The DUWC/Carolina Ranch Carbon Farm Project
An Introduction
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In December 2018, the Duke University Wetland Center and Carolina Ranch reached an agreement to create a 10,000-acre "carbon farm" on privately owned land in eastern North Carolina. When fully operational, the farm -- located in Hyde County on a tract of pocosin peatlands\(^1\) formerly drained for agriculture -- could potentially store enough carbon to offset much of the university’s carbon emissions and help Duke meet its goal of achieving carbon neutrality by 2024. Offset credits not used by the university could be sold to others.

The new carbon farm is located on coastal wetlands that formerly were drained for farming and forestry.

Carbon farming is a new approach for fighting global warming that uses enhanced land management and conservation practices to increase the amount of carbon that current or former agricultural lands pull out of the air and lock away in their soil and vegetation.

\(^1\)What is a pocosin? It’s a freshwater evergreen shrub bog, or wetland, found in the coastal plain of the Southeastern United States.
"By rewetting and reverting these former peatlands to their natural wetland state, we can significantly increase their capacity for long-term carbon storage," said Curtis J. Richardson, director of the Duke University Wetland Center, who spearheaded the efforts to launch the project with Hyde County Partners LLC.

The freshwater marshland will also protect local groundwater supplies and provide wildlife habitat as side benefits.

"This is a tremendous opportunity for the state of North Carolina, Duke University and the private landowner to create the largest carbon farm in the eastern United States, maybe the entire country," Richardson said.

Carbon farming programs already under way in Australia, New Zealand, Europe, Canada, California and the Midwest have shown that a 2.5-acre plot of working rangeland or pasture can store more than one metric ton of carbon annually.
Recent studies indicate that pocosin peatlands, such as those found in Hyde County, have much greater potential.

A five-year study by the DUWC at Pocosin Lakes National Wildlife Refuge in nearby Tyrrell County showed that these peatlands have some of the highest net carbon credit values ever recorded. When restored to their natural state as shrub-dominated bog wetlands, the pocosin peatlands can potentially store 10 to 15 times more metric tons of carbon per year than drained or unrestored agricultural lands.

Left undisturbed, carbon in pocosins can remain stored for millennia due to the unique natural antimicrobial compounds that prevent the waterlogged peat from rapidly decaying and releasing the carbon back into the atmosphere. The presence of these compounds acts as a protective mechanism or latch -- greatly reducing the release of greenhouse gases, even during periods of drought.

In this first phase of the project, DUWC researches have established study sites to identify the best ways to restore the former farm fields to their original wetland state and measure and verify how much carbon their saturated peat soil can store.

Sturdy fences are required to keep curious, hungry bears out of the study sites. Black bears are abundant in the North Carolina coastal plain, and many of them live on the Carolina Ranch pocosins.

The DUWC researchers are taking soil and water sampling to collect data on peat depth, nutrient levels, microbial communities, and more.
Researchers collect soil and water samples in the pocosins at both natural and drained sites.

LEFT: DUWC researchers measure peat depths at the Carolina Ranch carbon farm sites.

ABOVE: Lots of critters call the pocosins home. Researchers have to be prepared with netting, snake boots, and bear repellant spray.

Researchers collect soil and water samples in the pocosins at both natural and drained sites.
In addition to taking water and soil samples, DUWC researchers have installed equipment to study atmospheric gases at Carolina Ranch. Eddy covariance is a micro-meteorological method that can be used to directly observe the exchanges of gas, energy, and momentum between ecosystems and the atmosphere. This method can also measure the carbon, water, and heat flows between plant communities and the atmosphere. The Wetland Center is operating eddy flux towers equipped with sensitive instruments that record atmospheric CO$_2$ flux$^2$ 24/7, necessary data for a climate-change related carbon sequestration study.

$^2$What is carbon flux? It’s the amount of carbon exchanged between Earth’s carbon pools (oceans, air, land, and living things), typically measured in units of gigatons of carbon per year (GtC/yr).

DUWC members Bryan Stokes-Cawley and Neal Flanagan put the final touches on an eddy flux tower and its scientific instruments, Bryan climbing to the top for a final adjustment. The fencing protects the sites from the bears that live on the coastal-plain pocosins.
Patrick Gray from NSOE’s Marine Robotics and Remote Sensing Lab launches a drone over the pocosin.

Wetland Center scientists are also using drones to collect aerial photographs and GIS images of the Carolina Ranch site. The data will contribute to the development of restoration techniques and management practices to maximize the peatland’s carbon sink capabilities.

Spatial analysis by DUWC researchers shows there are hundreds of thousands of acres of drained pocosin peatlands that have been drained for agriculture or forestry, or simply abandoned, across eastern North Carolina and other southern coastal states. As the value of natural and restored wetlands in the fight against climate change becomes better known, more landowners and industries in the area will consider partnering in similar projects across the pocosins.
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