Coastal Blue Carbon: methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrass meadows

Dr. Jennifer Howard
Marine Climate Change Manager
Conservation International
Coastal Wetlands
Healthy coastal ecosystems are essential for people

Fisheries
Coastal protection & erosion control
Coastal water quality
Livelihoods (tourism etc.)
Cultural value
Food
Biodiversity
Carbon sequestration and storage
Coastal habitats store significant amounts of carbon.

Source: IUCN, DukeNichols Institute
These ecosystems are being rapidly lost

<table>
<thead>
<tr>
<th>COASTAL HABITAT</th>
<th>EST. GLOBAL AREA (km sq)</th>
<th>ANNUAL LOSS</th>
<th>TOTAL LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seagrass Meadows</td>
<td>300,000</td>
<td>2%</td>
<td>29%</td>
</tr>
<tr>
<td>Salt Marshes</td>
<td>400,000</td>
<td>2%</td>
<td>50%+</td>
</tr>
<tr>
<td>Mangroves</td>
<td>152,000</td>
<td>1.8%</td>
<td>35%</td>
</tr>
</tbody>
</table>

© Boone Kauffman
Globally significant emissions.

<table>
<thead>
<tr>
<th></th>
<th>Global Extent</th>
<th>Loss</th>
<th>Carbon Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangroves</td>
<td>137,760 km²</td>
<td>30–50% in the last 50 years</td>
<td>0.02 – 0.12 Pg C yr⁻¹</td>
</tr>
<tr>
<td>Seagrass Meadows</td>
<td>300,000-600,000 km²</td>
<td>1.5% annually</td>
<td>0.06 – 0.3 Pg C yr⁻¹</td>
</tr>
</tbody>
</table>

Total emissions from Blue Carbon systems ~ Japan
Can blue carbon provide incentives for conservation and restoration of coastal ecosystems?

- Climate change adaptation and mitigation
- Improve management and regulation
- Provide basis for incentives to conserve or restore
http://thebluecarboninitiative.org/

- International Blue Carbon Scientific Working Group
- International Blue Carbon Policy Working Group
- Blue carbon research projects
- Demonstration projects
- Capacity building
International Blue Carbon Policy Working Group

- Provide guidance for blue carbon policy development
- Build integrated blue carbon community
Provide the scientific foundation

Identify the next big science questions, Create tools, Develop guidelines, Support policy, Identify priority geographies
Managers need to be able to assess and monitor carbon stocks and changes in carbon stocks over time.

To date, managers and other stakeholders interested in quantifying blue carbon have lacked practical tools and guidance.

This is particularly true in developing country context where data and technical and financial resources to carry out complex analysis is often lacking.
Objective of the Manual

- Provide background information on key concepts
- Describe standardized methods for measuring carbon stocks and fluxes in the field
- Utilize data produced to support improved conservation and restoration of coastal ecosystems
Who is the Manual For?

The manual has been designed to be used by a wide range of stakeholders including managers, scientists, community groups, or local or national government agencies who are interested in having a better understanding of their blue carbon stocks.
• Provides background information
• Why measure carbon stocks
• Explains how these measurements can be used to inform management and policy decisions

Why Measure Carbon Stocks

LEAD AUTHORS
Jennifer Howard, Kirsten Isensee, Hilary Kennedy, Emily Pidgeon, Maciej Tulszewski

CO-AUTHORS
Steve Crooks, Igino Emmer, Dorothée Herr, Sarah Hoyt, Daniel Laffoley, Marco Ouesada, Jorge Luis Vildes, Tonny Wagey
Conceptualizing the Project and Developing a Field Measurement Plan

LEAD AUTHORS
James Fougereau, Beverly Johnson, J. Boone Kaufman, Hillary Kennedy

CO-AUTHORS
Igino Emmer, Jennifer Howard, Emily Pidgeon, Oscar Serrano

- Stocks vs pools (and which pools to measure)
- Stratification
- Plot design
Field Sampling of Soil Carbon Pools in Coastal Ecosystems

LEAD AUTHORS
James Fourqurean, Beverly Johnson, J. Boone Kauffman, Hilary Kennedy, Catherine Lovelock

CO-AUTHORS
Daniel M. Alongi, Miguel Cifuentes, Margaret Copertino, Steve Crooks, Carlos Duarte, Miguel Fortes, Jennifer Howard, Andreas Hootahassan, James Kairo, Catherine Lovelock, Nuria Marbà, James Morris, Daniel Murdyarsno, Emily Pidgeon, Peter Ralph, Neil Saintilan, Oscar Serrano

- Coring methods
- Documenting
- Sampling strategies
- Laboratory analysis
- Data analysis
Field Sampling of Vegetative Carbon Pools in Coastal Ecosystems

LEAD AUTHORS
James Fourquarean, Beverly Johnson, J. Boone Kauffman, Hillary Kennedy, Catherine Lovelock, Neil Saintilan

CO-AUTHORS
Daniel M. Alongi, Miguel Cifuentes, Margareth Copertino, Steve Crooks, Carlos Duarte, Miguel Fortes, Jennifer Howard, Andreas Hutahean, James Kairo, Núria Marbà, Daniel Murdiyarso, Emily Pidgeon, Peter Ralph, Oscar Serrano

- Sampling methods (by ecosystem type)
- Biometric equations
- Laboratory analysis
- Data analysis
• Stock difference method
• Gain loss method
• Flux method (static chamber, with example)
Remote Sensing and Mapping

LEAD AUTHORS
Abdullah (Fazl) Rahman, Marc Simard

CO-AUTHORS
Chandra Giri

- Background information
- Available tools (pros and cons)
- Freely available data sets
- Data analysis
- Ground truthing
Data Management

- Keeping good records
- Meta data
- QA/QC
- Data sharing
Appendices

- Guidance documents
- List of relevant equations
- Start to finish example
- Data collection worksheets
- Supplementary information
NEXT STEPS

Field Test

Input from the users
Free to download:

thebluecarboninitiative.org/manual

If you have any comments, questions, or corrections please send an email to:

thebluecarboninitiative@conservation.org
Thank you

Dr. Jennifer Howard
Conservation International
jhoward@conservation.org

thebluecarboninitiative.org/manual