Elevating the Science of Blue Carbon in Federal Policy: COMPASS-RAE Blue Carbon Roundtable Summary

October 4, 2022

Introduction

As the impacts of climate change increase, so does the urgency of developing effective, well-rounded climate mitigation strategies. While reducing greenhouse gas emissions remains the key priority for addressing this global issue, carbon sequestration is a promising, complementary approach to any climate change policy [1]. In particular, blue carbon, the carbon captured and stored in coastal and ocean ecosystems, should be pursued as a part of a holistic, national climate mitigation strategy.

In recent years, Congress has expressed an increasing interest in exploring blue carbon as part of broader climate mitigation policy. In the past two Congressional sessions, legislation addressing blue carbon has been introduced, either explicitly or implicitly. For example, the Blue Carbon Protection Act would establish a Blue Carbon Program within the National Oceanic and Atmospheric Administration; other legislation would allocate funds for the protection of blue carbon ecosystems in key places across the nation.

Much of the applied research around blue carbon has developed in the last three decades; meaning this area is teeming with new research questions to explore. The recent energy around blue carbon, in both science and policy, presents a unique opportunity for experts and decision makers.

To support this, COMPASS and Restore America's Estuaries brought together blue carbon experts and policy makers in a roundtable discussion on October 4, 2022. The goal of the discussion was to foster a shared understanding about the current state of blue carbon science and identify key questions for both science and policy in an effort to inform sound policy making and create long term, trusted pathways for engagement around coastal and oceanic blue carbon.

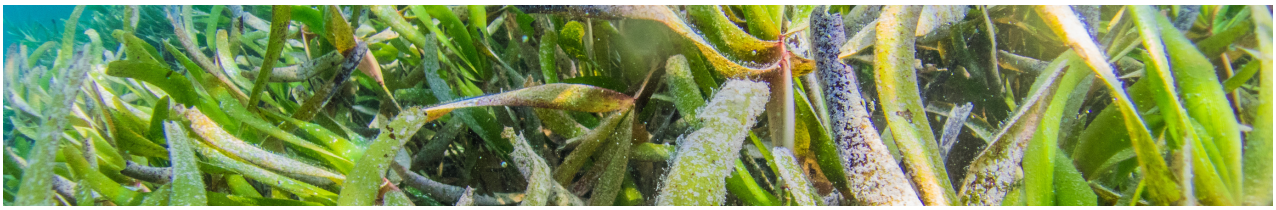
The outcomes of the roundtable include:

- **Build connections and relationships between blue carbon experts and a range of key policy staff**
- **Elevate recommendations from experts to inform future policy strategies**
- **Identify pathways for long-term, meaningful engagement for blue carbon experts in the federal policy process**

To prepare for the roundtable, COMPASS and Restore America's Estuaries conducted extensive research on the latest in blue carbon science and the current policy landscape.

This process included multiple meetings with a diverse array of blue carbon experts and congressional offices as well as a thorough literature review. Throughout the research phase, several key considerations continued to surface, which informed the design of the roundtable. The key considerations were:

- **Blue carbon is a promising piece of a holistic, whole ecosystem approach to addressing climate change.**
- **The "readiness" of blue carbon science to inform federal policy varies widely, particularly between coastal and oceanic ecosystems.**
- **Communicating blue carbon science strategically is critically important, particularly to policy audiences.**



Key Scientific Insights & Recommendations from Blue Carbon Experts

Blue carbon is a quickly developing field of study. This is partially due to the hope it appears to offer in the face of the looming climate crisis. The current level of understanding around what blue carbon is and the role it should play in the broader picture of climate mitigation varies within and across science and policy spaces.

In the last few decades, the definition of blue carbon has expanded. It is no longer limited to carbon stored in soils and coastal vegetation and now includes carbon within systems in the open ocean [3]. This shift in scientific thinking has generated a range of new questions and research areas to explore. The roundtable presented an opportunity for blue carbon experts with wide ranging perspectives and experiences to share the latest in their research.

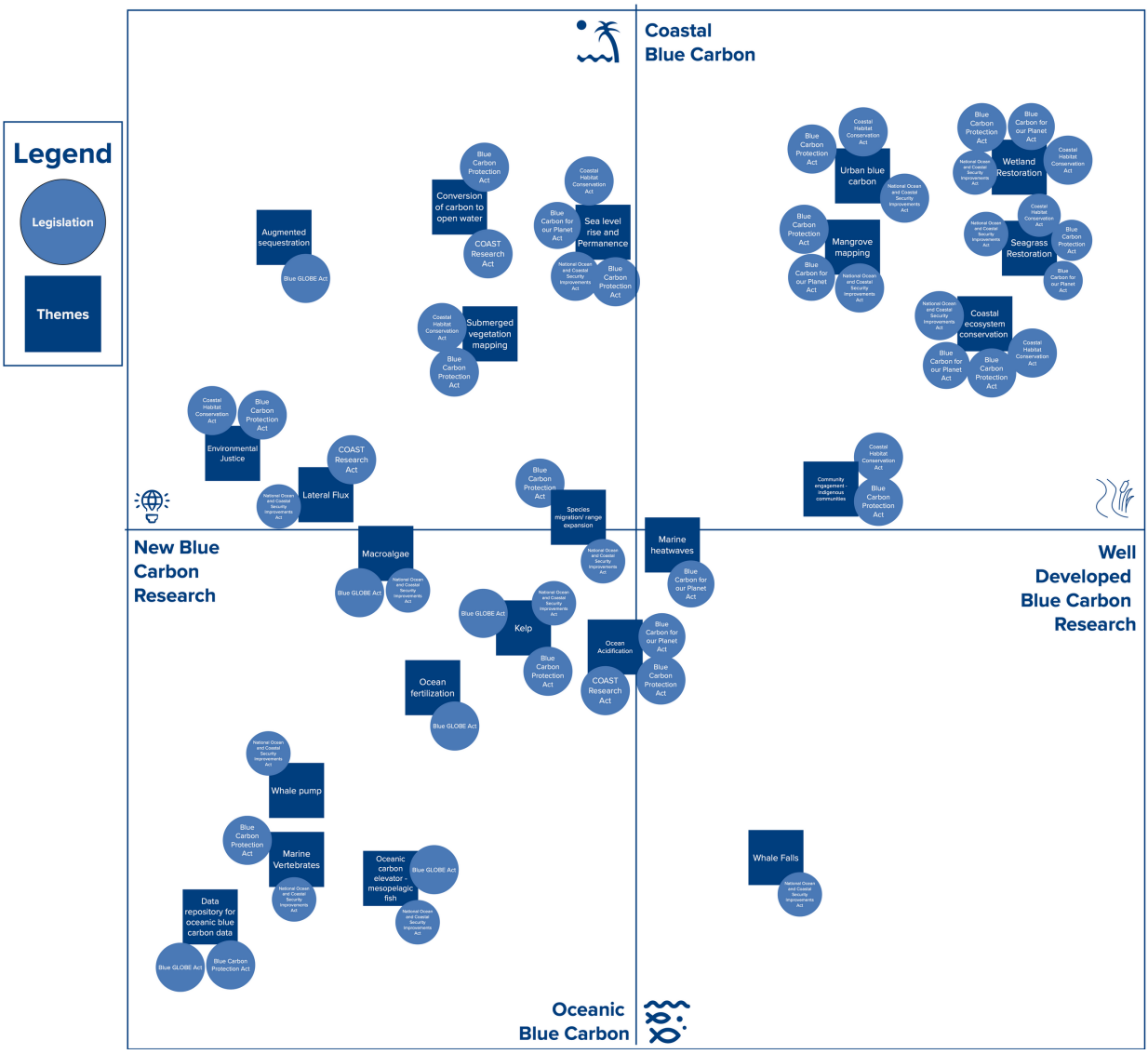
At the roundtable, each expert presented a short flash talk on varying aspects of blue carbon. Topics included an introduction to blue carbon, social and community dimensions, approaches to governance, marine mammals & fish, data quality and management, seagrass restoration, small-scale urban ecosystems, and permanence. The slides for each presentation can be found here.

Note the roundtable was held under Chatham House Rule so all attributions are generalized with no identifiable information included.

Exploring the Readiness & Role of Blue Carbon in Climate Mitigation

Blue carbon is often perceived as an amorphous scientific space that is challenging to navigate. The roundtable offered an opportunity to better understand the scope of blue carbon. In small discussion groups, experts and policy makers worked to uncover the "readiness" of the science and blue carbon's potential as a climate strategy.

COMPASS created a framework to guide the discussions to illuminate some of the differences in newer and well developed blue carbon science in both coastal and oceanic ecosystems. Participants worked together to identify research areas and place them on the X-Y matrix based on the ecosystem and depth of knowledge. One of the most revealing results from this activity was the dearth of well-developed science on oceanic blue carbon. You can view the interactive version of the Matrix here.

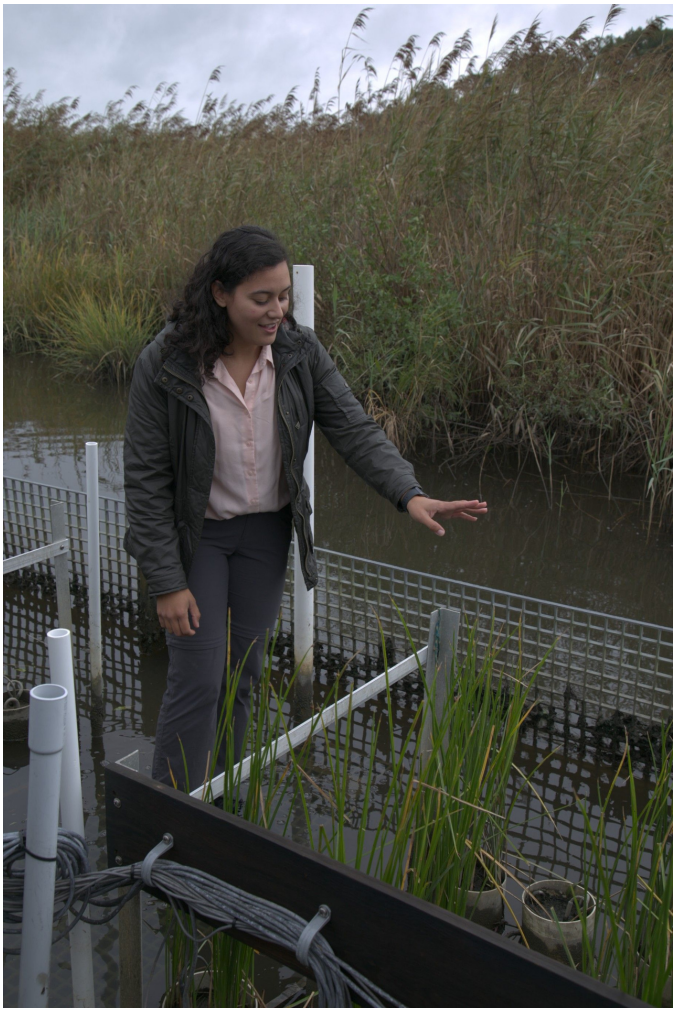


Participant generated framework illuminates some of the differences in newer and well developed blue carbon science in both coastal and oceanic ecosystems.

Through these discussions, a variety of interesting scientific insights surfaced. One of which was the distinctions between "natural" and engineered blue carbon solutions. Both approaches promote carbon sequestration. "Natural" solutions refer to sequestration capacity in naturally occurring ecosystems like seagrasses and mangroves. Engineered solutions are made possible by human intervention; they either increase the sequestration capacity of preexisting natural systems or create sequestration capacity in new places.

One expert participant referred to the rush to promote blue carbon as a climate solution despite the sometimes lacking depth of research as "blue grabbing." Blue grabbing being commercial and government entities seeking opportunities to claim as many blue carbon offsets as possible with little analysis of the potential risk and impacts this would have on communities who reside in or depend on these areas.

The high levels of enthusiasm and potential "blue grabbing" reflects many of the recommendations made by the expert participants around the need for further research and investigation into areas of blue carbon that are often proclaimed publicly as major steps and keys to addressing climate change. It also highlights the need for, and value of, collaboration across scientific and social disciplines. This collaboration can ensure blue carbon research and implementation is conducted in a manner that produces useful information applied effectively to help both the communities that live near/depend upon these marine systems and to protect the full potential of these marine ecosystems as a key part of climate policy. A final, but nonetheless important potential benefit, is that scientific collaboration produced can help inform broader societal decisions about the role blue carbon can and should play in efforts to address climate change via the development of responsible and effective governance frameworks.



Long term greenhouse gas monitoring experiment at the Smithsonian Environmental Research Center Credit: COMPASS

Expert Recommendations

Each expert presented recommendations that were uniquely tailored to a federal policy audience; recommendations focus on research, community, or governance and policy.

A summary of the recommendations from each flash talk can be found here. Note that these are contributions from each expert and do not represent the full suite of perspectives on this topic.

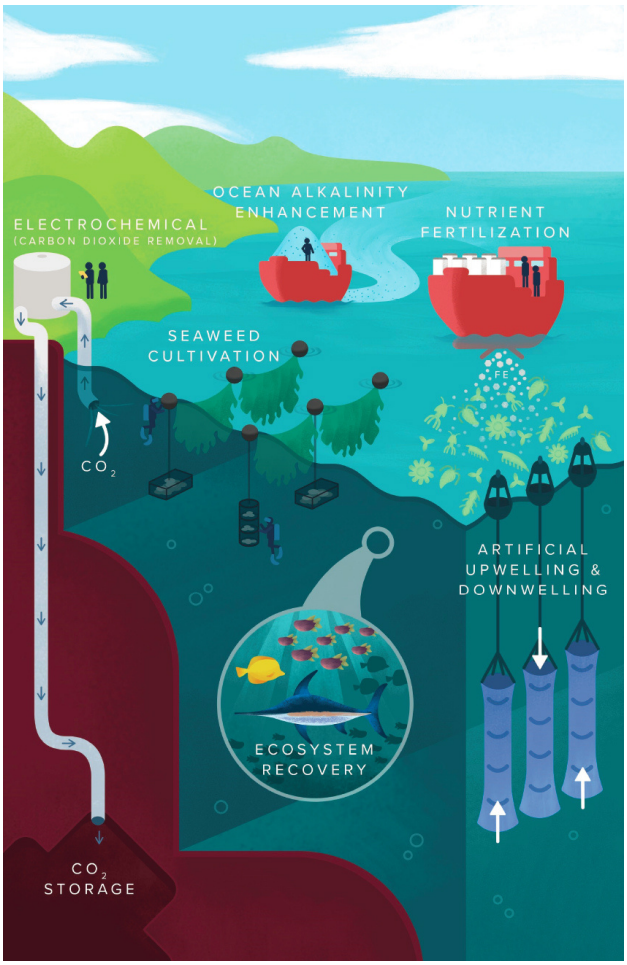
Research

Overall, there is a need for interdisciplinary blue carbon research that explores the potential of these ecosystems to collectively store and sequester carbon; investigates the connections between oceanic and coastal systems; and explores the interactions between blue carbon ecosystems and those who depend on them.

More specifically, quantifying the sequestration potential of current blue carbon stocks within the United States is crucial. Experts suggested funding research to develop a clearer picture of how much carbon these ecosystems store nationally. Also, science and policy communities would benefit from more information about sequestration rates and the co-benefits these systems provide.

As a part of these research efforts, data collection should be standardized, which would increase access and usability of blue carbon data and improve alignment between research practices. For example, the Coastal Carbon Clearinghouse is an excellent standardization tool managed by the Smithsonian Environmental Research Center.

Blue carbon experts and policymakers tour the Smithsonian Environmental Research Center Global Change Lab Wetland
Credit: COMPASS



Emerging methods of ocean based carbon dioxide removal. Credit: NASEM

In addition, an emerging area of research explores the interconnectedness of coastal and oceanic blue carbon ecosystems. There is a need for more research to understand the role that marine mammals and mesopelagic fisheries play in carbon cycling and sequestration. Currently, research shows that whales contribute to oceanic carbon cycling; it is possible that different approaches to ecosystem recovery could increase ocean carbon sequestration. Also, science is beginning to emerge about the value and role mesopelagic fisheries play in carbon cycling and sequestration.

These emerging areas of insight should be a subject of collaborative focus via federal structures like the Marine Mammal Protection Act and independent scientific research like that highlighted in a recent NAESM report on Ocean Based Carbon Dioxide Removal research priorities as well as in a recent Environmental Defense Fund report addressing Natural Climate Solutions in open ocean systems. [9, 10]

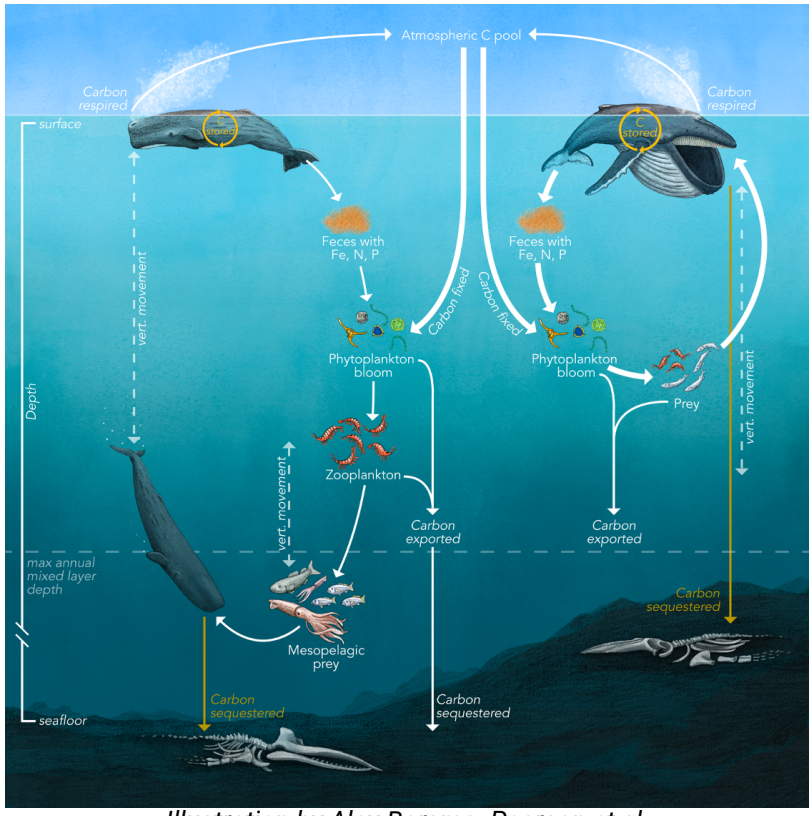


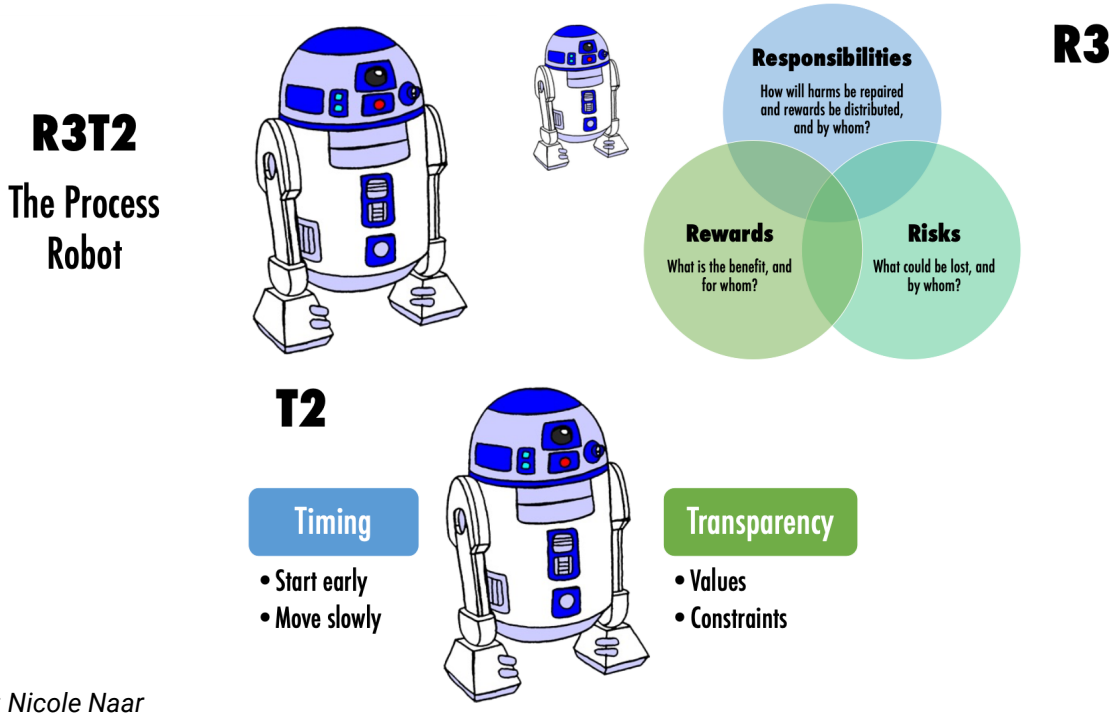
Illustration by Alex Borsma. Pearson et al.

Community

It is critically important to partner and meaningfully engage with communities that depend on blue carbon ecosystems in any climate mitigation strategy.

For grant-funded blue carbon projects, communities should be partners in the design and implementation from inception to completion and reporting should be prioritized by federal and state agencies. This is crucial to ensure that communities are meaningfully represented and engaged in blue carbon science & policy. Also, this ensures community ownership and enables communities that inhabit spaces where blue carbon ecosystems are present to reap the broad ecosystem service benefits or maintain cultural ties.

One social science expert developed a memorable graphic to provide guidance (below) for external partners and governments in thoughtfully approaching this process.



Credit: Nicole Naar

In addition, there is a distinct need for the protection of urban blue carbon ecosystems. Further research is needed to illuminate the value they provide to carbon sequestration and community wellbeing.

Urban blue carbon ecosystems are often undervalued and seen as wasted space. In actuality, they are highly effective systems that provide a myriad of environmental and social benefits such as flood mitigation, reduction of urban heat islands, improved air quality, and recreational opportunities to people who most need it.
Though they may not scale up to storing the greatest stocks of blue carbon, programs to sustainably manage urban and degraded coastal ecosystems are crucial to a holistic climate mitigation approach.

Governance & Policy

There are existing legal and policy mechanisms that should be used to protect existing blue carbon ecosystems. While many of these mechanisms don't explicitly mention blue carbon, structures like the Coastal Zone Management Act [5], Magnuson Stevens Act [6], and Department of Interior's Adaptive Management plans [7] could all be employed. Additionally, experts shared the benefits of establishing an active, interagency working group that has a deep and up to date understanding of these existing structures and all existing federal blue carbon work could be a positive step for the federal government to help support blue carbon. The use of the existing policy structures and additional blue carbon support of an interagency working group (e.g., Carbon Cycle Interagency Working Group) could lend itself to a recommended "all government approach" to blue carbon management and protection.

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

A second, critical policy-related recommendation relates to the need to establish effective governance frameworks that facilitate blue carbon research, while ensuring that it is conducted in a scientifically sound manner that does not pose undue risks to the environment or communities. There is increasing interest, particularly from within the U.S. tech industry, and investment in a variety of approaches aimed at increasing the carbon sequestration potential of the open ocean, for instance through ocean alkalinity enhancement [8]. However these methodologies are relatively new and untested. To ensure they develop in a safe and responsible way that maximizes climate benefits and minimizes risks to the environment and people, the federal government should establish a comprehensive governance frameworks to establish guardrails around research and any subsequent deployment.

Lastly, the participants emphasized the importance of protecting and conserving existing, functional blue carbon ecosystems as opposed to the prioritization of ecosystem restoration in legislation and policy interventions. The most effective ecosystem services provided by blue carbon systems comes from keeping the already sequestered carbon buried in the soils . Along with the prioritization of protection versus restoration, participants recommended that policymakers and industry experts should also seek to streamline carbon offset verification processes without compromising the integrity of established verification processes. As they exist currently, the verification processes are highly structured which helps to ensure the integrity of carbon offset verification. It is worth noting however that this highly structured process including time intensive and costly verification and monitoring, while important for offset integrity, do create some challenge for potential offset projects that hold promise but lack the capacity of larger projects. The allowance of increased nuance would potentially help to incentivize the pursuit of scientifically sound verification that takes into account ecosystem variability due to climate change or other natural fluxes.

Blue Carbon Roundtable
Credit: COMPASS

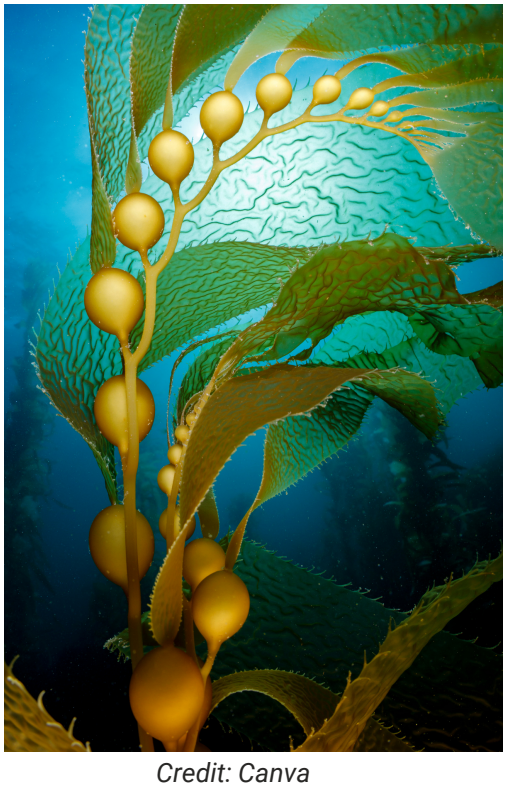
Credit: Canva

Further Considerations and Knowledge Gaps

Throughout the roundtable, participants identified areas where more research and support is needed to establish scientifically sound baselines and create durable, equitable blue carbon policy in the U.S. These gaps offer potential opportunities for collaboration between experts and policy makers in the development of legislation.
These include:

- **Blue carbon mapping: spatial visualization of blue carbon potential of marine habitat in quantitative terms**
- **A better understanding of lateral flux (e.g. flow of carbon between coastal and oceanic systems)**
- **A better understanding of permanence (e.g. how long blue carbon will stay in an ecosystem, particularly in the face of climate change)**
- **How to incentivize blue carbon protection using market and non-market approaches to recognize benefits such as community resilience, fisheries production and water quality**
- **Equity considerations of blue carbon (e.g. how can blue carbon increase resilience for frontline, coastal communities)**

Note that a number of these topics are not new. Questions about the vulnerability of blue carbon ecosystems to climate change, permanence of sequestered carbon in the face of disturbances, and the role macroalgae play in carbon sequestration have been highlighted for a number of years [1]. Their repetition in settings like this roundtable with policymakers in attendance however reflects a positive movement of science and research into the hands of policy makers and the importance of opportunities for engagement and relationships between experts and policymakers.



Credit: Canva

Pathways for policy engagement for researchers, scientists and technical experts

Discussions at the roundtable identified a multitude of pathways for engagement in federal blue carbon policy dialogues. These conversations also shed light on some of the complexity in authority around blue carbon that exists currently within the federal government.

One key challenge for those seeking to engage with federal agencies is that there is no centralized blue carbon authority within the federal government. NOAA does not have an "Office of Blue Carbon" or a centralized location where blue carbon work is housed [8]. Understanding the variety of offices who work on blue carbon within the federal government is an important step to take for those seeking to share their research with policymakers.

An important pathway for engagement is sharing information directly with members of Congress. While this approach seems simplistic on the surface, policy makers in attendance highlighted ways this approach can be most impactful and effective. They emphasized sharing research that has direct policy aims, referred to as the research-to-operations pipeline. Letter-writing was another method emphasized as being particularly effective, especially as a constituent seeking to connect with their representative's office. Lastly, seeking out and engaging with offices who are less connected to the oceans and coastal space is critically important. This helps create broad support for blue carbon work and any policy effort, more broadly.

COMPASS emphasizes the importance of strategic, well-crafted messages when communicating with any audience; this is especially important when engaging in federal policy. Decision makers on the panel highlighted that it can be helpful to provide specific language to be used in policy development. For example, in the form of specific definitions, statements of baseline information, and easily adapted information that can be integrated into legislation.

The Congressional Research Service (CRS) and the Library of Congress are excellent resources for experts seeking to share their work. They often facilitate learning lunches where external experts share their research which can be used as informal briefings and are widely attended by congressional staffers.

Conclusion

COMPASS and Restore America's Estuaries convened this roundtable with the intention of elevating the science of blue carbon in federal decision making. It was our goal to illuminate the diversity of scientific and policy perspectives related to blue carbon. The roundtable discussion revealed the opportunities and challenges of moving this issue forward in both research and policy spaces. It also illuminated the many ways experts can help paint a realistic picture of the ways blue carbon can support climate mitigation.

Blue carbon is an exciting opportunity for both scientific and social researchers to connect with policymakers and pursue equitable, just, and effective policy based solutions. However it is critical to remember that, while blue carbon is an important piece of the climate puzzle, it in itself is not the entire solution to climate change.

Related Documents

Roundtable Agenda
Participant Bios
Expert Flash Talks
Expert Recommendations
Blue Carbon Matrix
Legislative Panel Insights (see below)

Expert Participants:

Hilary Stevens, Restore America's Estuaries
Karen McGlathery, University of Virginia
Nicole Naar, University of Washington Sea Grant
Jaxine Wolfe, Smithsonian Environmental Research Center
Melissa Baustian, The Water Institute of the Gulf
Matthew Costa, Northeastern University
Romany Webb, Columbia University Law School Sabin Center for Climate Change
Heidi Pearson, University of Alaska Southeast
Jamie Collins, Environmental Defense Fund

Appendix: Legislative Panel Insights

Along with the pathways for engagement shared in the main body of this report the Legislative Policy Panel addressed a number of questions around the types of science and evidence policymakers are looking for and how scientists and technical experts can help policymakers form policy around developing and incomplete research.

Many of the science and technical questions about blue carbon that legislators have reflect the themes and knowledge gaps identified throughout the roundtable. Some examples of these questions include:

- **How should federal agencies be making decisions on blue carbon when they are often working off of incomplete data?**
- **How is CO2 sequestration quantified when talking about carbon credits?**
- **Are there other options for offsets and restoration beyond carbon markets?**
- **What are the barriers to blue carbon projects and restoration? Are these ecological, financial, or political, and what do scientists want from policy makers to help overcome these?**

As a key component of the roundtable was exploring how equity and environmental justice can be integrated into blue carbon work, we asked the panelists how communities and people are being integrated into the thinking around blue carbon legislation. The Panelists shared that one of the main methods of integrating communities into blue carbon legislation is through grant development and administration that include requirements for co-development and management with impacted communities. It can be challenging to develop legislation that supports equitable partnerships. Larger, more well-resourced organizations that have the capacity to apply for funding often do not have the trust and relationships needed to successfully partner with smaller groups focused on environmental justice. They believe that a key to overcoming this challenge involves pushing federal agencies to pursue effective and equitable partnerships since the agencies are often those administering funding.

All of the panelists emphasized that there is a real interest in blue carbon science and policy within Congress despite the politicized nature of climate policy. They shared that they are hopeful about the relationships and opportunities for engagement facilitated by this roundtable and are eager to continue working with the expert participants.

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