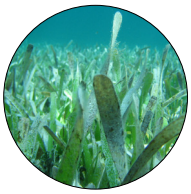
Coastal Blue Carbon Restoration and Management

Background and Best Practices

MANGROVES
Found along tropical and subtropical coastlines

SALT MARSHES
Coastal tidal wetlands with plants adapted to saline and brackish conditions



SEAGRASS MEADOWS
Grow in shallow coastal environments

What is Coastal Blue Carbon?

"Coastal Blue carbon" refers to the carbon that is absorbed from the atmosphere and captured by rooted vegetation in the coastal zone, such as mangroves, salt marshes and seagrass, which have high carbon burial rates on a per unit area basis and accumulate carbon in their biomass, soils, and/or sediments (IPCC, 2019). Coastal blue carbon systems also provide several benefits including flood risk reduction, water filtration, and serving as nursery for fish and other species, among others.

Management Actions for Blue Carbon

- Restore degraded habitats to create new carbon sinks
- Protect existing habitats to prevent losing carbon that is already stored
- Manage existing or restored habitats to increase carbon sequestration rates
- Support science on blue carbon sequestration and restoration to increase understanding of coastal blue carbon systems

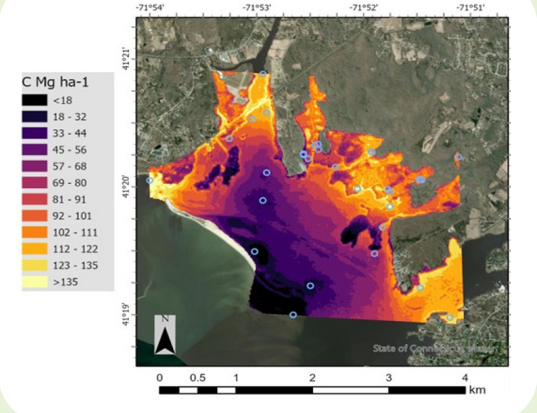
Blue Carbon Reservoir Mapping

Maine to Long Island, New York, United States

This project aimed to establish a baseline of existing blue carbon habitats and carbon storage from northern Maine to southern Long Island, New York. The project focused on salt marshes and eelgrass, and also involved merging existing habitat mapping data and sediment carbon data to create a carbon heat map. The heat map shows areas that are likely to store high quantities of carbon.

The extensive data mining effort faced challenges due to methodological inconsistencies in data collection, subsampling, differences in analysis (bulk densities and loss on ignition were not always recorded), GPS accuracy, and a lack of vegetation data.

For more information: The Blue Carbon Reservoirs from Maine to Long Island, New York



Source: Little Narragansett Bay carbon storage estimates. Phil Colarusso (2023).

Marine Protected Areas (MPAs)

MPAs are clearly defined geographic zones within coastal and marine areas that are managed to ensure the long-term conservation of nature and the benefits it provides to people (IUCN 2012). In the North American region, MPAs can vary widely in purpose, level of protection, and governance. Types of MPAs include:

- No-take areas / marine reserves
- Multiple-use areas
- Zoned areas (including year-round or seasonal closures)

Other Effective Area-Based Conservation Measures (OECMs)

OECMs are designated areas that are not MPAs, but that generate biodiversity conservation outcomes. OECMs may include, for example:

- Fisheries management areas
- Cultural sites
- Historic sites (e.g., shipwrecks)

In North America, only Canada recognizes OECMs as part of its conservation tools.

An MPA or OECM designation can be valuable for a blue carbon project as it formally recognizes the conservation and sustainable use of coastal ecosystems that sequester carbon.

Blue Carbon Governance

There are three main modes of governance for blue carbon projects within North America. Indigenous-led and co-governance approaches are becoming recommended best-practice.

GOVERNMENT-LED

Projects managed and led by federal and state or provincial governments

CO-GOVERNANCE

Sharing of management and leadership between governments and communities

INDIGENOUS-LED

Projects managed and led by Indigenous communities

Source: Mangrove seedlings plantation. Comcáac Nation (2021).

Indigenous-Led Protection of Mangroves and Seagrasses

Comcáac Territory, Sonora, Mexico

The Comcáac community conservation and ecosystem restoration initiative aims to protect mangroves and seagrasses through the integration of Traditional Ecological Knowledge and new information on blue carbon storage and climate change.

The primary objectives of the project are to conserve and restore mangrove habitats, which are recognized for their carbon-capturing potential, and to develop sustainable living practices that align with cultural values. Mangrove seeds are cultivated in local nurseries before being transplanted to four designated restoration sites, reconnecting community members with traditional practices, and empowering women in leadership roles.

The initiative also extends to the restoration of seagrass beds, which hold cultural and nutritional importance as a traditional food source.

For more information: Comcáac Coastal Restoration Project

Challenges and Opportunities for Blue Carbon Projects in North America

CHALLENGES

- The term 'Blue Carbon' is abstract and often poorly understood
- Project benefits and outcomes vary between sites
- Blue carbon is not always prioritized in MPAs, making management challenging
- Coastal jurisdictions and permitting requirements are complicated
- Lack of standardization and consistency in methodology for measurements, including measurement of additional carbon sequestration in blue carbon habitats
- Lack of – or restricted access to – funding, training, and capacity
- Challenges maintaining Indigenous rights and culture associated with blue carbon ecosystems (e.g., harvest rights)

OPPORTUNITIES

- Adopt clear communication around goals, potential benefits, uncertainty, and timelines
- Include blue carbon conservation or restoration in MPA and OECM management plans
- Improve transparency and guidance for jurisdictions and permitting
- Use standardized and consistent methodology (especially within a region)
- Develop guidelines and examples for site selection, management, and quantification
- Leverage support for blue carbon to assist in broader effective management
- Establish more transparent and diversified funding sources
- Build community capacity and knowledge through training, education and partnerships
- Transfer ownership and responsibility to Indigenous communities

Promise versus Reality

There is a wide range of potential expectations associated with blue carbon projects. In some cases, these expectations may not be realized.

EXPECTATIONS

- Rapid carbon sequestration
- Immediate climate change mitigation impacts
- Monetary benefits, often through carbon credits
- Carbon credits as the primary driver / benefit

REALITY

- Gradual carbon sequestration
- Higher costs than anticipated
- Funding challenges
- Primary drivers: restoration, improved fisheries, restored traditional practices, etc.

Expectations and reality often differ because quantification is challenging (requiring mapping, field and laboratory work), costs related to restoration, conservation, and assessment are often higher than anticipated, project costs may be higher than the financial value of carbon stored, and carbon sequestration can happen over longer time scales than anticipated.

Best Practices

MANAGEMENT APPROACHES: There is no one-size-fits-all approach. Instead, consider site-specific needs, including those of rightsholders and stakeholders.

PARTNERSHIPS: Partnerships with universities, NGOs, and communities can bring added expertise to complex projects.

ENGAGEMENT: Stakeholders and rightsholders should be actively and meaningfully involved throughout the entire project.

CARBON SEQUESTRATION QUANTIFICATION: The IPCC Wetlands Supplement and Blue Carbon Initiative Guide provide methods and guidelines for carbon quantification.

FIRST STEPS: First estimates of regional carbon sequestration can use global estimates of carbon paired with regional habitat maps but remember to verify with local measurements.

Blue Carbon as a Co-Benefit: Huu-ay-aht First Nations Watershed Renewal Program

Barkley Sound, British Columbia, Canada

The Huu-ay-aht watershed renewal program focuses on restoring salmon populations, conserving wildlife and biodiversity, and generating local employment through watershed management, ecosystem restoration (including eelgrass bed restoration) and hatchery operations, to ensure sustainable food sources and economic benefits for the community. The program aims to connect the community with traditional practices such as clam digging and eelgrass harvesting, promoting food sovereignty.

Careful consideration is being given to how conservation activities, especially if they were to become associated with a neighboring MPA, could support the local economy and provide food sovereignty. While carbon sequestration is not the primary goal for this work, it is a welcome co-benefit.

For more information: Huu-ay-aht works toward salmon renewal with Sarita River restoration project

Source: Huu-ay-aht First Nations, Salmon survey (2024).

Key Resources

- Blue Carbon Atlas: Maps and metadata developed by the Commission for Environmental Cooperation (2021) showing the distribution of salt marsh, mangrove, and seagrass habitats across North America.
- Blue Carbon Manual: This manual, by Conservation International, UNESCO, and IUCN, provides standardized methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrass meadows.
- Marine Indigenous Protected and Conserved Areas: An Assembly of First Nations report outlining concrete steps for the Government of Canada to support the establishment of marine Indigenous Protected and Conserved Areas (IPCA).
- Mexican Carbon Program Report: Study on the identification, characterization and evaluation of the balance between greenhouse gas emissions and carbon storage in coastal ecosystems in the Pacific, Gulf of Mexico, and the Yucatan.
- Blue Carbon in Marine Protected Areas Report Series (Part 1, Part 2 and Part 3): The report series provides foundational / guiding information and a detailed case study to inform the assessment, protection, and management of blue carbon habitats.
- Methodological Guidance on Greenhouse Gas Inventories for Wetlands: This document extends the content of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories by filling gaps and providing updated information specifically related to wetlands.
- NOAA Blue Carbon Inventory Project: The project draws on the expertise at US technical agencies to develop tools and templates to help countries prepare National Greenhouse Gas Inventories consistent with IPCC guidelines and reduce emissions by promoting better wetland management strategies.