2025 Climate Resilience Strategy Report

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

2025 Climate Resilience Strategy Report

North Carolina Wildlife Resources Commission

Executive Summary

The *2025 North Carolina Wildlife Resources Commission Climate Resilience Strategy Report* is the second iteration of the agency's planning effort to address climate related impacts to our state's fish and wildlife resources. As the largest landholding agency in the state, the North Carolina Wildlife Resources Commission (NCWRC) is in a paramount position to support the state's commitment through Executive Orders 80, 246, and 305 to reduce greenhouse gas emissions through the conservation of natural lands. As of 2025, NCWRC currently maintains over 2,093,664 acres of game lands, many of which are wetlands, including pocosins and forested floodplains, and upland forests. NCWRC's forested land accounts for more than an estimated 9,042,368 tons of stored carbon and sequesters an average of 382.89 kg/acre/year.[1]

As stated in the *North Carolina Climate Risk Assessment and Resilience Plan,* '[a] resilient North Carolina is a state where our communities, economies, and ecosystems are better able to rebound, positively adapt to, and thrive amid changing conditions and challenges, including disasters and climate change; to maintain quality of life, healthy growth, and durable systems; and to conserve resources for present and future generations.' Following this lead, the NCWRC developed its first resilience strategy in 2024 to support the state's ecosystems and species, and to be able to provide opportunities to North Carolinians to enjoy these resources into the future. This is the second iteration of NCWRC's internal resiliency planning effort. NCWRC is committed to responsibly managing these resources to sustain our natural resources to support our state in becoming climate resilient. The approach to this planning effort has three goals,

1. to consider how the lands under NCWRC's management support North Carolina's resiliency goals to store and sequester greenhouse gas emissions, and

2. to consider strategies that address shifting ecological regimes and their impact on wildlife distributions, and lastly,

3. to consider the impacts that climate change will have on access to state game lands.

The planning effort was led by the Habitat Conservation Division and involved leadership from the Communications, Marketing, and Digital Engagement Office, Engineering Division, Habitat Conservation Division, Inland Fisheries Division, Land and Water Access Division, Law Enforcement Division, the Office of Conservation Policy and Research, and the Wildlife Management Division. The resulting *2025 North*

[1] This information was obtained from the North Carolina Conservation Benefits Calculator (Duke University & Conservation Trust for North Carolina, 2023).

Carolina Wildlife Resources Commission Climate Resilience Strategy Report is a "living document" that will be periodically updated as more divisions are consulted and as needed. The report is complementary to the North Carolina Wildlife Action Plan (NCWAP), which was also updated in 2025. This report is also included as an appendix in the NCWAP. This resiliency planning effort has helped our agency frame our work in a new perspective and reveals opportunities for our agency to contribute towards larger state (and international) goals.

The following strategies were identified through this planning process:

Evaluate the impacts of climate change on NCWRC programs and operations	
Species assessment	Re-evaluate aquatic species stocking strategies regularly to ensure that animals are provided suitable habitat
	Assess and update survey techniques and data points as necessary to account for changes in species behavior, distribution, and species' population status
	Collect data specific to habitat status and environmental covariates that can be used for modeling to mitigate the impacts of climate change
	Assess vulnerability of wildlife to climate impacts and use results to inform management decisions on NCWRC and privately owned lands
	Keep up with newest threats and science to provide support to enforce laws that protect vulnerable species
Planning	Use social science tools to capture stakeholder data on attitudes, values, and behaviors to understand how user groups interact with fish, wildlife, and agency resources and/or agency-led initiatives - these survey efforts create feedback loops so the agency can adapt to the changing needs of the constituents and ensure that climate resiliency efforts are grounded in the needs and priorities of communities who depend on the state's natural resources
	Use evaluation strategies to improve support for staff and the public post-disaster
	Review existing guidelines and management plans to develop and integrate climate change adaptation and resiliency strategies within these documents

Evaluate the impacts of climate change on NCWRC programs and operations	
	Monitor rulemaking authorities (i.e., state, councils, federal government) for fish and wildlife species that may become more or less abundant in North Carolina
	Develop and implement the North Carolina Wildlife Action Plan in collaboration with diverse partners
Game Lands Management	Assess vulnerability of game lands to climate impacts and use results to inform management decisions
	Use available threat assessment tools and modeling in game land management planning to maintain optimal habitats for species conservation
	Identify needs associated with maintaining and increasing the use of prescribed fire
Technical Guidance	Develop and use resiliency criteria in major investments (land, facilities constructions and retrofits, staff)
	Continue to keep up with research on Best Management Practices for stormwater and erosion control to provide recommendations that best protect and/or enhance fish and wildlife benefits
	Continue to keep up with research on Best Management Practices for dams to provide recommendations that protect and/or enhance fish benefits
	Collaborate with the North Carolina Department of Environmental Quality in determining stormwater standards for larger storm events
	Assess and update, if needed, Engineering Best Management Practices to ensure best practices and share best practices with external partners

Integrate climate change adaptation practices and resiliency planning into NCWRC policies and operations	
	Keep abreast of funding opportunities related to resiliency
Communications	Use multiple communications platforms to support outreach and engagement regarding NCWRC's resiliency work
	Develop relationships with journalists that are interested in climate change topics
	Communicate with agency staff about NCWRC's resiliency strategy and efforts
	Maintain a dedicated webpage to communicate closures of agency infrastructure, including game lands and boat access areas
Rulemaking	Collaborate with staff to implement rules which seek to mitigate the effects of climate change and extreme weather events on fish and wildlife resources, game lands, and NCWRC facilities (public fishing areas, boating access areas, etc.)
	Identify resources to ensure effective and accessible opportunities for public engagement and information-sharing
	Continue working with partner agencies and non-governmental collaborators to maximize adaptation and resiliency benefits
Law Enforcement	Work with partners to build trust with communities and create awareness of the importance of conservation law enforcement
	Continue to support search and rescue efforts during extreme weather events
	Continue to provide the expertise and equipment to support NCWRC operations during extreme weather events
Species Protection	Identify and prioritize land acquisition projects that support species and habitat conservation, reintroductions, and migration; land conservation provides carbon sequestration and storage benefits
	Continue to invest and identify vulnerable species in need of Propagation, Augmentations, Reintroductions, Translocations, and Introductions (PARTI)

Integrate climate change adaptation practices and resiliency planning into NCWRC policies and operations	
	Work with non-federal private landowners to implement Conservation Benefit Agreements (CBA), formerly Safe Harbor Agreements and Candidate Conservation Agreement with Assurances (SHA/CCAA)
	Continue to manage species based on changes in recruitment, growth, survival, and reproductive success
Habitat Protection	Foster and participate in partnerships with other natural resource entities to support resiliency efforts
	Continue to protect and maintain critical habitats identified in the *North Carolina Natural and Working Lands Action Plan* and in Executive Order 305 to support climate resiliency goals of the state
	Monitor spread of aquatic nuisance species (ANS) and disease and mitigate for their impacts
	Continue to identify and protect areas of thermal refuge on NCWRC-owned, privately owned, and partner agency lands and work with partners to encourage their protection
	Continue to participate in collaborations concerning submerged aquatic vegetation (SAV) and encourage the adoption of protective measures where SAV exists
	Identify priority habitats and assess conservation, protection, and management needs across the landscape
	Work closely with partners to identify key corridors and connectivity needs; identify and help pursue funding for wildlife passage and provide technical guidance and encouragement
	Continue to work with partners to promote and restore aquatic habitat
	Facilitate salt marsh migration through protection of migration corridors
	Provide technical guidance to other agencies and private landowners on species life history and habitat needs to identify and conserve thermal refuges and mitigate drought

Integrate climate change adaptation practices and resiliency planning into NCWRC policies and operations	
	Continue to investigate strategies that will result in increased implementation of prescribed burning by private landowners to support ecosystem resiliency and viability
	Support private landowners in converting introduced grass stands and low productivity cropland to native grasses and forbs to enhance wildlife habitat, improve drought resistance in forage production, and increase ecosystem services while strengthening carbon sequestration and storage capacity compared to non-native herbaceous species
	Utilize the Wildlife Conservation Lands Program (WCLP) to promote green space and diverse plant communities by deferring private landowners' property tax liability
	Continue to support natural infrastructure restoration projects (i.e., living shorelines, oyster reefs, etc.), where appropriate (and design appropriate)
	Continue to engage and support local governments in incorporating natural area protection in land use planning and policy to support climate resiliency via the Green Growth Toolbox
	Continue to encourage wide riparian, wetland buffers and floodplain protection through technical guidance and the Green Growth Toolbox
	Provide technical guidance on oyster reef projects to minimize and avoid impacts on fish habitat
	Provide technical guidance on development review to improve site preparation in support of retaining native tree cover
	Continue to prioritize restoration of native habitats and conservation of Species of Greatest Conservation Need through technical guidance
Game Lands Management	Continue to work with partners (i.e., The Nature Conservancy, land trusts, NC Natural Heritage Program) to support Natural Heritage dedication of nature preserves, land conservation, and restoration
	Continue to identify areas on game lands in need of habitat and stream restoration and replant buffers, as needed
	Continue to support and initiate research and monitoring activities that increase knowledge and understanding of impacts of environmental

Integrate climate change adaptation practices and resiliency planning into NCWRC policies and operations	
	stressors of change as well as to support continued forest health and resilience using the best available science
	Support and expand utilization of forest management to restore and maintain native forest types that sequester carbon and are more resilient to climate change, disease, and forest pests
	Continue to support the wood products market
	Collaborate with partners to bank seeds for replanting projects on game lands
	Rewet hydrologically altered peatlands, where appropriate, to provide species and habitat improvements, prevent soil loss and catastrophic fire, and increase carbon sequestration
	Continue to monitor game lands for invasive species
	Design bridges and culverts to allow for increased stream flow, i.e., a 500-year flood event
	Continue to limit the impervious surface of new structures and remove existing impervious surface areas when possible

Introduction

About North Carolina Wildlife Resources Commission

The North Carolina Wildlife Resources Commission (NCWRC) is a state government agency created by the General Assembly in 1947 to conserve and sustain the state's fish and wildlife resources through research, scientific management, wise use, and public input. The NCWRC is the regulatory agency responsible for the enforcement of North Carolina's fishing, hunting, trapping, and boating laws.

The mission of the NCWRC is:

> To conserve North Carolina's wildlife resources and their habitats and provide programs and opportunities that allow hunters, anglers, boaters, and other outdoor enthusiasts to enjoy wildlife-associated recreation.

The sale of hunting and fishing licenses, federal grants and other receipts provide financial support for the agency. The agency has an operational budget of approximately $100 million and employs approximately 700 full-time staff and 100 seasonal temporary staff across the state, including wildlife and fisheries biologists and technicians, wildlife law enforcement officers, wildlife educators, communication specialists, and customer service, information technology, and administrative professionals.

North Carolina Wildlife Resources Commission's Vulnerabilities to Climate Change

North Carolina's fish and wildlife resources are and will continue to be impacted by a changing climate. Biologists monitor species distributions and population dynamics to better understand how changing environmental conditions may impact the resiliency of species. For example, monitoring data demonstrates that streams and rivers are warming, resulting in shifts to aquatic species' distributions and the decline of coldwater species (e.g., Brook Trout). The agency also manages over two million acres of public lands, which are already experiencing ecological shifts, such as the transition from freshwater marsh to estuarine marsh in eastern North Carolina game lands. Infrastructure and access to public lands are also vulnerable to climate change as increased prevalence of flooding, fire, and extreme storm events reduces our ability to maintain access for the public. Management decisions on these lands aim to provide high quality wildlife habitats while also maintaining public access. The consideration of climate vulnerabilities needs to be a part of our decision-making on many fronts.

North Carolina Wildlife Resources Commission's Approach to Fulfilling the Strategies in the Climate Risk Assessment and Resilience Plan

As stated in the *North Carolina Climate Risk Assessment and Resilience Plan,* '[a] resilient North Carolina is a state where our communities, economies, and ecosystems are better able to rebound, positively adapt to, and thrive amid changing conditions and challenges, including disasters and climate change; to

maintain quality of life, healthy growth, and durable systems; and to conserve resources for present and future generations.' Following this lead, the NCWRC developed our first resilience strategy in 2024 to support the state's ecosystems and species and to be able to provide opportunities to North Carolinians to enjoy these resources into the future. This is the second iteration of our internal resiliency planning effort. Our approach has been threefold: 1. to consider how the lands under our management support North Carolina's resiliency goals to store and sequester greenhouse gas emissions, 2. to consider strategies that address shifting ecological regimes and their impact on wildlife distribution, and lastly, 3. to consider the impacts that climate change will have on access to state game lands. The resulting resiliency strategy report is complementary to larger wildlife conservation planning efforts captured in the North Carolina Wildlife Action Plan (NCWAP). This resiliency planning effort has helped our agency frame our work in a new perspective and reveals opportunities for our agency to contribute towards larger state (and international) goals.

Increase statewide resilience to the impacts of climate change

1 Evaluate the impacts of climate change on major investments in programs and operations in the N.C. Wildlife Resources Commission

1.1.1 Use resiliency criteria in major investments (land, facilities constructions and retrofits, staff)

Status: Ongoing

Expected Completion Date: N/A

For new construction, renovation projects, and land acquisition, NCWRC assesses and plans for addressing hazards related to flooding, sea level rise, saltwater intrusion, and increased storm intensity.

NCWRC will update resources to screen projects in the future.

2 Share information on N.C. Wildlife Resources Commission's resiliency work through the Communications, Marketing, and Digital Engagement Office

2.1.1 Use multiple communications platforms to support outreach and engagement regarding NCWRC's resiliency work

Status: Ongoing

Expected Completion Date: N/A

Communications, Marketing, and Digital Engagement Office staff have developed targeted email lists and social media platforms (i.e., NextDoor, LinkedIn, etc.) to deliver content to different types of constituents. NCWRC's Resiliency Strategy and related efforts are relevant to multiple types of customers.

Over the next year, Communications, Marketing, and Digital Engagement Office will work with other divisions to deliver content tailored to these groups, such as game land users, conservationists, hunting, and fishing groups.

2.1.2 Continue to develop relationships with journalists that are interested in climate change topics

Status: Ongoing

Expected Completion Date: N/A

NCWRC has developed press releases and worked with journalists to develop stories around NCWRC's resiliency work. Continued efforts to maintain these relationships with journalists provides a good avenue for developing stories around NCWRC's resiliency work. For example,

Swiftwater Rescue efforts to support public safety were publicized by multiple media outlets and Communications, Marketing, and Digital Engagement Office staff worked directly with journalists to highlight floodplain restoration work along the French Broad River, which supported flood storage during Hurricane Helene.

Over the next year, Communications, Marketing, and Digital Engagement Office will continue to foster those relationships with journalists and share stories of interest related to NCWRC's resiliency work.

2.1.3 Communicate with agency staff about NCWRC's resiliency strategy and efforts

Status: Ongoing

Expected Completion Date: N/A

NCWRC staff will lead by example and share agency successes and lessons learned with partners to support increased statewide efforts at resiliency.

Over the next year, Communications, Marketing, and Digital Engagement Office staff will support the delivery of the NCWRC Resiliency Strategy by enhancing its design and readability on the website (i.e., Flipping Book with photos and graphic design). Communications, Marketing, and Digital Engagement Office will highlight resiliency work in its monthly newsletter to staff, *Inside Wildlife*.

2.1.4 Continue to maintain a dedicated webpage to communicate closures of agency infrastructure, including game lands and boat access areas

Status: Ongoing

Expected Completion Date: N/A

In times of extreme weather or in the aftermath during recovery, some NCWRC facilities and game lands are not safe for public use. Communications, Marketing, and Digital Engagement Office will continue to use the website and other communication channels to provide information to the public on areas of restricted access.

3 The Office of Conservation Policy and Analysis will provide scientifically based assessments to support the agency in adapting its policies and programs to meet changing needs

3.1.1 Use evaluation strategies to improve support for staff and the public post-disaster

Status: Ongoing

Expected Completion Date: N/A

The Office of Conservation Policy and Analysis can use tools to learn from past experiences to improve disaster response approaches and outcomes. In the wake of natural disasters such as Hurricane Helene, there is a need to evaluate the institutional support provided to staff, the agency's communication to the public on closures and other disaster-related changes, and the resources and support required by Law Enforcement and other staff to most effectively carry out rescue and recovery work. These evaluations will help the agency be better prepared for future crisis situations.

Over the next year, staff will develop an evaluation protocol for assessing the agency's internal and public-facing response to natural disasters.

3.1.2 Support improved decision-making by using social science tools to capture stakeholder data on attitudes, values, and behaviors to understand how user groups interact with fish, wildlife, and agency resources and/or agency-led initiatives - these survey efforts create feedback loops so the agency can adapt to the changing needs of the constituents and ensure that climate resiliency efforts are grounded in the needs and priorities of communities who depend on the state's natural resources

Status: Ongoing

Expected Completion Date: N/A

The collection of stakeholder opinion data is a critical need in understanding and predicting user group needs and priorities. Social science research can identify barriers to implementing climate-resilient practices, assess community vulnerability, and evaluate the social and economic tradeoffs of adaptation actions. Over the past year, staff collected baseline data to understand the role that sea turtles have on coastal economies, and this provides a foundation for analyzing changes into the future and for understanding the contribution conserved habitats have for human communities. Surveys provide a continual way to gather feedback to improve the effectiveness of NCWRC's work.

3.2 Integrate adaptation and resiliency planning into the Office of Conservation Policy and Analysis rulemaking process.

3.2.1 Collaborate with staff to implement rules which seek to mitigate the effects of climate change and extreme weather events on fish and wildlife resources, game lands, and NCWRC facilities (public fishing areas, boating access areas, etc.)

Status: Ongoing

Expected Completion Date: N/A

Leaders from across the agency meet annually to identify and prioritize annual rule changes. Staff will support proactive approaches, informed by recent extreme weather events such as Hurricane Helene, to improve and update rules in response to changing environmental conditions.

3.2.2 Identify resources to ensure effective and accessible opportunities for public engagement and information-sharing

Status: Ongoing

Expected Completion Date: N/A

As new rules and policies are developed in response to a changing environment or a changing social need, Office of Conservation Policy and Analysis staff will identify resources to ensure effective and accessible opportunities for public engagement and information-sharing in impacted areas and to the public impacted by the policies.

Office of Conservation Policy and Analysis staff will coordinate with Communications, Marketing, and Digital Engagement Office staff to broadcast information about proposed rule changes across multiple platforms to maximize outreach and engagement.

Staff will explore opportunities to engage non-governmental conservation organizations to maximize outreach potential and engagement opportunities.

3.2.3 Continue working with partner agencies and non-governmental collaborators to maximize adaptation and resiliency benefits

Status: Ongoing

Expected Completion Date: N/A

Staff will update and develop rules and policies that support collaborative research, habitat restoration, and other fish and wildlife conservation goals.

Staff will support interagency conservation initiatives, such as working with the North Carolina Department of Environmental Quality (NCDEQ) on stormwater Best Management Practices (BMPs) or working with the North Carolina Forest Service to promote the use of prescribed fire.

4 Integrate climate change adaptation practices and resiliency planning into Engineering policies and operations

4.1.1 Continue to limit the impervious surface of new structures and remove existing impervious surface areas when possible

Status: Ongoing

Expected Completion Date: N/A

As renovations and new construction require new paving or repaving, staff work to implement the use of pervious paving grid systems where stormwater permitting limits development. These have been installed at multiple access areas already. In 2025, the Belhaven boat ramp is being evaluated for pervious paving grid systems.

4.1.2 Design bridges and culverts to allow for increased stream flow, i.e., a 500-year flood event

Status: Ongoing

Expected Completion Date: N/A

As bridges and culverts require replacement, inundation mapping is done to evaluate the proper sizing for adequate flood events. Floodplain/way requirements also continue to evolve and become more stringent. In 2025, design requirements are enhancing flood resiliency for the bridge replacement project at Armstrong Fish Hatchery and Gull Rock Bridge.

5 Evaluate the impacts of climate change on Habitat Conservation Division technical guidance programs and operations

5.1.1 Develop and implement the State Wildlife Action Plan in collaboration with diverse partners

Status: Ongoing

Expected Completion Date: N/A

The NCWAP was updated in 2025; it identifies fish and wildlife Species of Greatest Conservation Need (SGCN) and other species for which there are research or management priorities. The NCWAP's priority recommendations can be used to specifically target conservation or management options for SGCN and their essential habitats. The goal is to strategically target declining populations and imperiled animals and their required habitats early, thereby reducing the risk of extinction and precluding the need for listing under the Endangered Species Act.

The NCWAP will continue to reflect statewide conservation concerns by ensuring collaboration with diverse partners that includes federal and state agencies, local governments and communities, conservation organizations, businesses, American Indians, and individuals interested in the Plan's conservation strategies. Staff will continue to update and maintain the NCWAP and work with internal and external groups to implement the Plan's priority conservation actions. The NCWRC Climate Resilience Strategy Report will be included in the NCWAP as an appendix.

5.1.2 Continue to keep up with research on Best Management Practices for stormwater and erosion control to provide recommendations that best protect and/or enhance fish and wildlife benefits

Status: Ongoing

Expected Completion Date: N/A

Increasing storm intensities and frequencies may require changes to post construction stormwater management designs, particularly in situations that now focus on requirements for

outfall protection versus treatment of stormwater quantity. Staff attend trainings and conferences related to stormwater management and water quality to keep up with the latest science and engineering. In the aftermath of Hurricane Helene, staff shared information with partners, including the North Carolina Office of Emergency Management, to reduce the impacts of stream debris removal projects on streambank stability.

In the coming year, staff will informally assess BMP performance on completed projects, especially in the mountains, and coordinate with NCDEQ staff to apply those observations with comparable research in future project recommendations. Hurricane Helene provides an opportunity to improve infrastructure to withstand more extreme storms. Additionally, staff will update Green Growth Toolbox resources to include the most current BMP design information beneficial for wildlife and aquatic habitats. These updates will provide local governments with additional information to consider for their own stormwater design standards.

5.1.3 Collaborate with the North Carolina Department of Environmental Quality in determining stormwater standards for larger storm events

Status: Proposed

Expected Completion Date: N/A

Due to changes in Waters of the United States rules, many acres of wetlands may lose protection, and the capacity on the landscape to treat stormwater may be reduced. Additionally, larger storm events are impacting the ability of existing stormwater standards to work. In the next year, staff will engage with DEQ to identify how to enhance stormwater standards to address increasing needs. Staff will also recommend the use of higher standards in flood prone areas through technical guidance.

5.1.4 Continue to keep up with research on Best Management Practices for dams to provide recommendations that protect and/or enhance fish benefits

Status: Ongoing

Expected Completion Date: N/A

Climate change heightens the need to provide connectivity for aquatic organisms. Staff provide guidance to dam operators to maintain ecological flows, to minimize impacts of drought events on the aquatic environment, and to track and control aquatic nuisance species (ANS). To increase habitat connectivity, NCWRC has focused on dam removals to reconnect aquatic habitats and coordinate with the North Carolina Aquatic Connectivity Team. In 2024 and 2025, staff attended trainings related to ecological drought, dam removal, aquatic connectivity/aquatic organism passage, and ecological flows. Staff will continue to attend trainings to keep up with the latest science on dam operation and removal projects.

Additionally, NCWRC has partnered with Tennessee Tech University to research the ecological consequences of restoring sucker migrations in southern Appalachian rivers. Several sucker

species (family Catostomidae) can be found in the streams and rivers of Western North Carolina. These large-bodied benthic fish migrate upstream to spawn, but their migrations can be blocked by barriers such as dams. Removing barriers will allow suckers to migrate farther upstream to reach suitable spawning habitat. The project will monitor nutrient dynamics in streams at various trophic levels to assess the ecological effects of renewed sucker migration due to dam removal. This research will enhance our understanding of the effects of dam removal on nutrient dynamics and help inform future dam removal decision making.

5.1.5 Assess and update, if needed, Engineering Best Management Practices to ensure best practices and share best practices with external partners

Status: Ongoing

Expected Completion Date: N/A

Staff provide recommendations on engineering BMPs for reducing environmental impacts to other state agencies and external partners. The Division of Energy, Mineral, and Land Resources' plans for stream stabilization often require riprap which can block aquatic organism passage. Staff provide recommendations on how to design projects to reduce impacts on aquatic ecosystems as well as recommendations on best materials to use for reducing environmental impacts. Staff also provide recommendations on culvert designs that allow for non-erosive velocities and increase streambank stability, as well as allow for aquatic organism passage.

In response to Hurricane Helene, staff have been and will continue advocating, where possible and appropriate, for considering resilience in roadway repairs such as designing for increased hydraulic capacities of crossings and better retention of floodplain areas. Staff will continue to assist the North Carolina Department of Transportation (NCDOT) and other agencies with science-based recommendations that can make infrastructure not only less harmful to habitats but also more reliable during future flooding events.

Staff will informally assess the environmental performance of culvert designs (aquatic life passage, bedload retention, channel stability) on completed projects and collaborate with DEQ and other agencies on future modifications of hydraulic design criteria (e.g., NCDOT Guidelines for Hydraulic Studies).

5.2 Integrate climate change adaptation practices and resiliency planning into Habitat Conservation Division technical guidance policies and operations

5.2.1 Foster and participate in partnerships with other natural resource entities to support resiliency efforts

Status: Ongoing

Expected Completion Date: N/A

Staff participate, coordinate, and/or lead multiple partnership efforts aimed at the protection and restoration of natural and working lands, including the North Carolina Drought Council, North Carolina Natural and Working Lands Action Plan Steering Committee, the Ela Dam Coalition, the South Atlantic Salt Marsh Initiative, the Triangle Connectivity Collaborative, the Sandhills Conservation Partnership, Albemarle Pamlico National Estuarine Partnership, and others to provide technical guidance, leverage funding resources, and coordinate resiliency plans and projects.

In 2024 and 2025, staff worked with American Rivers, MountainTrue, and other partners to prioritize and implement dam removal projects in Western North Carolina. Staff continue to collaborate with Mainspring Conservation Trust, the Eastern Band of Cherokee Indians and other partners in the Ela Dam Coalition to work towards removing Ela Dam on the Oconaluftee River.

5.2.2 Continue to support natural infrastructure restoration projects (i.e., living shorelines, oyster reefs, etc.), where appropriate (and design-appropriate)

Status: Ongoing

Expected Completion Date: N/A

Staff review projects and provide recommendations to encourage projects that minimize wildlife habitat impacts and encourage designs that are truly ‘nature-based,' with minimal hardened structures. Staff also encourage the use of native vegetation wherever plantings are to be installed, they provide comments to minimize loss of submerged aquatic vegetation, natural shorelines, and public trust waters. Over the last year, staff provided guidance to ensure that pocosin restoration projects supported habitat goals for vulnerable wildlife species at Holly Shelter Game Lands.

Technical guidance will continue into the coming year.

5.2.3 Keep abreast of funding opportunities related to resiliency

Status: Proposed

Expected Completion Date: October 2026

Staff recognize opportunities when they are available and send them to appropriate staff within the agency. In 2024 and 2025, staff provided guidance to the US Forest Service on funding priorities for post-Helene recovery projects.

In the next 12 months, staff will develop and maintain a list of potential projects and partnerships that could be implemented as funding opportunities become available (e.g., list of locations where installation of new USGS monitoring gauges will be beneficial for aquatic species monitoring and surveys).

5.2.4 Continue to engage and support local governments in incorporating natural area protection in land use planning and policy to support climate resiliency via the Green Growth Toolbox

Status: Ongoing

Completion Date: N/A

The Green Growth Toolbox handbook and associated educational materials provide information and resources on the latest climate science and related community resiliency strategies. These resources are intended to assist local governments in developing plans and ordinances to protect their natural resources.

Over the next year, staff will continue to provide science-based natural areas-related climate resiliency strategies in their technical guidance work with local governments. They will also continue to partner with organizations that support climate resiliency planning with local and regional governments, such as the State Resilience Office and North Carolina Sea Grant.

5.2.5 Continue to encourage wide riparian, wetland buffers and floodplain protection through technical guidance, including the Green Growth Toolbox

Status: Ongoing

Expected Completion Date: N/A

Staff may need to identify new strategies to address flood attenuation, water quality/quantity, and wildlife habitat and continue to recommend protection of the widest riparian buffers and the minimum of the 100-year floodplain, as practical, in our recommendations for habitat conservation. In 2024, staff reviewed over 1,600 environmental documents and permit applications to identify opportunities to enhance these protections.

In 2025, staff developed BMPs for Stream Debris Removal to reduce impacts on aquatic ecosystems and vulnerable species during post-Helene recovery efforts; these BMPs were widely shared with partners and FEMA-funded contractors responsible for clean-up efforts.

Technical guidance work will continue as opportunities arise.

5.2.6 Continue to participate in collaborations concerning submerged aquatic vegetation (SAV) and encourage the adoption of protective measures where SAV exists

Status: Ongoing

Expected Completion Date: N/A

NCWRC is a signatory to the Albemarle Pamlico National Estuarine Partnership Memorandum of Understanding; staff continue to support SAV mapping work and provide technical guidance on projects that may impact SAV.

Technical guidance work will continue as opportunities arise.

5.2.7 Provide technical guidance on oyster reef projects to minimize and avoid impacts on fish habitat

Status: Ongoing

Expected Completion Date: N/A

Staff provide recommendations on where oyster reef projects will provide the most benefit and where these projects should be avoided to reduce impacts on fish and wildlife habitats.

Technical guidance work will continue as opportunities arise.

5.2.8 Provide technical guidance on development review to improve site preparation in support of retaining native tree cover

Status: Ongoing

Expected Completion Date: N/A

Staff review projects and provide recommendations to reduce mass grading and clear-cutting where feasible, encourage retention of native tree canopy, promote adequate marking of native trees to avoid damage during construction, and offer on-site assistance. Staff meet with developers to discuss the Wildlife Friendly Development Certification. In 2024, staff worked with one developer to help them meet the certification requirements of the program.

In the coming year, staff will learn more about soil amendment guidance to ensure natural areas are adequately marked so construction activities do not damage native trees and habitats.

5.2.9 Continue to prioritize protection and restoration of native habitats and conservation of Species of Greatest Conservation Need through technical guidance

Status: Ongoing

Expected Completion Date: N/A

Staff provide technical guidance to partners on native habitat restoration and conservation to support wildlife, including pollinator and native grass habitat restoration on private lands and on solar farms and aquatic and wildlife passage across road projects and through developed landscapes. Native grass restoration supports carbon sequestration and storage, in addition to providing pollinator habitat. NCWRC received funding through an America the Beautiful Grant to restore herbaceous groundcover in longleaf pine ecosystems within the Sentinel Landscape. A portion of this funding has been allotted to constructing a hoop house to propagate plants that are found in longleaf forests but rarely found commercially. These plants provide high pollen and nectar resources and support many specialist bee species not found in most other ecosystems. Seeds from over 40 plant species have already been collected from the Sandhills Game Lands and will be used to start propagation efforts in the hoop house in the Spring of 2026. Once grown out to plugs, these plant materials will be distributed to interested landowners throughout the Sentinel Landscape. In the future, the hoop house may be used to

propagate rare plant species that will be returned to game lands or other lands managed by partner agencies. The hoop house is planned for construction in the fall of 2025.

Staff also assisted game lands management staff in obtaining seed mixes that were not coated in neonicotinoids to support pollinator conservation in food plots and other game land projects.

Additionally, staff are conducting a long-term, multi-taxa wildlife study at a stream and wetland mitigation site in Guilford County. The data from this study will help guide compensatory mitigation providers in improving terrestrial and aquatic wildlife habitats, including for SGCN.

Technical guidance work will continue as opportunities arise.

5.2.10 Work closely with partners to identify key corridors and connectivity needs; identify and help pursue funding for wildlife passage and provide technical guidance and encouragement

Status: Ongoing

Expected Completion Date: N/A

NCWRC developed the Wildlife Passage Guidance (ncdot.gov) with NCDOT.

Staff helped the NCDOT reapply for a grant that would improve culvert capacity and add fencing in an area I-40 near the Tennessee state line to increase habitat connectivity for wildlife, particularly meso-mammals. The location was identified as a key opportunity based on research conducted by non-governmental organizations. Although the grant application was not successful, staff are continuing to collaborate with NCDOT on projects that will promote habitat connectivity in the I-40 gorge, especially as part of highway reconstruction following Hurricane Helene.

Staff worked with NCDOT to identify sites and write multiple grant proposals for aquatic organism passage under one of the Infrastructure Investment and Jobs Act grants. The last grant cycle resulted in one site being awarded. Staff have been working with NCDOT to identify culvert improvements for Brook Trout. Staff assisted with installation of baffles in a culvert in Maine Branch in Watauga County and helped obtain an agreement for a similar project in Powell Branch in Mitchell County.

Additionally, NCDOT, in coordination with US Fish and Wildlife Service (USFWS) and NCWRC, submitted a grant application for wildlife crossing on US 64 in the Alligator River National Wildlife Refuge. The $25M grant was awarded and will result in multiple wildlife crossings along a portion of US 64 in Dare County that will result in improved highway permeability and a reduction in wildlife-vehicle collisions with a specific emphasis on reducing mortality to the Red Wolf population.

Staff monitor the use of our wildlife passage structures to understand the importance of proper wildlife fence design and maintenance, to assess changes in wildlife usage in conjunction with vegetation management at underpass structures, and to analyze the use of various size wildlife

passage structures to better understand species willingness to use certain structure types in eastern North Carolina.

Staff also coordinate efforts to bring together conservation and local government partners in the Triangle to identify and prioritize the conservation and restoration of habitat connectivity. Staff have also assisted local governments in the Triangle in incorporating connectivity conservation priorities in local and regional planning documents and in development review.

Technical guidance and coordination efforts will continue into the coming year.

5.2.11 Provide recommendations that protect and/or enhance fish benefits on dam projects

Status: Ongoing

Expected Completion Date: N/A

Climate change heightens the need to provide connectivity for aquatic organisms. Staff provide guidance to dam operators to maintain ecological flows, minimize impacts of drought events on the aquatic environment, and work to track and control ANS. To increase habitat connectivity, NCWRC has focused on dam removals to reconnect aquatic habitats.

In 2024, staff worked with partners to design and/or construct dam removal projects on five dams in western North Carolina, as well as to perform feasibility analyses for removal of two additional dams. Staff will continue to work with cooperators to assess and remove high priority dams. Staff will continue to monitor aquatic animal populations both pre- and post- dam removal. Obtaining funding for future dam removals through grants will also be a high priority over the next 12 months.

Staff are part of a work group associated with the NC Aquatic Connectivity Team that is developing a stream crossing guidelines document aimed at providing technical assistance for stream crossings that will provide proper aquatic organism passage (AOP).

Staff have also worked with NCDOT to pursue grant funding for AOP improvement projects, with one being successfully awarded. In 2025, NCWRC hired a time-limited position that is tasked with assessing approximately 2,700 culverts for AOP.

This technical guidance will continue into the coming year.

5.2.12 Provide recommendations that protect and/or enhance aquatic resources in stormwater and erosion control projects

Status: Ongoing

Expected Completion Date: N/A

Staff provide technical guidance on stormwater and erosion control projects, such as native seed mixes for soil stabilization. Additionally, in 2025, staff developed BMPs for Stream Debris Removal to reduce impacts on aquatic ecosystems and vulnerable species during post-Helene

recovery efforts; these BMPs were widely shared with partners and FEMA-funded contractors responsible for clean-up efforts. Staff collaborated with Inland Fisheries staff to develop GIS layers to share with contractors to identify priority areas for implementing BMPs.

This technical guidance will continue into the coming year.

6 Evaluate the impacts of climate change on Inland Fisheries Division's programs and operations

6.1.1 Reevaluate aquatic species stocking strategies regularly to ensure that animals are provided suitable habitat

Status: Ongoing

Expected Completion Date: N/A

The NCWAP is periodically reviewed every 5 – 10 years. Staff completed the 2025 revision to the NCWAP including updates to species and habitat management actions. Staff are working on management plans for black bass, reservoir Striped Bass/Bodie Bass, and mountain trout. Plans like the NCWAP, Species Conservation Plans for state listed species, and fisheries management plans identify strategies such as stocking and habitat protection for priority species. Stocking success will be monitored in part through the use of genetic markers that will allow for analysis of genetic diversity and percent hatchery contribution in stocked systems.

Staff have drafted Species Conservation Plans for aquatic state-listed species including the Orangefin Madtom, Yellow Lampmussel, Cape Fear Shiner, Appalachian Elktoe, Bridle Shiner, and Green Floater.

6.1.2 Assess and update survey techniques and data points as necessary to account for changes in aquatic species behavior, distribution, and species' population status

Status: Ongoing

Expected Completion Date: N/A

Staff have completed over 300 survey efforts in 2025 for fish, crustaceans, and mollusks to update ongoing data collection and identify any changes in aquatic species distribution and population status. These surveys include general distribution of species, habitat assessments, habitat enhancements and restoration, and overall health of fish populations.

Over the next 12 months, staff will continue to monitor and assess aquatic organism populations including fish, crustaceans, and mollusks. These surveys will help evaluate ongoing population status and informed the NCWAP assessments for SGCN. These assessments will help identify species that need augmentation and restoration efforts due to anthropogenic impacts including climate change.

Biological samples will be opportunistically taken and preserved as genetic material to establish a timeline of allelic diversity and genetic health in current populations that may serve as a reference point for future studies.

6.1.3 Collect data specific to habitat status and environmental covariates that can be used for modeling to mitigate the impacts of climate change

Status: Ongoing

Expected Completion Date: N/A

NCWRC has been awarded four C-SWGs focusing on conducting surveys, monitoring, propagation, and modeling habitat use for the Robust Redhorse, Sandhills Chub, coastal plain crayfish, and fishes in shared drainages between South Carolina and North Carolina. Additionally, staff conducted over 300 surveys and collected data on habitat and environmental variables and NCWRC supports the maintenance of multiple USGS gauges to collect environmental covariates.

6.1.4 Review existing guidelines and management plans to develop and integrate climate change adaptation and resiliency strategies within these documents, and continue to monitor rulemaking authorities (i.e., state, councils, federal government) to provide guidance on proposed regulatory changes for fish species that may become more or less abundant in North Carolina

Status: Ongoing

Expected Completion Date: N/A

Staff are involved with non-governmental organizations, federal agencies, and other governmental bodies to assess populations of animals both within North Carolina and throughout the mid-Atlantic and Southeastern U.S. This involvement allows staff to understand the changes in population status (declines and increases) due to changes in North Carolina's climate. Staff review and comment on rules from other state and federal entities for fish and their habitats.

Staff recommend rule changes, when needed, for management of fish in North Carolina to mitigate the effects of climate (i.e., no stocking in July for trout related to thermal changes in habitat). For example, staff reviewed the state listing for the Pink Heelsplitter and updated the protected species list for aquatic organisms.

Staff recently completed and updated draft of the Reservoir Striped Bass and Bodie Bass Management Plan, which accounted for habitat changes due to warming temperatures and identified opportunities to switch Striped Bass fisheries to Bodie Bass fisheries to account for reduced habitat available to support Striped Bass. Staff are currently developing a Black Bass Management Plan and revising the Trout Management Plan. Staff are also developing Species Conservation Plans for Orangefin Madtom, Yellow Lampmussel, Cape Fear Shiner, Appalachian

Elktoe, Bridle Shiner, and Green Floater. These plans will integrate population assessments including habitat degradation (including increased water temperature), population genetics, and survival of stocked animals for restoration.

6.2 Integrate climate change adaptation practices and resiliency planning into Inland Fisheries Division's policies and operations

6.2.1 Continue to invest and identify vulnerable species in need of Propagation, Augmentations, Reintroductions, Translocations, and Introductions (PARTI)

Status: Ongoing

Expected Completion Date: N/A

NCWRC's Conservation Aquaculture Center (CAC) in Marion, NC works with partners to propagate and grow out 14 threatened and endangered species including, Appalachian Elktoe, Atlantic Pigtoe, Cape Fear Shiner, Carolina Heelsplitter, Carolina Madtom, Dwarf Wedgemussel, James Spinymussel, Lake Sturgeon, Longsolid, Magnificent Ramshorn, Roanoke Logperch, Spotfin Chub, Tar River Spinymussel, and Yellow Lance. Staff meet annually during the winter with collaborators and partners to review current species stockings and identify additional species for PARTI actions. In the last year, staff submitted one new reintroduction proposal for Carolina Heelsplitter.

6.2.2 Continue to manage species based on changes in recruitment, growth, survival, and reproductive success

Status: Ongoing

Expected Completion Date: N/A

Staff have established long-term monitoring sites for priority aquatic species. Staff target surveys for stocking and reintroduction sites to establish population trends. In 2024, staff conducted over 300 surveys to collect population level metrics and to analyze genetic diversity of wild and stocked priority species.

Staff plan to continue surveys at long-term monitoring sites.

6.2.3 Monitor spread of aquatic nuisance species (ANS) and disease and mitigate for their impacts

Status: Ongoing

Expected Completion Date: N/A

Staff continually monitor aquatic animal populations across the state. Currently, staff are documenting the spread of Alabama Bass, Flathead Catfish, Blue Catfish, river herring, White Perch, invasive crayfish, whirling disease, gill lice, Apple Snail, and others. Staff are testing trout

production facilities to ensure that trout stocked in North Carolina are free of whirling disease and gill lice. The state has launched a campaign for "Clean, Drain, Dry and Never Move" to slow the spread of these organisms. Staff have created signage at public access areas to reiterate the importance of not moving aquatic organisms. The Inland Fisheries Division liberalized harvest restrictions on many invasive species so that they may be removed by the public to hopefully reduce their impacts.

Staff plan to create new signage that explains the detrimental effects of Alabama Bass on other black bass species. Staff will continue to monitor the movement and distribution of ANS throughout North Carolina. These species and their detrimental effects are a management priority within the NCWAP. Staff created an ANS reporting tool for the public to submit sightings of ANS species. The tool aids NCWRC staff and partners in rapid response and management actions for unwanted aquatic invaders. NC Wildlife - Aquatic Nuisance Species Reporting.

In 2023, zebra mussels were detected in a private recreational dive quarry in Iredell County, NC, making the location the first known population of zebra mussels in open water in North Carolina. NCWRC received grant funding from the USFWS to investigate the population and eradicate it. NCWRC began treatment of the quarry in June of 2025. The treatment and evaluation of its efficacy are still ongoing.

6.2.4 Work with non-federal private landowners to implement Conservation Benefit Agreements (CBA), formerly Safe Harbor Agreements and Candidate Conservation Agreement with Assurances (SHA/CCAA)

Status: Ongoing

Expected Completion Date: Winter, 2072

The NCWRC and U.S. Fish and Wildlife Service finalized a SHA/CCAA for the reintroduction of 21 aquatic species in North Carolina. Aquatic Wildlife Diversity staff reintroduced Roanoke Logperch into the upper Mayo River in partnership with Mayo River State Park and Piedmont Land Conservancy in 2023 and 2024. Magnificent Ramshorn were released into a pond on the Green Swamp Game Land in 2023, 2024, and 2025.

Staff plan to work with Roanoke Logperch, Magnificent Ramshorn, and Spotfin Chub in 2025.

6.2.5 Continue to work with partners to remove dams and other barriers to support species' ability to move and adapt to changing ecosystems

Status: Ongoing

Expected Completion Date: N/A

Dam removal is important to many aquatic organisms including coastal anadromous species, coldwater stream assemblages, and many SGCN listed in the NCWAP because dams isolate aquatic communities by creating a barrier to movement and alter riverine habitats. Staff have

worked with partners to create a database that prioritizes dam removal based on ecological importance. In 2024, staff worked with partners to design and/or construct dam removal projects on five dams in western North Carolina, as well as to perform feasibility analyses for removal of two additional dams. Staff will continue to work with cooperators to assess and remove high priority dams. Staff will continue to monitor aquatic animal populations both pre- and post- dam removal. Obtaining funding for future dam removals through grants will also be a high priority over the next 12 months.

In 2024, staff also installed baffles and a rock pad in and below a hanging culvert in a Watauga County stream to facilitate upstream movements of its Brook Trout population.

In 2025, baffles will be installed in another steep culvert in a Mitchell County Brook Trout stream. Staff will continue to seek locations on NCDOT roadways and the funding sources and partnerships for similar projects that should promote the connectivity of high elevation Brook Trout populations and thereby enhance their resilience to possible long-term habitat changes.

Staff from Land and Water Access, Habitat Conservation, and Inland Fisheries divisions coordinated to identify opportunities on western game lands to address stream restoration and aquatic organism passage needs. NCWRC partnered with The Nature Conservancy to replace two culverts and one bridge on the Pollock's Ferry tract of the Upper Roanoke River Game Land to restore fish passage.

6.2.6 Continue to work with partners to promote and restore aquatic habitat

Status: Ongoing

Expected Completion Date: N/A

Native plant nursery propagation and planting projects continue. Plants were introduced to Harris Lake, Lake Gaston, Hyco Lake, Tuckertown Lake, Oak Hollow Lake, Cane Creek Lake (Union County), and Graham-Mebane Lake. Native vegetation was also established in Mud Creek in Henderson County.

Bank restoration work was done on multiple streams across the state, including Bartram/Coweeta Bottoms, Alarka Creek. Aquatic organism passage projects were completed at Maine Branch and Powers Branch. NCWRC has also restored off channel backwater floodplain sloughs on the French Broad River to support habitat for muskellunge and increase flood storage capacity during flood events.

Hurricane Helene impacted streams and infrastructure around streams. Staff developed BMPs to reduce the impacts of stream debris removal on aquatic ecosystems and stream banks. Staff shared this information with North Carolina Department of Emergency Management, US Army Corps of Engineers, local governments, and their contractors to increase implementation of the BMPs.

6.2.7 Provide technical guidance to other agencies and private landowners on species life history and habitat needs to identify and conserve thermal refuges and mitigate drought

Status: Ongoing

Expected Completion Date: N/A

Staff provide guidance on actions to mitigate climate change including coldwater releases, minimum flows, and flow pulses below dams as well as recommendations for land conservation.

Staff serve on more than 50 technical committees and provide technical guidance on aquatic species to universities, land trusts, partnerships, private consultants, USFWS, other state agencies, local governments, non-governmental organizations, private companies, and lake associations.

7 Evaluate the impacts of climate change on Land and Water Access Division's programs and operations

7.1.1 Review existing game land management plans to develop and integrate climate change adaptation and resiliency strategies within these documents

Status: Ongoing

Expected Completion Date: N/A

Over the next year, a reference sheet will be developed to support staff in integrating adaptation and resiliency strategies into management planning as the plans come up for review. The sheet will include information on tools that help staff identify threats and opportunities on game lands.

7.1.2 Assess vulnerability of game lands to climate impacts and use results to inform management decisions

Status: Ongoing

Expected Completion Date: N/A

Staff regularly assess vulnerabilities of game lands, i.e., rising sea levels, flooding, emerging diseases, impeded access, and adjust management decisions to address new vulnerabilities and to support SGCN. For example, in the mountains, to protect high elevation forests vulnerable to climate change, staff do not burn these forests or areas of rock outcrops. Prescribed fire is a regular part of management on lower elevation forests. This supports the protection of higher elevation forests, which are important areas of thermal refuge for cold-adapted species. Additionally, in 2024, NCWRC received funding from the Inflation Reduction Act to implement resiliency measures on waterfowl impoundments on the Albemarle-Pamlico Peninsula.

7.1.3 Use available threat assessment tools and modeling in game land management planning to maintain optimal habitats for species conservation

Status: Ongoing

Expected Completion Date: N/A

In 2024, staff developed a Forest Optimization Tool in collaboration with N.C. State University. This tool considers forest habitat scenarios until 2050 and is used to guide forest management on game lands. Additionally, in 2024, staff from the Habitat Conservation Division collaborated with the Southeast Climate Adaptation Strategy to develop a new threat assessment tool to identify Conservation Opportunity Areas.

Staff will use these tools to assist in management planning and decision-making related to game lands. Staff will investigate and utilize new technologies, resources, and methodologies that may assist in land management practices as appropriate.

7.1.4 Identify needs associated with maintaining and increasing the use of prescribed fire

Status: Ongoing

Expected Completion Date: N/A

The Forest Optimization Tool (mentioned in 7.1.3) is used to determine an optimal fire interval using two scenarios: 1. that which can be achieved with existing manpower and equipment, and 2. that which can be achieved with increasing manpower and equipment. This tool will be used in coming years to support decision-making on prescribed fire needs on game lands.

7.2 Integrate climate change adaptation practices and resiliency planning into Land and Water Access Division's policies and operations

7.2.1 Identify and prioritize land acquisition projects that support species and habitat conservation, reintroductions, and migration; land conservation provides carbon sequestration and storage benefits

Status: Ongoing

Expected Completion Date: N/A

Over the last year, land acquisition efforts have supported species and habitat conservation, as well as migration. Land acquisition priorities are guided by the NCWAP, species conservation plans, and game land management plans.

Land acquisition efforts will continue to prioritize species and habitat conservation using the most up-to-date science available, including sea level rise models. Internal land team meetings are held by staff, in addition to the Commission's Land Acquisition and Property Committee

meetings, which continue to inform land acquisition strategy and communication between agency staff and leadership within the NCWRC.

7.2.2 Continue to protect and maintain critical habitats identified in the North Carolina Natural and Working Lands Action Plan and in Executive Order 305 to support climate resiliency goals of the state

Status: Ongoing

Expected Completion Date: N/A

NCWRC currently maintains over 2,093,664 acres of game lands, many of which are wetlands, including pocosins, forested floodplains, and upland forests. NCWRC's forested land accounts for over an estimated 9,042,368 tons of stored carbon and sequesters an average of 382.89 kg/acre/year.[2] These habitats are priority habitats identified in the NCWAP and will have potentially higher priority for land acquisition than other habitat types.

7.2.3 Facilitate salt marsh migration through protection of migration corridors

Status: Ongoing

Expected Completion Date: N/A

Land acquisitions in the coastal region continue to protect migration corridors. NCWRC partners with the North Carolina Coastal Land Trust and The Nature Conservancy to identify priority acquisition opportunities. These partnerships are enduring and NCWRC will continue to acquire land for conservation in marsh migration areas.

7.2.4 Continue to support and initiate research and monitoring activities that increase knowledge and understanding of the impacts of environmental stressors of change as well as to support continued forest health and resilience using the best available science

Status: Ongoing

Expected Completion Date: N/A

Forest stands managed by staff are monitored to keep track of their growth, health, and management needs. A Forest Optimization Tool has been developed and is being used to identify management needs to address optimal forest health. NCWRC also developed a Smoke Tracking Tool to support decision-making around prescribed fire, and a Prescribed Fire Dashboard was developed to provide public access to information about prescribed fire activities. Additionally, NCWRC facilitates research by universities to identify emerging forest

[2] This information was obtained from the North Carolina Conservation Benefits Calculator (Duke University & Conservation Trust for North Carolina, 2023).

health threats; previous research includes projects on wooly adelgid (mountains), oak regeneration (mountains), and a fire needs assessment (statewide).

7.2.5 Support and expand utilization of forest management to restore and maintain native forest types that sequester carbon and are more resilient to climate change, disease, and forest pests

Status: Ongoing

Expected Completion Date: N/A

In addition to the Forest Optimization Tool referenced in previous strategies, the Land and Water Access Division also supports forest resiliency through planting and appropriate management of native forest types, including longleaf pine restoration on appropriate soils, Atlantic white cedar and buttonbush as part of the Angola Bay pocosin restoration, oak regeneration, and shortleaf pine restoration. Staff are also working with partners to replant red spruce and Frasier fir at high elevations.

7.2.6 Continue to support the wood products markets

Status: Ongoing

Expected Completion Date: N/A

The completion of the Forest Optimization Tool, mentioned in previous strategies, is used to understand where timber harvesting can be done to maximize habitat. NCWRC's goals are not to maximize wood production.

7.2.7 Continue to identify areas on game lands in need of habitat and stream restoration and replant buffers, as needed

Status: Ongoing

Expected Completion Date: N/A

Over the past few years, NCWRC has been partnering with The Nature Conservancy to identify and implement habitat and stream restoration projects on Angola Bay Game Land and Holly Shelter Game Land.

In the next year and beyond, NCWRC is committed to working with partners to develop, implement, and maintain stream and wetland restoration projects that are beneficial to the wildlife resources and their associated habitats on other game lands, especially in areas impacted by Hurricane Helene.

7.2.8 Rewet hydrologically altered peatlands, where appropriate, to provide species and habitat improvements, prevent soil loss and catastrophic fire, and increase carbon sequestration

Status: Completed, Underway

Expected Completion Date: June 2025, to be determined

Since 2020, NCWRC has partnered with The Nature Conservancy to rewet drained peatlands on Angola Bay Game Lands. 6,037 acres of peatland have been restored while still maintaining public access.

The Holly Shelter restoration project will rewet approximately 27,000 acres of ditched pocosin, making this the largest pocosin restoration project to date. The area was ditched in the last century and has a recent history of catastrophic wildfire. The Juniper Road fire of 2011, specifically, burned for two and a half months covering over 31,000 acres and resulted in peat soil loss of 3-5 feet in places, resulting in a "bowl" where drainage has been accelerated and peat soils are losing functionality. Five surface water monitors and eleven ground water monitoring wells have been installed to understand the current hydrologic condition of the project area and aid in restoration designs. Initial design framework calls for eight risers and eight sheet pile weirs to be installed as well as a large amount of road raising. The project is still in the initial stages of design and permitting. The Nature Conservancy has already secured funding for implementation. NCWRC has implemented long term flora and faunal surveys of the project area to understand the impacts of pocosin restoration on local wildlife and plant communities.

Staff will continue working with partners to assess and evaluate hydrologically altered peatlands and identify opportunities for restoration.

7.2.9 Continue to work with partners (i.e., The Nature Conservancy, land trusts, NC Natural Heritage Program) to support Natural Heritage dedication of nature preserves, land conservation, and restoration

Status: Ongoing

Expected Completion Date: N/A

Staff will continue to work with partners to support restoration of conserved lands. This includes enrollment of conserved lands as Natural Heritage dedications, US Forest Service stewardship projects in the mountains, and partnering with The Nature Conservancy to increase our ability to manage with prescribed fire, replant riparian buffers, enhance fish passage, and restore hydrologic functioning of drained peatland soils. These activities and partnerships will continue in the coming year, including projects mentioned in previous strategies.

7.2.10 Collaborate with partners to bank seeds for replanting projects on game lands

Status: Ongoing

Expected Completion Date: N/A

Staff collect native warm season grasses and tree seeds to enhance nursery stock and support habitat restoration projects, as requested. A portion of America the Beautiful funding will be allotted to constructing a hoop house on Sandhills Game Lands to propagate plants that are found in longleaf forests but rarely found commercially. Construction for this project will begin in Fall 2025.

7.2.11 Continue to monitor game lands for invasive species

Status: Ongoing

Expected Completion Date: N/A

Staff continuously monitor game lands for non-native invasive species as part of their regular monitoring activities; problem areas are treated as time permits.

8 Understand the impacts of climate change on game lands and fish and wildlife resources to support effective enforcement of conservation laws by the Law Enforcement Division

8.1.1 Keep up with newest threats and science to provide support to enforce laws that protect vulnerable species

Status: Ongoing
Expected Completion Date: N/A

Information-sharing between NCWRC divisions helps Law Enforcement Officers (LEOs) stay informed on what species become more vulnerable to poaching due to environmental, legal, and/or social changes. For example, reptiles and amphibians can become more desirable by collectors if they are perceived as rare or are listed. Fish species can be threatened by ANS; LEOs can help the public understand the need to clean equipment to prevent the transfer of ANS to other waterbodies. Information-sharing allows LEOs to adapt their work priorities to enforce laws to protect these species. It also provides an opportunity to craft public relations messaging related to emerging threats to reduce the need for law enforcement action.

8.1.2 Work with partners to build trust with communities and create awareness of the importance of conservation law enforcement

Status: Ongoing

Expected Completion Date: N/A

The Law Enforcement Division develops and maintains relationships with local District Attorney Offices and other state and local law enforcement agencies to create trust and create open

communication channels between these organizations as well as other constituent groups, such as hunting, fishing, and foraging groups. These efforts result in more effective protection of the resources and reduce conflict between users and the law.

This work is ongoing and a foundational part of effective law enforcement.

8.2 Adapt operations and practices of the Law Enforcement Division to support changing social and environmental needs

8.2.1 Continue to support search and rescue efforts during extreme weather events

Status: Ongoing
Expected Completion Date: N/A

The Law Enforcement Division includes the Swift Water Rescue Program which has a stated mission to 'utilize specialized boating skills and equipment to provide a rapid response to weather events and disasters by conducting search, rescue, and recovery for victims in water accidents of every sort and description.' NCWRC Swift Water teams are strategically located statewide and capable of responding on short notice to any location and providing relief to victims and the communities through the rapid deployment of properly trained and equipped personnel that can seamlessly integrate into the entire North Carolina Search and Rescue Program. Some members of these teams are also Emergency Medical Technicians and can provide life-saving support in these emergency situations. The teams provide transport to victims to secondary locations for further medical needs. The teams are also trained in drone operations to support preparation for rescue needs.

These teams will continue to be trained and implemented throughout the state to assist in search and rescue operations. In the next year, the Law Enforcement Division will be reviewing the response to Hurricane Helene and adapting their approach to incorporate lessons learned, including how to support the mental health needs of first responders. Additionally, the division will be purchasing new equipment and providing training to continue to support this work.

8.2.2 Continue to provide the expertise and equipment to support NCWRC operations during extreme weather events

Status: Ongoing
Expected Completion Date: N/A

The Law Enforcement Division has drones, all-terrain vehicles, utility terrain vehicles, and boats to support staff in retrieving and collecting data and equipment in areas made inaccessible from storm events. During Hurricane Helene, LEOs used drones to survey damage to facilities and

infrastructure. LEOs were also staffed to support Land and Water Access Division staff working on containing wildfires. LEOs are also used to keep the public out of unsafe areas.

This capacity will continue to be provided as needs arise.

9 Evaluate the impacts of climate change on Wildlife Management Division's programs and operations

9.1.1 Assess vulnerability of wildlife to climate impacts and use results to inform species and habitat management decisions on NCWRC and privately owned lands

Status: Ongoing

Expected Completion Date: N/A

The NCWAP was updated in 2025 and identifies species and habitats that are impacted by climate change.

Staff completed species conservation plans for bog turtles and southern hognose snakes in 2023; Virgina big-eared bats and sea turtles in 2024, and for black rails in 2025. The Peregrine Falcon Conservation Plan is in draft. A conservation plan for the American Alligator is planned. Staff use existing climate models to inform wildlife species vulnerability and will continue to address this in all upcoming species conservation plans.

Biological samples will be opportunistically taken and preserved as genetic material to establish a timeline of allelic diversity and genetic health in current populations that may serve as a reference point for future studies.

As opportunities arise, staff will work with the Land and Water Access Division to update Game Lands Management Plans such that predicted climate change impacts to habitats important to SGCN and game species are accounted for through land management, restoration, enhancement, and acquisition.

9.1.2 Assess and update survey techniques as necessary to account for changes in wildlife species behavior and distribution

Status: Ongoing

Expected Completion Date: N/A

Staff complete surveys on sea turtles, diamondback terrapins, colonial nesting waterbirds, piping plovers, American oystercatchers, gopher frogs and other species of frogs, tiger salamanders and other species of salamanders, rattlesnakes and other snake species, alligators, passerines, bald eagles, peregrine falcons, barn owls, bat species, bog turtles, spotted turtles, box turtles, riverine turtles, woodrats, flying squirrels, and small mammals to update ongoing data collection to observe any changes in wildlife species distribution and population status.

These surveys include general distribution of species, habitat assessments, habitat enhancements and restoration, and overall health of wildlife populations. Similar numbers of surveys will continue at pre-determined cycles.

These surveys will help evaluate ongoing population status and have informed the NCWAP assessments for SGCN. These assessments help identify species that need protection and restoration efforts due to anthropogenic impacts including climate change.

9.1.3 Review existing guidelines and management plans to develop and integrate climate change adaptation and resiliency strategies within these documents and monitor the need to implement regulatory changes for wildlife species that may become more or less abundant in North Carolina

Status: Ongoing

Expected Completion Date: N/A

Staff review the state listing of species annually and update the protected species list for wildlife. Staff currently are involved with non-governmental organizations, federal agencies, and other governmental bodies to assess populations of animals both within North Carolina and throughout the Mid-Atlantic and Southeastern U.S. This involvement allows staff to understand the changes in population status (declines and increases) due to changes in North Carolina's climate.

Staff will continue to develop conservation plans for at-risk species. These plans already integrate population assessments, including habitat loss and degradation (including changes due to climate change).

9.2 Integrate climate change adaptation practices and resiliency planning into Wildlife Management Division's policies and operations

9.2.1 Continue to invest in translocation and propagation of vulnerable species

Status: Ongoing

Expected Completion Date: N/A

The Wildlife Management Division collaborates with other NCWRC divisions, government entities, and private and public landholders to develop techniques and practices consistent with translocation and propagation of at-risk species. Currently, with partners, NCWRC propagates gopher frogs and uses a head-start program to augment existing populations on public land. Additionally, the division is working with Zoo Knoxville in Tennessee on a head-starting pilot project for bog turtles. In 2024, after the turtles grew to first-year size, they were returned to their nest sites. In the coming year, staff will continue these practices to support vulnerable

species and to learn more about these management options should they be needed in the future relative to climate change impacts on habitat needs.

9.2.2 Continue to manage species based on changes in recruitment, growth, survival, and population status

Status: Ongoing

Expected Completion Date: N/A

Staff have established long-term monitoring sites for priority wildlife species. In 2024, staff conducted over 400 surveys to collect population level metrics and genetic diversity information for priority species. Investigations were conducted to enhance understanding of bog use by bog turtles and isolated wetlands by gopher frogs. Additionally, all game species are managed under these parameters. Game species data are collected through hunter harvest, mail surveys, and observation surveys, and trend analyses are conducted. Surveys and monitoring of SGCN are conducted using appropriate methods (counts, cover boards, aural recording units, camera traps, mist nets, etc.) and data are evaluated for long-term trends. These data and influential factors, including climate variables, are collected and analyzed to determine needs for management actions.

Staff plan to continue surveys at long-term monitoring sites and through long-term data collection activities.

2.1.1 Continue to identify and protect areas of thermal refuge on NCWRC-owned, privately owned, and partner agency lands and work with partners to encourage their protection

Status: Ongoing

Expected Completion Date: N/A

Staff identify and protect habitats of thermal refuge, which are under threat from climate change. Winter hibernacula for bats are protected with gates and signage. Falcon eyries are protected through conservation actions with partners. Spruce-fir habitats are enhanced through plantings. Ephemeral ponds in longleaf pine and native grass habitats are restored, enhanced, and created for important amphibian habitat. Waterbird islands in North Carolina's sounds and the Lower Cape Fear River are protected with signage and enhanced through beneficial use of dredged material, in partnership with the U.S. Army Corps of Engineers. Staff also protect and restore riparian buffers and closed canopy systems, where needed, to support coldwater and coolwater aquatic species.

9.2.3 Identify priority habitats and assess conservation, protection, and management needs across the landscape

Status: Ongoing

Expected Completion Date: N/A

NCWRC uses a variety of tools to identify and work with landholders to focus conservation efforts on undeveloped lands with an effort towards managing for priority habitats listed in the NCWAP. In 2024, staff initiated the development of a rock outcrop management plan. Additionally, habitat surveys are conducted annually by Wildlife Diversity staff to determine use by SGCN and need for conservation, protection, and management. Staff within the Wildlife Management Division Operations Program, especially Wildlife Conservation Biologists, work with private landowners to evaluate habitat conditions and priority species' needs as they develop management recommendations to meet the landowner's goals and objectives for their property. These evaluations will continue into the coming year.

9.2.4 Support private landowners in converting introduced grass stands and low productivity cropland to native grasses and forbs to enhance wildlife habitat, improve drought resistance in forage production, and increase ecosystem services while strengthening carbon sequestration and storage capacity compared to non-native herbaceous species

Status: Ongoing

Expected Completion Date: N/A

Staff within the Wildlife Management Division Operations Program and Habitat Conservation Division will continue to promote the establishment of native vegetation to meet both production and habitat-oriented objectives. In 2024, 80 acres of private lands were converted to native warm season grasses and pollinator plants. The NCWRC maintains specialized seed drills which are required to effectively plant native seeds, as well as sprayers needed for site preparation herbicide treatments. In 2024, NCWRC purchased an additional Truax drill and trailer that will be housed in the southeastern coastal plain as well as a new truck to transport the drill. This equipment is available to private landowners who are interested in native vegetation establishment. This will be especially important for the establishment of groundcover in longleaf restoration projects using America the Beautiful funding and assisting to improve early succession habitat across the coastal plain. Wildlife Management Division Operations Program staff continue to influence financial assistance programs to ensure funds are available to offset costs associated with establishment and management of native herbaceous vegetation.

9.2.5 Continue to investigate strategies that will result in increased implementation of prescribed burning by private landowners to support ecosystem resiliency and viability

Status: Ongoing

Expected Completion Date: N/A

Staff continue to work with other partners to promote and, when possible, facilitate prescribed burning on private lands. This includes taking learnership roles in the Bladen Lakes Area Prescribed Burn Association and being active in other Prescribed Burn Associations to facilitate peer-to-peer learning between landowners. NCWRC loans equipment (e.g., water pumps) to landowners so they can implement burns on their property. Staff also participate in the N.C.

Prescribed Fire Council and work cooperatively with the North Carolina Forest Service and non-government organizations to promote fire as a valuable conservation tool. When appropriate opportunities arise, America the Beautiful funding will also be leveraged to increase prescribed burning on private lands.

Prescribed burning is recommended where it enhances habitat for SGCN in appropriate ecosystems. Staff are continuing to explore the ability to conduct or contract burning on private lands. However, liability and personnel demands limit those actions at this time. Staff continue to explore options to expand equipment loan opportunities in the future, as well as promote and influence financial assistance options to offset costs associated with conducting prescribed burns on private lands.

9.2.6 Utilize the Wildlife Conservation Lands Program (WCLP) to promote green space and diverse plant communities by deferring private landowners' property tax liability

Status: Ongoing

Expected Completion Date: N/A

Staff will continue to use the WCLP to aid landowners who wish to manage their property for ecological, not economic, goals and objectives. Removing the production-oriented requirements of the Present Use Value Program, the WCLP allows landowners to manage for more diverse plant communities that favor a wider range of wildlife species. Diversification of vegetation on the WCLP enrolled lands, compared to the monoculture stands often associated with timber or crop production, results in overall ecosystem resiliency. A much wider range of ecological services can be realized from these properties, and retaining open lands by reducing some of the financial incentive of development will likely provide a buffer in greenhouse gas emissions. Staff developed 90 Wildlife Habitat Conservation Agreements in 2024. These agreements resulted in 6,906 acres being eligible for the property tax deferment offered through the WCLP.