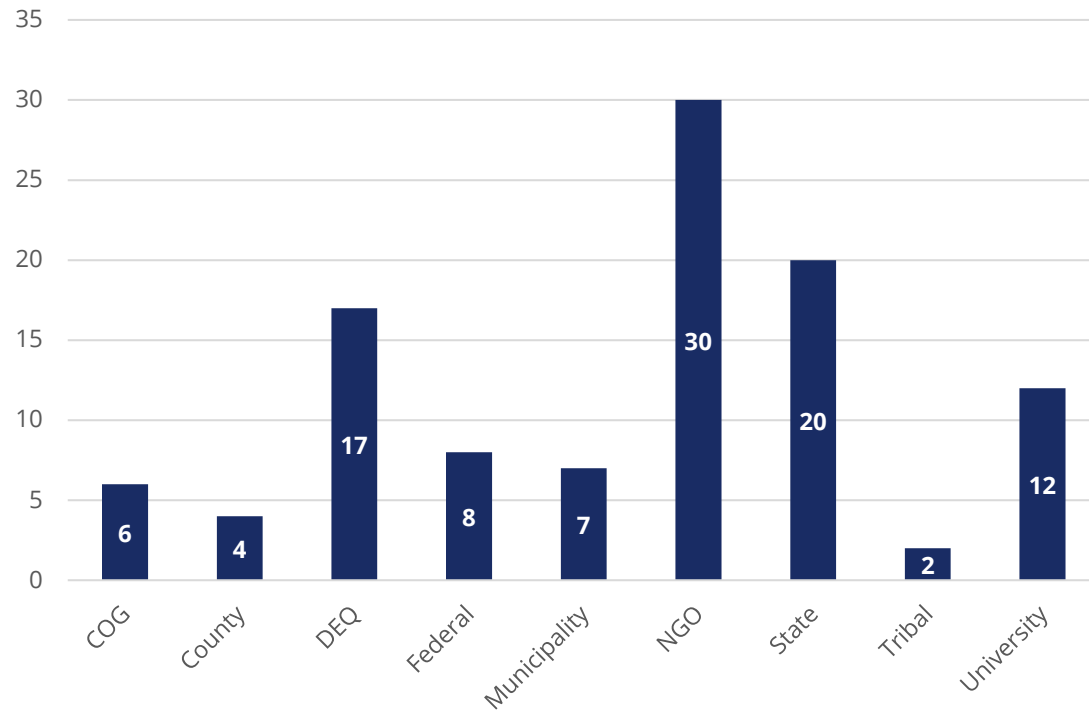
- 2022 – Scope of work development included extensive work with agencies, non-profits, academics, and local government representatives
- 2/9 - DEQ Secretary's Environmental Justice and Equity Advisory Board public meeting
- 2/14 – Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources
- 3/8 – Select Municipal, County, and Council of Government elected leaders
- 3/9 - North Carolina GIS Conference
- 3/15 – Technical Advisory Group Kickoff
- 3/22 – Principal Advisory Group Kickoff
- 4/12 – PEW Western Symposium

Technical Advisory Group Kickoff

March 15, 2023



Participants by Organization Type



- 106 participants
- 7 TAGs
- 11-20 people per TAG
- Approximately 80 organizations

Technical Advisory Group Structures

Government		Environmental		Social		Neuse
Governance	Partnership/ Funding	WHERE/WHEN: Hazard Identification	WHO/WHAT: Vulnerability/ Risk/Impact	HOW: Resilience/Mitigation/R education	Tool Development/ Acceptance	Neuse Regional Advisory Group

- Subject matter experts
- Review Blueprint deliverables
- Provide advisory input and feedback

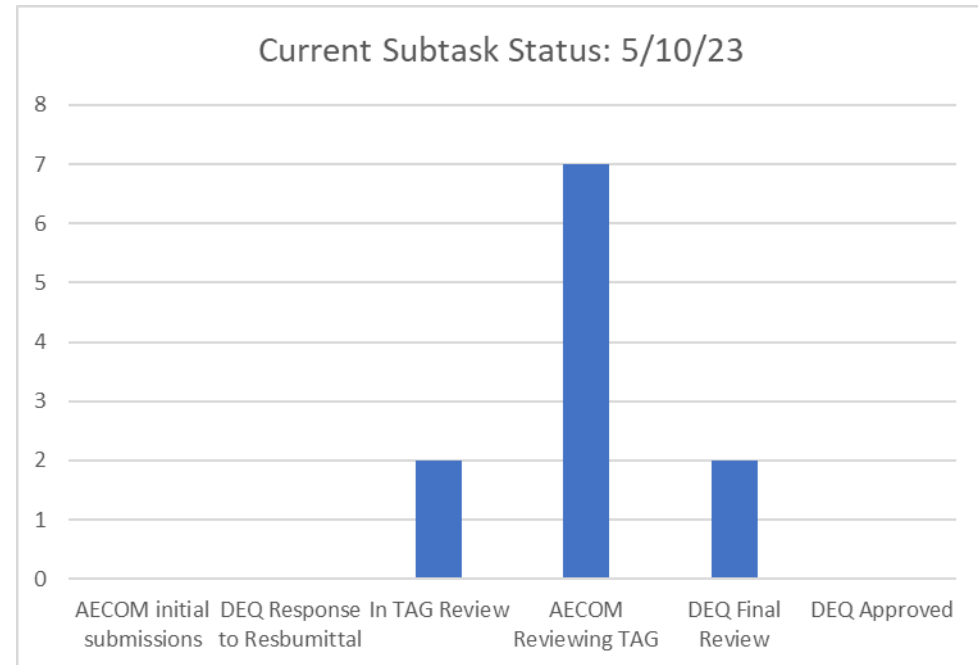
Principal Advisory Group Kickoff

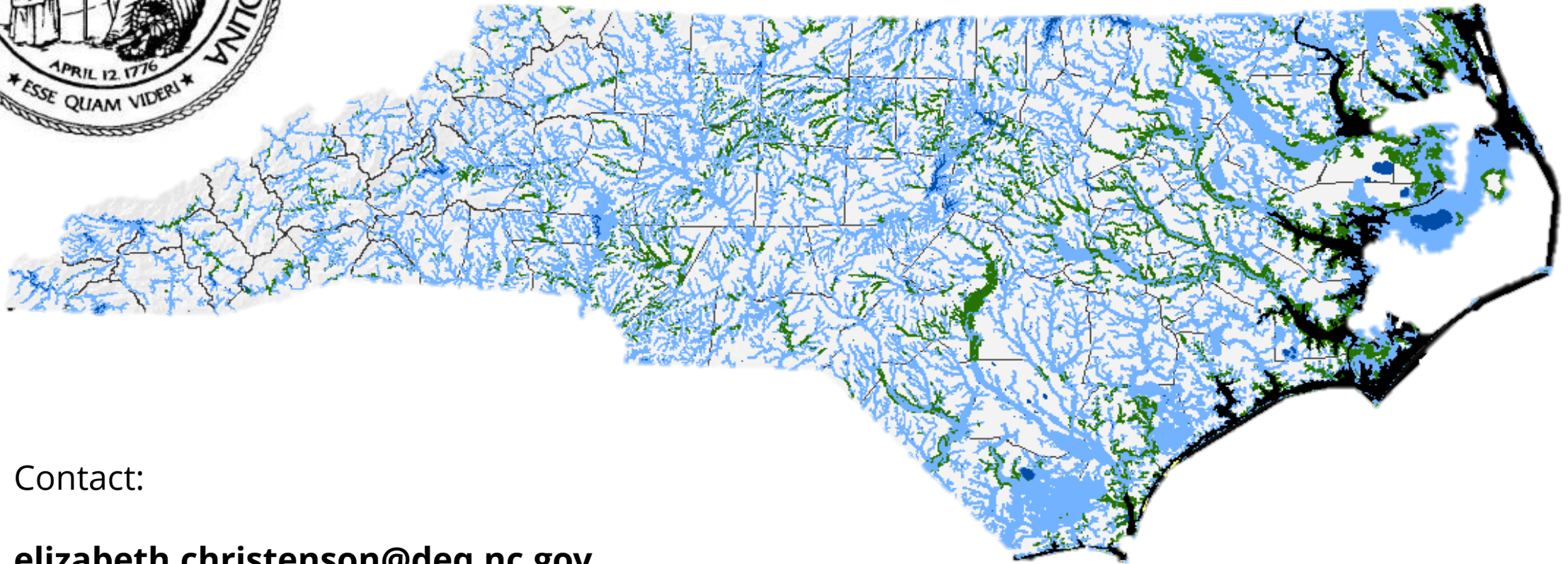
March 22, 2023

- Provide advisory input and feedback to the DEQ Core Team on the **policy, process, engagement, modeling, tools, and support utilized to implement the Blueprint**
- This group will need a **clear understanding of Blueprint's needs and how it will be integrated into further state prioritization** and floodplain management needs.

Deliverables (5/10/2023)

- Task 1: Stakeholder Outreach/Facilitation
 - 7 deliverables (**6 currently under review**)
- Task 2: Gap Analysis
 - 14 deliverables (**7 currently under review**)
- Task 3: Recommendations/Decision Framework
 - 16 deliverables
- Task 4: Draft Blueprint and Draft Pilot Action Strategy
 - 6 deliverables





Contact:

elizabeth.christenson@deq.nc.gov