

More Resilient by Design: North Carolina's Flood Resiliency Blueprint

Spring 2025 Update





To better equip the state and its communities to manage current and future flood risk, the North Carolina General Assembly passed Section 5.9(c) of Session Law 2021-180 in 2021, which directed the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) to develop the North Carolina Flood Resiliency Blueprint. The General Assembly provided additional guidance on the Blueprint's development in 2022 in Section 22 of Session Law 2022-75 including guidance on how the Blueprint should utilize data to support decision making and reduce the cost and complexity for local governments to develop projects that reduce flood risks.

Further NC Session Law 2021-180, Section 40.7(a), as amended by S.L. 2022-43, Section 2.(a), the General Assembly also appropriated \$96,000,000 to DEQ to be used for flood mitigation projects in prioritized river basins after the initial draft Blueprint was completed.

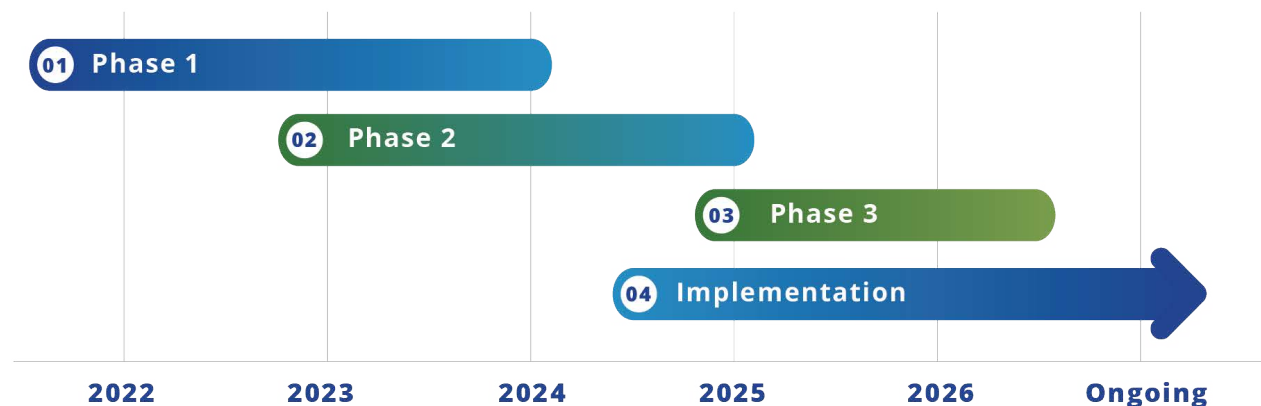
*Hurricane Florence, North Carolina
Image Credit: Alex Wroblewski/Bloomberg*

Executive Summary

The North Carolina Flood Resiliency Blueprint (the Blueprint) is the State’s science-based and stakeholder-driven initiative designed to support the planning, evaluation, and implementation of flood resilience strategies. In less than three years, North Carolina has become a national leader in resilience planning by developing innovative strategies and meeting critical milestones. As a first-of-its-kind comprehensive program for planning, modeling, and project development, the Blueprint unifies existing resources and knowledge, leveraging the best available science and tools to enhance North Carolina’s flood resilience cost-effectively. The Blueprint empowers local governments and other partners to plan, develop and implement mitigation strategies, providing direct benefit to communities, residents, and businesses across the State.

The Blueprint consists of several components developed in phases. This includes a decision support tool (Blueprint Tool) and a strategic framework for the creation of local resilience action plans and River Basin Action Strategies (RBAS). It also involves sound investments and leveraging available funds through partnerships with state programs and local governments to build flood resilience. Recognizing the extensive flood resilience needs of communities and state and local governments, DEQ is proactively advancing several initiatives across North Carolina as part of the Blueprint program. This report highlights key achievements and advancements from the past year.

Program Timeline and Progress



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The Need for Resiliency

North Carolina has been impacted by significant flooding and related hazards in the recent past. Strategic planning and continual investments in mitigation efforts can help increase community resiliency across the state.



Progress on the Flood Resiliency Blueprint (Phase I)

DEQ completed the draft Flood Resiliency Blueprint framework to guide state flood resiliency investments and support for development of local and basin-scale plans.



Project Implementation

DEQ is using the Blueprint to target available funds and expedite project implementation through project partnerships with local government and fellow state agencies to maximize impact of the \$96 million. DEQ is also developing Full Delivery RFPs to implement additional projects.



Model Improvements

Harnessing the best available science to improve models, DEQ is partnering with North Carolina Emergency Management and is investing in upgrades to the tools that will keep North Carolina safer and more flood resilient.



Decision Support Tool (Phase II)

DEQ is committed to providing local governments with technical and decision-making support through the online Blueprint tool available in Spring 2025. DEQ is engaging with technical advisors from state, local, regional, private, and public entities to develop and test the tool to ensure DEQ develops an effective and user-friendly tool.



Initiation of River Basin Action Strategies (Phase III)

Working with local partners, applying the Flood Resiliency Blueprint framework and using the Blueprint Tool, DEQ will lead the development of 6 comprehensive basin strategies to address flood risk in 2025-2026.



Future of the Blueprint

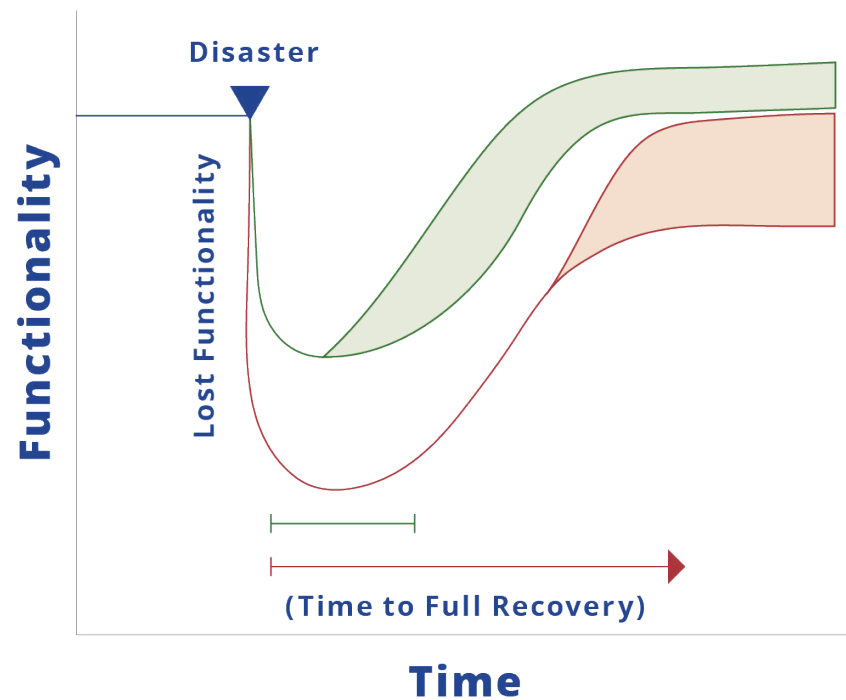
Building on the strong foundation of the Blueprint program, DEQ intends to continue to deliver resources, support, and guidance to ensure a more resilient future for North Carolina.

The Need for Resiliency

In 2024, North Carolina experienced devastating flooding impacts following Hurricane Helene. This disaster highlighted the reality of changing flood risks and reemphasized the urgent need for increased flood resiliency. As the state shifts from disaster response to long-term recovery in Western counties, DEQ is committed to supporting resilient rebuilding efforts through the Flood Resiliency Blueprint.

Over the past decade, North Carolina has experienced a sharp increase in major flood events, a trend that continued

in 2024. Hurricane Helene was not the only historic flood event North Carolina experienced this year. In September, [Potential Tropical Cyclone Eight](#) brought upwards of 15 to 20 inches of rain to the Lower Cape Fear region. Even seemingly common events such as severe storms in February and May, and Hurricane Debby in August caused damage and disruption across the state. The Blueprint is steering North Carolina towards a future where sustained investments in resilience planning and project implementation reduce the cost and disruption from future disasters.



Beyond Response and Recovery

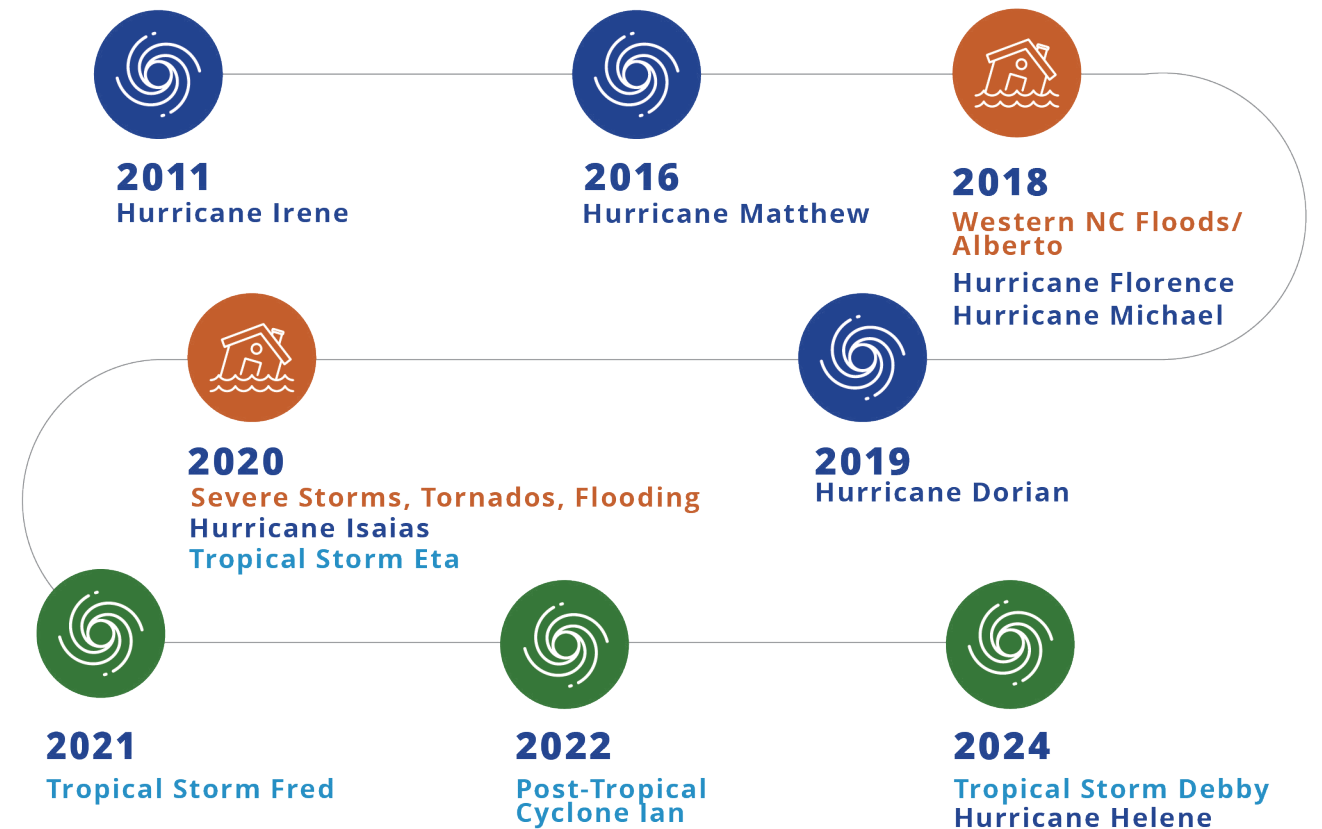
Traditionally, disaster management focuses on preparedness, response, and recovery. The Blueprint's focus is on proactive resilience planning and implementation that can reduce the initial impact from future flood events and help communities recover more quickly.

- Resilient Communities
- Vulnerable Communities
- ▼ Disaster Event

THERE WILL ALWAYS BE FLOODS, BUT WE CAN MAKE TARGETED INVESTMENTS THAT REDUCE DAMAGE AND HELP COMMUNITIES AND INDIVIDUALS RECOVER MORE QUICKLY.

The Scale of the Challenge

13 Federally Declared Disasters with Flooding Events since 2011, costing tens of billions of dollars



Progress on the Flood Resiliency Blueprint (Phase I)

In 2024, DEQ completed Phase I of the Flood Resiliency Blueprint by publishing the [Draft Flood Resiliency Blueprint](#) document. The Blueprint provides a structured, comprehensive framework to make it easier for local communities to get started with or advance their planning and mitigation efforts. Reducing the cost and complexity for local governments in this process is one of the primary objectives of the Blueprint, which is why the framework was designed to provide guidance and resources at every step along the way.

ENGAGED COMMUNITIES ARE MORE RESILIENT COMMUNITIES.

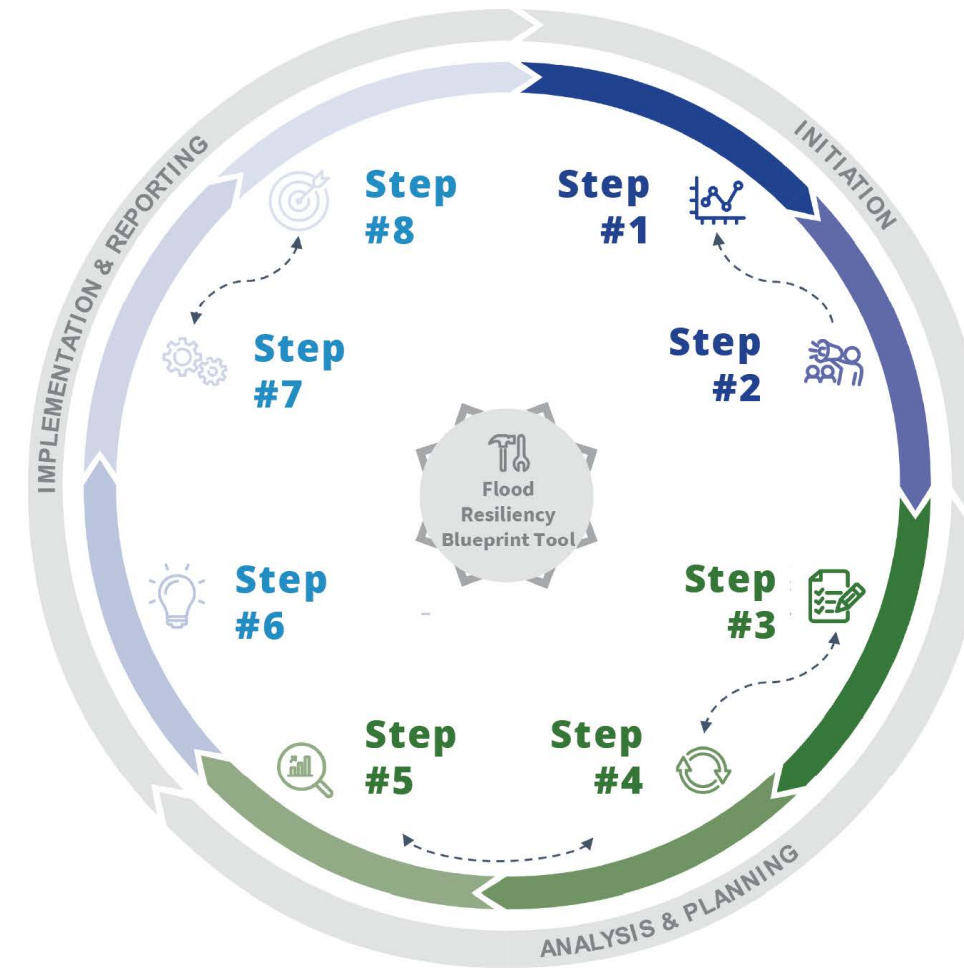


Outreach and engagement were vital to developing the Blueprint framework. DEQ connected with hundreds of individuals, including community members, local government leaders, and technical experts, both within North Carolina and across the country, during its creation. The result is a Draft Flood Resiliency Blueprint that is well-suited to support communities, local governments, and the state in enhancing resilience. The Draft Blueprint provides [key recommendations](#) for the implementation and long term success of the Blueprint Program.

DEQ and partners also developed the [Draft Neuse River Basin Strategy](#) as part of Phase I. To develop the draft strategy, DEQ and partners followed the Blueprint framework, from initiation through analysis and planning (see figure on next page). For the development of future River Basin Action Strategies, which are currently underway (see pg 16), the Draft Neuse River Basin Strategy provides a clear example. DEQ will also update the draft strategy in Phase III (see page 16) to ensure residents of the Neuse River Basin have an action strategy informed by the best available data through model updates (see pg 12), the Blueprint Tool (see page 14), and lessons learned from the draft development.




Food Resiliency Blueprint Program

Key Components and Workflow



- Step 1:**
Actionable Data, Modeling, Analysis
- Step 2:**
Initiate Community Engagement & Discovery
- Step 3:**
Flood Risk Planning and Analysis
- Step 4:**
Action Review, Creation, and Adjustment
- Step 5:**
Action Analysis and Ranking
- Step 6:**
Flood Resiliency Blueprint Basin Action Strategy
- Step 7:**
Action Implementation
- Step 8:**
DEQ - Program & Project Accountability

Developing the Draft Flood Resiliency Blueprint

 <p>150 Technical Advisory Group members</p>	<p>30+ Public Presentations</p> <p>31 reports published</p>	 <p>60+ Meetings with Communities and Advisory Groups</p>
 <p>78 flood-related plans, technical reports, research studies, and state programs reviewed</p>		

Project Implementation

Strategic Partnerships

In 2024, Blueprint staff began implementing projects in six priority basins, with the \$96 million appropriated by the North Carolina General Assembly. To implement projects efficiently and responsibly, DEQ established project partnerships with fellow state agencies and local governments. By supporting the ongoing flood resilience work of North Carolina Emergency Management (NCEM), the North Carolina Land and Water Fund (NCLWF), and the North Carolina Department of Agriculture and Consumer Services (DACs), the Blueprint's early investments made possible the implementation of 54 projects worth over \$40M for just over \$21M in costs to the Blueprint program.

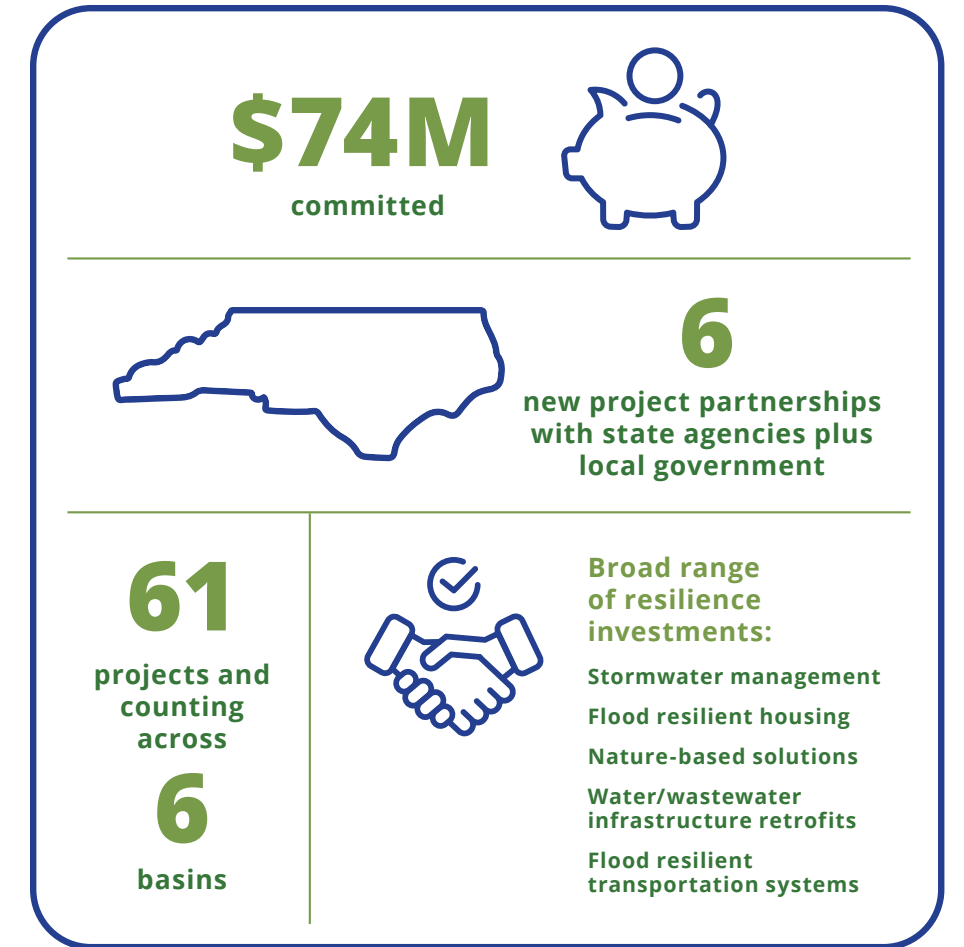
These partnerships have also helped inform the development of the Blueprint tool and program. The Blueprint supports existing programs in making better informed flood resilience project decisions to improve flood-related outcomes.

To date, the Blueprint has also committed an additional \$56 million in investments in support of projects alongside the North Carolina Department of Transportation (DOT), North Carolina Office of Recovery and Resiliency (NCORR), North Carolina Division of Coastal Management, and Department of Natural and Cultural Resources (DNCR).

Looking forward, the Blueprint program is building the capacity and infrastructure to directly fund and manage resilience

projects. At the same time, DEQ continues outreach to communities and state agencies to establish additional project partnerships and accomplish overlapping flood resiliency goals. Blueprint staff continue to work with staff from NCLWF, DSWC, NCEM, DACs, NCORR, and other granting agencies to identify additional project partnership opportunities. The diversity of partners in this work showcases the breadth of entities involved in flood resilience and scope of their efforts across the state.

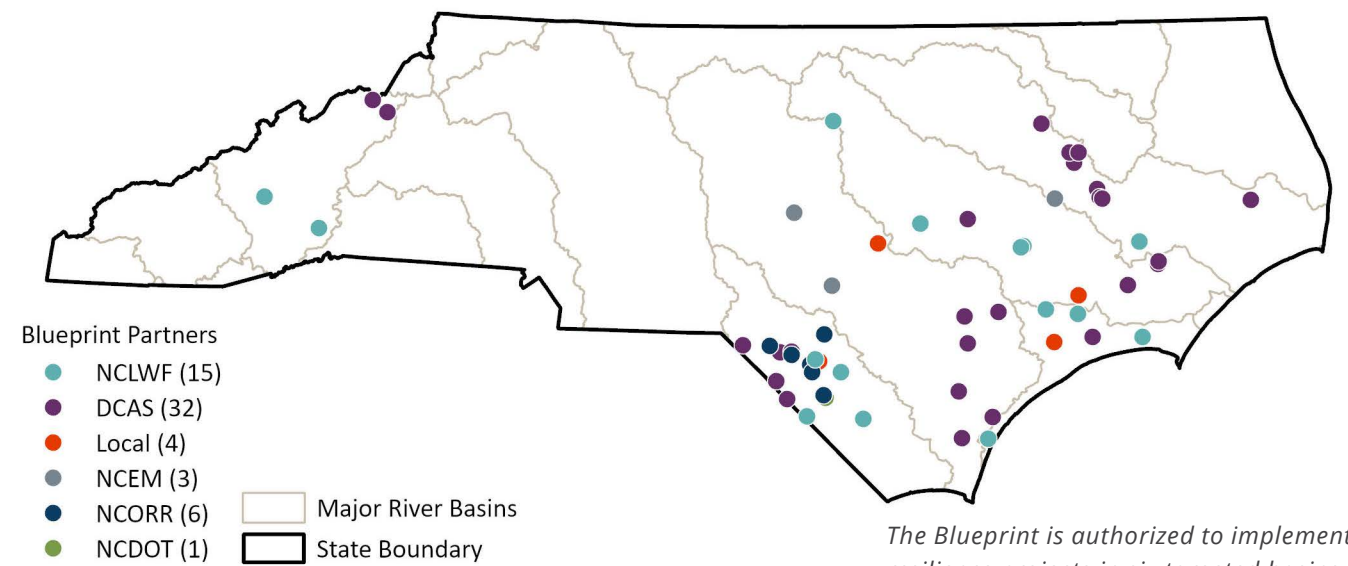
Prioritized Investment in Project Implementation



Implementation Table

Implementation Opportunity - Partner	Total Committed	Under Contract	In Process
StRAP 2023 - Department of Agriculture Consumer Services	\$4,387,666.00	\$4,387,666.00	\$0.00
NC Land and Water Fund - Dept. of Natural and Cultural Resources	\$9,047,404.00	\$9,047,404.00	\$0.00
Disaster Relief and Mitigation Grants - NC Emergency Management	\$3,910,000.00	\$3,910,000.00	\$0.00
RISE Priority Projects - Direct Funding Local Governments	\$3,679,476.00	\$0.00	\$3,679,476.00
Lumberton Recovery and Infrastructure Resilience - NCORR	\$8,000,000.00	\$0.00	\$8,000,000.00
Water Resources Development Grants - DEQ - Water Resources	\$5,000,000.00	\$5,000,000.00	\$0.00
Agricultural Pond Flood Storage - Department of Agriculture Consumer Services	\$10,000,000.00	\$0.00	\$10,000,000.00
Natural Infrastructure Flood Mitigation Program Implementation - DEQ Mitigation Services	\$10,000,000.00	\$0.00	\$10,000,000.00
Resilient Transportation - NC Dept. Of Transportation	\$10,000,000.00	\$270,000.00	\$9,730,000.00
French Broad Resilient Recovery Opportunities - Direct Funding Local Governments	\$10,000,000.00	\$0.00	\$10,000,000.00
Total	\$74,024,546.00	\$22,615,070.00	\$51,409,476.00

2024 Project Implementation



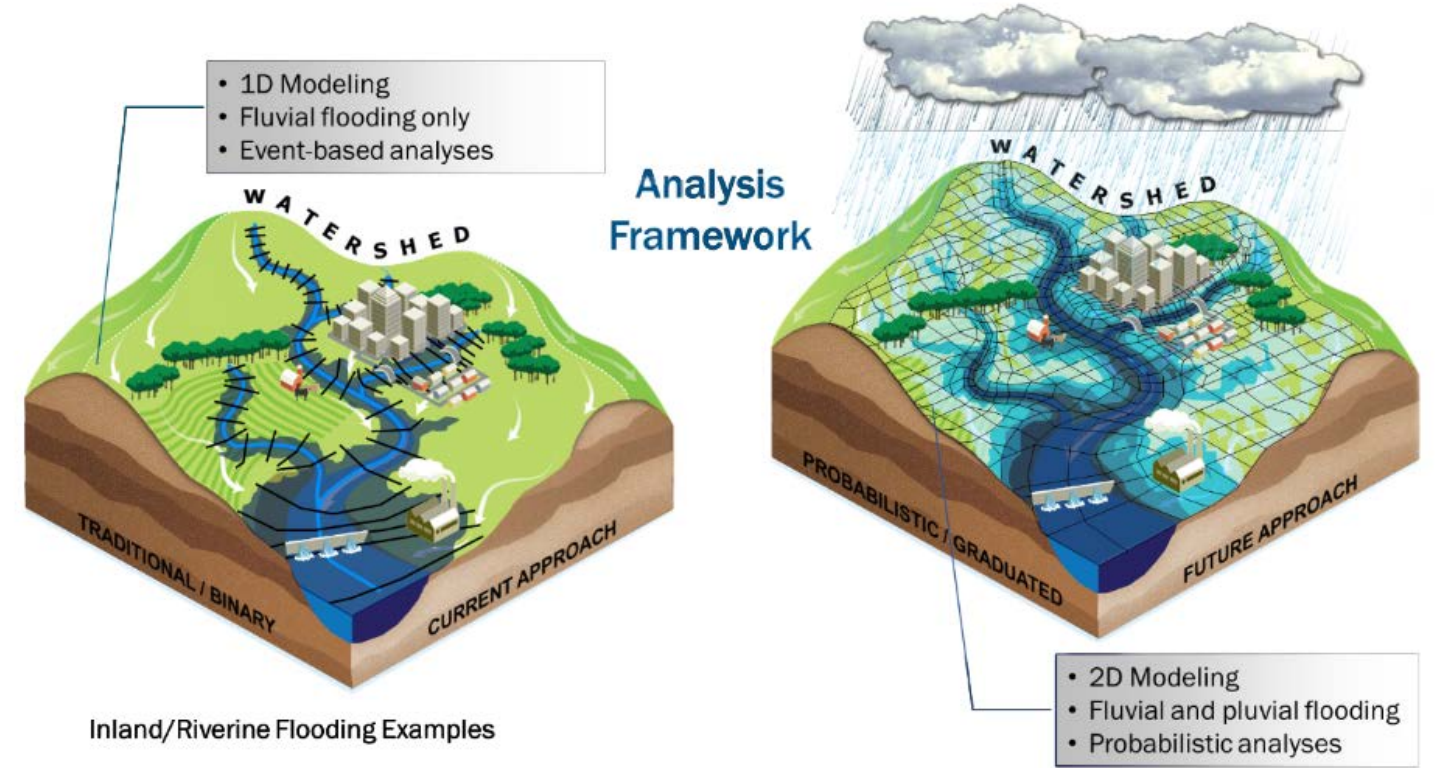
The Blueprint is authorized to implement resilience projects in six targeted basins.

Model Improvements

According to a 2022 [study](#) from North Carolina State University, across the nation, 68 percent of flood damage reports were outside of the high-risk flood zones mapped by the Federal Emergency Management Agency (FEMA). This discrepancy illustrates the need for improved flood risk information, which considers both observed flooding and anticipated future changes to weather, climate, and land use.

DEQ has been working with NCEM to build upon and enhance the effectiveness of existing modeling tools through the Blueprint program. The improved models will provide more accurate estimates of current flood risks and project future flood risk to support long-term strategic planning.

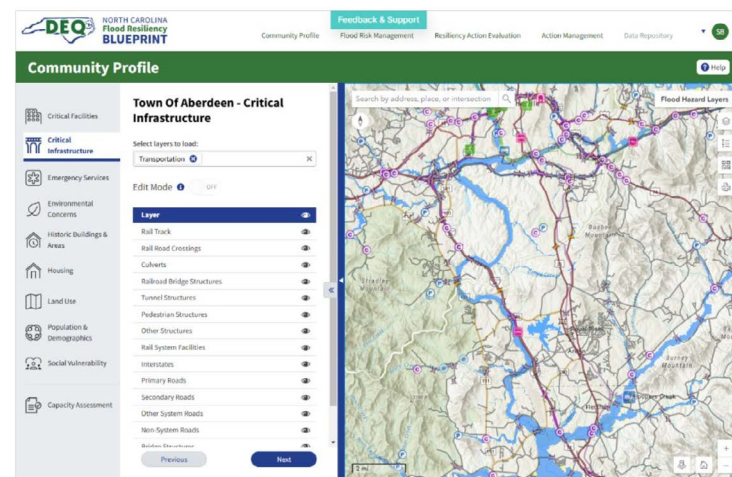
To ensure the flood models are informed by the best available science, the Blueprint team has worked with the State Climate Office to include projected climate conditions, precipitation patterns, sea level changes, and development trends. DEQ is currently making key improvements, including the addition of enhanced 2D Rain-on-Grid modeling, which encompasses both river and rain-induced flooding. This allows for a comprehensive evaluation of risk factors that can be integrated into the Blueprint program’s decision support tool (see pg 14). These improvements are essential for informed decision-making and implementing proactive mitigation efforts.



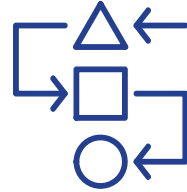
Inland/Riverine Flooding Examples

DEQ is partnering with North Carolina Emergency Management on model improvements that better capture both riverine and rain-induced (pluvial) flooding.


IMPROVED MODELS CAN REDUCE RISKS, COSTS, AND DISRUPTIONS.




Data Inputs to the Blueprint Tool



6
improved flood models in targeted basins



128
NC-specific data sets identified and evaluated



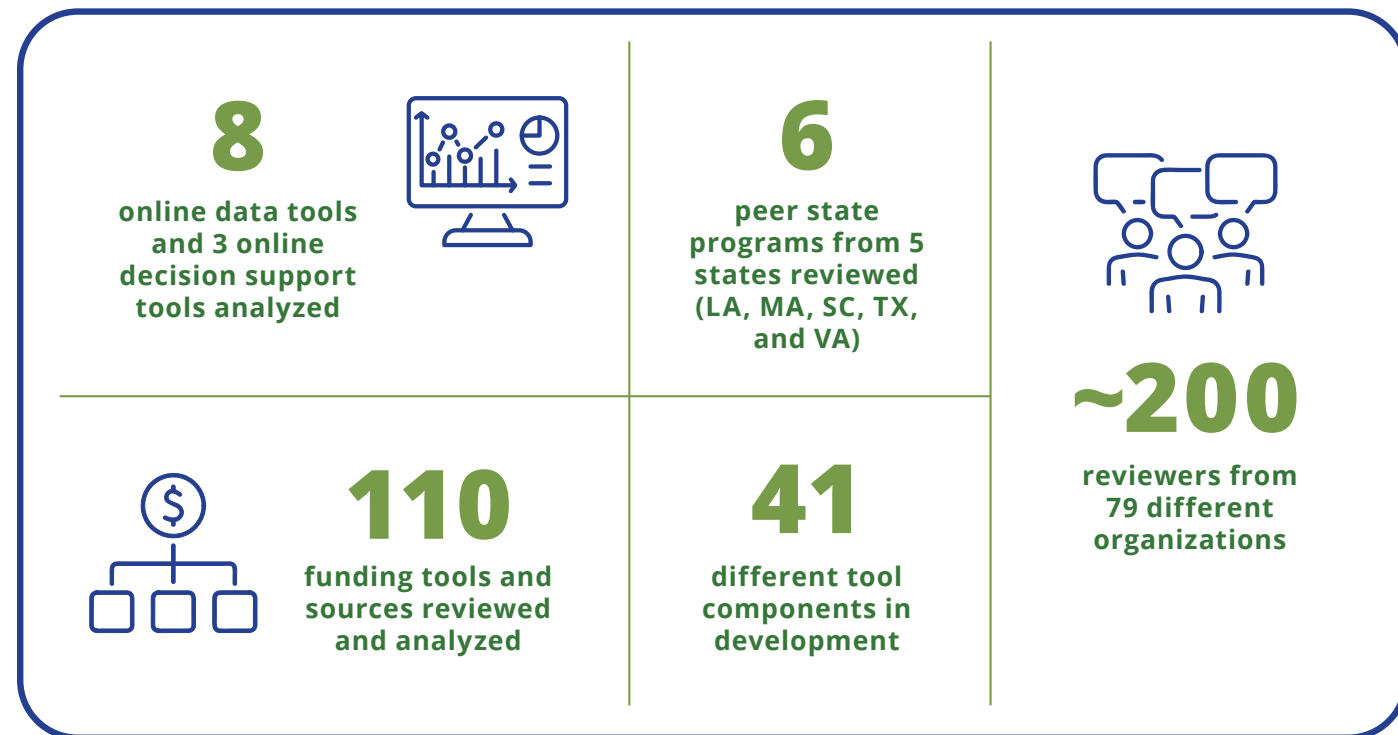
10
future flood hazard data sets identified

Decision Support Tool (Phase II)

The Blueprint development process reinforced the need for a decision support tool that would empower state agencies, local governments and flood resiliency partners to make informed flood resilience decisions. Many communities lack the resources or technical expertise to conduct thorough analyses of flood risk data for informed project decision-making. To address this, DEQ is developing an online decision support resource called the Blueprint Tool to ease the planning burden on state, regional, and local government entities.

Blueprint staff have also been trained to provide direct technical assistance to communities, local governments, and other partners in using the Blueprint Tool. Partners' planning and mitigation efforts will be informed by the robust, scientific data supporting the Blueprint Tool. Engagement with the Blueprint Tool also helps to build local flood resilience capacity in the long-term. Collaborators and stakeholders have actively engaged in testing Version 1 of the Blueprint tool, launched in October 2024, with the inaugural public release slated for Spring 2025.

What Went Into Development of the Blueprint tool



Key Functions of the Blueprint Tool

- ✓ Provide users with accurate, data-driven flood risk and vulnerability assessments
- ✓ Assist in developing River Basin Action Strategies for DEQ and partners
- ✓ Empower users to explore and create flood mitigation strategies
- ✓ Guide funding decisions for resilience projects in alignment with prioritized strategies
- ✓ Help users prioritize effective actions through Local Action Plans

The Blueprint Tool can support communities and local governments who want to...



River Basin Action Strategies (Phase III)


In 2024, DEQ launched Phase III of the Blueprint—the development of five new River Basin Action Strategies (RBAS). This phase directly builds on the achievements of earlier phases. DEQ is applying the Flood Resiliency Blueprint framework to develop strategic plans in the river basins prioritized in the Blueprint legislation: Cape

Fear, French Broad, Lumber, Tar-Pamlico, and White Oak River basins. In this phase, DEQ will also update the draft Neuse River Basin Strategy to incorporate the most up-to-date modeling and scientific data.

Through the development of the RBAS, DEQ and its partners will conduct detailed flood risk assessments for current and future conditions, prioritize resilience actions (projects), and identify funding strategies to support project implementation. This work is made possible by the cutting-edge Blueprint Tool (see pg 14) and model upgrades (see page 12) identified in Blueprint development and implemented by the Blueprint program.

The Blueprint identified extensive outreach and strategic collaboration with state and regional entities, communities and local governments as a critical component of the successful development of the RBAS. To meet the need, DEQ has engaged eight consultant teams to work alongside Blueprint staff and local experts to provide direct technical support tailored to each basin. The relationships built between DEQ and state agencies and communities through close collaboration on RBAS development will result in more effective resilience efforts that are directly responsive to the needs and concerns of community members. These relationships can also be built upon in the long-term to increase flood resilience through future initiatives.

Planning for Resilience




6.2M

million residents
in the targeted
basins

6

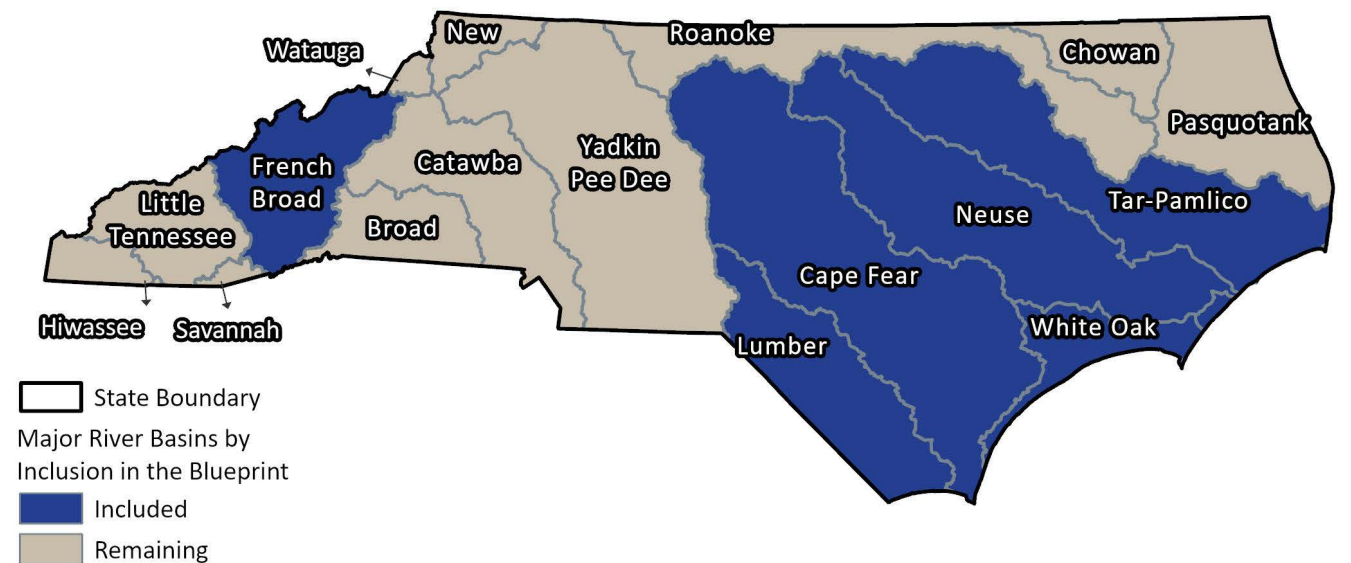
target river
basins in which
the Blueprint is
authorized and
funded to work.



Blueprint Community Engagement Meeting, Canton, NC



Phase III Focus River Basins



Future of the Blueprint

This is an exciting time in the Blueprint program, with many of the initial investments in strategic planning and project implementation coming together in the six priority basins. The ultimate goal is a statewide Flood Resiliency Blueprint program that covers all seventeen North Carolina river basins. As the program continues, DEQ is looking ahead to implement the Blueprint recommendations and anticipate additional next steps and future needs in a variety of areas.

Adaptive Management and Improvements

As identified in the Blueprint, the Flood Resiliency Blueprint tools and process will evolve as we are able to incorporate additional feedback from users as well as new data and information. This will require funding for ongoing data updates which will improve models and other tools that inform decision-making. These improvements will further reduce uncertainty in the planning process and allow the Blueprint program to adapt to changing flood risk-related needs at the local and state level.

Technical Support

The Blueprint identified the capacity challenges of local governments, particularly small, rural communities and recommended the state help meet these challenges. Blueprint staff and contractors have

already begun providing support for local governments within the six targeted basins. The nature of that support will evolve throughout the development of the new River Basin Action Strategies (RBAS) and ideally, continue beyond its completion. This will include many different types of necessary support related to local planning processes, project development, and implementation. Blueprint staff will provide targeted support and build local capacity to marshal funds and administer projects to address flood risk. The Blueprint identified the need for cyclical RBAS updates to make use of data and model updates and improvements to ensure effective decision-making. As identified in the Blueprint, this will require recurring funding.

Program Expansion

The Blueprint is only funded for one round of RBASs and \$96 million in project implementation in six river basins. While the Blueprint tool will be available across the state, it will be less effective and accurate in areas that haven't developed and improved modeling. The entire state has flood resilience challenges. The Blueprint recommended that the effort be expanded to the entire state and utilize a staggered five-year RBAS cycle. Furthermore, the Flood Resiliency Blueprint defines a process that builds upon itself. As communities use the Blueprint Tool and framework in their planning processes, they build local capacity. As they develop, prioritize, and implement better flood resilience projects,

they increase their resilience. With expanded use of the tool across the state, RBAS will become more informed and robust, leading to more effective and efficient flood resilience investments at all levels of government. This recommendation has not been funded.

Implementation

The events of 2024 highlighted the need for continued flood resilience initiatives and project implementation across North Carolina. The need extends beyond the six target basins. The Blueprint program needs additional funding to build on its initial successes. With additional funding, the Blueprint will continue to leverage funds across a variety of resilience efforts to amplify impact, establish and maintain strong project partnerships with fellow state agencies and local governments (see pg 10) and help fill resource gaps and increase flood resilience.

Within areas impacted by storms, DEQ and Blueprint staff are committed to leveraging incoming recovery dollars to build communities back more resiliently than before. This requires more than repairing or rebuilding what was damaged or destroyed. It requires rebuilding in a way that reduces

future damage and disruption from floods. The Blueprint team is poised to work with local partners and fellow state agencies to identify opportunities to relocate or reinforce critical infrastructure and implement flood mitigation projects in impacted river basins.

The development of the Flood Resiliency Blueprint and the Blueprint Tool has laid the foundation for future success. In less than three years, North Carolina has transformed from having no statewide flood resilience program to becoming a national leader. The DEQ has led coordination across agencies and local communities to implement flood resilience projects. It has brought together a diverse group of experts from federal, state, and local agencies, academia, the private sector, agriculture, and NGOs to develop the Blueprint Tool. The DEQ has also begun working with state and local entities to develop RBASs that will prioritize specific projects and other actions to enhance flood resiliency in the six priority river basins. Additionally, the DEQ has hired a supervisor and six project managers to continue developing and implementing the Blueprint. These efforts will make North Carolina more resilient. Additional program and project funding will be essential to sustaining this mission and building the Flood Resiliency Blueprint into a statewide initiative.



