



**Undergraduate Program**

Ecological Technology Design  
Ecosystem Health  
Soil and Watershed Science  
Natural Resources Management

**Graduate Program**

Soil and Watershed Sciences  
Ecological Technology Design  
Wetland Science  
Ecosystem Health & Natural Resource Management



# Blue Carbon: Linking Climate Change to Coastal Wetland Restoration and Conservation

*Professor Brian Needelman has been researching how coastal wetland restoration and conservation can be used to help reduce greenhouse gases in the atmosphere. Coastal wetlands – which include salt marshes, seagrass, mangroves and other tidal wetlands – are some of the most productive habitats in the world. In addition to providing critical fish habitat, improving water quality, and protecting the coastline from storms, coastal wetlands remove large amounts of carbon dioxide from the atmosphere through photosynthesis. This carbon – referred to as “blue carbon” – is then stored in wetland soils, where it can remain for centuries or more, as long as the habitat is not degraded or destroyed.*

However, development pressures, polluted runoff, and sea-level rise has caused the loss of 50 percent of U.S. wetlands since the 1800s. Globally, coastal wetland loss is estimated to be between 0.7-7 percent a year, and restoration projects are largely underfunded, despite the myriad of benefits these habitats provide. As coastal habitats are lost, these ecosystems stop removing carbon dioxide from the atmosphere and the carbon stored in their soils may be emitted back into the atmosphere.

## Carbon Credits for Coastal Wetland Restoration Projects

Dr. Needelman was part of a team of scientists who developed a method for measuring the removal of greenhouse gases from the atmosphere achieved through coastal wetland restoration, creation and conservation. The methodology, approved by the Verified Carbon Standard, makes it possible for these types of environmentally beneficial projects to receive funding around the world. This landmark methodology provides the procedures for how to calculate, report, and verify greenhouse gas reductions for tidal wetland carbon projects globally. Now, projects such as removing tidal barriers, improving water quality to increase seagrass habitat, beneficial use of dredged material, and reintroducing native plant communities will be eligible to earn carbon credits on the voluntary carbon market, generating new sources of funding. Carbon credits are purchased by companies or individuals to offset the emissions they can't reduce.

## Methane: The Crucial Greenhouse Gas

After carbon dioxide, methane is the second most important greenhouse gas. Methane is emitted from coastal wetlands during the decomposition of organic matter when the soils are saturated. In some cases, there is enough methane emitted from coastal wetlands to offset the blue carbon benefits these systems have of removing carbon dioxide from the atmosphere. Dr. Needelman conducts research that helps identify which coastal wetlands emit significant amounts of methane and how to better quantify the amount of methane these wetlands produce.

## Research Benefits

- Quantifying blue carbon benefits of coastal wetland ecosystems.
- Providing funding for coastal wetland restoration and conservation projects.
- Understanding and predicting methane emissions from coastal wetland soils.
- Increasing benefits of coastal wetlands, including fish and wildlife habitat, water quality, storm protection, and reducing greenhouse gases in the atmosphere.