Developing Science and Policy on Blue Carbon: Information Needs

Stephen Crooks Ph.D.
Climate Change Services Director
ESA PWA

North American Carbon Project

Lisa Windham-Myers

Jim Fourqurean

Washington DC
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Ecosystem Services of Coastal Blue Carbon Ecosystems: Mangrove, Marsh & Seagrass

- Biological diversity
- Water quality and storage
- Flood and storm buffering
- Forest and non-timber forest products
- Aesthetic and ecotourism values
- Fish and Shellfish
- Carbon Sinks

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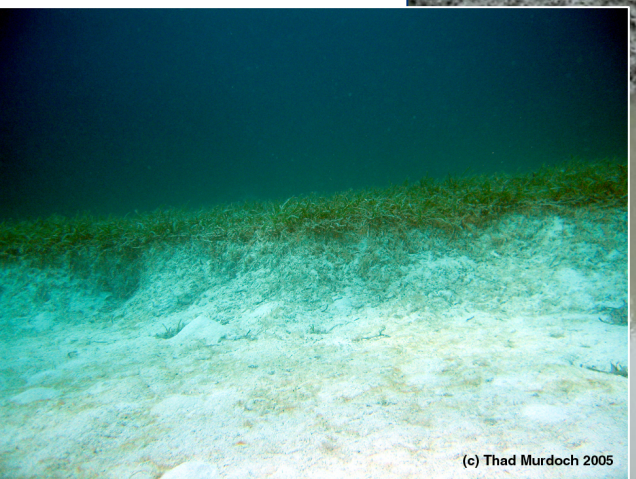
Floodplains Feed Fish
(*floodplain fatties*)

Photo: Jeff Opperman. Research by Carson Jeffres

Coastal ecosystems: long-term carbon sequestration and storage



Ecosystems in focus for climate change mitigation

Forest

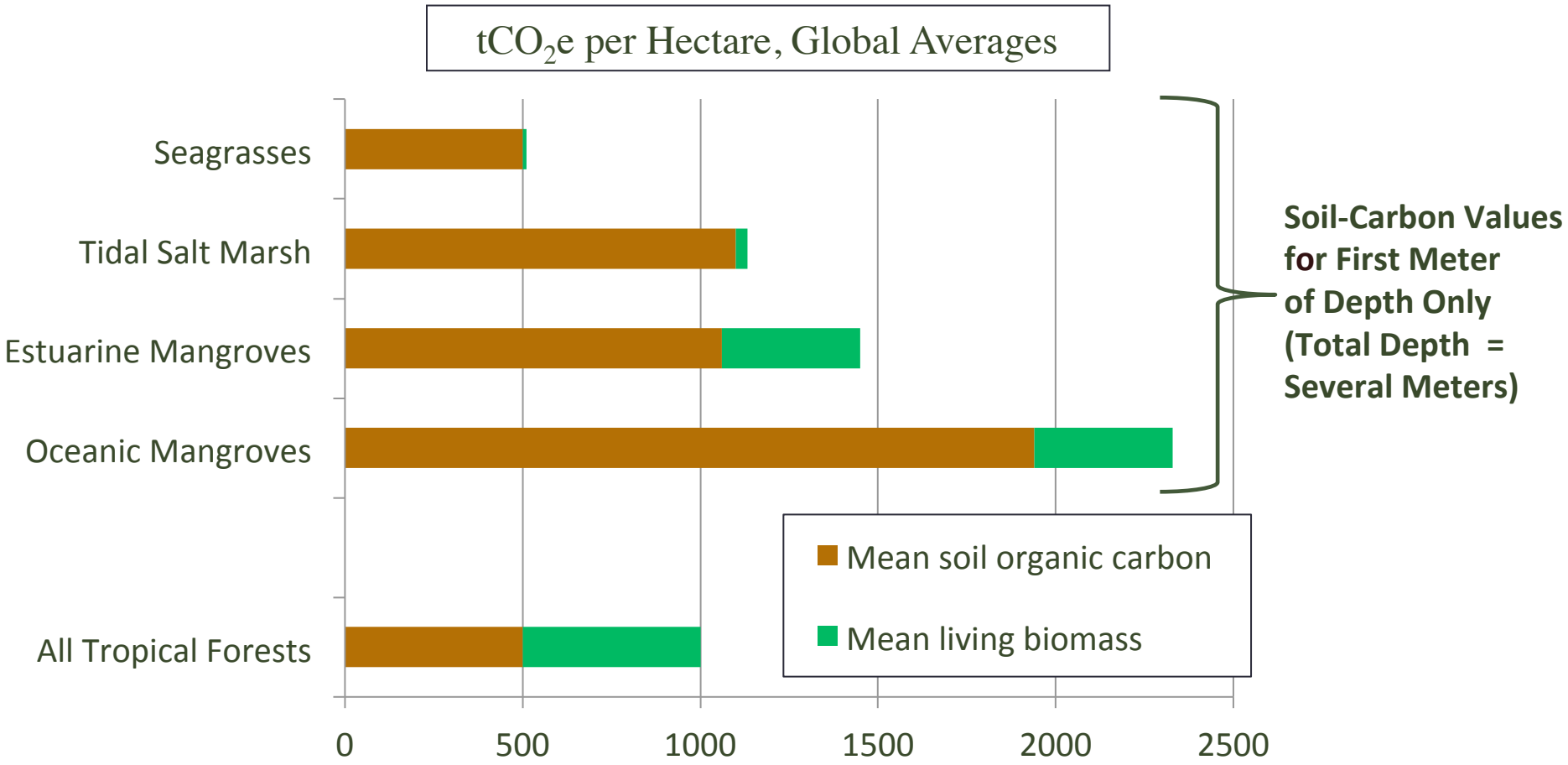
Peatland

Mangroves

Tidal Marshes

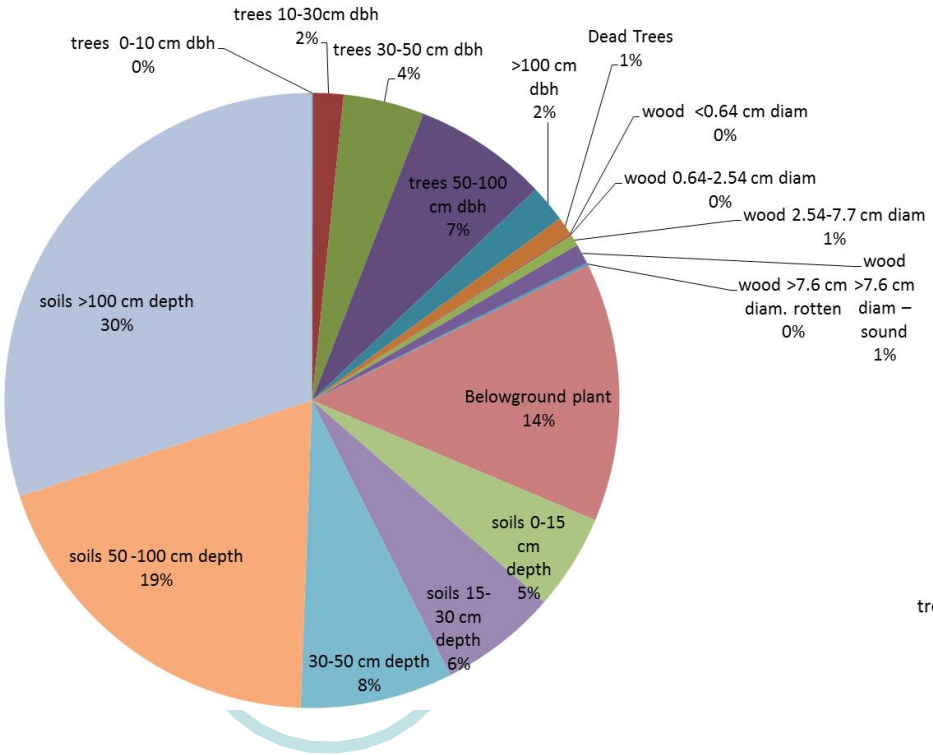
Seagrass

Distribution of carbon in coastal ecosystems

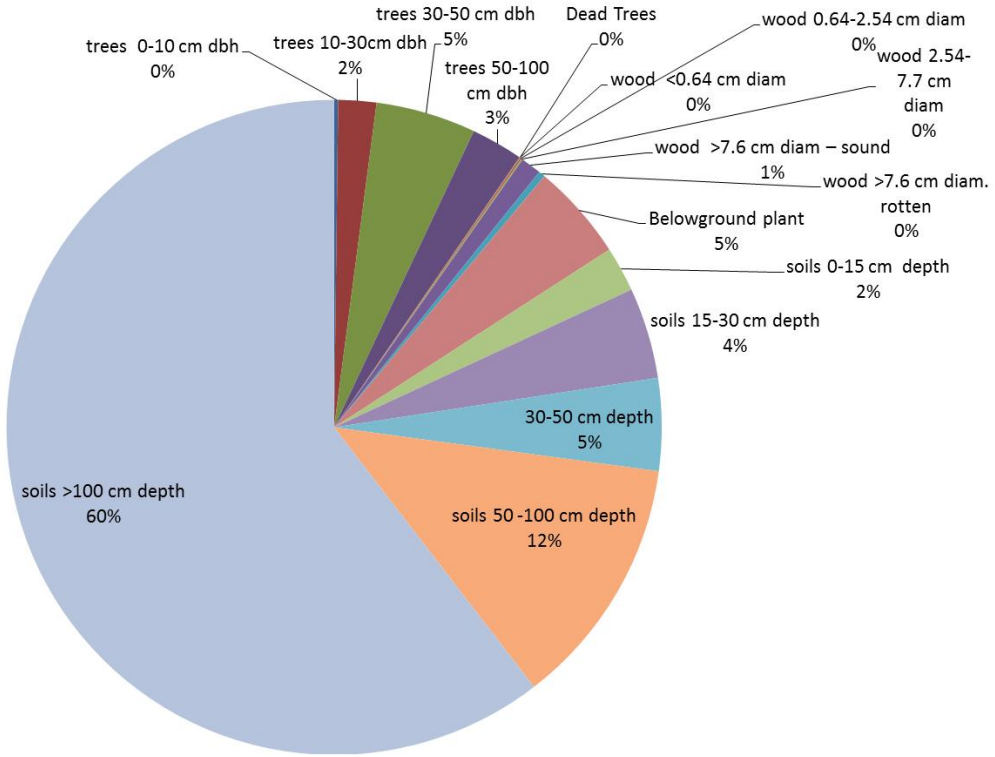


Data summarized in Crooks *et al*., 2011; Murray *et al*., 2011, Donato et al., 2011

Ecosystem C-pools - Mangroves



Kalimantan, Indonesia Riverine (83%)
1259 Mg/ha



Coastal Fringe Yap FSM (68%)
1066 Mg/ha

Donato, Kauffman et al., 2012

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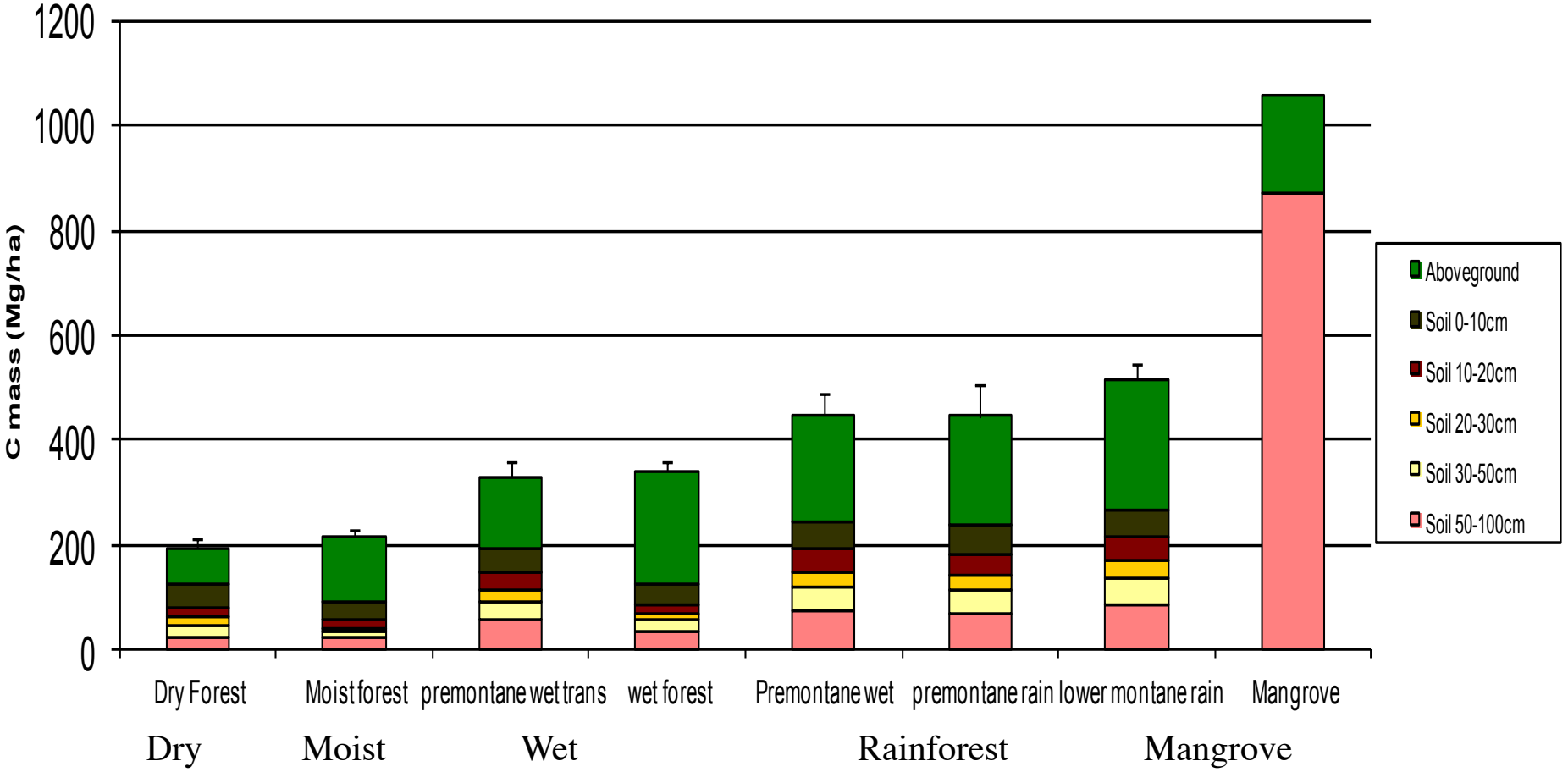
Carbon Stocks

Tropical forests and mangroves of Costa Rica



Kauffman, Cifuentes, et al. In prep

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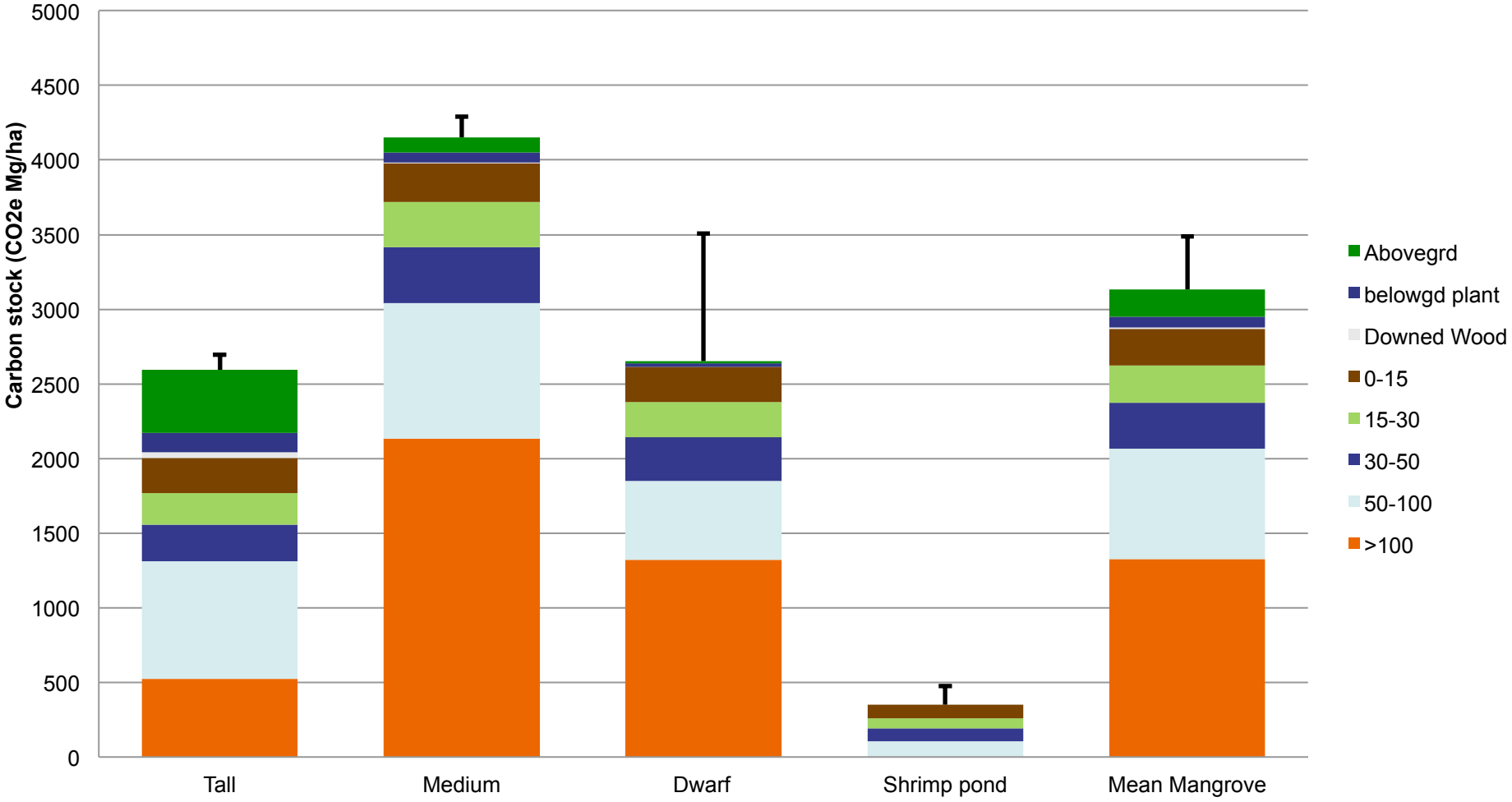
CARBON STOCKS OF NEOTROPICAL MANGROVES ARE AMONG THE LARGEST OF ALL TROPICAL FORESTS

Ecosystem C stocks in CO_2e, Republica Dominicana 2012

Kauffman, Cifuentes et al. 2013 (In press)



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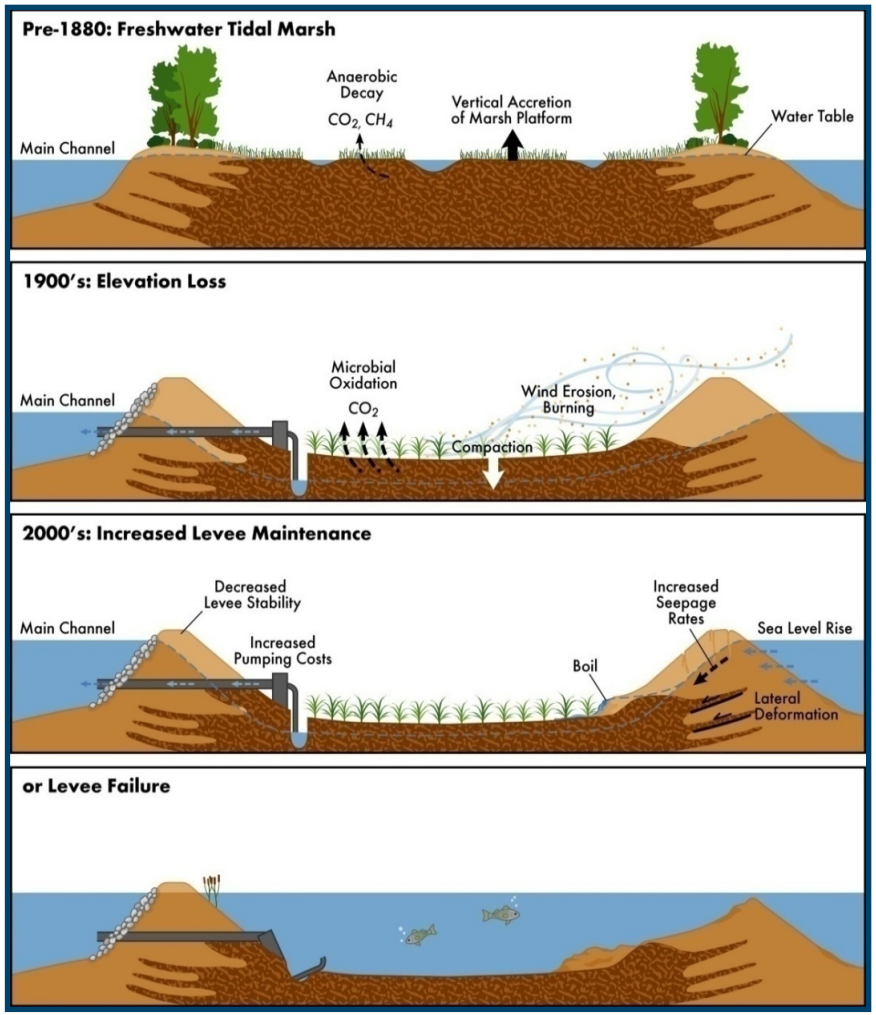

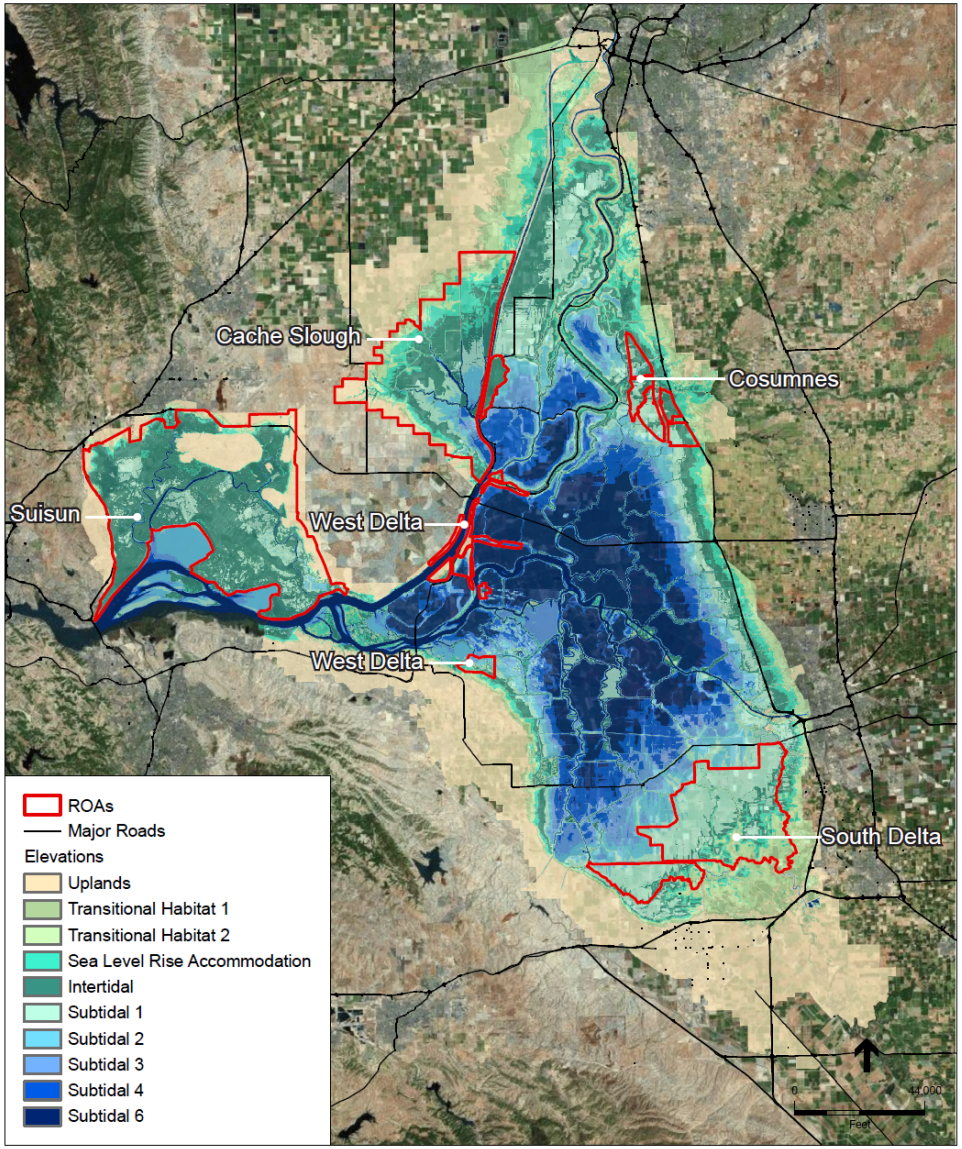

SOURCE:

DWR 2007 LiDAR; ESA-PWA 2012

Bay Delta Science Conference.

Figure 1

Elevations and ROAs of Delta-Suisun Marsh Planning Area

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Emissions from One Drained Wetland: Sacramento-San Joaquin Delta

Area under agriculture	**180,000 ha**
Rate of subsidence (in)	1 inch

3-5 million tCO_2/yr released from Delta

1 $GtCO_2$ release in c.150 years
4000 years of carbon emitted

Equiv. carbon held in 25% of California's forests

Accommodation space: 3 billion m^3

Carbon Capture Wetland Farm Bio-Sequestration

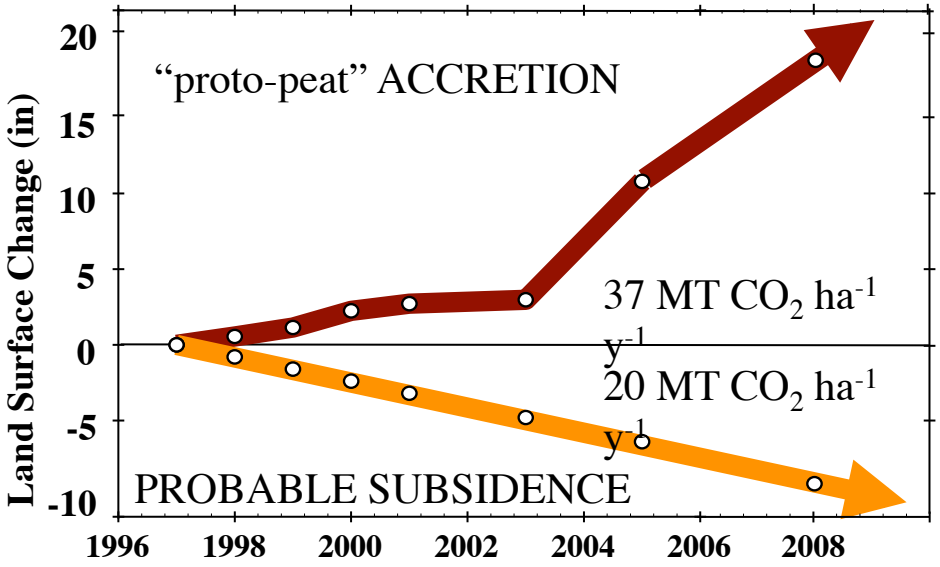
Stops peat oxidation and accretes "proto-peat" rapidly

Continuously submerged about 1 ft

Low oxygen conditions

Balance between plant growth and reduced decomposition

Average annual soil sequestration:
1 kg C m^{-2} yr^{-1} in soil



USGS
U.S. Department of the Interior
U.S. Geological Survey

Miller et al. 2008, SFEWS

OPEN ACCESS Freely available online

PLOS ONE

Estimating Global "Blue Carbon" Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems

Linwood Pendleton[1*], Daniel C. Donato[2*], Brian C. Murray[1], Stephen Crooks[3], W. Aaron Jenkins[1], Samantha Sifleet[4], Christopher Craft[5], James W. Fourqurean[6], J. Boone Kauffman[7], Núria Marbà[8], Patrick Megonigal[9], Emily Pidgeon[10], Dorothee Herr[11], David Gordon[1], Alexis Baldera[12]

Table 1. Estimates of carbon released by land-use change in coastal ecosystems globally and associated economic impact.

	Inputs			Results	
Ecosystem	Global extent (Mha)	Current conversion rate (% yr^{-1})	Near-surface carbon susceptible (top meter sediment+biomass, Mg CO_2 ha^{-1})	Carbon emissions (Pg CO_2 yr^{-1})	Economic cost (Billion US$ yr^{-1})
Tidal Marsh	2.2–40 (5.1)	1.0–2.0 (1.5)	237–949 (593)	**0.02–0.24 (0.06)**	**0.64–9.7 (2.6)**
Mangroves	13.8–15.2 (14.5)	0.7–3.0 (1.9)	373–1492 (933)	**0.09–0.45 (0.24)**	**3.6–18.5 (9.8)**
Seagrass	17.7–60 (30)	0.4–2.6 (1.5)	131–522 (326)	**0.05–0.33 (0.15)**	**1.9–13.7 (6.1)**
Total	33.7–115.2 (48.9)			**0.15–1.02 (0.45)**	**6.1–41.9 (18.5)**

Compare to national emissions from all sources

Poland

Japan

Blue Carbon: Connecting Policy to Practice

- United Nations Framework Convention on Climate Change
  - Brief national climate change negotiators
  - Identify policy opportunities
  - Engage IPCC and SBSTA
  - Multi-national demonstration projects

- National Governments
  - Establish programs and science research
  - Recognize wetlands in national accounting
  - Agency awareness, action, funding

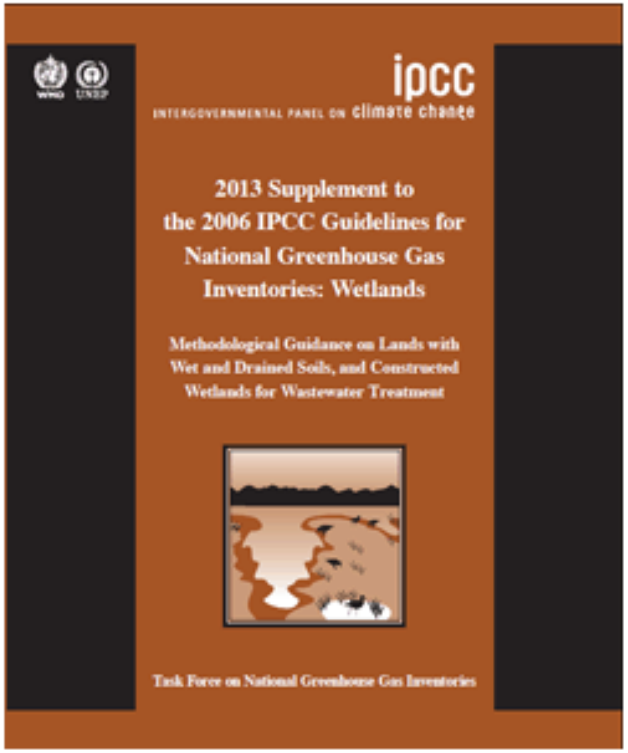
- Local Demonstration and Activities
  - Landscape level accounting
  - Establish carbon market opportunities
  - Look for synergistic conservation benefits
  - Demonstration projects and public awareness

Methodological Guidance for Coastal Wetlands in the *2013 SUPPLEMENT TO THE 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES: WETLANDS*

2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

1. Introduction
2. Cross cutting guidance on organic soils
3. Rewetting and restoration of organic soils
4. Coastal wetlands
5. Other freshwater wetlands
6. Constructed wetlands
7. Good practice and implications for reporting

Adopted by IPCC Oct 2013, Published Feb 2014
http://www.ipcc-nggip.iges.or.jp/



Chapter 4: Coastal Wetlands

This chapter updates guidance contained in the *2006 IPCC Guidelines* to:

- Provide default data for estimation of C stock changes in mangroves living biomass and dead wood pools for coastal wetlands at Tier 1

This chapter gives new:

- Guidance for CO_2 emissions and removals from organic and mineral soils for the management activities of extraction (including construction of aquaculture and salt production), drainage and rewetting and revegetation
- Default data for the estimation of anthropogenic CO_2 emissions and removals for soil in mangrove, tidal marsh and seagrass meadows.
- Guidance for N_2O emissions during aquaculture use.
- Guidance for CH_4 emissions for rewetting and revegetation of mangroves and tidal marshes.

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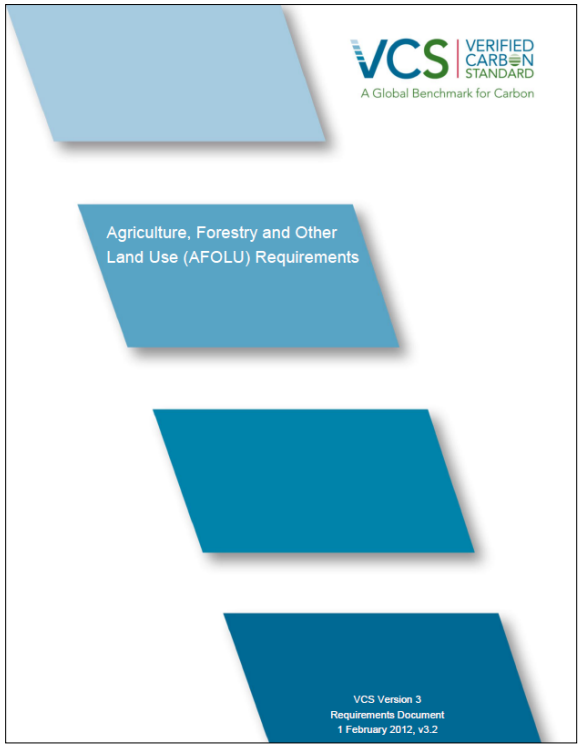
VCS VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

Wetlands Restoration and Conservation (WRC)
Adopted into Standard Oct 4, 2012
http://v-c-s.org/wetlands_restoration_conservation



Other Categories:
- Afforestation, Reforestation, Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management IFM)
- Reduced Emissions from Deforestation and Degradation (REDD)

RESTORE AMERICA'S ESTUARIES

Example Project Activities

- **Conservation**
  - Protection of at risk wetlands
  - Improved water management on drained wetlands
  - Sediment recharge to coastal wetlands
  - Space for migrating wetlands

- **Restoration / creation**
  - Lowering of water levels on impounded wetlands
  - Raising soil surfaces with dredged material
  - Increasing sediment supply by removing dams
  - Restoring salinity conditions
  - Improving water quality
  - Revegetation
  - Combinations of the above

National Level Opportunities

1. Establish a national blue carbon working group to inform science and planning activities
2. Support additional research and analysis of GHG implictions of estuary wetland management
3. Assess blue carbon emissions and removals across landscape
4. Assist reporting on GHGs (new IPCC guidelines)
5. Integrate climate mitigation, adaptation, and restoration actions in local land-use plans
6. Enact blue carbon demonstration projects
7. Integrate blue carbon into regulatory and policy frameworks
8. Scale up public and private investment in estuary wetland restoration and protection

Stephen Crooks
Climate Change Services Director
ESA PWA
+1 415 272 3916
SCrooks@esassoc.com

CONSERVATION INTERNATIONAL IUCN

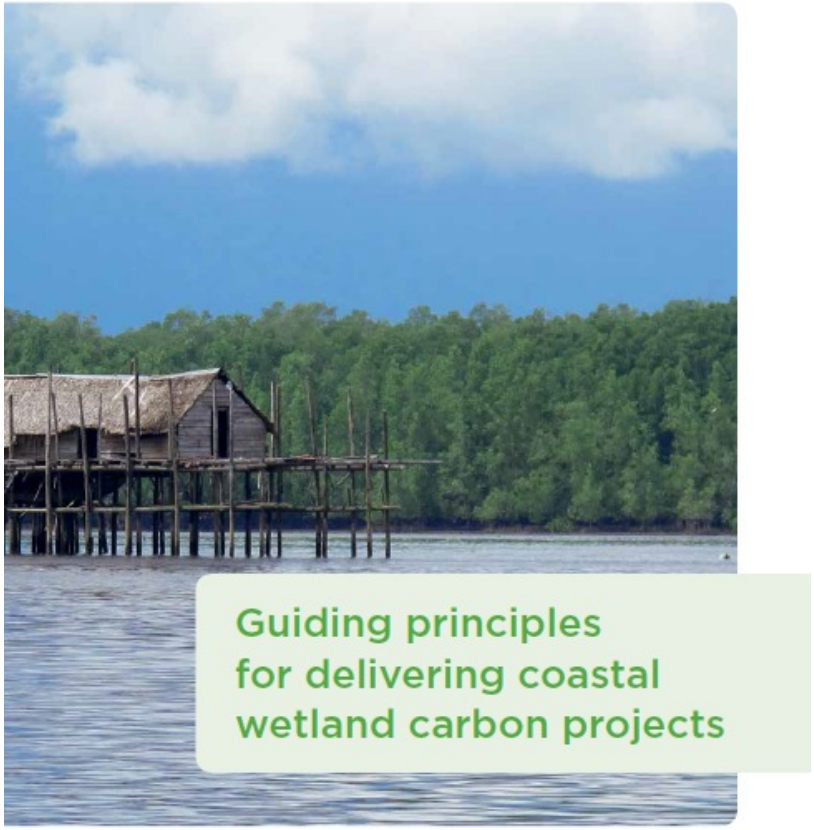
Contents

- Why measure C stocks?
- Field Campaign Planning
- Sampling Soils
- Sampling Vegetation
- Estimating Emissions
- Remote Sensing and Mapping
- Data Management

TheBlueCarbonInitiative.org

Best Practice Principles for Delivering Coastal Wetland Carbon Projects

- Overarching principles
- Connects experience:
  - Wetland landscape restoration
  - Carbon projects
  - Carbon policy
  - Community engagement
- Demonstration projects
  - Scaling up
  - Linking adaptation and mitigation
  - Avoid pitfalls
- Intended audience:
  - Technical (summary messages for policy)



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