North Carolina
Natural and Working Lands Action Plan

Turnball Creek Educational State Forest in Bladen County. (Photo courtesy of North Carolina Forest Service)

June 2020

Executive Summary

The purpose of the North Carolina Natural and Working Lands Action Plan (referred to as the NWL Action Plan) is to identify and create opportunities and outline specific projects for North Carolina's natural and working lands (NWL) that sequester carbon, build ecosystem and community resilience, provide ecosystem benefits, and enhance our economy. This action plan can be used by 1) public and private landowners and managers; 2) impact partners such as universities, nonprofit organizations, corporations, land-use consultants and investors; and 3) federal, state and local planners, and policymakers to facilitate meeting North Carolina's goals identified under the plan.

This plan seeks to identify and prioritize short-term, cost-effective, and pragmatic solutions, as well as identifying longer-term actions that require more effort and funding, including potential legislative or programmatic changes. The writers also see this plan as a "living document" with periodic updates and progress reports. The NWL Action Plan is North Carolina's initial response to the increasing challenges facing our state.

Development of the Plan

The North Carolina Department of Environmental Quality (DEQ) convened a group of expert stakeholders to explore potential opportunities within the NWL sector to mitigate climate change. The stakeholders were asked to develop specific actions the State and others could take. The stakeholders first developed a set of goals for the action plan that reflect their shared values.

NWL Action Plan Goals

- Enhance the ability of NWL to sequester carbon and mitigate GHG emissions.
- Build resilience in ecosystems and communities to climate-related natural disasters.
- Provide public health and ecosystem co-benefits.
- Create economic opportunities for agribusiness, recreation, and tourism.
- Ensure implementation of any action is a socially equitable process.

In order to develop recommendations, the stakeholders formed subcommittees that would focus on a particular land sector. Close to 100 people participated in the NWL subcommittees, developing and vetting recommendations for the NWL Action Plan over the course of 2019.

NWL Subcommittees

1. Forestry
2. Floodplains & Wetlands
3. Pocosins[1]
4. Coastal Habitats
5. Agriculture
6. Urban Lands

The stakeholders developed recommendations by identifying and quantifying opportunities and barriers for each action as well as developing steps toward implementation.

NWL Recommendation Development

- Geographic scope
- Impacts on GHGs and resilience
- Potential co-benefits
- Required actors and resources
- Road map for action
- Examples of implementation

Recommendations

A summary of each recommendation is presented below.

Transformative Recommendations
1. Protect and restore forests and wetlands within flood prone areas. This recommendation seeks to significantly increase funding or create a funding mechanism for conservation and restoration of forest land. Conservation of 1.0 million acres of existing forest land with potential to protect against climate change impacts protects 170 MMT CO_2e of stored carbon and 1.7 MMT CO_2e that the forests sequester each year. Reforestation of 1.0 million acres would sequester 3.1 MMT CO_2e annually.
2. Facilitate voluntary landowner participation in carbon offset and ecosystem services markets. Given our potential to sequester carbon in forests and the growing carbon offset and ecosystem services markets, North Carolina should develop a state program to coordinate and encourage private landowner participation in carbon offset markets.
3. Build a multi-state NWL solutions toolbox. Establish ongoing funding for a state-supported toolbox with mapping capability that identifies the areas and communities most vulnerable to climate-related disasters and displays how NWL solutions can reduce risks and impacts.
4. Integrate climate adaptation and resiliency strategies into local government comprehensive plans. NC General Statutes, Chapter 160D should be amended to mandate that all North Carolina counties and municipalities incorporate climate adaptation and resiliency strategies into their comprehensive plan.

Recommendations for Forest Lands	
Protect	**5. Conserve forest lands through easements and acquisition**. Protecting forests from conversion to other land uses maintains our current level of carbon sequestration and resilience. Land acquisition by public agencies and nonprofit conservation organizations provides permanent protection. Increased and recurring funding of land acquisition grants by the legislature and private entities would expand the scale and rate of forestland conservation.
	6. Modernize forest policy and tax incentives. A few changes in forest policy can reduce the threat of converting forests to other land uses and maintain our current level of carbon sequestration and resilience. Modernization of forest policy includes 1) expanding aspects of the current present use value (PUV) system, 2) creating conservation tax credits, and 3) implementing a "No Net Loss" forest policy. These changes encourage landowners to retain their forestland and invest in management and

Recommendations for Forest Lands	
	restoration rather than harvesting prematurely or even selling the land for financial gain.
Restore	**7. Expand restoration efforts on publicly owned lands**. Publicly owned lands may require restoration due to 1) land use/management before its acquisition or 2) removal of invasive exotic species or diseased trees. Restoring forest lands increases aboveground storage of carbon and ecosystem services such as resiliency/water quality. Restoration should focus on publicly owned pocosin wetlands, riparian lands, and coastal zones to provide the highest carbon sequestration and resilience benefits.
	8. Encourage restoration and reforestation on private lands. Several forest management practices improve forest health, productivity, and increase carbon sequestration. However, landowner access to existing programs for assistance with these practices is limited. Additional resources are needed to 1) enroll landowners; 2) develop private forest management plans; and 3) to cost-share costs implementation of practices.
Enhance	**9. Increase access to forest management technical assistance for landowners.** A number of forest management practices strengthen forests and increase carbon sequestration. However, access to existing programs to educate and assist landowners with these practices is limited. Additional resources and funding are needed to 1) enroll more landowners 2) develop more private forest management plans and 3) to share costs of these management activities.
	10. Support the wood products markets. Landowners need a strong wood products market to provide financial incentives to actively manage their forestland. Trees store about 80 tons of carbon per acre when they are actively growing. When trees are turned into products, much of that carbon stays in those products and out of our atmosphere. Access to strong and diverse markets for forest products, especially in long-lived products such as furniture and building supplies, provides incentives for forest landowners.

Recommendations for Floodplains and Wetlands	
Protect and Restore	**11. Coordinate the state's floodplain buyout and restoration program to increase resilience.** Federal and state programs buy flood-damaged properties on a voluntary basis after natural disasters. These often result in a "checkerboard" pattern of land acquisition within communities. It is recommended that state government develop a coordinated program to utilize the buyout processes to create functional floodplain areas and greater resilience. Connected, natural, permeable floodplains build flood resilience within at-risk communities while reducing costs for local governments and sequestering carbon. Local governments can create parks, trails, and greenways in floodplains, returning these areas to productive use and enhancing communities. The program should include farmland and be tied to the local planning process.

Recommendations for Coastal Habitats	
Protect	**12. Provide incentives to stakeholders for coastal habitat protection**. Protecting coastal habitats, such as natural shorelines, coastal wetlands, oyster beds, and submerged aquatic vegetation (SAV), through landowner incentives will provide benefits to community and ecosystem resilience and increase carbon sequestration. Providing these

Recommendations for Coastal Habitats	
	incentives can ensure protection of coastal habitats and the ecosystem services they provide. This protection will result in increased hazard mitigation and decrease costs required to repair assets and property and restore coastal habitats after major storm events.
	13. Facilitate salt marsh migration through protection of migration corridors. There is significant need for the state to facilitate conservation of migration corridors (natural areas without barriers such as development) for salt marsh, and other coastal habitats. Ensuring these migration spaces remain undeveloped is key to facilitating marsh migration with sea-level rise, and therefore preserving the coastal protection, ecological functions, and carbon benefits of North Carolina's marshes. Minimizing risk and expenses of hazard damage by ensuring protection and migration of salt marsh and other coastal habitats will increase ecosystem and community resilience.
Restore	**14. Prioritize climate change and sea-level rise in coastal habitat restoration planning**. Climate change and sea-level rise considerations need to be incorporated into planning processes for coastal habitat restoration by state, federal, and local governments. Currently, federal habitat restoration programs consider the impacts of climate change and SLR, and North Carolina should also require these impacts be considered when planning habitat restoration projects. Improved restoration planning will allow for more targeted and cost-effective efforts that will increase coastal resilience and carbon sequestration.

Recommendations for Pocosins	
Restore	**15. Rewet hydrologically altered peatlands to prevent soil loss and catastrophic fire**. Over 70% of North Carolina's peatlands have been ditched and drained resulting in substantial loss of soil carbon, land subsidence, and increased wildfire risk. Rewetting altered peatlands, using approved and verified methods, reverses the soil carbon loss and land subsidence while increasing adaption and resilience of coastal communities/ecosystems to sea-level rise and extreme weather events. Restoration costs are relatively low and provide co-benefits in addition to those listed above. Implementation can begin immediately on tens of thousands of state-owned and private lands using the return on restoration investments that come from selling verified credits in carbon offset markets. Educating and engaging private landowners is also key.
	16. Reforest peatlands with Atlantic White Cedar. Large areas in eastern NC will be flooded by rising sea-level during the next century, resulting in major losses in plant and animal communities, some of which are rare and threatened. Healthy forests that are adapted to wetter conditions will be important for climate adaptation and resilience of eastern ecosystems. Atlantic white cedar (AWC), a historically important species classified as "threatened", occurs mostly in peatland swamps in eastern NC and does not tolerate saltwater. There is a potential for these stands to be lost unless we establish a plan and prioritize areas for mitigation plantings further inland and fund it using cost sharing programs and tax incentives.
Enhance	**17. Enhance soil health and retention on working peatlands via best management practices and drainage management**. Traditional agricultural practices and drainage on these soils result in high soil and soil carbon losses. Holistic planning of agricultural operations, water management, and adoption of existing technologies/practices, such as no-till and drainage management systems, would significantly decrease this loss. These

Recommendations for Pocosins	
	improvements maintain or even increase carbon sequestration and reduce GHG emissions. They also improve sustainability of the farms and surrounding communities in the face of climate change. Existing Natural Resource Conservation Service cost-share and state grant programs could be utilized to facilitate planning and installing systems.
	18. Implement targeted interventions to protect peatlands from sea-level rise and saltwater intrusion guided by scenario-based modeling. Artificial drainage, extensive timbering and agricultural activities have altered the natural hydrological processes of the pocosins region. These alterations increase the vulnerability of the land to salinization and eventual loss of the freshwater ecosystems. This recommendation assists stakeholders in prioritizing locations for climate change defense and adaptation of peatlands. Existing models for hydrology, saltwater intrusion and habitats can be used to predict outcomes under various management scenarios to facilitate decision-making.

Recommendations for Urban Lands	
Protect	**19. Promote urban forests through statewide programs to foster the retention of urban trees and their proper management**. The NC Forest Service's Urban & Community Forestry program should be expanded to provide hands-on assistance to NC communities to manage their urban canopy. The Forest Service already has the program in place but due to limited resources they provide mainly guidance and recommendations through a 2-person team. Staffing for this program should be expanded to at least 4-person team to assist local governments with their forestry programs and to help homeowners/landowners better manage their urban trees. Funding would be needed through the NC Department of Agriculture and Consumer Services and the NC Legislature to permanently support the new positions.
Protect and Restore	**20. Protect and restore forested lands in water supply watersheds.** Water supply watersheds already have limits on development to protect the quality and quantity of water supply systems. However, preservation and restoration of forested lands in these watersheds may mitigate the impacts of future urban and suburban population growth and water demand. Key steps include 1) facilitate regional planning, 2) prioritize areas with high hydrology/water quality benefits within the watershed, 3) implement a stakeholder approach, 4) employ new funding mechanisms, and 5) determine the appropriate agencies and authorities to implement.
Enhance	**21. Improve site preparation and soil amendment during land development**. Urban planning and development should utilize a set of best practices that include using soil with adequate organic content, maintaining tree stands in high-value habitats, planting native vegetation, maintaining streams/wetlands, and reducing impervious surface. Best practices would have many benefits including sequestering carbon and building resilience by increasing soil carbon and water capacity, and reducing soil erosion, stormwater runoff, and pollutant loading of waterways. Developers will require incentives to use BMPs and create green infrastructure, carbon sequestration, and manage stormwater for the future.

Recommendations for Urban Lands	
	22. Urban forestry climate adaptation research and urban canopy baseline needs. Research on understanding the impact of climate change on urban forests and ecosystem services is still needed. This includes 1) developing a template for canopy studies for each region, 2) compiling existing urban tree canopy assessments into a database, 3) funding additional urban tree canopy assessments and inventories. This research would allow for state-level management and priority setting for urban forests.

Recommendations for Agriculture	
Enhance	**23. Encourage adoption of high mitigation agricultural conservation practices on croplands and pasturelands**. The adoption of conservation practices that produce GHG mitigation co-benefits has been dominated by conservation tillage (69%) in North Carolina; however, other well-established practices also have a substantial potential to mitigate GHG emissions through biological carbon sequestration in croplands and pasturelands. Adopting these practices conserves farmland by increasing the productivity/profitability of farms, restoring soil health, and enhancing climate resilience of agricultural businesses and rural communities. The existing network of Soil and Water Conservation districts is well-positioned to promote these practices; however, these programs are chronically underfunded. Additional funding from the Legislature and/or other public and private sources would increase the adoption of these practices by North Carolina farmers.
	24. Improve manure management on North Carolina farms. This recommendation focuses on installing anaerobic digesters with methane capture coupled with combustion of the methane either on-farm or off-farm for energy recovery. This approach is a near-term, cost-effective management system that will lead to substantial GHG emission reductions. However, RTI International is currently tasked with studying the costs, impacts, resilience, and equity of large-scale implementation of off-farm use of renewable natural gas (RNG). The outcome of this study will determine the feasible of off-farm RNG across the state. In the long-term, alternative non-methane generating manure management systems and add on technologies to further reduce pollutants should be explored and supported by the state and its impact partners.
	25. Food system efficiency through reducing food loss and waste. Food loss/waste occur at the farm, within the supply chain, during processing, at retail stores and food service facilities, and with the consumer. There are various options for reducing this loss and waste including field gleaning, tax credits for donations, farm to food bank initiatives, redirecting waste from landfills to animal feeding or composting. Developing coordinated mechanisms, creating new strategies, and educating stakeholders to address food loss/waste will be required to realize the GHG mitigation potential of reducing food loss and waste.

Implementation

Implementation of these recommendations and other nature-based solutions requires a focused commitment of both financial and human capital from North Carolina. It also requires leadership at all levels of government. Lastly, it requires landowners to recognize the importance of their resources to our State and be willing to adopt new practices and economic valuations.

We need to act quickly in order to protect existing NWL areas and develop the required land area into a functional "green-infrastructure" state to help mitigate climate change impacts and sequester carbon. Action must start *now* due to time to plan, implement and grow these solutions. Some solutions begin working in a short time frame, such as improved crop practices or rewetting drained pocosins, where the carbon and soil benefits are realized quickly and extend out for the life of the restoration. Others, such as reforestation, may take decades to fully realize the carbon and ecosystem co-benefits.

The NWL stakeholders and implementation partners will work to lay out the next steps for the NWL Action Plan and to coordinate the State's first implementation efforts.

Given its carbon sequestration potential, sustainable management and financial support of the 14 million acres of forest owned by North Carolina's private forest landowners must be the cornerstone of any NWL actions taken by the state.