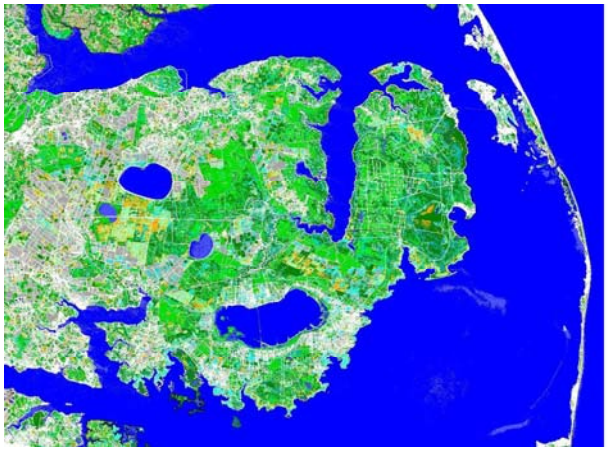
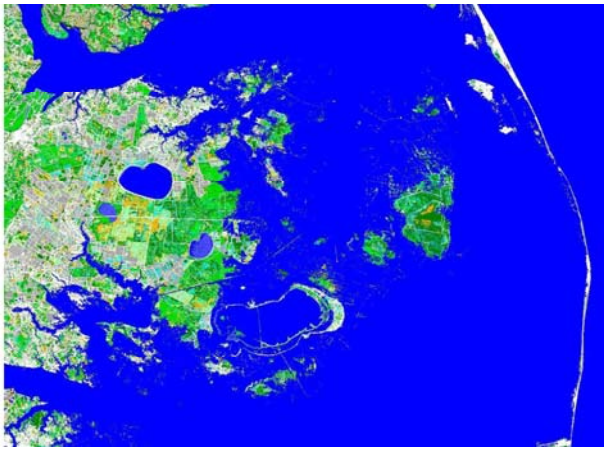
The Alligator River Climate Change Adaptation Pilot Project

Climate change, caused primarily by the release of heat-trapping gases such as carbon dioxide, is literally changing the world we live in. Around the globe, temperatures are climbing, seas rising, seasons shifting. Global warming is changing landscapes, putting wildlife at risk and increasing the likelihood of drought, floods, storms, and wildfires. But ecological damage is not the only consequence of climate change; the human health and economic impacts are also potentially catastrophic.

Among landscapes vulnerable to the effects of climate change, few are in as precarious a position as North Carolina's Albemarle Peninsula. The Albemarle landscape is a study in balance, where water is as much a part of the landscape as the land itself. Global climate change, however, is upsetting that balance, and rising seas threaten to forever change this complex ecosystem of estuaries, swamp forests, marshes, and meandering rivers. The effects of climate change are already visible on the Peninsula: the region's peat soils are degrading quickly and natural communities are in retreat from saltwater intrusion. Unless something is done soon to protect the landscape and manage the inevitable ecological changes, we could well lose as much as a million acres to rising seas within the next 100 years. The two maps below show present conditions on the left and, on the right, the extensive areas that would be flooded by the most conservative projection of 32 inches in the next 100 years.





More than 540,000 acres on the Peninsula are currently under conservation protection as National Wildlife Refuges, North Carolina Wildlife Resources Commission Game Lands, North Carolina Coastal Reserves, and other preserves established by The Nature Conservancy, the Conservation Fund, the North Carolina Coastal Land Trust, and other private and public agencies. Albemarle and Pamlico Sounds are part of the largest closed lagoon in the world and the healthiest and second largest estuary in the eastern United States.

The effects of climate change threaten decades of work by The Nature Conservancy on the Peninsula. Although we must accept the virtual certainty that the landscape will change with the climate, this doesn't mean we are powerless to preserve its natural diversity and richness. In fact,

we can take steps now to make the Peninsula's ecosystems more resilient to climate change and to reduce the likelihood of catastrophic changes.

Executive Summary

With the help of Duke Energy, The Nature Conservancy is prepared to bolster the Peninsula's resiliency and mitigate the effects of climate change on the landscape. We have designed a multifaceted climate change program for the Albemarle that includes land conservation, habitat restoration, and a variety of science-based adaptation techniques to increase the ability of ecosystems on the Peninsula to adapt to changing climate forces. Ultimately, we aim to develop a comprehensive Albemarle Peninsula Climate Adaptation Program. Such a program would support ecosystems by maintaining their resilience in the face of extreme stresses originating with changing climate. The program would ensure that, as the ecosystems of the Peninsula are inevitably transformed by changing climate and rising seas, they are transformed into ecosystems that still support many species and complex natural communities, sequester large volumes of carbon, and provide human ecosystem services such as clean air and water, ocean and forest products, and outstanding outdoor recreation opportunities. The program would ensure that organisms that can migrate inland and upland have corridors through which to do so.

We propose to launch this program with a $3 million Alligator River Pilot Project and we invite Duke Energy to join the Conservancy in this undertaking. We request Duke Energy's consideration of a $1 million commitment, over a period of up to 5 years, to help establish the pilot project.

Conservation tactics will include:

- Hydrologic Restoration: restoring the hydrologic regime and associated wetland systems, primarily through mitigation and management of damages caused by artificial ditches;
- Land Restoration, Reforestation and Shoreline Transition: protecting existing natural habitat, especially inland and upland of current conservation lands in order to facilitate the movement of species as sea level rises; ensuring that shorelines are not subject to hard armoring and supporting living shorelines;
- Oyster Reef Restoration: restoring oyster reefs in Pamlico Sound to buffer shorelines from storms and rising seas; and
- Measuring and Monitoring Project Impacts on Carbon Sequestration: working with experts, develop strategies for establishing a baseline for soil carbon in the system and monitoring the effects of various management tactics on the gain and loss of soil carbon.

The Albemarle Peninsula Climate Adaptation Program will be the first large-scale, multi-factor adaptation program in the United States, each component of which will also sequester new carbon and/or prevent the loss of old sequestered carbon. The program will occupy one of the places in the world most threatened by climate change and rising seas. The Alligator River Pilot Project will focus on modeling, proving concepts, and implementing the two highest priority

regional strategies: hydrological restoration to control salt intrusion and oyster reef restoration to provide habitat and reduce wave energy—and thus erosion—in the near-shore environment.

Support from Duke Energy would allow us to immediately embark on the most critical conservation strategies outlined in this proposal, including work to control processes that will rapidly release soil-based carbon to the atmosphere. The Nature Conservancy would use a $1 million commitment from Duke Energy to leverage at least $2 million of additional private support. Public funds will also be sought to further leverage the private investment.

Carbon on the Albemarle Peninsula

The Alligator River Climate Change Adaptation Pilot Project will have a wide range of impacts on carbon sequestration. Installing tide gates and selectively plugging or regulating ditches can reduce the impact of salt intrusion and maintain a level of soil saturation that would limit soil ignition during prescribed fires. If peat-based soils can be kept locally intact until they are colonized by salt-marsh as the sea rises, then most of these peats may be sequestered permanently beneath sediments trapped by the marshes.

Monitoring Carbon Stored in the Soil

We propose to document precisely the contemporary inventory of soil carbon on the Albemarle Peninsula and to establish a spatially comprehensive approach to monitoring the success of our soil carbon sequestration strategies. Initially, we will map peat lands using satellite data. We will also evaluate Ground Penetrating Radar (GPR) as a tool to map the spatial extent and depth of peat soils. Peat depths will also be measured manually with probes and cores along transects designed to be statistically robust. Soil bulk density and carbon content measures will provide accurate estimates of the carbon present in the system. Thus, TNC will be able to provide information about the carbon baseline in the soil and the effectiveness of conservation actions at preventing its rapid loss to the atmosphere. Control sites, where measures to reduce soil erosion were not taken, will also be measured in order to gauge the effects of our peat protection activities.

Measuring Carbon Stored in Protected and Newly Planted Forests

A permanent and statistically robust sampling strategy using permanent transects will document existing carbon in standing biomass and allow us to monitor changes over time. These data will allow us to establish a comprehensive inventory of carbon in standing biomass and to build, prioritize and implement land-cover restoration and conservation plans in order to optimize the carbon sequestration potential of the program.

With funding from the U.S. Department of Energy, the Nature Conservancy's Global Climate Change Initiative has developed a tool to estimate the expected carbon gains and the potential carbon revenue from reforestation and afforestation projects. In addition, the Initiative is collaborating with Winrock International to develop and refine new tools and technologies—including the use of aerial videography to estimate carbon in forest vegetation—for designing accurate and cost-effective carbon sequestration projects. As these new tools and technologies are refined, we will use them to ensure the most accurate measurement of carbon stocks in existing and restored forest lands.

Measuring Carbon Stored in Oyster Reefs

One of the benefits of oyster reef restoration will be the sequestration of new carbon in oyster shells as calcium carbonate. The baseline for carbon on new reefs is zero; we will develop a method to estimate carbon accumulation in shell as reefs grow.