TECHNICAL AND SCIENTIFIC ASPECTS OF SOURCES, SINKS AND RESERVOIRS OF ALL GHGS FOR COASTAL AND MARINE ECOSYSTEMS

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Coalition for Rainforest Nations

OSU Oregon State University

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Consulting, Research, Educational services

Blue Carbon
Sinks include:

Seagrass Meadows

Seagrass, Babeldoab Island, Palau

Blue Carbon sinks include tall mangrove :Mangle Caballo (*Rhizophora racemosa*) Estero Damas, Costa Rica

Altura de canopia -30-35m

Profundad de suelos - >3m

Otros – *Peliceara rhizophorae, Rhizophora mangle, Avicennia germinans, Laguncularia racemosa*

Blue carbon sinks include Salt marshes

Port Aransas ,Texas

Ecosystem Services of Coastal Ecosystems: mangroves, seagrass, and marshes

- Biological diversity
- Water quality and timing
- Flood and storm damage
- Forest and non-timber forest products
- Aesthetic and ecotourism values
- Fish and Shellfish
- Carbon Sinks (of great importance with respect to REDD+ and other mitigation strategies

Tropical Wetlands Initiative on Climate Change Adaptation and Mitigation (TWINCAM)

A global research project on ecosystem services of tropical wetlands throughout the world.

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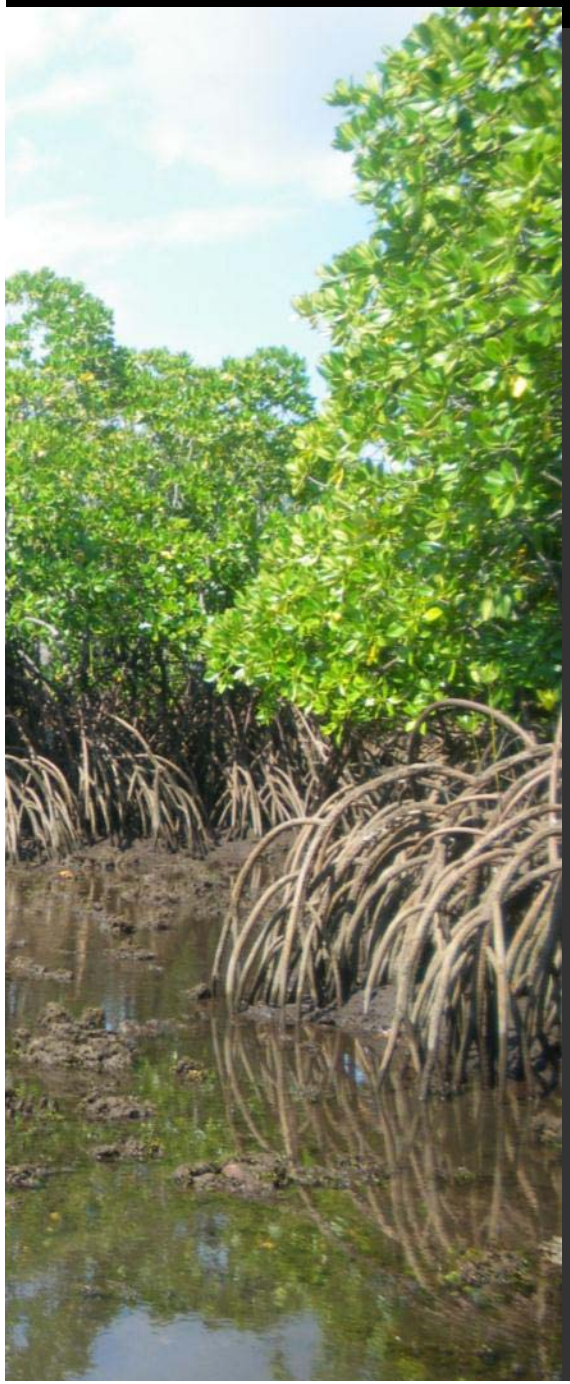
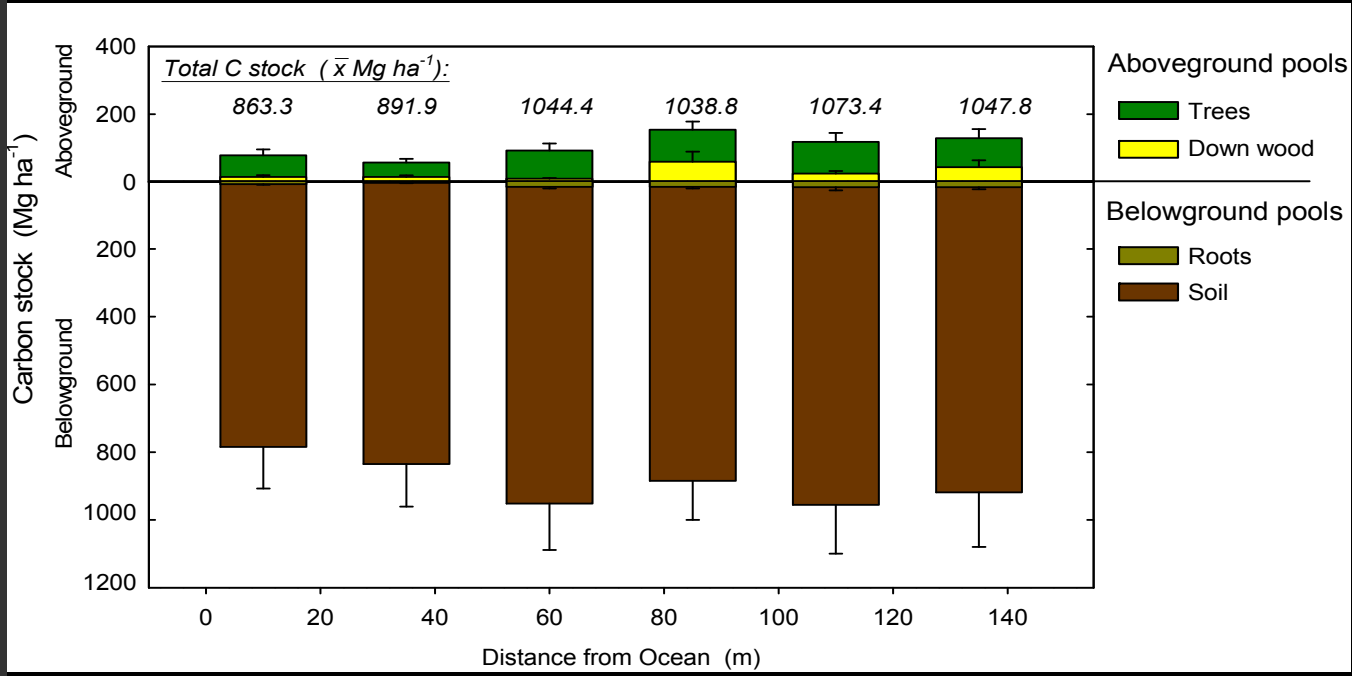
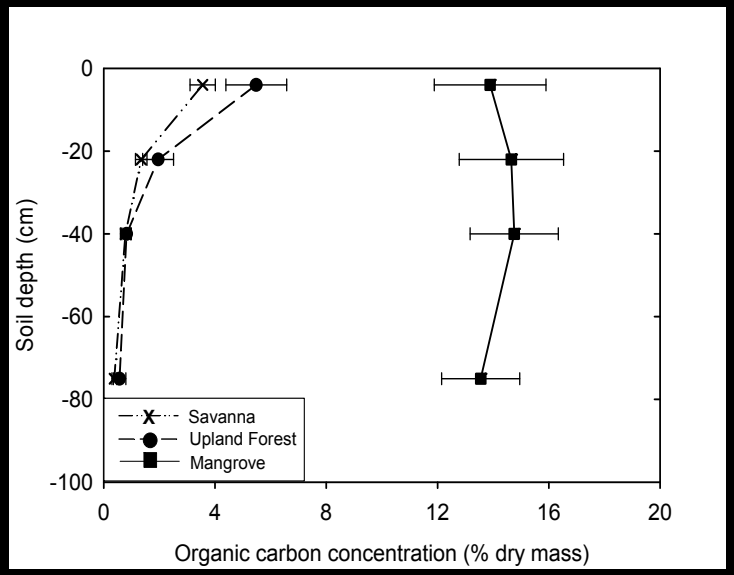
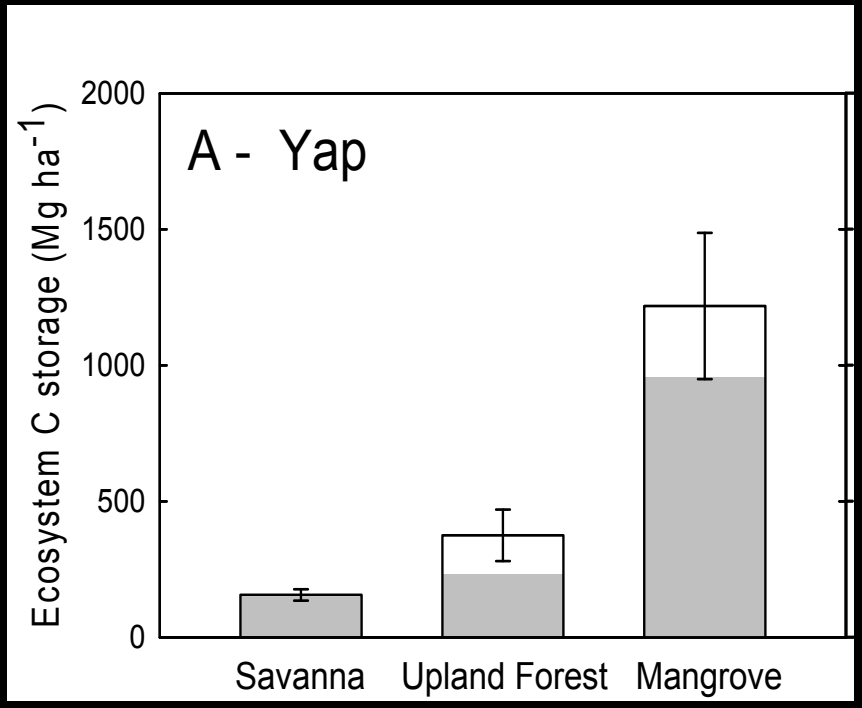


C-stocks in mangroves: The Indo-Pacific



Donato et al 2011; Murdiyarso et al. (2010)

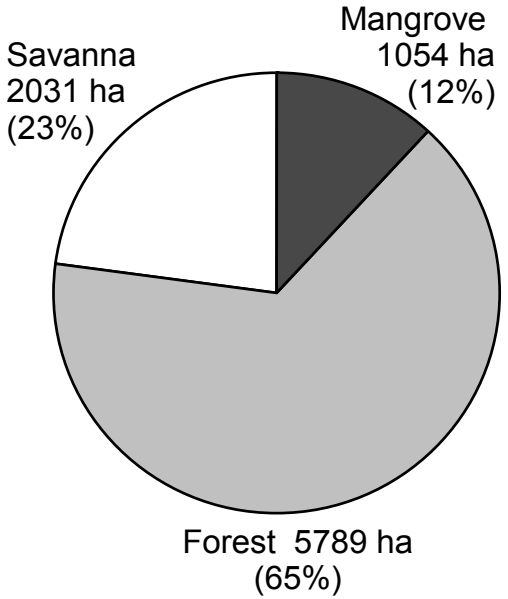




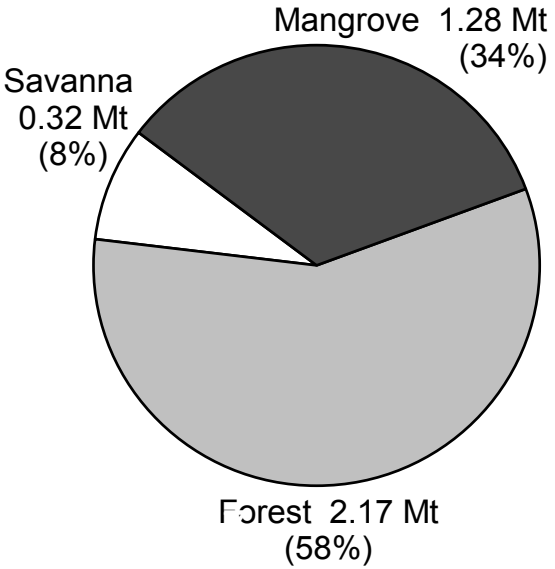
Donato et al. (2012)

Yap

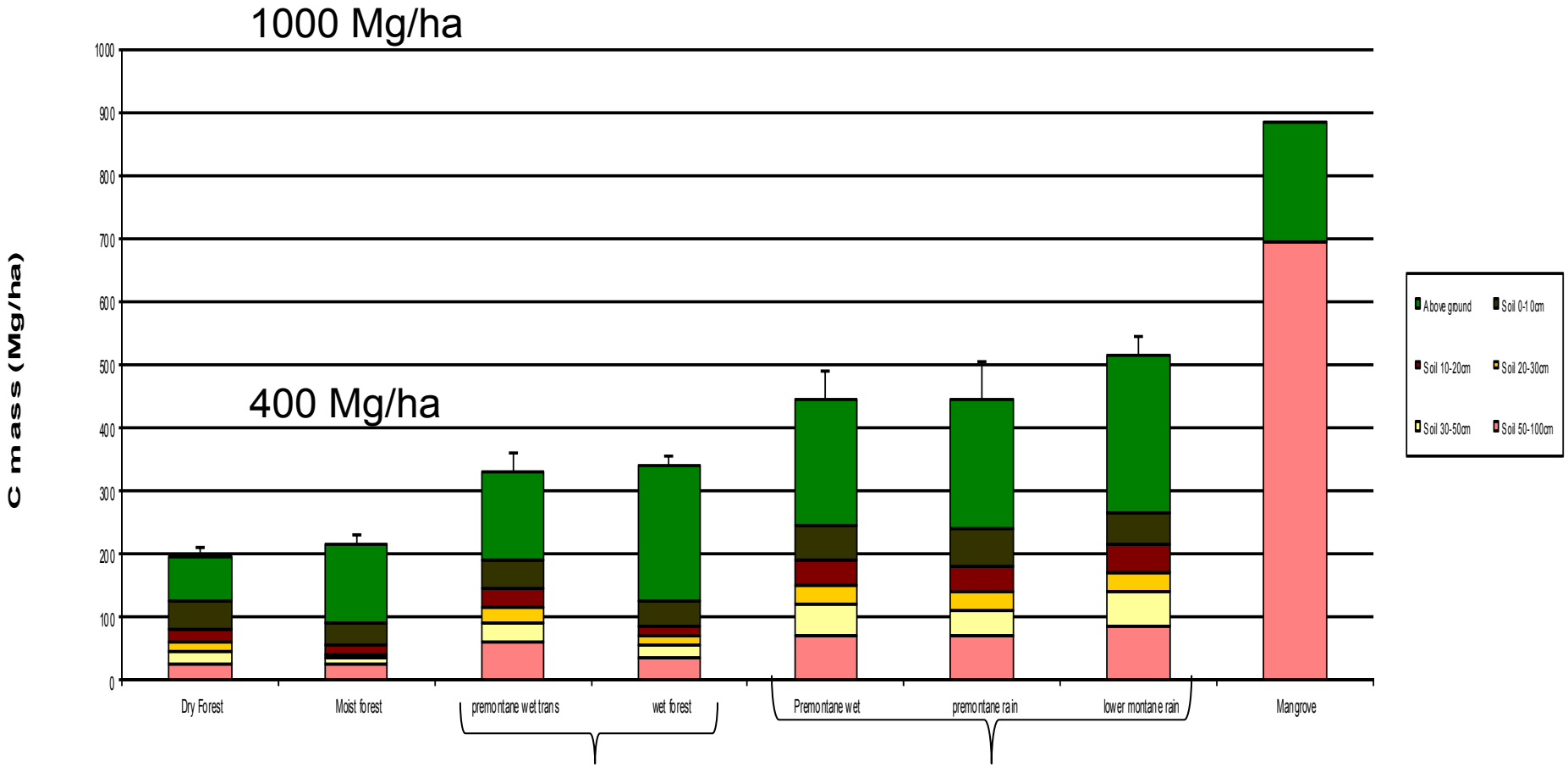
Land Area



Carbon Stock

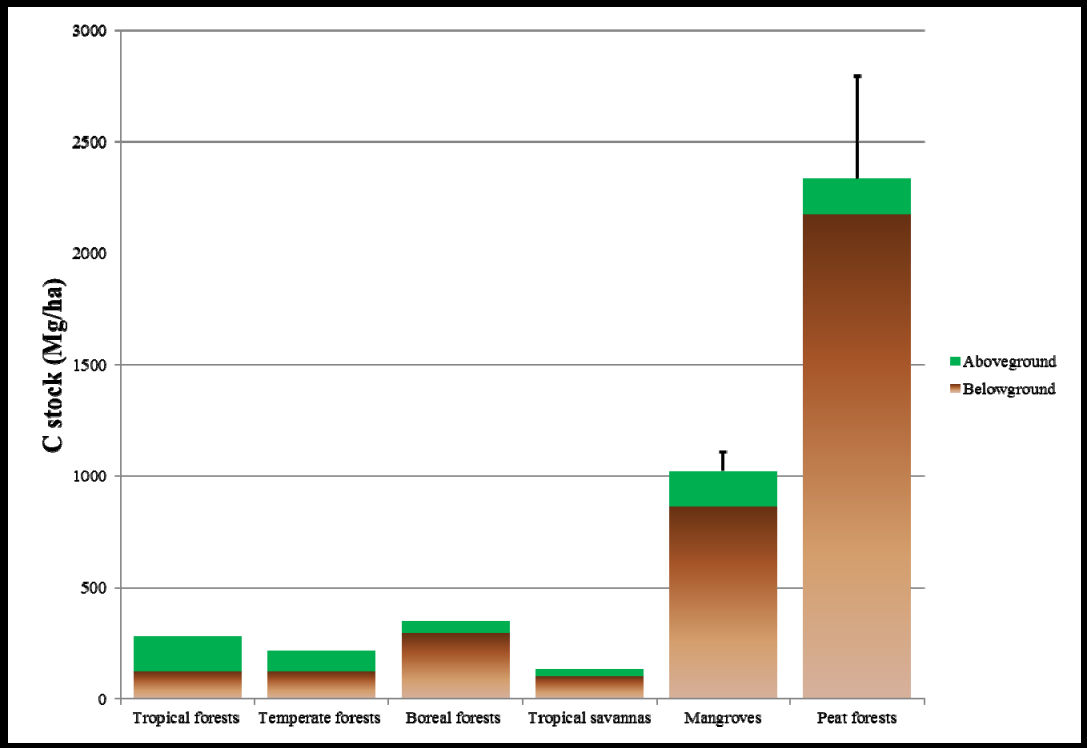


Ecosystem Carbon stocks – Costa Rican upland forests compared to carbon stocks of mangroves



Kauffman, Cifuentes, et al. (In prep)

Forest Carbon stocks



Data are from: IPCC, 2001: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change ; Donato et al. (2011), and this presentation.

Currently, on average, between 1-7% of blue carbon sinks are being lost annually:

Upstream disruptions

Aquaculture

Rice/Agriculture

Road development /hydrological disruptions

Coastal development

Estimates of carbon released by land-use change in coastal ecosystems.
Pendleton et al (In press).

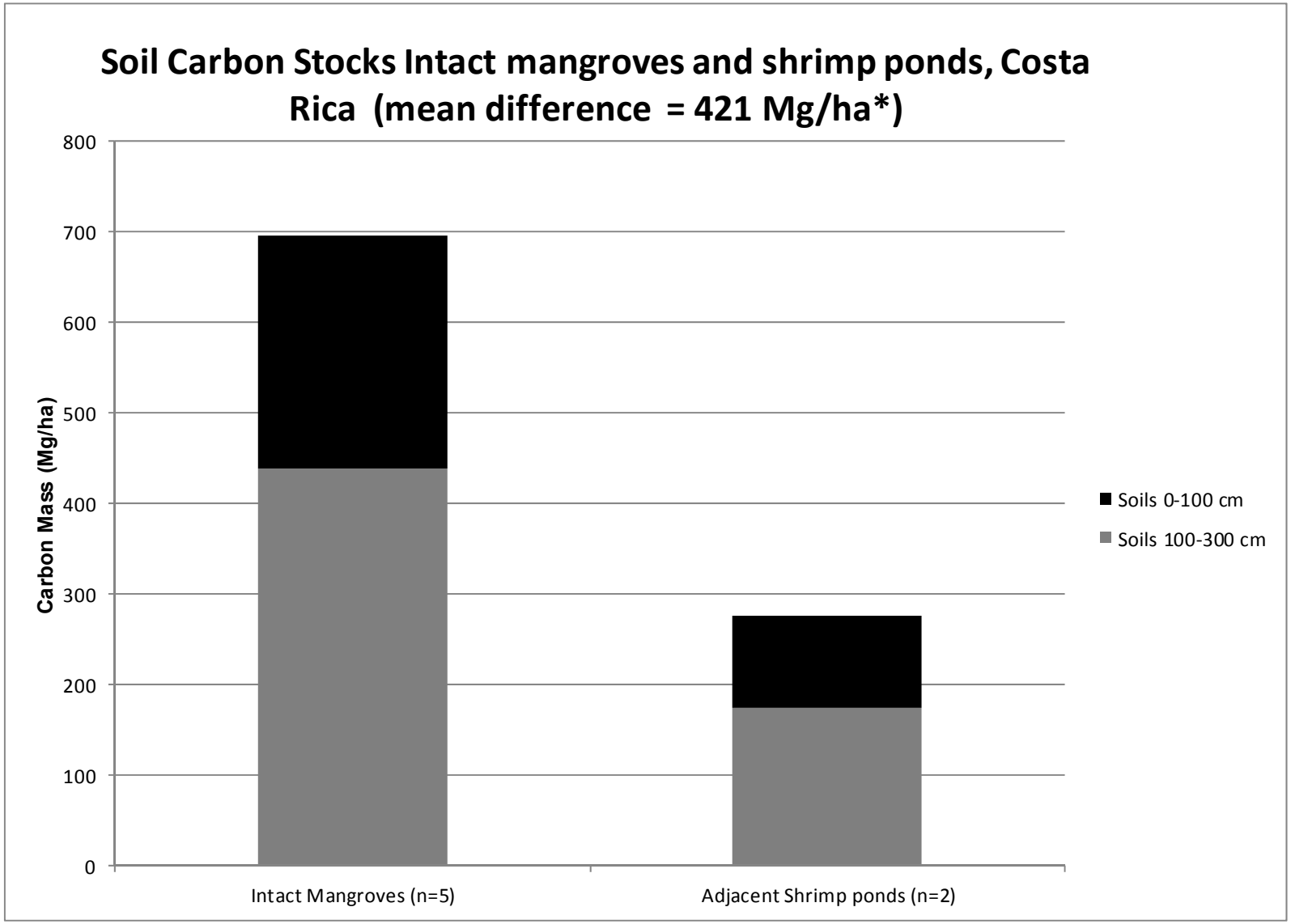
	Inputs			Results
Ecosystem	Global extent (Mha)	Current conversion rate (% yr^{-1})	Near-surface carbon susceptible (top meter soil + biomass, Mg CO_2 ha^{-1})	Carbon emissions (Pg CO_2 yr^{-1})
Tidal Marsh	2.2 – 40 (5.1)	1.0 – 2.0 (1.5)	237 – 949 (593)	0.02 – 0.24 (0.06)
Mangroves	13.8 – 15.2 (14.5)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

The net tropical deforestation emission is about 1.3 Pg C $year^{-1}$ (Pan et al. 2011 Science).

Direct evidence of emissions rates from land conversion – mangroves coastal ecosystems?

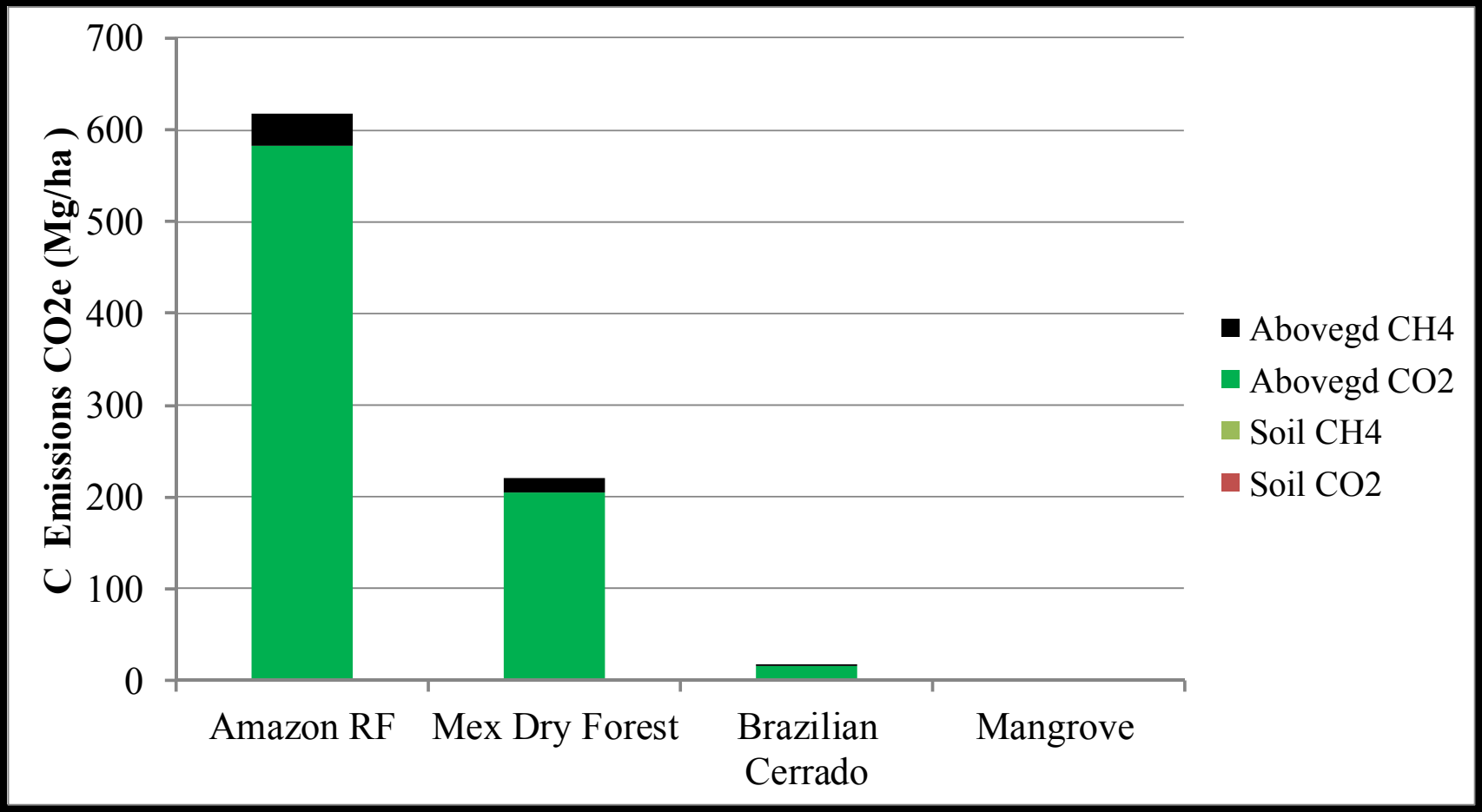
Abandoned shrimp pond with mangroves on the edge, Costa Rica

The core on the left is from an intact mangrove while the core on the right is from an adjacent abandoned shrimp pond formed in mangrove. The differences in carbon and root mass are very apparent suggesting large emissions with conversion



* A CO_2 equivalent of 1545 Mg/ha (C mass * 3.67)

Modeled fire emissions –forest conversion



Data are from Kauffman et al 2004, Steele 2000, de Castro 1996, and Donato et al. 2011
Data from rainforest and methods to predict emissions from fires are from Guild et al. (2004) *Ecol Apps* 14:232-246.
Mangrove emissions are based on the assumptions of the oxidation of top 30 cm of soil C.

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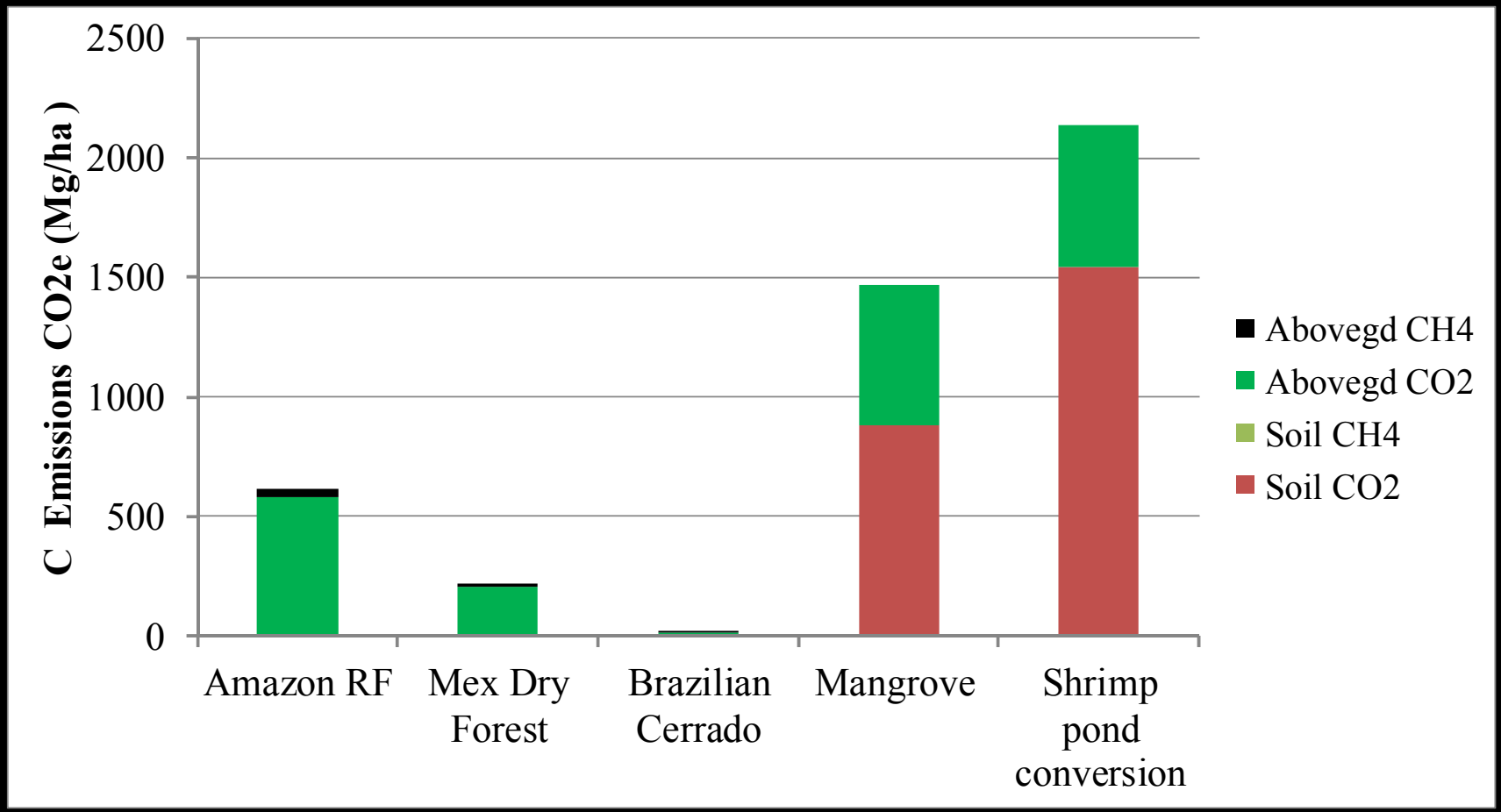

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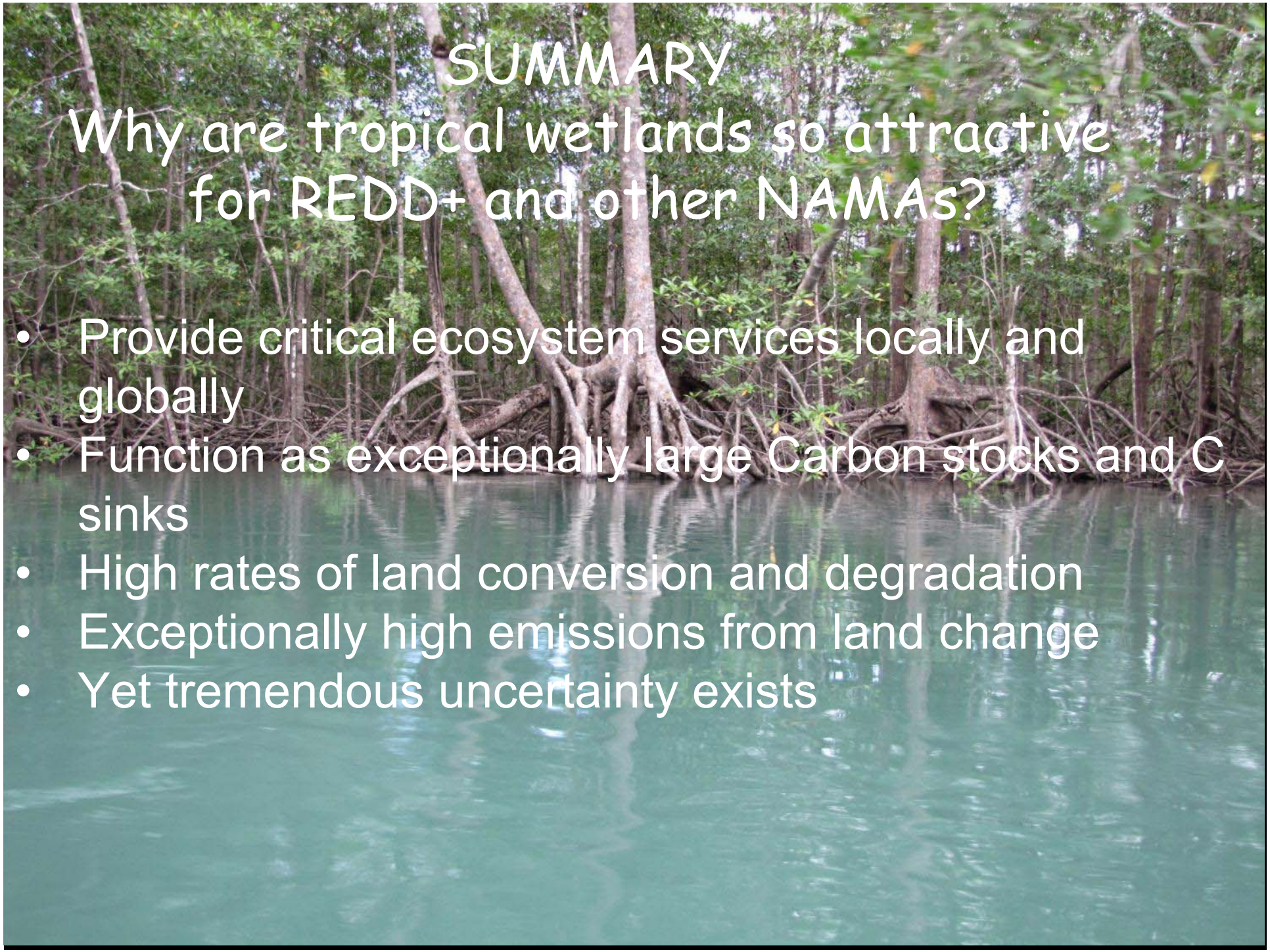
Shrimp pond conversion are calculated emissions from stock change approaches from field measurements Kauffman and Cifuentes In prep)



SUMMARY
Why are tropical wetlands so attractive for REDD+ and other NAMAs?

- Provide critical ecosystem services locally and globally
- Function as exceptionally large Carbon stocks and C sinks
- High rates of land conversion and degradation
- Exceptionally high emissions from land change
- Yet tremendous uncertainty exists

Considerations

- **Initiate a work programme aimed at quantifying the role of coastal marine ecosystems on global atmospheric fluxes of greenhouse gasses. This should also include the vulnerability of coastal marine ecosystems to climate change – Research to address the uncertainties related to mitigation and adapatation**

- **Workshop- Progress and developments in research activities relevant to the technical and scientific aspects of greenhouse gas emissions by sources, removals by sinks, and reservoirs of coastal and marine ecosystems with a view to identifying and quantifying the impact of human activities.**
- **Establish Networks/Demonstration Areas for the monitoring and reporting of greenhouse gas emissions by sources, removals by sinks, and reservoirs of coastal and marine ecosystems .**

Thank you!

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