

Waquoit Bay National Estuarine Research Reserve Awarded \$1.3 Million Climate Change Research Grant

*NERRS Grant Funds Research into Roles Salt Marshes Play
in Sequestering Greenhouse Gases; Will Link Salt Marsh Restoration to the Carbon Markets*

(Falmouth, MA)—The Waquoit Bay National Estuarine Research Reserve (WBNERR) has been awarded a \$1.3 million grant by the National Estuarine Research Reserve System (NERRS) Science Collaborative to examine the role that salt marshes play in taking up carbon dioxide and offsetting climate change and the effect that nitrogen pollution has on that role. The three-year project will quantify how much carbon in the form of greenhouse gases (GHG) is stored and emitted from coastal wetlands, and how increases in nitrogen affect their ability to store that carbon.

The project is a collaborative effort of WBNERR, the NERR Association, United States Geological Survey (USGS) and the Marine Biological Laboratory (MBL) in Woods Hole, the University of Rhode Island (URI), Restore America's Estuaries, Manomet Center for Conservation Sciences, and Florida International University.

Heading the study will be Dr. Kevin Kroeger of USGS, Dr. Jianwu Tang of the MBL, and Dr. Serena Moseman-Valtierra of URI. The NERRS Science Collaborative is administered by the University of New Hampshire through a cooperative agreement with the National Oceanic and Atmospheric Administration.



Carbon dioxide, nitrous oxide and methane are potent greenhouse gases (GHG), which contribute to global warming by trapping heat in the atmosphere.

While it is well known that forest ecosystems store large amounts of GHG carbon—a process popularly known as “Green Carbon”—and help reduce global warming, new research is focusing on so-called “Blue Carbon” in coastal wetland ecosystems such as mangroves, seagrasses, and salt marshes. Recent findings suggest that coastal wetlands may sequester and store carbon at rates 3-5 times greater than temperate forests, making them efficient—and essential—carbon “sinks,” as world temperatures rise.



But data indicate that when nitrogen from sources such as septic systems, stormwater discharges, fertilizer runoff, and airborne pollution is added to coastal marshes, their ability to store carbon may be substantially reduced. In extreme cases, coastal wetlands may even become net “sources” of GHG and thus contribute to climate change.

“This long-term study offers researchers a real-world ‘laboratory’ to test if excess nitrogen produces the same type and volume of GHG emissions that we have observed in shorter-term experiments,” says Moseman-Valtierra. If data from the three-year study bears this out, it would strengthen incentives for reducing the amount of nitrogen pollution flowing into coastal ecosystems. “We will use a laser-based technology to develop a cutting-edge system to measure greenhouse gas emissions from salt marshes directly in the field, which has not been conducted before,” said Tang.

A large focus of the NERRS Science Collaborative is to link scientists with “end-users,” who will apply the science to better manage the coast.

“The idea is to foster research that has direct, relevant, and significant applications for communities locally and across the nation,” said Alison Leschen, WBNERR Reserve Manager, and Project Manager for the grant.

To further this goal, the collaborative project requires that end-users—coastal habitat restoration practitioners—be involved in project development, and that the research is a high priority for at least one of the 28 NOAA NERRs located around the U.S. coast.

In this case, Restore America's Estuaries (RAE), a national alliance of 11 regional, coastal conservation organizations, was heavily involved in development of the proposal, and will play an essential role in "translating" the science into products that will be used by the coastal management community.

Among RAE's goals is the creation of a national greenhouse gas offset protocol for coastal tidal wetlands. Such a protocol would help bring coastal wetlands into international carbon markets, providing new opportunities and incentives for private and public investment in the restoration and preservation of vital tidal wetlands.

"We know that coastal tidal wetlands sequester greenhouse gases like carbon dioxide at impressive rates," said Steve Emmett-Mattox, Senior Director of Strategic Planning and Programs for Restore America's Estuaries. "The GHG quantification model that will be developed under this project will help refine wetlands GHG methodologies."

As part of the collaborative project, the Manomet Center for Conservation Sciences in Plymouth will conduct an economic analysis of the potentially deleterious effect that nitrogen has on the "value" of a salt marsh for storing GHGs. If the effect is significant, carbon markets may provide one economic incentive for towns to remove nitrogen, helping defray the costs of additional sewers, storm drains, and other expensive and infrastructure-heavy mitigation strategies.

Using study data, a user-friendly model will be developed by a modeler from Florida International University that will enable towns to evaluate this potential. Such a model could also be used by land trusts and others to provide another way to "measure" land restored or preserved besides number of acres. As an example, The Nature Conservancy or Massachusetts Division of Ecological Restoration, which both supported the grant proposal, could state that a land purchase or restoration project contributed "X" tons of GHG storage.

WBNERR staff will be working closely with scientists and end-users and actually facilitating the dialogue between them using a collaborative learning model. Local communities and other user groups will be brought into the project to help frame research questions and where the research goes.

WBNERR is particularly interested in the project because it addresses two of the most significant issues facing coastal communities today – climate change and nitrogen pollution.

"We are very excited to be part of this incredibly talented team doing cutting-edge research that has local, national, and even global applications," said Leschen.

Most of the field work will take place at the Reserve's salt marsh at South Cape Beach in Mashpee, which is being set up with infrastructure to measure sea level rise and its effect on this important ecosystem as part of a NERRS-wide "bio-monitoring" project.

"The two projects meshed so well – our hope is that by establishing that area as an observatory for all types of research on climate change, we will create a real synergy between projects, enabling scientists to feed off each others' findings," said Leschen.

WBNERR is one of 28 NOAA National Estuarine Research Reserves around the U.S. coast, whose goal is to improve coastal stewardship through research, education, and demonstration. They translate science conducted on the Reserve and elsewhere to coastal managers, school classes, and community members to foster understanding about the importance of coastal ecosystems and how what people do on land affects the water. WBNERR is a federal/state partnership and is also part of the Massachusetts Department of Conservation and Recreation (DCR).

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