

**American Rivers • Audubon North Carolina • Cape Fear River Watch •
Catawba Riverkeeper Foundation • Clean Air Carolina • Environment North Carolina •
Haw River Assembly • MountainTrue • Natural Resources Defense Council •
NC Conservation Network • NC League of Conservation Voters • NC Sierra Club •
Sound Rivers • Waterkeeper Alliance • Winyah Rivers Foundation**

RECOMMENDATIONS FOR POST-FLORENCE RECOVERY

*Rebuild Better
Restore our Economy, Environment & Communities
Slow, Capture & Infiltrate More Water*

IMMEDIATE RESPONSE

North Carolina should take a number of immediate steps to avert still-unfolding harms from Florence, and to set the stage for a strong recovery.

1. *Support immediate approval of a new US Army Corps of Engineers 'Living Shorelines' general permit to encourage their use in post-Florence recovery.*

Research indicates that Living Shorelines are more resilient during storms than bulkheads and other hardened structures. Living Shorelines also protect water quality and create habitat. The U.S. Army Corps of Engineers has issued a draft general permit for Living Shorelines that will make the permit process for Living Shorelines as convenient as it is for bulkheads and other less sustainable erosion control strategies. North Carolina should support issuance of this permit, update the existing state general permit to match, and provide at least \$1 million in cost share funds to encourage private landowners to deploy Living Shorelines.

2. *Include wetland restoration in NC 24 repair project in Cape Carteret.*

Florence washed out the drainage wetlands in Cape Carteret along NC 24. These wetlands provide an outlet for storm drains from NC 24 (as well as area shopping centers) to the Outstanding Resource Waters of Deer Creek, a tidal tributary to Bogue Sound. To ensure the effectiveness of wetland repairs that handle drainage from NC 24 in this area, wetland restoration should be included in repair plans.

3. *Fund coastal debris cleanup*

Florence scattered storm debris from destroyed docks and other sources across a large area of North Carolina's coastal marshes and waterways. North Carolina can protect fish and water quality by hiring commercial fishermen to clear the debris, on the model of the state-funded crab pot cleanup program. Federal Emergency Management Agency (FEMA) funding is available for this purpose if local governments and/or the state make the request.

4. *Inventory and remove destroyed docks and other navigation hazards.*

The U.S. Army Corps requires that docks and bulkheads be kept in good repair, to prevent navigation hazards and other harms. While many dock owners will repair their docks, previous storm recovery efforts indicate others will not, leaving broken poles, decking and other hazards in waterways. The state Department of Environmental Quality (DEQ) should work with the Corps to seek FEMA funding to survey dock damage, notify property owners about the need to clean up these hazards, and remove damaged docks that impair navigation.

5. *Test water quality in groundwater drinking wells for residents who experienced flooding.*

Many rural residents in the Coastal Plain rely on groundwater wells for their drinking water. Floodwaters from Hurricane Florence carried human and animal wastes long distances, and may have contaminated some drinking water wells, especially those with deficient seals. State-funded testing of drinking water wells in the footprint of flooding can help prevent public health and economic harms to these residents and to their broader communities.

6. *Conduct accurate damage assessments to ensure that structures that were substantially damaged by Florence are rebuilt to stronger standards, not simply to their pre-Florence conditions.*

Structures that are substantially damaged in a storm typically must be restored to current standards, which may be more protective than the standards in place when the structures were built. These assessments are traditionally a local function; the state should ensure that local governments have adequate resources to carry them out.

7. *Discourage wholesale clearing – ‘snag and drag’ – of coastal plain streams and rivers.*

Snag & drag projects do significant damage to the state's waterways. They do not limit the damage from catastrophic floods, and simply transfer harm to other communities downstream during smaller events. Dollar for dollar, these projects are a waste of recovery funding and should be avoided.

PLAN FOR LASTING RESILIENCE/ LONG TERM RECOVERY

As North Carolina rebuilds from Florence, the state should plan for a recovery that endures. Greater resilience can help North Carolina weather future hurricanes and floods with less harm.

8. *Appoint a ‘hurricane recovery chair’ in the Governor’s Office to knit together the long-term recovery work.*

The charge for the chair should be to integrate floodplain restoration, affordable housing, wise infrastructure investments, and planning for sustainable economic development in the affected communities. It may be helpful if the chair has a board of bipartisan advisors to ensure that plans for recovery make sense to stakeholders across North Carolina’s political spectrum; recommendation 11, below, may serve that purpose.

9. *Prioritize environmental justice during rebuilding efforts.*

Recovery should be completed in a fair and equitable manner that respects the racial and economic diversity of the state. Low-income communities and communities of color in the hardest-hit areas of the state need the most support, and therefore should receive priority in cleanup, rebuilding, and future flood risk mitigation efforts. Displaced residents should be able to return to homes as soon as possible and those homes should be free of contamination and safe to live in. Public meetings on recovery efforts should be held at times and places where residents are most able to attend, in multiple languages to ensure access and participation.

10. *Convene a scientific advisory board to consider the questions, what does the best science tell us about the actual frequency of high-intensity storm events in North Carolina? What standard references (storm definitions, flood definitions) need to be updated to reflect this?*

North Carolina has experienced three ‘500-year plus’ storms in less than 20 years. That’s not statistically impossible, but it is extremely unlikely. It is more probable that our estimated frequency of major storms and flooding is wrong, and/or is being altered by climate change. A panel of expert scientists can help

better ground our estimates, which underlie a number of investment and resource management decisions.

11. *Convene a separate, bipartisan commission to address the questions, what does a healthy regional economy look like if eastern NC can expect catastrophic flooding every 15- 20 years, and how should we adjust state economic development, infrastructure investment, and tax policies to promote that vision?*

If one assumes that large areas of the coastal plain can expect to experience catastrophic flooding at least once every 20 years (or more often), how should that shape North Carolina's strategies for job creation, economic development, infrastructure investments, service provision, and environmental management?

12. *Promote use of microgrids for critical infrastructure in the coastal plain.*

Solar energy and battery storage microgrids can provide dependable power for critical infrastructure, such as hospitals, schools, storm shelters, military buildings, fire stations, and police stations. North Carolina law already allows utilities to recover costs for reasonable and prudent investments, but state leadership can help signal that this is a priority for a resilient recovery.

13. *Update hazard mitigation and adaptation plans to reflect future vulnerabilities.*

The state should update its State Hazard Mitigation Plan to account for how changing future conditions – the potential for larger storms, increased rates of coastal erosion, development patterns, and population demographics – may affect future risks and vulnerabilities to natural hazards. Similarly, the state should update its Climate and Health Adaptation Plan to reflect these same factors.

14. *Update projections of sea level rise.*

North Carolina should update projections of sea level rise impacts to reflect the most recent scientific research. In so doing, the Coastal Resources Commission's Science Panel (CRC Science Panel) should not be constrained to making projections to a maximum of thirty years, but rather should make projections that extend to at least the year 2100.

15. *Encourage coastal communities to offer 'coastal retreat' easements to help limit future losses and protect public investments while allowing economically valuable uses in the near term.*

Under a 'coastal retreat' ordinance, a landowner agrees to a number of conditions – among others, to cede title to lands when they submerge and to remove underground storage tanks, septic tanks, and structures when erosion or sea level rise renders a building uninhabitable. In exchange, the owner's property tax is reduced each year by the expected value of the loss of the property to erosion or subsidence. This protects both the property owner and state and local budgets.

16. *Design new state construction to withstand extreme events.*

The state can lead by example by ensuring that all new state construction is built to withstand extreme events whenever practicable. Similar standards have already been approved by the U.S. Department of Defense. These standards should utilize Living Shorelines and low impact development, which have been proven to be storm-resilient while also protecting water quality.

17. *Protect North Carolina's remaining undeveloped barrier islands.*

State acquisition of the last remaining pristine and natural barrier islands can avoid placing new homes at risk and can maximize the protection these islands provide to nearby communities. For example, Lea-Hutaff Island, between Figure Eight and Topsail islands, acted as a giant shock absorber during Florence, helping protect the community of Hampstead on the mainland from even worse storm surge or flooding. Additional funding of \$10 million to the Clean Water Management Trust Fund specifically for barrier island

protection can help protect undeveloped barrier islands like Lea-Hutaff from development that would place new homes at risk and increase damage on the mainland.

18. Buy out the most vulnerable properties on the barrier islands.

Dozens of homes on North Topsail Beach, Ocean Isle Beach, Holden Beach, and Emerald Isle are currently protected by ‘temporary’ sandbags but have encroached on public beach and are in jeopardy of significant damage or collapse in future storms. Strategic buyouts would protect these communities and properties from near-term harm, reduce the pressure to construct harmful hardened structures, and establish important new areas for public recreation and natural habitat.

19. Convene a regional group of stakeholders to plan for resilience in western NC.

Western NC can also benefit from more careful planning for resilience, but faces threats – such as wildfires and landslides – that are not common in the east; and mountain floodplains look different as well. We recommend that the state convene a group of western stakeholders to discuss, plan for, and make recommendations for resilience in the state’s mountain counties.

REMOVE THREATS FROM THE FLOODPLAIN

The greatest damage from Florence – as from Floyd and Matthew – came from flooding. To minimize future flood damage, we should remove repetitive loss properties and sources of pollution from the floodplain.

20. Before owners start rebuilding, use FEMA Hazard Mitigation Grant Program and HUD Community Development Block Grant Disaster Recovery Program (CDBG-DR) funds to purchase repeatedly flooded structures from willing landowners.

North Carolina should immediately request that FEMA make available HMGP funds in order to initiate the process of buying out properties, sparing owners from having to make repairs and rebuild, only to be offered a potential buyout later. Acquired properties should be managed as green infrastructure to further reduce flood risk for the participating community.

21. Use a variety of tools to buy out repetitive loss properties over the longer term.

The Hazard Mitigation Program in the NC Department of Public Safety (DPS) runs several programs: the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program, all of which rely heavily on federal funds. In addition to increasing state funding, North Carolina could try additional mechanisms: guaranteeing buyouts as a benefit of National Flood Insurance Program (NFIP) coverage; instituting state or locally financed “quick buy” programs; and providing Payment in Lieu of Taxes (PILOT) payments for participating low-income communities.

An additional idea is to create a Resilience State Revolving Fund (Resilience SRF), funded with state or federal funds, to make below market rate loans to communities and property owners to reduce vulnerability to flood events. As low interest loans are repaid, the Resilience SRF would serve as a self-perpetuating source of funding to be supplemented with periodic state appropriations.

22. Establish incentives for and directly fund construction of affordable housing in upland areas to replace repeat-loss owner-occupied and rental housing in floodplains, and provide subsidies to help low-wealth residents afford housing.

Buyout programs are good policy, but must be paired with programs to get displaced residents into affordable housing. Most of the residents in flood-damaged housing – renters or occupant owners – do not have the financial resources to find or purchase affordable housing on higher ground.

23. *Map and identify critical water infrastructure in the 500-year floodplain. Provide incentives to water utilities to relocate water treatment and wastewater treatment plants outside the 500-year floodplain.*

Using FIMAN, the DPS can identify all water infrastructure that is vulnerable to a 500-year flood; the state should provide incentives to water utilities to move these out of harms' way, especially when the facilities are being expanded, upgraded, or rebuilt following a disaster. Given the scale of post-Matthew and post-Florence flooding, it makes sense to move critical infrastructure out of what is currently delineated as the 500-year floodplain, not just the 100-year floodplain.

24. *Identify and phase out industrial pollution sources from the 100-year floodplain.*

Across the coastal plain, too many industrial facilities and waste disposal sites are still located in the 100-year floodplain, at risk of flooding that can contaminate surrounding properties and threaten downstream communities. The state has the capacity to identify these facilities; they should be encouraged and ultimately required to relocate out of the 100-year floodplain. State funding may be needed for remediation of contamination that has already resulted from flooded sites.

25. *Require removal of coal ash from all unlined pits beside rivers and require storage in lined landfills away from water and out of floodplains.*

Duke Energy owns unlined pits containing waste coal ash at 14 sites across the state. Settlement agreements require the company to move nine, but the status of the other five remains uncertain. As post-Matthew and post-Florence flooding has demonstrated, we cannot expect ash buried beside flooding rivers to stay put. All 14 sites should have their ash removed to lined landfills away from rivers.

Confined animal feeding operations (CAFOs).

26. *Prohibit siting, including rebuilding, of confined animal feeding operations (CAFOs) – both swine and poultry – in the 100-year floodplain.*

Since Hurricane Floyd, new swine operations, landfills and junkyards have been excluded from the 100-year floodplain. Voluntary buyouts of swine farms after Floyd still left a set of facilities in the floodplain, and poultry farms have never been excluded. Given that both swine and poultry farms are, by statute, not supposed to discharge wastes into water, none should be built or rebuilt in the 100-year floodplain.

27. *Fund buyouts and closures of poultry and swine CAFOs in the 100-year floodplain.*

28. *Require that flooded swine farms being rebuilt outside the 100-year floodplain transition to environmentally superior technologies. Make Rainy Day and federal funds available to support this transition.*

Funding suggestion for #27 & #28: We recommend a phased buy-out of CAFOs in 100-year floodplain and for conversion of CAFOS outside the floodplain to environmentally superior technology. We recommend that this initiative receive at least \$20M/year for 3 years.

29. *Require permitting of poultry farms.*

Hog farms are already permitted with state-rule based nondischarge permits; poultry operations have no permits and therefore virtually no visibility to state environmental regulators, but had major impacts in Matthew and Florence – dead chickens and turkeys, and large piles of manure washed away.

30. *Appoint a CAFO/drinking water task force that includes community representatives, public health and drinking water experts, and the Secretaries of DHHS and DEQ (or their designees).*

The task force should be charged to recommend ways the state can ensure safe drinking water for all affected by floodwaters, identify long-term solutions for drinking water access and protection, improve protections to drinking water from flooding and run-off, and make provisions for community based monitoring.

RESTORE AND MAINTAIN FLOODPLAIN HEALTH

In addition to removing current threats from the floodplain, North Carolina should restore our floodplains' natural functions, and guide development to prevent new risks to life and property.

31. Restore disconnected floodplains.

When floodplains are connected to their rivers they provide vital benefits. One acre of properly functioning floodplain wetlands can hold up to 330,000 gallons of water when inundated up to one foot. Wise investment in floodplain reconnection and wetland and stream restoration can rapidly reduce future flood damages. We recommend increasing funding for the NC Clean Water Management Trust Fund by \$100 million per year to acquire and restore floodplains.

32. Invest in expanding the network of gaging stations underpinning the state Flood Inundation Mapping and Alert Network (FIMAN).

The state Flood Inundation Mapping and Alert Network (FIMAN) is a powerful tool to predict flooding where there are gaging stations, but there are significant swathes of eastern North Carolina where a lack of gages means FIMAN cannot predict local inundation. We recommend an investment of at least \$1 million a year for 3 years to bring more gages into FIMAN.

33. Require NC Division of Emergency Management and local governments to use FIMAN to inform planning decisions and development approvals.

State and local governments can use FIMAN to map risks from future floods and sea level rise. Current state and FEMA maps only look backwards, so local governments often approve development that FIMAN clearly shows will flood in the future, or cause other flooding. Using FIMAN for forward-looking analyses can help local governments build in ways that do not exacerbate flood risk and do not cause flood insurance premiums to increase.

34. Use LIDAR & floodplain maps to update maps of perennial and intermittent streams as recommended by StreamMAC, a committee of the Statewide Mapping Advisory Committee of the NC Geographic Information Coordinating Council (GICC)

North Carolina's LIDAR mapping program is respected across the nation, and has the capacity to substantially reduce danger to public health and costs from future floods. However, that promise will only be realized if LIDAR's better data about land elevation and stream courses informs the state stream maps used for a variety of other purposes, including water quality protections and local land use decisions. Updating the maps with LIDAR data will also help deliver consistency across programs.

35. Raise the floor for local Hazard Mitigation Plans and require that they be reflected in state and local infrastructure investments.

Following Hurricane Floyd, FEMA required all local governments participating in the federal flood insurance program to develop hazard mitigation plans (HMPs) that set out policies and programs the jurisdictions will use to minimize future flood losses. At this point, most local jurisdictions in North Carolina have update-to-date FEMA-approved plans, but their quality and extent of implementation is uneven. For the next round of these plans, it is time to raise the baseline. All plans should include adoption of implementing local ordinances, and state investments in infrastructure should be consistent with the current and revised plans.

36. *Require mitigation for filling the floodplain, similar to mitigation requirements for impacting wetlands and streams. Mitigation funds should be used to preserve and restore floodplains.*

This is a key step for realizing on-the-ground protection for businesses, residents, and public investments in or near the floodplain. When development fills part of a floodplain, the floodplain expands. A mitigation requirement helps ensure that development does not harm other properties nearby or downstream.

37. *Improve stream crossings to reduce flooding*

Significant road flooding and washouts after Florence were caused by stream crossings that were too small to convey the volume of water flowing through the streams. When roads are replaced, bridges should be installed that are 1.5 to 2 times the bankfull width of the streams they cross. Where bridges are not cost-effective, failed culverts should be replaced with open bottom culverts of similar dimensions. At least \$2 million in annual funding should be allocated to begin replacing undersized culverts.

38. *Update real estate disclosure law to require disclosure of flood hazards.*

North Carolina should reform the state's real estate disclosure law to require sellers of real property to disclose whether a structure has been previously been damaged. The disclosure should describe the cost of damage, the number and value of an past flood insurance claims, whether the property is in a flood zone, and whether the owner has received federal disaster aid in the past that will obligate future owners to purchase flood insurance.

39. *Do not rely on new dams for flood control.*

We have better options for managing floods today than in previous eras, and new dams are among the least effective or efficient. After Hurricane Matthew, NC Emergency Management commissioned a study of flood management techniques across eastern NC. The least cost-effective options were building new dams; buyout programs consistently beat new structures on speed, flexibility, cost, and effectiveness across a range of storms.

STRENGTHENING EXISTING DEQ PROGRAMS

Beyond floodplain management, existing state environmental regulatory programs can be improved to better protect North Carolinians from future hurricanes and floods.

40. *Improve coastal stormwater management, including maintenance of control measures.*

Stormwater control infrastructure in too many coastal communities has been poorly maintained, leading to unnecessary flood damage. DEQ, DPS, and local governments must work together to ensure that local stormwater systems can manage big storm events. New systems should use the natural landscape, living shoreline techniques, and other, updated stormwater controls. DEQ should assess the contribution of poorly designed and maintained systems to flooding, and put a program in place to retrofit and correct these widespread problems. A dedicated state funding source will be needed to match local funds to pay for retrofit needs. A task force should be formed to develop a strategy that can be implemented to solve this vexing problem plaguing many coastal communities.

41. *Integrate flood reduction and stormwater policies; require new development to protect and restore our landscapes' natural water management capacity.*

Stormwater management nationally and in North Carolina is evolving towards management of stormwater onsite through infiltration and evaporation – not just detention and gradual release. In the near term, DEQ should use its Storm EZ tool to encourage development to better mimic the natural hydrology of sites.

Longer term, North Carolina should adopt policies that allow for only limited deviation from a site's predevelopment hydrology.

42. *Encourage communities to conduct sourcewater protection analysis to identify and better manage risks of contamination from floodwaters.*

The Public Water Supply section of the DEQ Division of Water Resources is a small but active program that assists local governments in designing and carrying out plans to protect their drinking water sources from contamination. Additional resources are needed to bring this support to a meaningful portion of water systems affected by Florence, and to encourage local governments to implement plan recommendations.

43. *Reduce the threat of dam failure by strengthening the state's dam safety program.*

Multiple dams breached during the flooding from both Matthew and Florence. The NC Dam Safety program needs expanded funding. Policy (15A NCAC 02K .0301) should be updated to require that private dam owners take responsibility for their property. All dams on perennial and intermittent streams should be inspected every two years with reports to the state. High hazard dams should be inspected annually. Dam removal should be an option for any dam owner that no longer wishes to maintain the liability of dam ownership.