

From the Coast to the Deep Ocean:

The potential of blue carbon as a part of a holistic climate adaptation and mitigation strategy

In October 2022, COMPASS and Restore America's Estuaries held a roundtable on "Elevating the Science of Blue Carbon" in Washington D.C. with invited blue carbon experts and U.S. Congressional staff members. For more details, and a longer summary of the outcomes, [please visit the report here.](#)

We are seeing the implications of a changing climate everyday, and the ocean plays a critical role. Recent studies and research including Restore America's Estuaries recently published [Blue Carbon National Action Plan](#) have identified the potential of the ocean as not a "victim" of climate change, but a source of solutions to help close gaps in strategies to mitigate carbon emissions. One of the roles of the ocean in mitigating the emissions is referred to as "blue carbon" or the carbon captured by the world's ocean and coastal ecosystems.



Aerial view of tidal wetland
Credit: USGS



Submerged seagrass bed
Credit: Benjamin I. Jones

Blue carbon, the carbon captured and stored in coastal and ocean ecosystems, is a large component of the global carbon cycle, and these systems have the potential to sequester additional carbon if managed well. Blue carbon is a relatively new area of applied research, most of which was developed in the last three decades. The term "blue carbon" has evolved from referring to the greenhouse gasses (GHGs) stored in, sequestered by, and released from coastal marine ecosystems such as seagrasses, mangroves, salt marsh and other tidal wetlands to now broadly mean carbon dioxide captured in both coastal marine ecosystems and the open ocean.

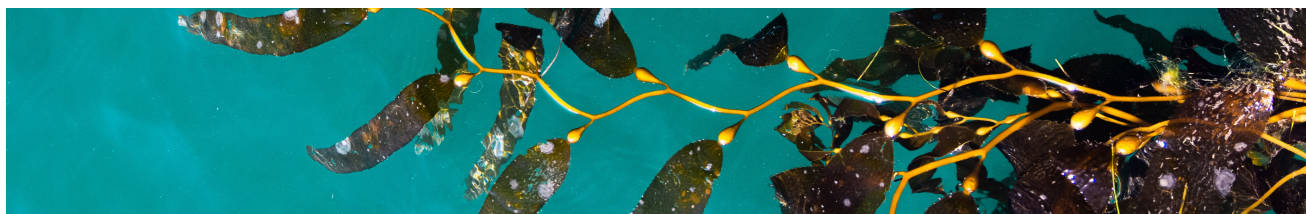
Key Points:

Blue carbon can serve as part of a holistic, whole ecosystem approach to addressing climate change. Protection for existing blue carbon stocks and restoration of degraded systems will maximize the carbon removal and storage capacity of these systems.

The “readiness” of the science to support sustainable federal policy on blue carbon varies widely, particularly between oceanic and coastal blue carbon.

- Coastal blue carbon is a fairly well-established science, widely recognized and codified in international carbon policies. Additionally, this research supports a voluntary carbon market.
- Oceanic, or marine, blue carbon, is an emerging area of study. This includes the carbon stored in whales, other marine mammals and mesopelagic fish, and seaweed cultivation. It also includes engineered solutions such as ocean alkalinity enhancement, nutrient fertilization, artificial upwelling and downwelling, electrochemical carbon dioxide removal and storage. The state of the science on these topics are extensively covered in the 2022 National Academies Report “A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration.”
- Research addressing the interconnectedness of coastal blue carbon and oceanic carbon ecosystems is an important emerging area of study.
- Further research and discussion is needed to understand the social and environmental justice implications of blue carbon.

While blue carbon is a complex topic, the benefit of the complexity is that there are many entry points for discussion and engagement on the topic. This makes the framing and communication of blue carbon critically important.



Recommendations

Prioritize protection and restoration of coastal ecosystems

There are many reasons to value coastal ecosystems and all they do for us, in addition to carbon sequestration. They stabilize the soil and protect from erosion. They provide a dynamic and rich habitat for fish, shellfish, birds and other animals, and provide recreational areas. Coastal flooding has long been a problem and is only increasing with sea-level rise and severe weather. Blue carbon systems such as mangroves are naturally designed to absorb the flooding and energy from waves and reduce climate impacts on inland infrastructure.

Improve community partnership & engagement

Federal and state agencies should prioritize grants and funding opportunities for blue carbon projects that require community engagement from project inception to completion and reporting. This is critical to ensure both community engagement and representation in blue carbon research, but also in ensuring community ownership, which allows communities that inhabit spaces where blue carbon ecosystems are present to reap the broad benefits of blue carbon policies and/or maintain cultural to these systems.

Expand protection of urban blue carbon systems

Urban blue carbon systems, which can be viewed as environmental lost causes, eyesores, or wasted space in urban settings, are often highly effective ecosystems which provide critical ecosystem services, particularly in the face of increasing climate threats. Though they may not scale up to storing the greatest stocks of blue carbon relative to larger blue carbon ecosystems, programs to sustainably manage urban and degraded coastal ecosystems will bring a wealth of additional benefits to the communities around them, including flood mitigation, reduction of the urban heat island effect, improved air and water quality, and recreational opportunities to those historically excluded from such spaces.



Incorporate blue carbon into existing U.S. legal and policy mechanisms

To better promote the integrity of blue carbon systems in the U.S., an “all of government” approach to blue carbon through dedicated resources and better coordination of Federal activities, including a research agenda, should be considered. Additionally, a dedicated legal framework for ocean dioxide removal should be created, including a well-defined regime for permitting projects, frameworks for assessing existing risks and for stakeholder engagement, and requirements for monitoring, reporting and managing any adverse effects.

*A single, juvenile mangrove grows in
sight of downtown Miami
Credit: Faith Crabtree*

Prioritize research in several key areas

Improving knowledge in several key areas would support federal decision making on blue carbon. Areas for continued study include:

- Open ocean carbon movement & sequestration (e.g. within whales and small fish);
- Understanding how long blue carbon will stay in an ecosystem, especially in the face of climate change impacts (i.e. permanence);
- Better spatial visualization of the blue carbon potential of marine habitats through mapping;
- Understanding the interconnectedness of oceanic and coastal blue carbon and what happens to carbon when wetlands convert to open water ecosystems;
- Strategies to improve data standardization and increase transparency and collaboration between states and federal government will strengthen blue carbon assessments and thus improve management and decision making

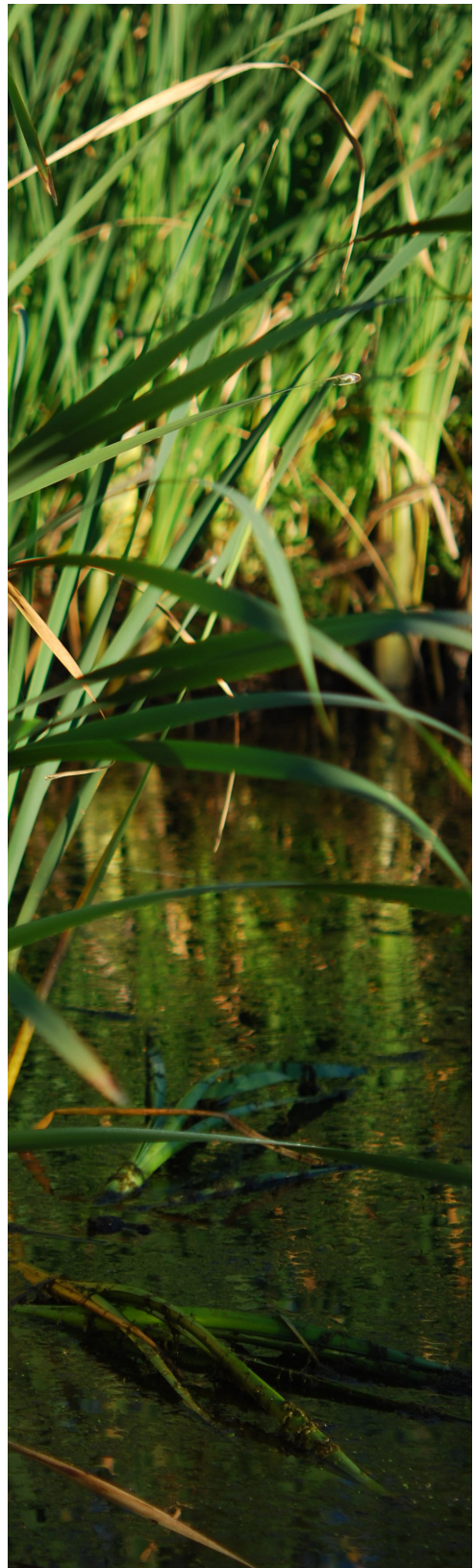
Continued interaction with scientists and experts

Blue carbon is a rapidly evolving research space. Creating opportunities for researchers, technical experts and policy makers to interact will create durable, evidence based policy.

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