# North Carolina
# Natural and Working Lands Action Plan

# Annual Report from the Stakeholder Committee

# March 2022

# Acknowledgements


**Natural and Working Lands Steering Committee**

Misty Buchanan, NC Department of Natural and Cultural Resources

Emily Barrett, Triangle J Council of Governments

Jacob Boyd, NC Department of Environmental Quality

Paula Hemmer, NC Department of Environmental Quality

Joe Hudyncia, NC Department of Agriculture

Brooke Massa, NC Wildlife Resources Commission

Scott Pohlman, NC Department of Natural and Cultural Resources

Rick Savage, Carolina Wetlands Association

Jeremy Tarr, Office of Governor Roy Cooper

**Additional Contributing Writers**

Paul Cough, Albemarle-Pamlico National Estuary Partnership Leadership Council

Rebecca Ellin, North Carolina Coastal Reserve and National Estuarine Research Reserve

Stacey Feken, Albemarle-Pamlico National Estuary Partnership

Barry New, NC Forest Service

Lydia Olander, Duke University Nicholas Institute for Environmental Policy Solutions

Andrew Pleninger, NC Forest Service

Amanda Sand, NC Foundation for Soil and Water Conservation

***Introduction***

In 2018, the North Carolina Department of Environmental Quality (DEQ) convened the Natural and Working Lands (NWL) Stakeholder Group consisting of private and public landowners and managers, scientists, policymakers, and planners from state and local governments, universities, consulting firms, and nonprofit organizations. The purpose of the group was to discuss carbon sequestration opportunities available in the NWL sector. Working together in subcommittees representing six land use types, the group created the 2020 North Carolina Natural and Working Land Action Plan (2020 Action Plan), which was released as Appendix B of the 2020 North Carolina Risk Assessment and Resilience Plan, available online at https://www.ncnhp.org/nwl/natural-and-working-lands.

The purpose of the 2020 Action Plan was to identify and create opportunities and outline specific projects for North Carolina's NWL's that sequester carbon, build ecosystem and community resilience, provide ecosystem benefits, and enhance our economy. The 2020 Action Plan can be used by a wide range of stakeholders and partners to facilitate carbon sequestration and storage across North Carolina's landscapes and help reduce net greenhouse gas emissions.

Within the 2020 Action Plan, stakeholders identified five shared core goals. These goals helped to guide the subcommittee work in developing and prioritizing recommendations:

1. Enhance the ability of NWL to sequester carbon and mitigate greenhouse gas (GHG) emissions.
2. Build resilience in ecosystems and communities.
3. Provide public health and ecosystem co-benefits.
4. Create economic opportunities for communities.
5. Ensure implementation of any action is a socially equitable process.

Recognizing the primary land use types contributing to North Carolina's high rate of carbon sequestration statewide, the NWL Stakeholders continue to work together through six committees (a list of Stakeholder organizations is included in Appendix A):

- Agriculture
- Coastal Habitats
- Floodplains and Wetlands
- Forests
- Pocosins
- Urban Lands

This report of 2021 stakeholder activities in support of the NWL Action Plan is voluntarily submitted as an update to the interested public. The 2020 NC Risk Assessment and Resilience Plan (2020 Resilience Plan) requires annual Agency Resilience Strategy Reports, but this stakeholder report goes beyond the 2020 Resilience Plan requirements by reporting some example NWL activities led by Council of State agencies, Cabinet agencies, and non-government stakeholders. This report includes recent stakeholders' activities supporting the ability of NWL to 1) reduce overall greenhouse gas emissions by sequestering and storing carbon, 2) improve NWL resilience to climate change and other natural disasters, and 3) support climate adaptation strategies. Many projects reported here provide multiple benefits for these related themes.

***The Importance of NWL for GHG Emissions Reductions and Resilience***

The NWL sector is an important component of North Carolina's statewide GHG reduction strategy because it can 1) mitigate the impacts of climate change by removing carbon from the atmosphere and 2) build adaptive capacity and resilience to climate change-related weather events and stressors. North Carolina's GHG Emissions Inventory update released by DEQ in January 2022 reported that each year, North Carolina sequesters about 37 to 43 million metric tons (MMT) of CO2e. The carbon sinks are primarily due to carbon sequestered in aboveground biomass and storage of carbon in wood products and landfills. As of 2018 (the most recent year estimated), net carbon sinks offset North Carolina's GHG emissions by an estimated 42.1 MMT CO2e, which is about 26% of the State's gross emissions in that year. This represents a 13% increase in the annual carbon sequestered between 2005 and 2018.

According to the 2022 NC GHG Inventory Report, the Land Use, Land-Use Change, and Forestry (LULUCF) sector accounts for GHG emissions and/or carbon sinks from the following six source/sink subsectors:

- Carbon flux from forest management
- Carbon flux from agricultural soil
- Carbon flux from urban and rural settlements
- Carbon storage from landfilled yard trimmings and food scraps
- Fertilization of settlement soils
- Forest fires

Carbon flux refers to the net change in carbon from year to year resulting from activities that emit or store carbon on NWL such as: clearing an area of forest to create cropland; restocking a logged forest; draining a wetland; allowing a pasture to revert to grassland; and long-term storage of carbon in wood products such as lumber.

It is particularly challenging to measure and quantify the mass of carbon associated with various land use activities. Therefore, this sector has a larger amount of uncertainty associated with it compared to other source sectors in the GHG inventory. Federal, state, and non-governmental agencies are working to better understand carbon cycles, improve measurement techniques, and develop more robust methods to collect, analyze and model data. Further analysis may result in changes to the historical and projected emissions, and storage from this sector that may impact the net GHG emissions estimates. North Carolina is working with various partners to improve the methodology and the datasets used to estimate carbon emissions, sequestration, and storage by NWL.

Partners within the Coastal Habitats Stakeholder Subcommittee are working together to develop GHG inventories for Submerged Aquatic Vegetation (SAV) and subaerial wetlands suitable for incorporation into the NC Greenhouse Gas Inventory. Inventories will cover roughly 190,000 acres of SAV and additional acreage of palustrine and estuarine wetlands, as defined in North Carolina's Coastal Habitat Protection Plan. As part of this effort, partners will also develop a technical appendix that can serve as a guide for estimating the GHG impact of SAV and subaerial wetlands protection and restoration projects. These efforts are being led by collaborators at the NC Department of Environmental Quality Division of Marine Fisheries, Albemarle-Pamlico National Estuary Partnership, East Carolina University, NOAA National Ocean Service (retired), The Pew Charitable Trusts, Duke University Nicholas Institute for Environmental Policy Solutions, and others.

**NWL Stakeholder Group 2022 Implementation Report (reporting on activities of 2021 calendar year)**

Table 1 presents the 25 strategies recommended in the 2020 Natural and Working Lands Action Plan (presented in bold font). Generally, "short-term" is defined as less than one year, "medium-term" is defined as 1-2 years, and "long-term" is defined as more than 2 years. Beneath each numbered strategy is one or more example project led by NWL stakeholders, which address or promote the strategy in some way. Many of the projects included in the table provide multiple benefits (for example, "1.1 Land Conservation by State Agencies" is presented under Strategy Number 1, but this activity also supports Strategies 5, 7, 17, and 20). The authors tried to include example projects for each strategy. This report was compiled from voluntary reports submitted by stakeholders, and it is certain that many more projects have been undertaken across North Carolina that support the 2020 NWL Action Plan and were not captured here. This report is intended to report progress and inspire more action and collaboration, resulting in even more participation in future years.

**Table 1: 2020 Natural and Working Land Action Plan Priority Recommendations and Selected Current Projects in Support of the Recommendations.** *Brief descriptions of each project are provided below the table.*

| Strategy | Status | Completion Date |
|---|---|---|
| *Transformative* | | |
| **1. Protect and restore forests and wetlands within flood prone areas.**<br>1.1 Land Conservation by State Agencies<br>1.2 Research Report: Improving North Carolina's Resilience to Coastal Riverine Flooding | <br>Ongoing<br>Completed | <br>Long-term<br>May 2021 |
| **2. Facilitate voluntary landowner participation in carbon offset and ecosystem services markets.**<br>2.1 North Carolina Forest Carbon Community of Interest | <br>Ongoing | <br>Long-term |
| **3. Build a multi-state NWL solutions toolbox.**<br>3.1 Resilience Clearinghouse Steering Committee and Grant from US Climate Alliance | Ongoing | Medium-term |
| **4. Integrate climate adaptation and resiliency strategies into local government comprehensive plans.**<br>4.1 NC Resilient Communities Program<br>4.2 Using Natural and Nature-Based Features to Build Resilience to Storm-Driven Flooding | <br>Ongoing<br>Ongoing | <br>Short-term<br>2022 |
| *Protect Forest Lands* | | |
| **5. Conserve forest lands through easements and acquisition.**<br>5.1 NC Forest Service Land Acquisitions and Forest Legacy Easements | <br>Ongoing | <br>Short-term |
| **6. Modernize forest policy and tax incentives.** | Researching | Long-term |
| *Restore Forest Lands* | | |
| **7. Expand restoration efforts on publicly owned lands.**<br>7.1 NC Land and Water Fund Stream Restoration Grants<br>7.2 Case studies using NWL information | <br>Ongoing<br>Completed | <br>Long-term<br>Summer 2021 |
| **8. Encourage restoration and reforestation on private lands.**<br>8.1 Restoration Through Prescribed Burning in North Carolina<br>8.2 Forest Establishment - Tree Planting | <br>Ongoing<br>Ongoing | <br>Short-term<br>Short-term |

| Strategy | Status | Completion Date |
|---|---|---|
| *Enhance Forest Lands* | | |
| **9. Increase landowner access to forest management technical and financial assistance.** | | |
| 9.1 NC Forest Service Forest Management Program | Ongoing | Short-term |
| 9.2 NC Forest Service and American Forests Carbon Sequestration Partnership | Ongoing | Medium-term |
| **10. Support the wood products markets.** | | |
| 10.1 North Carolina Forestry Best Management Practices Manual Update | Completed | December 2021 |
| 10.2 North Carolina Forest Service Forest Inventory & Analysis (FIA) and Timber Product Output Programs | Ongoing | Long-term |
| 10.3 North Carolina Forest Service Forest Markets & Utilization Program | Ongoing | Long-term |
| *Protect and Restore Floodplains and Wetlands* | | |
| **11. Coordinate the State's floodplain buyout and restoration program to increase resilience.** | | |
| 11.1 Removing buildings from the floodplain | Underway | Long-term |
| 11.2 Mapping Sea Level Rise Impacts on NC Coastal Habitats and Blue Carbon | Completed | Summer 2021 |
| *Restore Pocosins* | | |
| **12. Rewet hydrologically altered peatlands to prevent soil loss and catastrophic fire.** | | |
| 12.1 Mapping Pocosin Status and Restoration Potential | Completed | Summer 2021 |
| 12.2 Restoring Pocosin Hydrology to Improve Flood Resiliency and Wildlife Habitat in Southeastern North Carolina | Ongoing | 2021-2024 |
| **13. Reforest peatlands with Atlantic White Cedar.** | Researching | Medium-term |
| *Enhance Pocosins* | | |
| **14. Enhance soil health and retention on working peatlands via best management practices and drainage management.** | Researching | Medium-term |
| **15. Implement targeted interventions to protect peatlands from sea level rise and saltwater intrusion guided by scenario-based modeling.** | | |
| 15.1 Scuppernong Regional Water Management Study | Underway | Medium-term |
| *Protect Coastal Habitats* | | |
| **16. Provide incentives to stakeholders for coastal habitat protection.** | | |
| 16.1 Living Shoreline Training for Marine Construction Professionals | Completed | Spring 2021 |
| 16.2 Cherry Point Marine Base Living Shoreline Project | Ongoing | Short-term |
| 16.3 Submerged Aquatic Vegetation (SAV) Mapping, Monitoring, and Economic Valuation | Completed | June 2021 |
| **17. Facilitate migration of coastal habitats through protection of migration corridors.** | | |
| 17.1 Battleship USS North Carolina – Living with Water | Underway | Short-term |
| *Restore Coastal Habitats* | | |
| **18. Prioritize addressing climate change and sea level rise in coastal** | | |

| Strategy | Status | Completion Date |
|---|---|---|
| **habitat restoration planning.** | | |
| 18.1 Rachel Carson Reserve Habitat Resilience Plan | Underway | Short-term |
| 18.2 Research and Monitoring to Enhance Resilience | Underway | Short-term |
| *Protect and Restore Urban Lands* | | |
| **19. Promote urban forests through statewide programs to foster the retention of urban trees and their proper management.** | | |
| 19.1 Urban & Community Forestry Education & Outreach | Ongoing | Short-term |
| 19.2 Community Forestry Initiative | Ongoing | Short-term |
| **20. Protect and restore forested lands in water supply watersheds.** | | |
| 20.1 NC Trees & Storms; Readiness, Response & Recovery (3Rs) | Ongoing | Short-term |
| *Enhance Urban Lands* | | |
| **21. Improve site preparation and soil amendment during land development.** | Researching | Long-term |
| **22. Research urban forestry climate adaptation and canopy baseline needs.** | Researching | Medium-term |
| 22.1 Literature Review on the Ecological Functions and Human Benefits of Urban Forests | Completed | 2021 |
| *Enhance Agriculture* | | |
| **23. Encourage adoption of high mitigation agricultural conservation practices on croplands and pasturelands.** | Researching | Medium-term |
| 23.1 Carbon Farm Planning | Underway | 2022 |
| 23.2 Multi-Species Cover Crop Initiative | Complete | 2022 |
| **24. Improve manure management on farms.** | Researching | Long-term |
| **25. Encourage food system efficiency through reduced food loss and waste.** | Researching | Medium-term |

**Strategy Progress**

***Transformative Actions***

1. ***Protect and restore forests and wetlands within flood prone areas.***

   The 2021 budget for North Carolina was passed with bipartisan support by the NC legislature, and officially signed by Governor Cooper. This budget substantially increased funding for land acquisition; investment in parks, trails, and open space statewide; and resilience planning and floodplain protections. With a total of nearly $200 million for resilience and more than $300 million for conservation projects, this budget directly supports many of the recommendations of the 2020 Action Plan.

   Many of the stakeholders who participated in developing the 2020 Action Plan also contributed information to help make the case for state support of conservation and restoration. Participants included Conservation Trust for North Carolina, Environmental Defense Fund, NC Conservation Network, The Nature Conservancy, The Conservation Fund and many others.

The 2021 State Budget includes:

NC Land and Water Fund (NCLWF), the primary source of grants allowing local governments, state agencies, and conservation nonprofits to protect clean water and conserve ecologically, culturally, or historically significant lands.

- $48.5 million in FY21-22 and $51.5 million in FY22-23.
- $15 million in FY21-22 for projects to protect and restore wetlands and floodplains to reduce flood risk.

Parks and Recreation Trust Fund (PARTF), supporting land acquisition and improvements within parks. PARTF is the main funding source for local parkland acquisitions, facility improvements, and public beach and estuarine access.

- $45.5 million new revenue in both FY21-22 and FY22-23.
- $10 million new revenue in FY21-22 for local parks projects to increase access for persons with disabilities.

Agriculture Development and Farmland Preservation Trust Fund, supporting agricultural conservation easements; the development and implementation of plans for production of food, fiber, and value-added products, agritourism activities, marketing, and sales; and conservation agreements reinforcing the active production of food, fiber and other agricultural products.

- $13 million new revenue in both FY21-22 and FY22-23 for agricultural conservation easements.

Coastal Storm Damage Mitigation Fund

- $40 million for shoreline stabilization, living shorelines, oyster reefs, and marsh restoration.

Streamflow Rehabilitation Assistance Program

- $38 million to protect and restore the integrity of drainage infrastructure through routine maintenance to existing streams and drainage ways.

Nearly $200 million in additional funding to reduce the risk of catastrophic flooding, including floodplain buyouts, waterway debris removal, and other flood mitigation projects.

- $96,142,500 for the removal and disposal of waterway debris.
- $32,342,000 in grants to units of local governments for flood mitigation projects.
- $20 million for a flood resilience blueprint, an interconnected hydrologic model of watersheds and river basins to help state and local governments design, evaluate and prioritize projects for flood resilience.
- $5 million for floodplain acquisitions to prevent construction in the Stoney Creek Watershed.

Other Highlights include $3.5 million for floodplain pilot projects.

**1.1 Land Conservation by State Agencies** **ONGOING**

In 2021, state agencies acquired approximately 16,563 acres in natural and working lands, with funding from the state budget (including NCLWF and PARTF) and non-state funds, and assistance from many partners and voluntary landowners. These projects represent the culmination of years of effort including negotiating with landowners, fundraising, grant management, real estate transactions, and final closing with the State Property Office. Approximate acreage within each state agency is shown in Table 2. Nonprofit land conservation agencies and local and federal agencies also acquired NWL in 2021, but these acreages were not readily available at the time of compiling this report.

**Table 2: State Agency Land Acquisition in 2021.** Acquisitions shown in this table include only transactions that closed with the State Property Office (not projects funded but not yet closed).

| Program | Acres | Land Use Sector |
|---|---|---|
| **Department of Agriculture and Consumer Services** | | |
| Agricultural Development and Farmland Preservation Trust Fund (ADFP)* | 2,583 | Agriculture |
| Forest Legacy Easement | 4,656 | Forests, Floodplains and Wetlands |
| Soil & Water Conservation Reserve Enhancement Program (CREP) | 835 | Floodplains and Wetlands |
| State Forests | 445 | Forests, Floodplains and Wetlands |
| **Department of Environmental Quality** | | |
| Division of Coastal Management (Coastal Reserves) | 25 | Coastal Habitats, Floodplains and Wetlands |
| Division of Mitigation Services | 410 | Floodplains and Wetlands |
| **Department of Natural and Cultural Resources** | | |
| Division of Parks and Recreation<br>(State Parks) | 1,188<br>208 | Forests, Floodplains and Wetlands<br>Pocosins*** |
| State Historic Sites | 48 | Agriculture, Floodplains and Wetlands |
| **Department of Public Safety** | | |
| Division of Adult Correction and Juvenile Justice | 44 | Forests, Floodplains and Wetlands |
| Hazard Mitigation Buyout** | 10 | Floodplains and Wetlands |
| **Wildlife Resources Commission** | | |
| Game Lands | 5,986<br>125 | Forests, Floodplains and Wetlands<br>Agriculture |
| ***State Agency Land Conservation 2021 Total*** | ***16,563*** | |

**Example 2021 Land Conservation Activities with High Benefits for Multiple Land Sectors**

The North Carolina Wildlife Resources Commission acquired approximately 5,986 acres of forested floodplains and wetlands agriculture to be added to Game Lands. Much of the funding for this land acquisition was provided by the NC Land and Water Fund.

The Division of Coastal Management acquired additional coastal habitats for inclusion in the Masonboro Island Reserves. Twenty-five acres of maritime habitat and salt marsh will be included in the Masonboro Island Reserve provided by a donation from the property owner and closing costs from the NC Land and Water Fund. The land and water will be dedicated as a state nature preserve.

The Department of Public Safety (DPS) allocated 44 acres to create the new Lumber River Swamp Dedicated Nature Preserve in Robeson County. Working together under Executive Order 80, DPS and Natural Heritage Program conducted a statewide analysis of all natural and working lands within Division of Adult Correction and Juvenile Justice ownership. The tract at Lumber River Swamp was identified as a high priority for conservation due to its contribution to protecting approximately one mile of river frontage within one of North Carolina's most extensive remaining Cypress-Gum Swamp forests, adding to an existing network of protected lands. The Lumber River is recognized as a National and State Natural and Scenic River. The DPS and Natural Heritage Program will continue to work together to identify suitable sites for creating Dedicated Nature Preserves.

The North Carolina Land and Water Fund is one of the state's primary sources of funding for land conservation and restoration. In 2021, the NC Land and Water Fund awarded more than $60 million, including:

- $54 million for land acquisition
- $5.25 million for stream and wetland restoration
- $492,000 for innovative stormwater projects
- $583,767 for planning projects

Lands conserved and restored with funding from the NC Land and Water Fund (formerly Clean Water Management Trust Fund) preserve resilient landscapes, provide flood abatement for nearby communities by helping store and slow the flow of water during storm events, protect natural streambank vegetation to stabilize shorelines, and provide habitat for rare species. In total, over 51,000 acres will be protected, including over 33 miles of waterways, as a result of the 2021 grant awards. This includes Game Lands, State Parks, Historic Sites, and local parks, and 71 Endangered, Threatened, and Special Concern species.

**1.2 Research Report: Improving North Carolina's Resilience to Coastal Riverine Flooding**

A multidisciplinary team of university faculty, staff and student researchers from North Carolina State University and University of North Carolina at Chapel Hill and nongovernment organization representatives evaluated the potential for natural infrastructure (NI) to mitigate riverine flooding in eastern N.C. The study team conducted geospatial mapping analyses; hydrologic, hydraulic and water quality modeling; economic analyses; landowner and community outreach and a preliminary review of potential programs and measures for implementing a conservation-based NI program. The Middle Neuse River Basin from Johnston to Lenoir County, which has been heavily impacted by recent riverine flooding events, was the focus area of the study. Through a literature review and

exploration of 18 conservation, restoration and land management measures, eight key natural infrastructure measures were identified with the greatest potential to help improve flood resilience in Eastern North Carolina. The goals of the study were to determine the extent to which natural infrastructure can mitigate the impacts of flooding and improve water quality in the Neuse River Basin. Eighteen NI measures initially considered were reduced to the three best measures - reforestation, water farming, and flood storage wetlands - based on a literature review, expert opinion, geospatial mapping of opportunity, and ground truthing of three study sub-watersheds. The full report is online at:
https://collaboratory.unc.edu/wp-content/uploads/sites/476/2021/05/improving-resilience-to-coastal-riverine-flooding.pdf

***2. Facilitate voluntary landowner participation in carbon offset and ecosystem services markets.***

**2.1 North Carolina Forest Carbon Community of Interest** **ONGOING**

Members of the Natural and Working Lands Forest subcommittee, along with other North Carolina based researchers created the Forest Carbon Community of Interest. The purpose of the group is to work together and engage experts working outside of North Carolina to help identify strategies that could be used to implement the forest carbon-related 2020 Action Plan recommendations. In 2021, the group held 3 meetings and consulted with 4 external organizations. This group is led by Duke University Nicholas Institute for Environmental Policy Solutions.

***3. Build a Multi-state Natural and Working Lands Solutions Toolbox.***

**3.1 Resilience Clearinghouse Steering Committee and Grant from US Climate Alliance** **ONGOING**

NC Department of Environmental Quality staff led the formation of a Resilience Clearinghouse Steering Committee, with the goal of consolidating various efforts across state government to compile information related to resilience, reduce redundancies, and promote information sharing. This effort was supported by recommendations in both the 2020 Action Plan and the 2020 Climate Risk and Resilience Plan to develop resilience toolboxes (including interstate toolboxes for shared waterways). Based on the groundwork laid by the Steering Committee, the US Climate Alliance awarded seed funding to the NC Office of Recovery and Resilience to develop a scope of work for the Clearinghouse during 2022. This effort is led by the DEQ Division of Marine Fisheries Habitat and Enhancement Section and NC Office of Recovery and Resiliency, with participation from multiple state agencies and programs including the Albemarle-Pamlico National Estuary Partnership and Department of Natural and Cultural Resources.

***4. Integrate Climate Adaptation and Resiliency Strategies into Local Government Comprehensive Plans.***

**4.1 NC Resilient Communities Program** **ONGOING**

The North Carolina Department of Environmental Quality's Division of Coastal Management awarded the first ever Resilient Coastal Communities Program grants in 2021. This new program provides funding to local governments to help overcome barriers in coastal resilience and adaptation planning, increase local government capacity, and support a proactive, sustainable, and equitable approach to

coastal resilience planning and project implementation. This initiative, funded through the N.C. State Legislature and the National Fish and Wildlife Foundation, awarded a total of $675,000 for county and municipal governments in CAMA counties. The Resilient Coastal Communities Program provides a phased framework to assess coastal risks and vulnerabilities, engage community stakeholders, and develop projects to strategically improve the resiliency of communities and their natural and built infrastructure.

**4.2 Using Natural and Nature-Based Features to Build Resilience to Storm-Driven Flooding** **ONGOING**

The Albemarle-Pamlico National Estuary Partnership (APNEP) continued participation with Virginia Institute of Marine Sciences (VIMS) on a NOAA-funded Coastal Resilience project which began in 2017. The project team developed a spatial analysis tool for Virginia local governments to identify opportunities and criteria for using natural and nature-based features that increase resilience to flooding and generate credits for local governments in water quality and hazard mitigation programs. APNEP is working with the project team and other partners to evaluate the tool's applicability in N.C. coastal localities as a possible extension of the guidance to areas beyond coastal Virginia. APNEP developed a scope of work to assess N.C. locality needs, build a template tool comparison database, and develop outreach materials and resources that N.C. local government staff can use to compare tools and the types of natural and nature-based features that can meet their needs. These outreach materials will promote the use of natural infrastructure to build community and ecosystem resilience, and complement outreach being conducted for the Coastal Habitat Protection Plan and by the NC Coastal Federation-APNEP led Living Shorelines Committee. APNEP has contracted with Wetlands Watch to complete this remaining phase of the project which will be completed in 2022. North Carolina participation in this effort is led by APNEP. More information can be found at: https://apnep.nc.gov/our-work/protection/using-natural-and-nature-based-features-build-resilience-storm-driven-flooding and https://www.vims.edu/ccrm/research/climate_change/adaptation/nnbfs/index.php .

***5. Conserve forest lands through easements and acquisition.***

**5.1 North Carolina Forest Service Land Acquisitions and Forest Legacy Easements** **ONGOING**

The North Carolina Forest Service manages state forests primarily for protection of unique natural communities and cultural resources, forestry research and demonstration, wildlife protection and watershed protection. In 2021, NC Forest Service worked with partners to acquire forest lands at:

- Bladen Lakes State Forest: 445-acre donation from The Nature Conservancy serves as a critical wildlife and Threatened and Endangered Species corridor between Suggs Mill Pond Game Lands and Bladen Lakes State Forest.
- Balsam Range Forest Legacy Project: 710-acre acquisition adds to the protection of 3,765 acres of working forestland in the Plott Balsam Mountains. The project offers multiple-use trails, trout streams open to the public, and hunting opportunities in western North Carolina. Maggie Valley, Sylva, and Waynesville will be connected, and more than 30 miles of streams, 13 rare natural communities, and documented occurrences of two federally endangered species and six federal species of concern will be protected through this project.

- Walthour-Moss Conservation Easement: Forest Legacy Project adds 2,198 acres of well managed natural longleaf pine forest to an overall project area total of 3,946 acres of working forestland. This Moore County project was awarded a USFS Regional Forester's Award in October 2021. A conservation easement donation from the Walthour-Moss Foundation made this project possible.

***6. Modernize forest policy and tax incentives.*** **RESEARCHING**

Stakeholders and partners are researching forest policy and tax incentives that could help enhance and protect Natural and Working Lands.

***7. Expand restoration efforts on publicly owned lands.***

**7.1 NC Land and Water Fund Stream Restoration Projects** **ONGOING**

The North Carolina Land and Water Fund (NCLWF) was described in section 1.1. An example stream restoration project that was funded by NCLWF in 2019 and completed in 2021 was restoration of almost 2,500 feet of tributaries to Grassy Creek in Surry County. Surry County Soil and Water Conservation District partnered with Pilot Mountain State Park and Resource Institute to restore an eroding, degraded channel to a natural, stable system with excellent aquatic habitat. This reduces the sediment loading to Grassy Creek and Yadkin River and established permanently protected vegetated streamside buffers along the creek corridor within Pilot Mountain State Park. The project also stabilizes trail stream crossings to improve public safety and reduce erosion within the park. Overall, the Grassy Creek Restoration Project maximizes water quality improvements by connecting to protected and restored areas up- and downstream of this project, creating a continuous riparian buffer, and enhancing water quality entering Grassy Creek and the Yadkin River.

**7.2 Case Studies using Natural and Working Lands Information** **COMPLETED**

Researchers at the Duke University Nicholas Institute for Environmental Policy Solutions have worked with Jordan Lake One Water (JLOW) and the NC Land and Water Fund (NCLWF) to develop case studies using information from datasets related to carbon, resilience, and ecosystem services originally developed for the 2020 Action Plan. For JLOW, the research team created a slide deck summarizing the current and potential ecosystem services (including carbon storage and resilience-related services) of natural lands in the Jordan Lake watershed, including both protected and unprotected lands, to inform ongoing planning for conservation and restoration. For NCLWF, the researchers assessed the ecosystem services provided by properties protected through NCLWF and compared benefits of NCLWF properties to several other types of conserved land in NC (e.g., land preserved by state agencies or land trusts).

These case studies support organizations working to protect and restore natural lands in NC by providing information about opportunities for conservation or restoration of forests, flood prone areas, and urban areas. Therefore, this work relates to several NWL recommendations across multiple objectives, as listed below. This project is led by Duke University Nicholas Institute for Environmental Policy Solutions. Documents related to case studies will be added to the Nicholas Institute NWL project web page https://nicholasinstitute.duke.edu/project/north-carolina-natural-and-working-lands as they are finalized.

***8. Encourage restoration and reforestation on private lands.***

**8.1 Restoration Through Prescribed Burning in North Carolina** **ONGOING**

Fire is a natural part of the environment and frequently occurs throughout North Carolina. Many of our forests require fire to remain healthy and thrive. Prescribed fire is the planned use of fire under predetermined weather and fuel parameters to obtain specific management objectives. This is a critical management tool that benefits forests and wildlife and helps reduce the impact of wildfire hazards in North Carolina. Under controlled conditions, prescribed fires burn primarily the finer fuels (e.g. leaves, twigs) of a forest. Prescribed fires are planned to be conducted during weather conditions that allow smoke to disperse quickly. This reduces the probability of catastrophic wildfires, which can consume much greater amounts of fuel, releasing carbon dioxide as biomass and soils are burned, and exposing human communities to potentially harmful quantities of smoke. In State Fiscal Year 2021, the North Carolina Forest Service of the Department of Agriculture and Consumer Services conducted 834 prescribed burns on 88,829 acres of public and private land. Within the North Carolina Department of Natural and Cultural Resources, the Division of Parks and Recreation (State Parks) conducted 70 prescribed fires on 15 parks and natural areas totaling 5,708 acres.

In 2021, the N.C. General Assembly allocated additional funds to the NC Forest Service for a prescribed burning matching cost-share program. Time-limited funding is available for this program for approximately 2 years at $1 million per year. Eligible practices include the following types of prescribed burning:

Silvicultural Burning – The use of prescribed fire to prepare areas for natural pine or oak regeneration, pre-commercial thinning to reduce competing tree density of undesirable species and the use of prescribed fire to manage for insects or disease concerns to promote forest health.

Hazard Reduction Burning – The use of prescribed fire for the purpose of mitigating forest fuels to reduce the risk from potential damage from wildfires.

Wildlife Habitat Burning – The use of prescribed fire for the purpose of maintaining or creating improved forest, or open field conditions for desired plants, species, and habitat.

Funds provided by the program must be matched by funds from the landowner or other non-State sources. For more information, contact North Carolina Forest Service Technical Development & Planning Branch.

**8.2 Forest Establishment - Tree Planting** **ONGOING**

The NC Forest Service (NCFS) has been dedicated to the protection, conservation and stewardship of North Carolina's forests for more than a century. Through the Forest Development Program, Florence Restoration Fund, and other sources, the NC Forest Service allocated $5.81 million in State Fiscal Year (SFY) 2021 and $4.45 million in SFY 2020. In SFY 2021, this investment resulted in 62,681 acres of forest establishment on private lands with NCFS technical and financial assistance. For more information, contact Technical Development & Planning Branch North Carolina Forest Service.

***9. Increase landowner access to forest management technical and financial assistance.***

**9.1 NC Forest Service Forest Management Program** **ONGOING**

NC Forest Service offers a wide variety of forest management programs and services that can help landowners become more knowledgeable about their woods as well as their options. NC Forest Service Foresters and Rangers work one-on-one with landowners to prepare woodland plans that are tailored to the landowner's unique management goals and the features of the property. Highlights from 2021 include:

- 4,662 Woodland Management Plans prepared on 227,964 acres
- 1,696 forest protection/forest health technical assists on 83,783 acres
- 587 landowners implemented forest stand improvement on 16,829 acres
- 7,128 water quality inspections were conducted on 161,191 acres
- Forestry cost-share funding allocated to landowners in SFY 2021:
    - Forest Development Program: $2.21 million
    - Florence Reforestation Program: $3.6 million
    - Southern Pine Beetle Prevention Program: $196,901

**9.2 North Carolina Forest Service and American Forests Carbon Sequestration Partnership**

The NC Forest Service (NCFS) and American Forests entered into a memorandum of understanding in September 2021 to work together for planting trees to sequester carbon on public and private lands in NC; improving NCFS-managed State Forests and Educational State Forests; and strengthening/expanding NCFS tree seedling nursery capacity. A notable outcome will include the planting of at least 750,000 tree seedlings on public and private lands in NC. Details of this 3-year, $375,000 agreement, made possible by an anonymous donation, include:

- Years 1 & 2 - $100,000 tree planting cost-share to private landowners and $25,000 for tree planting and forest stand improvements on state forests, each year.
- Year 3 - $100,000 for NCFS tree seedling nursery capacity investments and $25,000 for tree planting and forest stand improvements on state forests.

For more information, contact North Carolina Forest Service Technical Development & Planning Branch.

***10. Support the wood products markets.***

**10.1 North Carolina Forestry Best Management Practices Manual Update COMPLETED**

The North Carolina Forestry Best Management Practices (BMP) Manual describes measures and actions that should be implemented to protect water quality and conserve soil when conducting forestry/silviculture operations. Using BMPs can help to comply with the N.C. Forest Practices guidelines Related to Water Quality and other required standards. The manual was revised by the North Carolina Forest Service in 2021, including new chapters on Connecting Resilience and Forestry BMPs and Threatened and Endangered Species. The corresponding BMP field guide will be revised in 2022. Information in the Manual may be used to support many of the recommendations in the 2020 Action Plan, including all of the Forest-related topics. More information about the manual is available online at:
https://www.ncforestservice.gov/water_quality/bmp_manual.htm .

**10.2 North Carolina Forest Service Forest Inventory & Analysis (FIA) and Timber Product Output Programs**

Through a partnership with the US Forest Service, the NC Forest Service (NCFS) collects field data on more than 5,000 permanent plots across the state on a 5-year cycle. FIA data has been collected in NC since the 1930s. This data provides information on the status and trends of North Carolina's forests: how much forest exists, where it exists, who owns it, and how it is changing, as well as how the trees and other forest vegetation are growing and how much has died or has been removed in recent years. This information can be used in many ways, such as in evaluating wildlife habitat conditions, assessing the sustainability of ecosystem management practices, and supporting planning and decision-making activities undertaken by public and private enterprises.

NCFS also conducts an annual Timber Product Output (TPO) survey of the primary forest products industry in NC to estimate industrial and non-industrial uses of roundwood. Questionnaires are designed to determine location, size and types of mills, and the volume of roundwood received by product, species and geographic origin. TPO is also used to determine the volume, type and disposition of wood residues generated during primary processing. FIA and TPO data form the foundation for determining existing forest carbon stocks, sequestration rates and carbon stored in harvested wood products, and is used in Greenhouse Gas Inventory monitoring and reporting.

**10.3 North Carolina Forest Service Forest Markets & Utilization Program**

The NC Forest Service (NCFS) maintains databases of primary and secondary forest product manufacturers in the state as well as buyers of standing timber, log exporters and specialty wood processors. NCFS also assists in forest-based economic development efforts to support new forest industry investments in NC. NCFS also conducts timber supply and forest sustainability assessments which are used in forest industry recruitment/expansion.

***11. Coordinate the State's floodplain buyout and restoration program to increase resilience.***

**11.1 Removing buildings from the floodplain** **UNDERWAY**

The North Carolina Office of Recovery and Resiliency (NCORR) administers the ReBuild NC Strategic Buyout Program, which is a voluntary program through which NCORR purchases properties that are at-risk for flooding and turns them into deed-restricted greenspace. NCORR works with local governments and communities to identify contiguous areas that are good fits for the program, and the program offers generous financial incentives to encourage property owner applicants to move to places that are less at-risk for flooding. Since the program began accepting applications in January 2020, 184 property owners have applied for the program. ReBuild NC is made possible through U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) and Community Development Block Grant – Mitigation (CDBG-MIT) funding.

**11.2 Mapping Sea Level Rise Impacts on NC Coastal Habitats and Blue Carbon** **COMPLETED**

Researchers at Duke University Nicholas Institute for Environmental Policy Solutions have updated and extended the coastal habitat projections and blue carbon estimates originally done for the 2020 Action Plan. Projections of seagrass loss due to increased water depth have been added, and carbon estimates now include a more complete picture of carbon sequestration and emissions from habitats

such as forests and freshwater wetlands in the transition area (low-lying coastal area that may convert to salt marsh due to sea level rise). The team developed maps of the NC coastal area showing existing and projected coastal blue carbon habitats (salt marshes and seagrasses) and other habitats in the transition area that is projected to convert to marsh or open water due to sea level rise, and state-level estimates of carbon sequestration and emissions in the coastal area over the next 100 years, with and without sea level rise effects on habitats. After finalizing the analysis, updates will be added to the NWL Coastal Habitats StoryMap, at:
https://storymaps.arcgis.com/collections/2154ab2816674f7d8c7429fe87f48830?item=4.

This work supports many of the land use sectors recognized in the 2020 Action Plan by updating coastal habitat and carbon models and providing carbon sequestration and emissions estimates for coastal and low-lying areas likely to convert to marsh due to sea level rise. The analysis has also been used in the 2021 NC Coastal Habitat Protection Plan update. This project is led by Duke University Nicholas Institute for Environmental Policy Solutions.

***12. Rewet hydrologically altered peatlands to prevent soil loss and catastrophic fire.***

**12.1 Mapping pocosin status and restoration potential** **COMPLETED**

Pocosins are naturally occurring evergreen shrub-dominated freshwater wetlands of the Southeastern Coastal Plain with deep, acidic, sandy, peat soils. North Carolina contains the world's largest acreage of pocosins. Proper management of pocosins has the potential to sequester significant amounts of carbon while decreasing the risk of catastrophic fire on these lands. According to the 2020 Action Plan, about 250,000 acres of drained pocosins are in public ownership. Researchers at Duke University Nicholas Institute for Environmental Policy Solutions have updated maps of NC pocosin status; existing maps were created by NC Division of Coastal Management in 1999 using data from the 1980s-1990s. Updated maps classify pocosin areas by their hydrology (drained or undrained) and vegetation (cleared or intact), based on data currently available. The team received input from some members of the pocosins subcommittee and maps were presented for additional feedback during a series of meetings. The updated maps can be used to identify pocosin areas that may be suitable targets for restoration given their hydrologic or vegetation status. Overlaying the pocosin maps with land ownership information can identify restorable pocosin areas on state-owned or conservation lands. This next step is a high priority for the coming year. This project is led by Duke University Nicholas Institute for Environmental Policy Solutions. The new maps are available online at:
https://dukeuniv.maps.arcgis.com/apps/webappviewer/index.html?id=a52bb5da376f4699adc4f9514a39fb56
Better maps of peat depth, more accurate carbon estimates, and additional data could help prioritize restoration and conservation; partners will continue to search for funding to research this information.

**12.2 Restoring Pocosin Hydrology to Improve Flood Resiliency and Wildlife Habitat in Southeastern North Carolina** **ONGOING**

The North Carolina Wildlife Resources Commission is participating with partners in a three-year project to restore pre-drainage conditions in 6,500 acres of ditched and drained pocosin habitat. The total project involves a pre-implementation hydrology monitoring period to determine baseline

conditions followed by a construction phase involving placement of water control structures. Refining water level management to accommodate the water pulses associated with flood and drought events will continue several years after the implementation phase. The primary purpose is to increase environmental resilience to flooding associated with hurricanes that threaten downstream human communities. Secondary benefits include improving quality of pocosin and other associated wetland habitats; arresting the soil subsidence associated with breakdown of dewatered organic soils; mitigating potential negative impacts to the soil profile, plant communities and ambient air quality, as a result of prolonged soil combustion from wildfire events on dewatered organic soils; enhancing ability to apply prescribed fire for habitat and risk management; and, preserving carbon sequestration within organic soils. While the restoration methods have been applied elsewhere in coastal North Carolina, other sites have been in the lower reaches of a watershed. The Angola Bay project is unique for its location in a headwaters section with results to serve as a model for future hydrology restoration in similar landscape positions. Study Location: Angola Bay Game Land, Pender County. Project Status: Year 1 of 3. This project is led by North Carolina Wildlife Resources Commission, The Nature Conservancy, and Kris Bass Engineering.

***13. Reforest peatlands with Atlantic White Cedar.***

NWL Stakeholders and partners are currently researching opportunities for restoration of Atlantic White Cedar in appropriate areas.

***14. Enhance soil health and retention on working peatlands via best management practices and drainage management.***

NWL Stakeholders and partners are currently researching opportunities for implementing best management practices and drainage management at farms and forests in former pocosin areas.

***15. Implement Targeted Interventions to Protect Peatlands from Sea Level Rise and Saltwater Intrusion Guided by Scenario-based Modeling***

**15.1 Scuppernong Regional Water Management Study** **UNDERWAY**

The Albemarle-Pamlico National Estuary Partnership (APNEP) is collaborating with NC State Parks, NC Soil and Water Conservation, US Fish and Wildlife Service, and Washington and Tyrrell Counties on a hydrologic study of the northern Albemarle-Pamlico peninsula. Washington County was awarded a planning grant from the Water Resources Development Fund to conduct the study. APNEP is assisting with convening technical partners and stakeholders, grant application preparation, and securing partners and match for the project. APNEP will continue working with these local governments, who have requested assistance from the state with technical and grant administrative capacity to address flooding and resilience planning, to conduct a hydrologic study of the headwaters of the Scuppernong River, Lake Phelps, and the surrounding land. The outcomes from the study will be utilized to build a more comprehensive approach to regional water management in order to create a water budget for the northern Albemarle-Pamlico peninsula, which has been experiencing cycles of flooding and drought in an area that is highly vulnerable to sea level rise. APNEP is participating in a North Carolina Resilient Communities Program called Regions Innovating for Strong Economies and Environment Program (RISE) developed in a partnership between NC Office of Recovery and Resilience and the NC Rural Center.

***16. Provide incentives to stakeholders for coastal habitat protection.***

Several living shoreline projects were implemented or funded in 2021, many with help from NC Land and Water Fund and NC Coastal Federation. Living shorelines meet several 2020 Action Plan Objectives, including:

1. Develop and implement coastal restoration projects utilizing the best available siting tools and methods to support coastal habitat restoration and protection for coastal resilience and carbon sequestration.
2. Research the capability of oysters and other coastal habitats to protect and enhance adjacent coastal habitats that sequester carbon and increase coastal resilience.
3. Education and shared learning.

**16.1 Living Shoreline Training for Marine Construction Professionals** **COMPLETED**

To increase the knowledge of living shoreline construction practices among marine contractors, engineers, environmental consultants, and regulators, NC Coastal Reserves, North Carolina Coastal Federation, and North Carolina Sea Grant partnered to offer a training course focused on living shoreline design for typical structures in residential settings along North Carolina's estuarine shorelines. The workshop combined three online classroom sessions with on-the-ground field training.

**16.2 Cherry Point Marine Base Living Shoreline Project** **UNDERWAY**

Researchers at Duke University and NC Coastal Federation are partnering with Cherry Point Marine Base and the Pew Foundation to establish 8,100 linear feet of living shoreline for coastal protection and habitat enhancement, develop best practices, and share information with future projects. Outcomes are expected to include reduced storm impacts to Cherry Point base, possible reintroduction of oysters into the area, enhancement in fish habitat and water quality improvement, increase in carbon sequestration, and future living shoreline projects informed by this project. Project team members include Duke University Nicholas Institute for Environmental Policy Solutions.

**16.3 Submerged Aquatic Vegetation (SAV) Mapping, Monitoring, and Economic Valuation** **COMPLETED**

The Albemarle-Pamlico National Estuary Partnership (APNEP) worked with an interdisciplinary team of researchers at NC State University and Duke University to research and publish a report that estimates the market and nonmarket economic losses from declines in submerged aquatic vegetation (SAV) in the Albemarle-Pamlico estuary. Focusing on the losses to commercial and recreational fisheries, residential property values, and carbon sequestration, the team conservatively estimates aggregate losses of $1,290 per acre over the next decade. The final report can be found at: https://apnep.nc.gov/documents/files/publications/2021-economic-valuation-sav-albemarle-pamlico-estuary and https://apnep.nc.gov/our-work/monitoring/submerged-aquatic-vegetation-monitoring . This work builds on previous work contracted with RTI International to conduct an economic valuation of the natural resources of the watershed, available online at https://apnep.nc.gov/media/296/download?attachment . These findings should improve policy and decision makers' understanding of the value of ecosystem services provided by the natural resources of the Albemarle-Pamlico region, consistent with the objectives and actions outlined in APNEP's 2012-22 Comprehensive Conservation and Management Plan.

APNEP's SAV Team continued to lead efforts to map and monitor SAV. A summary of efforts conducted in 2021 is highlighted below; more details and information can be found in APNEP's annual workplan and report to EPA:
https://apnep.nc.gov/resources/publications-and-reports/governance-guidingdocuments

- SAV Integrated Monitoring Plan: With the input of APNEP's Science and Technical Advisory Committee (STAC), APNEP staff developed a proof-of-concept Integrated Monitoring Plan whose initial scope focused on coastal submerged aquatic vegetation (SAV) and estuarine water quality factors that impact coastal SAV. The plan was accepted by the Leadership Council on March 11, 2021.
- SAV Metric Report: APNEP published a report showing a net loss in the extent of high-salinity submerged aquatic vegetation (SAV) habitat in North Carolina's sounds between 2006-2008 and 2013. While the data also confirm that the state possesses the largest acreage of seagrass along the east coast of the United States, around 100,000 acres, the overall extent of seagrass meadows in the Albemarle-Pamlico estuary decreased by 5,686 acres or 5.6% despite the availability of suitable habitat for expansion of the resource. Seagrass is declining worldwide; North Carolina is experiencing annual rates of seagrass loss at or below the global average.
- SAV Map Data Collection: During 2020-2021 APNEP coordinated with the N.C. Department of Transportation and other partners on the APNEP SAV Team to gather SAV data via aerial imagery and boat-based surveys. In addition to this information supporting the creation of an updated map of high-salinity SAV (seagrass) for the Albemarle-Pamlico Estuarine System, this effort in 2021 marked the initial implementation of APNEP's monitoring plan by focusing on several indicator metrics reflecting the condition of the region's coastal SAV resource. These efforts were coordinated by Albemarle-Pamlico National Estuary Partnership. More information can be found at the SAV Story Map: https://storymaps.arcgis.com/stories/12322fb3c13e42eaabda6f6111743e43.

***17. Facilitate migration of coastal habitats through protection of migration corridors.***

Coastal habitat migration corridors refer to natural areas that are likely to change over time due to sea level rise. Keeping these coastal natural areas in an unspoiled condition allows marshes and swamps to respond to changes in salinity and rising water. When habitat migration corridors are conserved, natural communities respond to environmental changes and animals are allowed to migrate to find suitable habitat. Alternatively, coastal development, pavement, roads, and buildings interrupt these natural migration corridors and prevent the ecological adaptation process from taking place.

**17.1 Battleship USS North Carolina – Living with Water** **UNDERWAY**

In its coastal setting, Battleship North Carolina is a sentinel site for climate change. It has witnessed a 770% increase in tidal flooding over the last decade. Rising sea levels interrupt visitation, create safety and operational hazards and degrade the State's water quality and fragile coastal habitats. The Battleship's Living with Water flood mitigation and resiliency project will: 1) install an intertidal

living shoreline at an actively eroding section of the berth to help protect the site, 2) create an estuarine wetland and tidal creek in a portion of the parking lot most subject to chronic flooding to restore a coastal habitat migration corridor, 3) elevate the remaining parking area above the measured tide flood level, and 4) deliver public education messages on building climate change resiliency in response to coastal conditions. Living with Water, a $4M engineered solution to rising sea levels, is supported by $2.3M in state and federal grants, including NC Land and Water Fund, and a $700K contribution in Battleship revenues.

***18. Prioritize addressing climate change and sea level rise in coastal habitat restoration planning.***

**18.1. Rachel Carson Reserve Habitat Resilience Plan** **UNDERWAY**

The Division of Coastal Management is developing a habitat resilience plan for its Rachel Carson Reserve that identifies and prioritizes areas for resilience projects based on known vulnerabilities and hazards. The plan is funded by the National Fish & Wildlife Foundation with match from the NC General Assembly. The project team is currently synthesizing resources such as research studies, historical records of environmental change, and other applicable data and tools into a knowledge base to inform the resilience planning effort. The knowledge base will be hosted on an ArcGIS Hub site and provided to collaborators. The project team convened a meeting with stakeholders and partners (e.g., local governments, academia, environmental NGOs) in September of 2021 to identify and prioritize areas and habitats at the Rachel Carson Reserve for restoration and/or enhancement actions. The project team is also analyzed habitat and shoreline change at the Reserve over the last few decades to inform the prioritization process and contribute to the knowledge base.

To inform this project and facilitate sharing, Coastal Reserve staff hosted the Coastal Protected Lands Environmental Resilience Workshop on December 8, 2020, at which land managers discussed implementing resilience-related projects on coastal protected lands, including presentations of case studies of such projects that are in progress and a discussion of barriers to implementation of such efforts. The workshop group will reconvene in early 2022 for a presentation on the completed Rachel Carson Habitat Resilience Plan. Updates on existing projects or new efforts relating to improving resilience of managed lands will also be shared, and the opportunity to form a Community of Practice for coastal protected land managers will be revisited.

This project is led by the North Carolina Coastal Reserve and National Estuarine Research Reserve within the N.C. Department of Environmental Quality Division of Coastal Management, stakeholders, and partners.

**18.2. Research and Monitoring to Enhance Resilience** **UNDERWAY**

The Division of Coastal Management conducted applied research on techniques to enhance resiliency at Coastal Reserve sites and in coastal N.C. such as thin layer deposition and living shorelines, and continued monitoring environmental conditions, species, and habitats at Coastal Reserve sites to better understand change. The Reserve's NOAA Margaret A. Davidson Fellow is researching the impacts of sea level rise on wintering populations of vulnerable saltmarsh sparrows to inform future habitat and species management strategies. Monitoring and research such as this help inform coastal planning efforts by providing information about what changes are taking place and viable mitigation strategies.

***19. Promote urban forests through statewide programs to foster the retention of urban trees and their proper management.***

**19.1 Urban & Community Forestry (U&CF) Education & Outreach** **ONGOING**

NC Forest Service Urban and Community Forestry Program partnered with the NC Urban Forest Council and North Carolina State University Extension to provide education and training to municipalities and the public. In 2021, 11 urban and community forestry educational events drew 753 attendees and 3 workforce development events reached 95 attendees. Accomplishment measures reported for 2021 include:

- 5.6% of municipalities have Managing U&CF programs
    - 54.4% of NC population live in Managing U&CF communities
- 18.2% of municipalities have Developing U&CF programs
    - 26.1% of NC population live in Developing communities
- 10.6% of municipalities have active urban and community forestry management plans
- 17% of municipalities have professional urban and community forestry staff
- 31.6% of municipalities have ordinances or policies focusing on planting, protection, and maintenance of their urban forest
- 10.6% of municipalities have active urban and community forestry management plans
- 22.9% of municipalities have local urban and community forestry advocacy/advisory committees or organizations.

More information may be found at: https://ncforestservice.gov/Urban/Urban_Forestry.htm and https://www.ncufc.org/ .

**19.2 Community Forestry Initiative** **ONGOING**

The Community Forestry Initiative (CFI) is an effort to increase the level of Urban & Community Forestry service and program delivery to NC municipalities. NC Forest Service District staff provide training, tools, information, and technical assistance to deliver services to municipal customers. 2021 Accomplishments include: 1,164 Urban & Community Forestry technical assists provided to communities and landowners, 51 municipalities provided technical assistance, 83 municipalities awarded Tree City USA designation, 13 Colleges & Universities awarded Tree Campus Higher Education USA designation, and 5 utilities awarded Tree Line USA designation. This effort is led by Urban and Community Forestry Program within the N.C. Forest Service. More information can be found at: https://ncforestservice.gov/Urban/Urban_Forestry.htm.

***20. Protect and restore forested lands in water supply watersheds.***

**20.1 NC Trees & Storms; Readiness, Response & Recovery (3Rs)** **ONGOING**

NC Forest Service partnered with the NC Urban Forest Council and North Carolina State University Extension to provide education and technical assistance to homeowners and municipalities in storm preparedness, response and recovery. Three municipal training webinars drew 173 attendees and two (2) homeowner webinars draw 333 attendees in 2021. Publications include two storm readiness and response audio/video Public Service Announcements, three municipal "3Rs" best management practices publication, one professional Storm-Damaged Tree Assessment best management

practices publication, and two homeowners best management practices publications. This project is led by the Urban and Community Forestry Program within the N.C. Forest Service, along with NC State University Forestry Extension. More information may be found at: https://www.ncforestservice.gov/treesandstorms.htm.

***21. Improve site preparation and soil amendment during land development.*** **RESEARCHING**

The Urban Lands Committee is researching mechanisms and construction project best practices for maintaining healthy soils that support landscaping and water and carbon retention.

***22. Research urban forestry climate adaptation and canopy baseline needs.*** **RESEARCHING**

**22.1 Literature Review on the Ecological Functions and Human Benefits of Urban Forests** **COMPLETED**

NC Forest Service Urban & Community Forestry (U&CF) Program partnered with Alliance for Cape Fear Trees, University of North Carolina Wilmington, and the Wilmington Tree Commission under a grant to complete a literature review on the ecological functions and human benefits of urban forests and share with stakeholders.

***23. Encourage adoption of high mitigation agricultural conservation practices on croplands and pasturelands***

High mitigation agricultural conservation practices refer to farming techniques that help conserve soil and enhance underground carbon storage in organic material. Examples include planting cover crops and no-till farming.

**23.1 Carbon Farm Planning** **UNDERWAY**

The North Carolina Foundation for Soil and Water Conservation is partnering with seven teams across the state to expand opportunities for agricultural resilience at the farm and community level by testing ways to increase carbon cycling in southeastern production systems. The teams include Soil and Water Conservation Districts, Natural Resource Conservation Service (NRCS) Division of Soil and Water Conservation, USDA- Agricultural Research Service, NC State University Amazing Grazing, Carbon Cycle Institute, Sustainable Forestry and Land Retention Project through the Roanoke Center, and champion farmers. The project focuses on evaluating North Carolina production systems through the lens of USDA's COMET-Farm to inform conservation adoption, specifically soil health management systems. Model farms participating in the pilot project range from row crops, agritourism, livestock and pasture management (cows and goats), to silvopasture and agroforestry. Funded project partners are training 40 technical staff on the use of COMET-Farm and Carbon Farm Planning. Outreach activities include online engagement on social media platforms and field days in 2022. Funding is provided by grants from USDA Sustainable Agricultural Research and Education, NC Agriculture Development and Farmland Preservation Trust Fund, and USDA Natural Resources Conservation Service Conservation Collaboration Program. More information may be found online at https://ncsoilwater.org/programs/agriculture-resilience-carbon-farm-planning/.

**23.2 Multi-Species Cover Crop Initiative** **COMPLETE**

The NC Foundation for Soil and Water Conservation partnered with five Soil and Water Conservation Districts and champion farmers to pilot multi-species cover crops on-farm.

Participants planted farm plots for cover crops utilizing a combination of cereal rye, daikon radish, hairy vetch, crimson clover, Austrian winter peas, and oats. Four of the farms grow traditional row crops (corn, soybean, wheat, tobacco, sweet potatoes) and one farm is pastured cattle (annual rye and millet rotation). The purpose of the project is to demonstrate the use of multi-species cover crops to reduce erosion and increase soil health, soil-water holding capacity, and soil organic matter. Funding for this project is provided by an EPA Region 4 Environmental Education grant. More information can be found online at https://ncsoilwater.org/programs/soil-health-cover-crops/.

***24. Improve manure management on farms.*** **RESEARCHING**

Stakeholders and partners are researching manure management strategies that could reduce greenhouse gas emissions.

***25. Encourage food system efficiency through reduced food loss and waste.*** **RESEARCHING**

Stakeholders and partners are researching food system practices that could help reduce greenhouse gas emissions.

**Equitable Implementation**

One of the overall goals of the 2020 Action Plan includes ensuring that implementation of all the recommendations occurs in a way that is socially equitable. Environmental justice and equity applies to all of the recommendations in the 2020 Action Plan. In order to help stakeholders promote equitable implementation, an Equity Committee was formed in 2021. The Committee's first action was to organize a training session designed to educate participants in basic concepts of environmental equity and how it applies to NWL work. Next steps for the Committee will be to review the recommendations in Executive Order 246 and engage with environmental justice and equity leads from participating cabinet agencies to share and coordinate related activities, best practices, and relevant data. Further information and recommendations will be provided to all NWL Stakeholders.

**Looking Ahead**

Overall, in 2021, numerous new and ongoing programs led by government and private organizations supported the 2020 Action Plan. This report captures only a snapshot of activities and accomplishments, based on reports submitted by Committee members. Many more conservation, restoration, and land management activities across North Carolina contributed to implementation of the 2020 Action Plan and benefitted natural and working lands' ability to sequester and store carbon, increase resilience in ecosystems and communities, support public health, create economic opportunities, and implement actions in a socially equitable way.

In 2022, the NWL Stakeholder Group will continue making progress on ongoing efforts described in this report by providing coordination, leadership, and a network of subject-matter experts. The NWL Stakeholders Group hopes to capitalize on recent state and federal funding opportunities to continue the momentum of implementing projects in support of the 2020 Action Plan recommendations and tracking progress on public and private efforts. Further, the group will determine existing information/data gaps, resource needs, and if additional partners/stakeholders are needed to collaborate on specific needs.

Some priorities for 2022 include:

Land Conservation and Management:

- Conservation of public and private forests, farms, and natural areas across North Carolina
- Participation in the South Atlantic Salt Marsh Initiative, to conserve coastal lands
- Restoration of pocosin ecosystems on public and private conservation lands
- Promoting Best Management Practices for forestry and farms, to enhance carbon sequestration and storage aboveground and in soils
- Researching, fostering, and supporting voluntary participation in carbon offset programs

Planning:

- Development of the first North Carolina Flood Resiliency Blueprint
- Implementation of the 2021 Coastal Habitat Protection Plan Amendment
- Planning creation of the online NC Resilience Clearinghouse
- Cooperation with Executive Order 246, including participation in a pathways analysis to better understand how high priority actions contribute to statewide emission reductions goals
    - Identify metrics most useful for tracking progress
- Working with Environmental Justice and Equity leads in Cabinet agencies to identify strategies for equitable implementation of the 2020 NWL Action Plan

More information and updates can be found at the Natural and Working Land website at: https://www.ncnhp.org/nwl/natural-and-working-lands

**Appendix A**

**2021 North Carolina Natural and Working Lands Stakeholder Group Participating Organizations**

| Affiliation |
|---|
| Albemarle-Pamlico National Estuary Partnership (APNEP) and APNEP Leadership Council |
| Appalachian State University |
| Audubon NC |
| Carolina Wetlands Association |
| City of Asheville |
| City of Raleigh |
| Conservation Trust for North Carolina |
| Cultivating Resilience, LLC |
| Duke University Nicholas Institute for Environmental Policy Solutions |
| Environmental Defense Fund |
| NC Department of Agriculture & Consumer Services, North Carolina Forest Service and Environmental Programs |
| North Carolina Department of Commerce |
| North Carolina Department of Environmental Quality, Division of Marine Fisheries and Division of Coastal Management |
| North Carolina Department of Natural and Cultural Resources |
| North Carolina Farm Bureau |
| North Carolina Foundation for Soil and Water Conservation |
| North Carolina Governor's Office |
| North Carolina Sea Grant |
| North Carolina Urban Forestry Council |
| North Carolina Wildlife Resources Commission |
| NOAA National Ocean Service |
| North Carolina Forestry Association |
| North Carolina State University |
| Research Triangle Institute |
| Resource Management Service, Inc |
| The Nature Conservancy |
| Triangle J Council of Governments |
| USDA Southeast Climate Hub |
| Wake County |
| Wake County Extension |