NATURE-BASED CARBON CAPTURE & STORAGE IN COASTAL LOUISIANA HABITATS

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NATURE-BASED CARBON?

- Also known as green or blue carbon
- **Blue Carbon**
  - Captured in coastal habitats by aquatic and wetland plants
- **Blue Carbon** is found in coastal habitats (fresh to saline) including:
  - Tidal forests
  - Marshes
  - SAV and seagrasses (Windham-Myers et al. 2019)
- Store organic carbon in flooded soils as a long-term sink
- Louisiana's coastal habitats are diverse and have great potential of **blue carbon** (Stagg et al. 2017, Baustian et al. 2017, 2020)

Port Fourchon, LA

SWAMPS

Photo credit: Joe Baustian, TNC

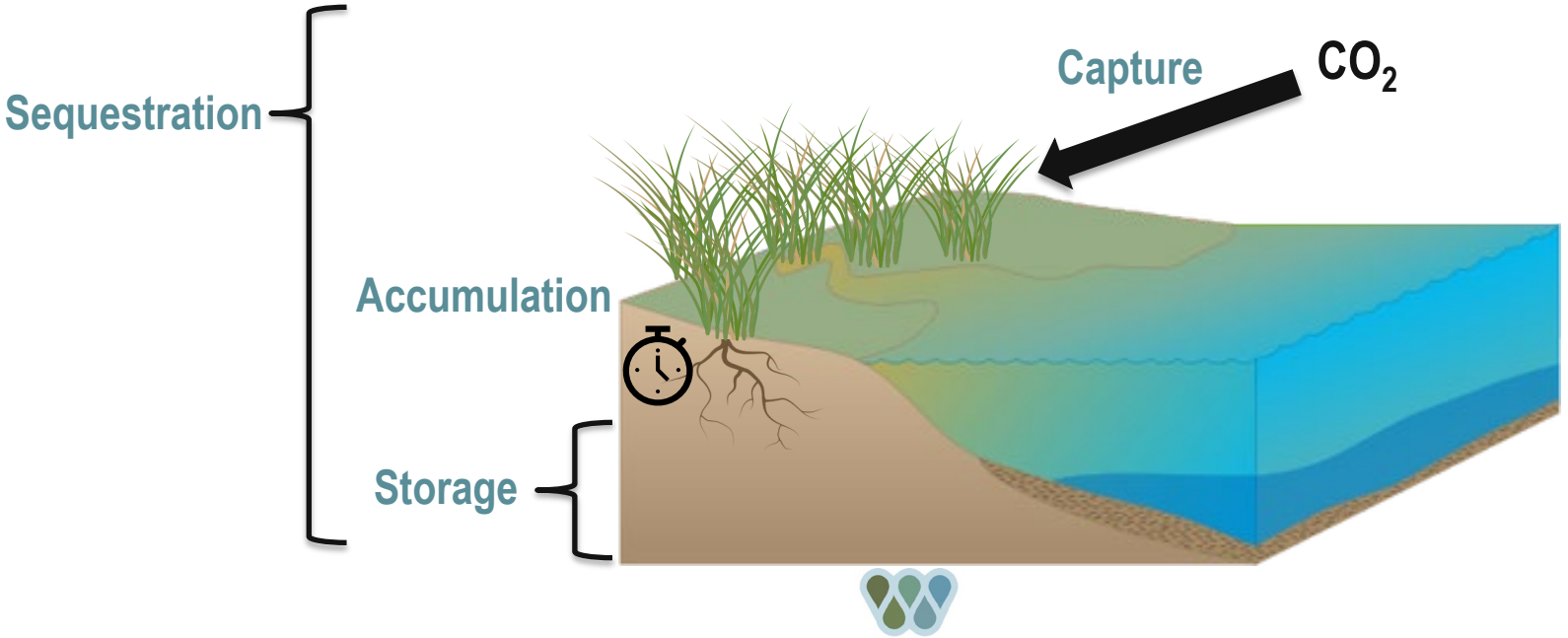
MARSHES

MANGROVES

LOTS OF CARBON WORDS

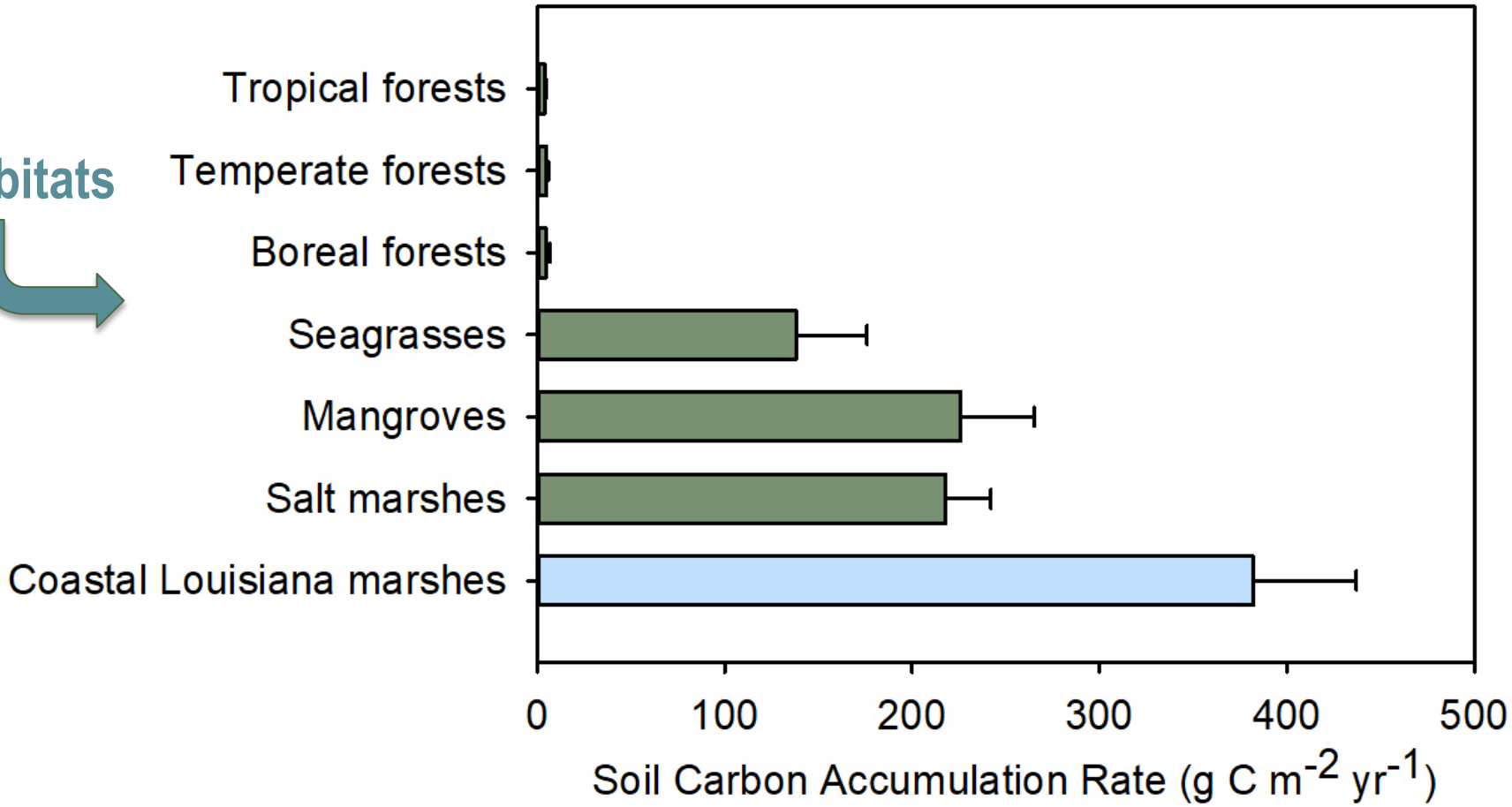
Capture: Process of grabbing CO_2
Accumulation: Amount gained over time
Storage: Long-term preservation in soils
Sequestration: Capturing and storing atm. CO_2
Sinks: Reservoir stores more carbon than releases
Sources: Reservoir that releases more carbon than it stores

Windham-Myers et al. 2020



LOUISIANA RIVALS OTHERS!

Habitats



*mean global rates from McLeod et al. (2011)

Coastal Louisiana marshes from Baustian et al. (2017, 2020)

Blue Carbon in Soils

HOW IMPORTANT ARE LOUISIANA CARBON SINKS?

Soil carbon burial in Louisiana marshes
(fresh to saline, 1 m, year 2013): **4.3 Tg C yr^{-1}**

That equates to:

65% of capacity in Gulf of Mexico

47% of capacity in North America

5-21% of capacity Globally

(Bouillion et al. 2008, Baustian et al. In press, Cai, 2011, Duarte et al. 2005, Hopkinson et al. 2012, Windham-Myers et al. 2018)

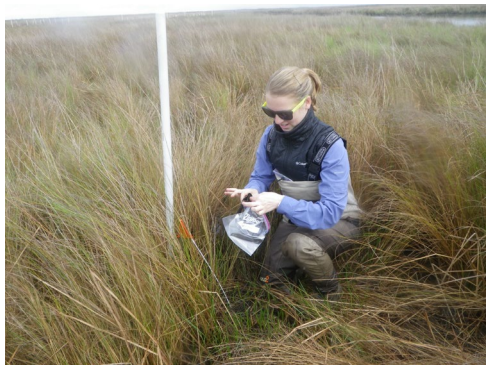
WHERE DO WE MEASURE IT?

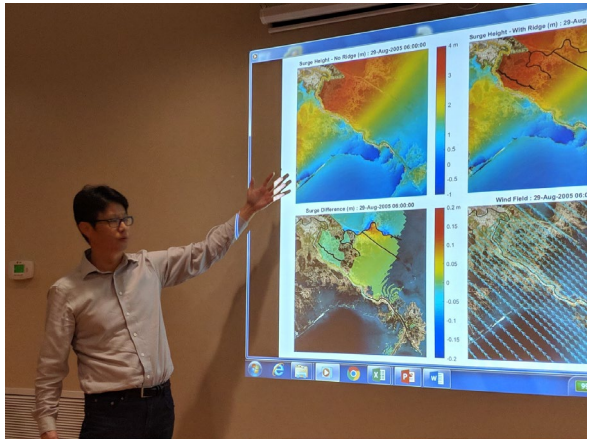
- **Blue Carbon**
  - Captured in coastal habitats by aquatic and wetland plants
  - Stored in sediment/soils
- Visit coastal habitats and take **blue carbon** samples of:
  - Vegetation
  - Soils
  - Water
  - Air

Port Fourchon, LA

HOW DO WE MEASURE IT?

- Various methods including:
  - Field
  - Laboratory
  - Computer modeling





WHERE CAN YOU FIND LOUISIANA INFO?

- Find **blue carbon** results in reports, journal articles, presentations, thesis/dissertations, newspapers, social media, etc

CARBON CAPTURE SOLUTIONS

- Decisions to be made about solutions:
  - **Natural:** Conserving existing habitats (e.g., salt marsh)
  - **Nature-based:** Creating solutions by utilizing nature-type processes

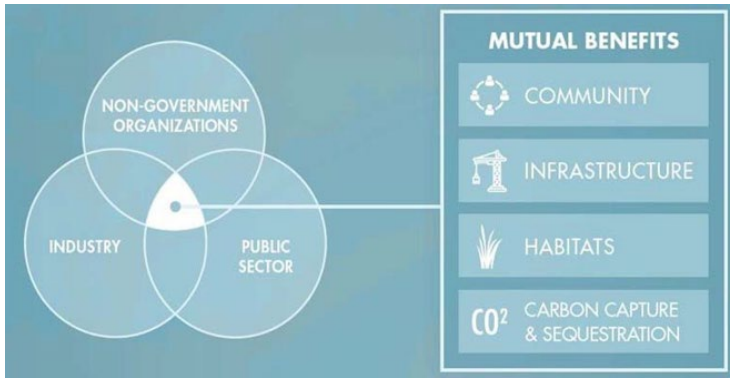
    (e.g., created marsh)
  - **Engineered approaches**
- Nature is a great **blue carbon** technology!
- Solutions require community buy-in and local knowledge

(Arkema et al. 2017, Sutton-Grier et al. 2018)

Natural marshes near Breton Sound

NATURAL AND NATURE-BASED SOLUTIONS

- Natural and nature-based solutions support ecosystem processes or co-benefits:
  - **Blue carbon** storage
  - Wave attenuation
  - Nutrient assimilation
  - Fisheries Habitat
- Win-Win-Win-Win!
- Example, P3:

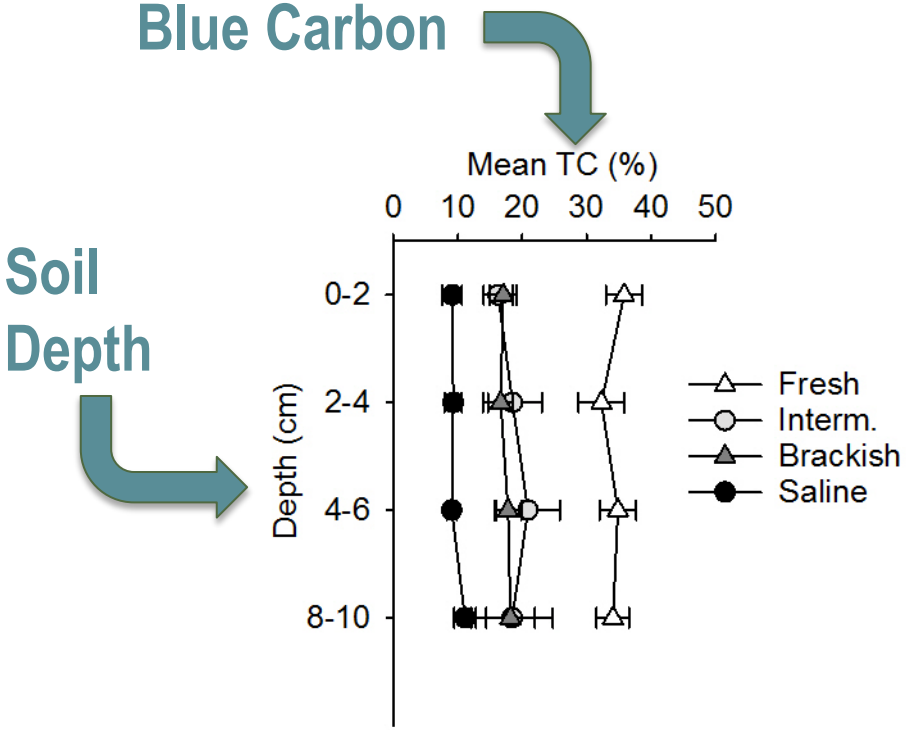


Marsh soil core

Blue Carbon in Soils

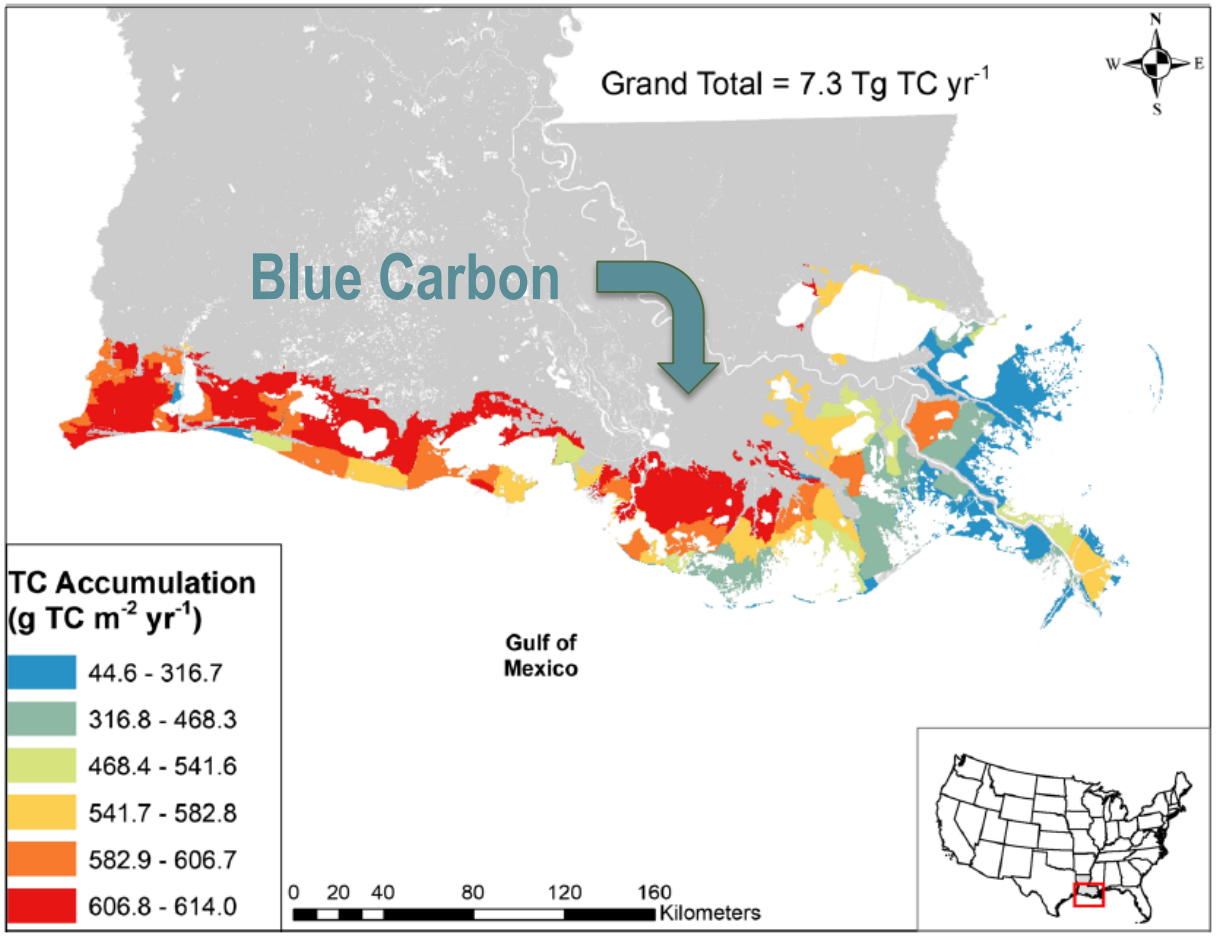
WETLAND CONSERVATION IS KEY!

- Current natural habitats (natural solutions) are capturing and storing **blue carbon**
- We need to protect those habitats now to protect those **blue carbon** sinks



Baustian et al. 2017, 2020

WETLAND SOILS (SHORT-TERM)



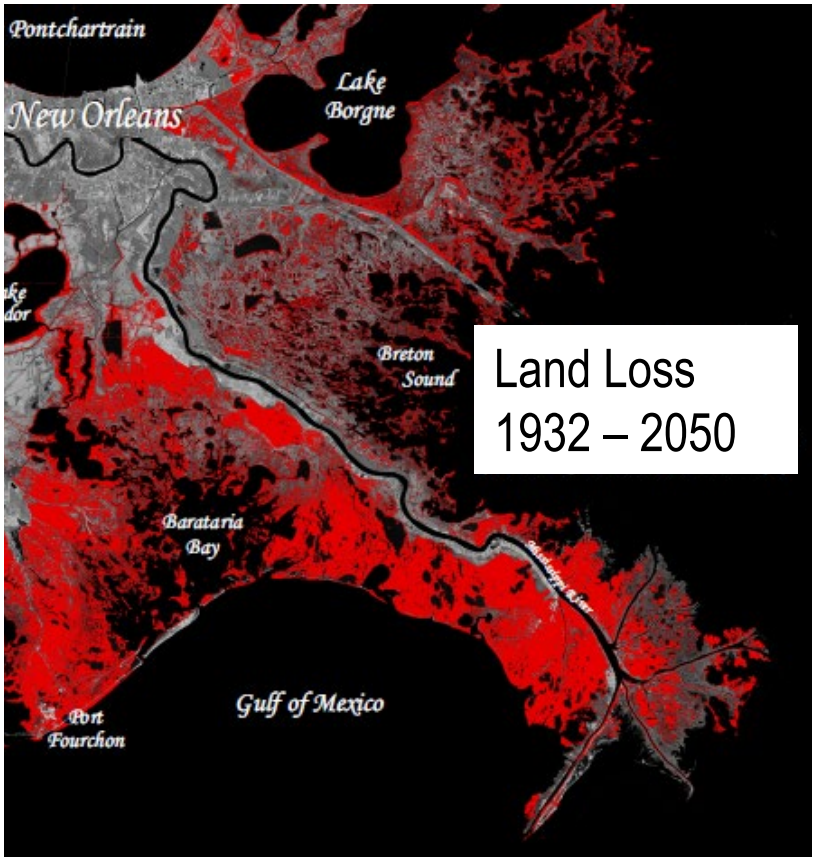
Low

High

Baustian et al. 2017, 2020

COASTAL CRISIS

- Land Loss
  - From 1932 to 2010, decrease of about 25% of coastal land
    - Habitat loss (means **blue carbon** loss!)
    - Fisheries loss
    - Reduced protection from flooding
    - Reduced water purification
- State of Louisiana hopes to invest ~$50 billion on addressing land loss (2017 Coastal Master Plan)



USGS-NWRC 2005-16-0001

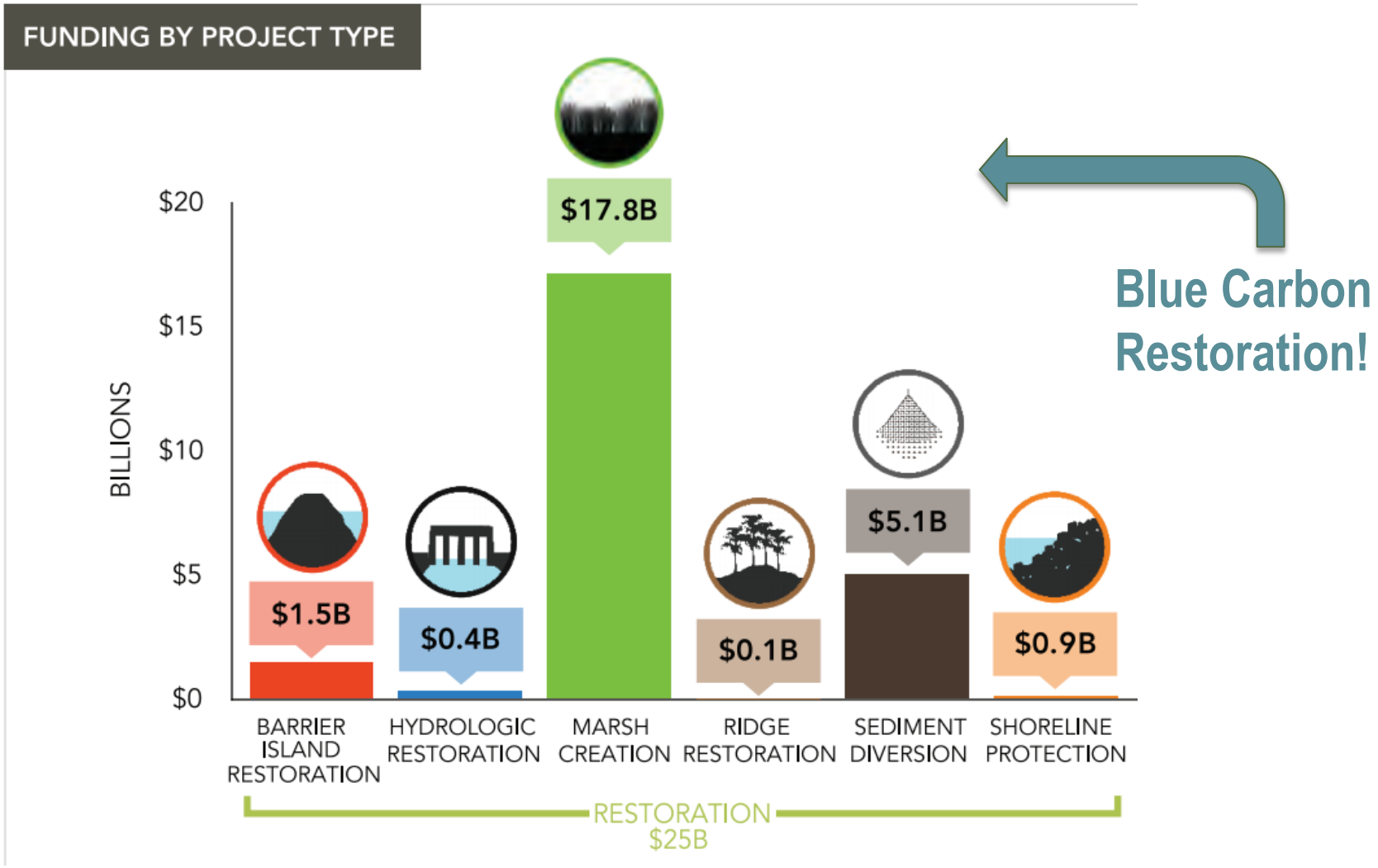
(Turner 1997, Barras et al. 2003, Blum and Roberts 2009, Couvillion et al. 2011, Tornqvist et al. 2008)

COASTAL RESTORATION

- Coastal Master Plan
- Nature-based solutions include:
  - Barrier Island Restoration
  - Hydrologic Reconnection
  - Marsh Creation
  - Sediment Diversions

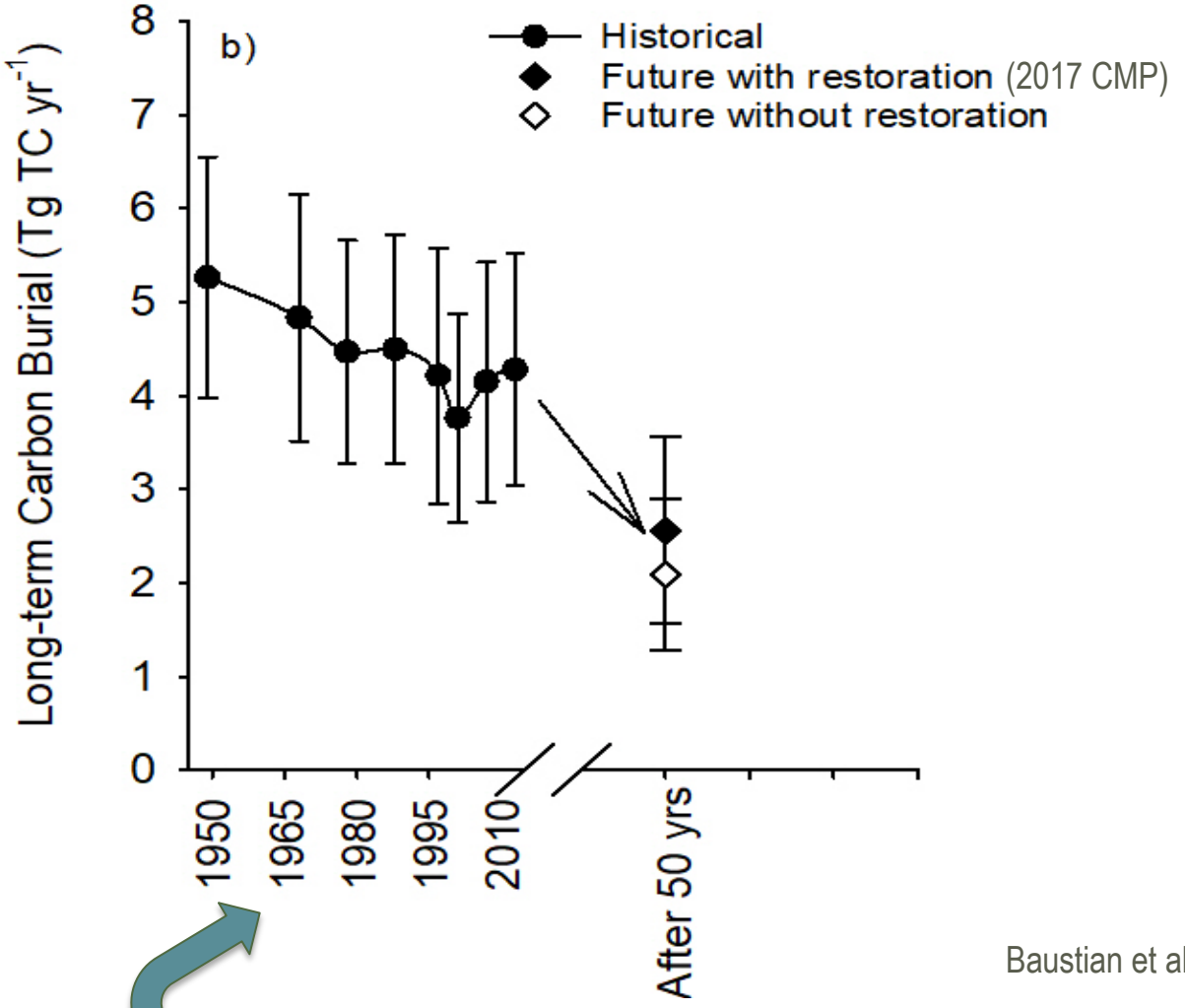
2017, 2012 and 2007 Coastal Master Plan

2017 COASTAL MASTER PLAN



SOIL CARBON & WETLAND LOSS

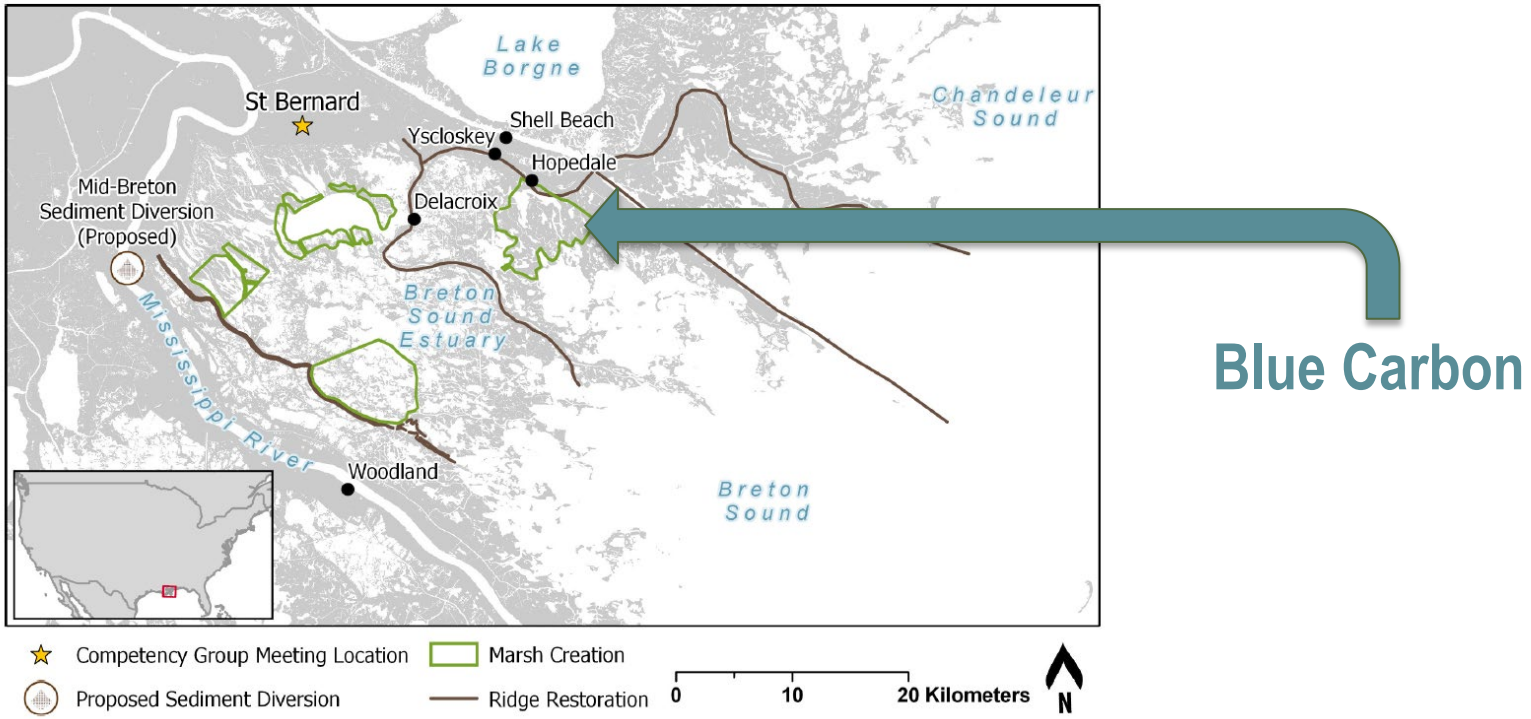
Blue Carbon in Soils



Time (Past, Current and Future)

Baustian et al. In Press

COMMUNITY INVOLVEMENT

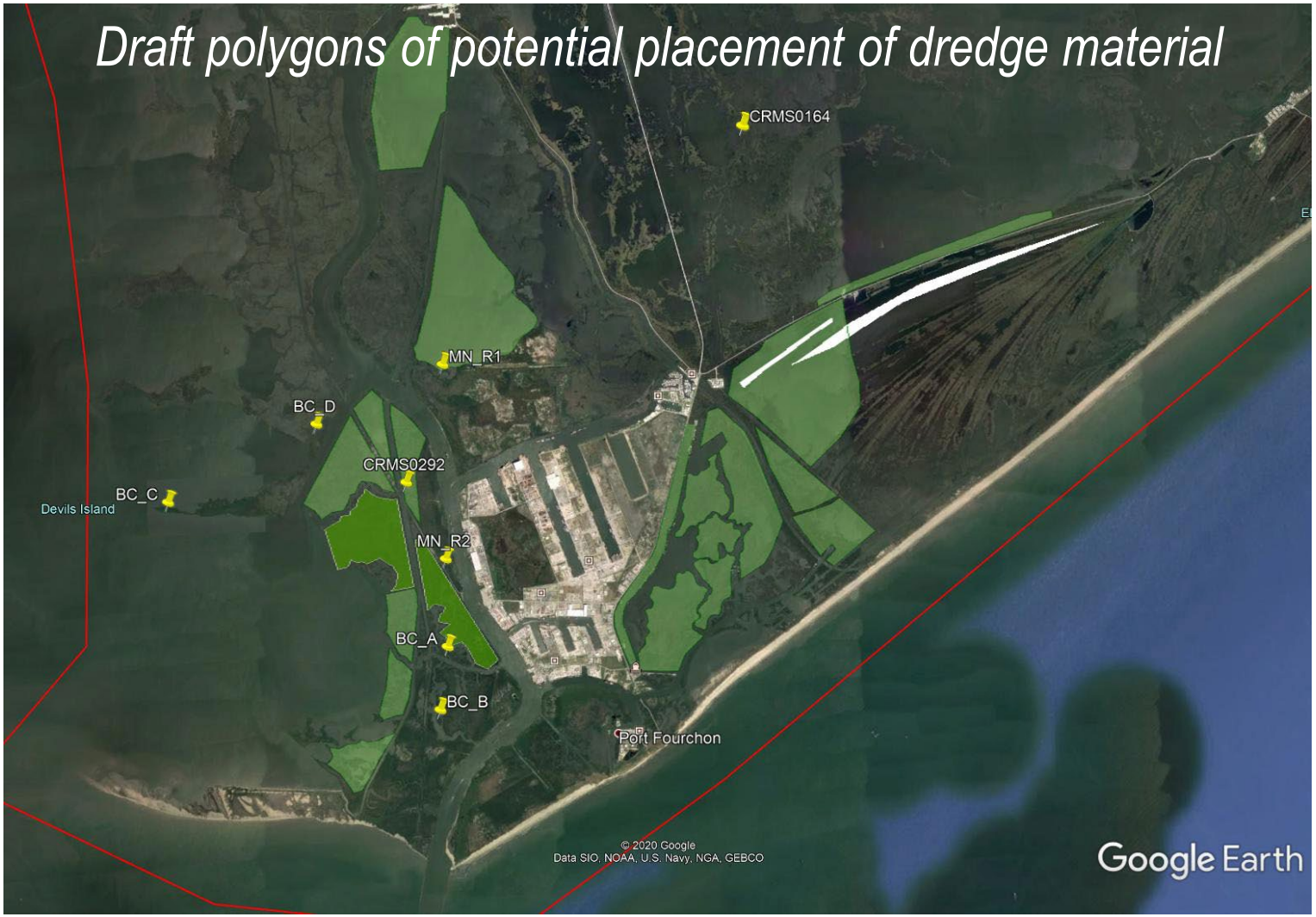


Baustian et al. 2020

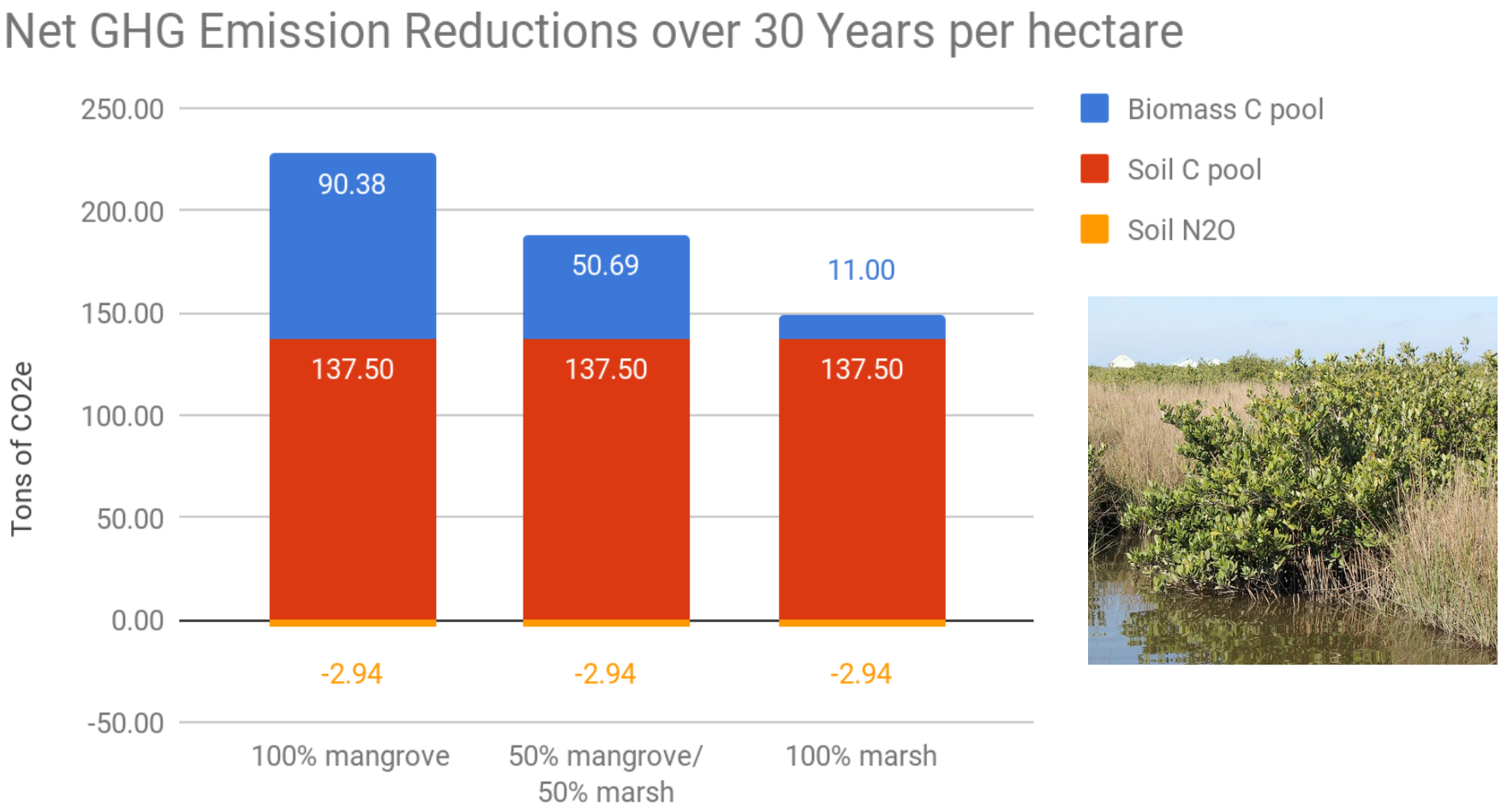
- Engaged local communities to understand hazards and solutions
- Co-developed an ecosystem model
- Ran scenarios with natural and nature-based solutions

Hemmerling et al. 2020, Barra et al. 2020

WETLAND CREATION

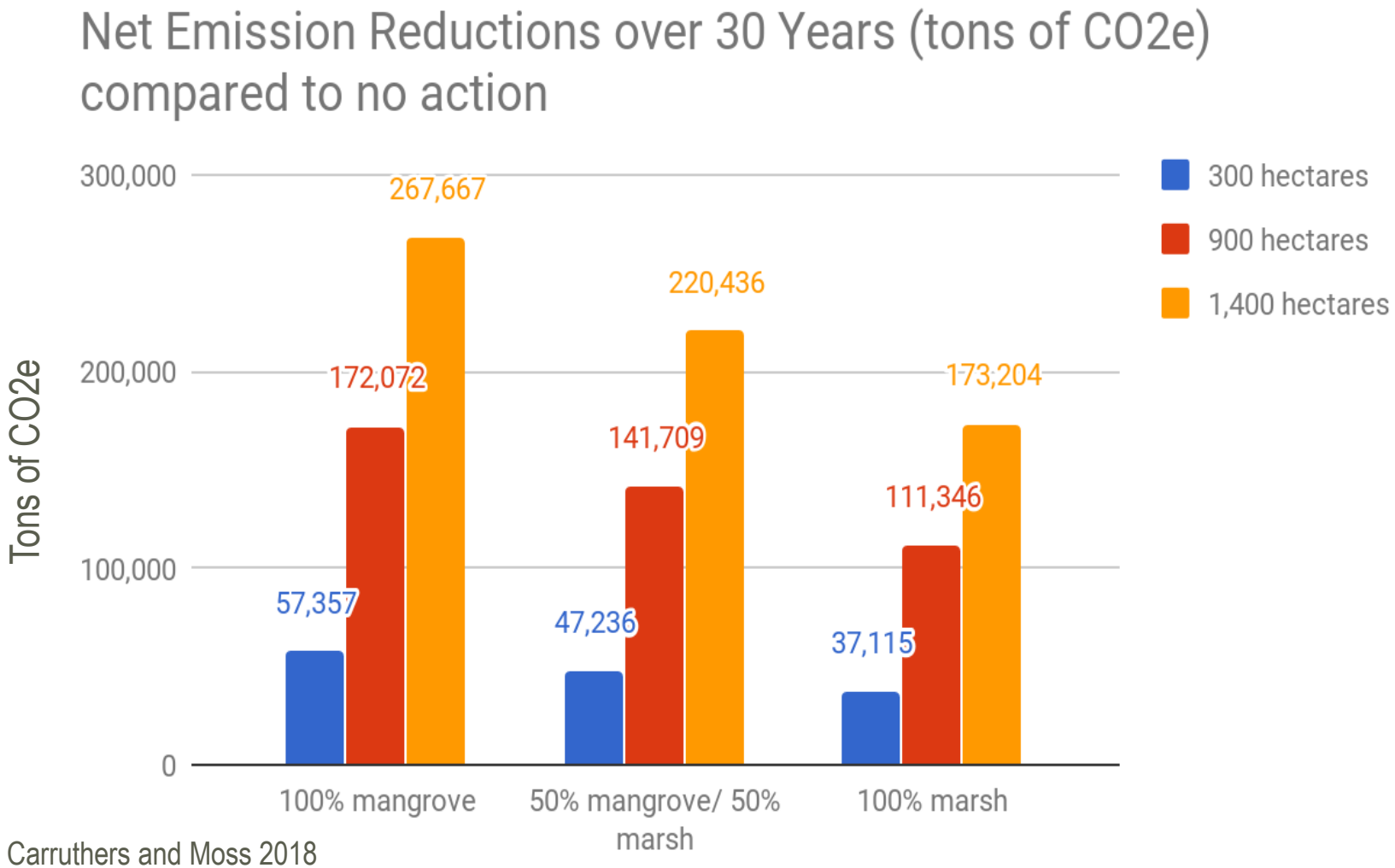


VEGETATION BIOMASS



Carruthers and Moss 2018

SCALING RESTORATION PROJECTS

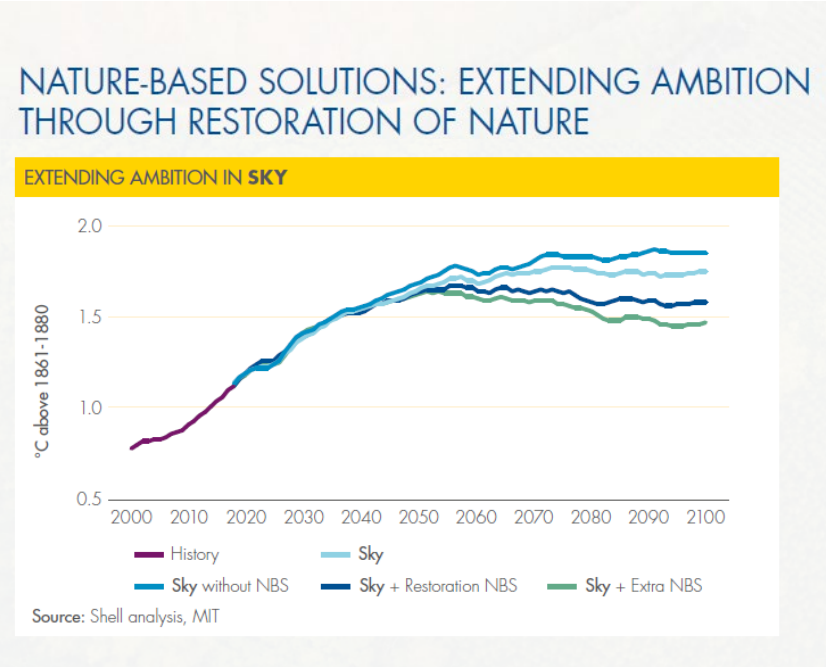


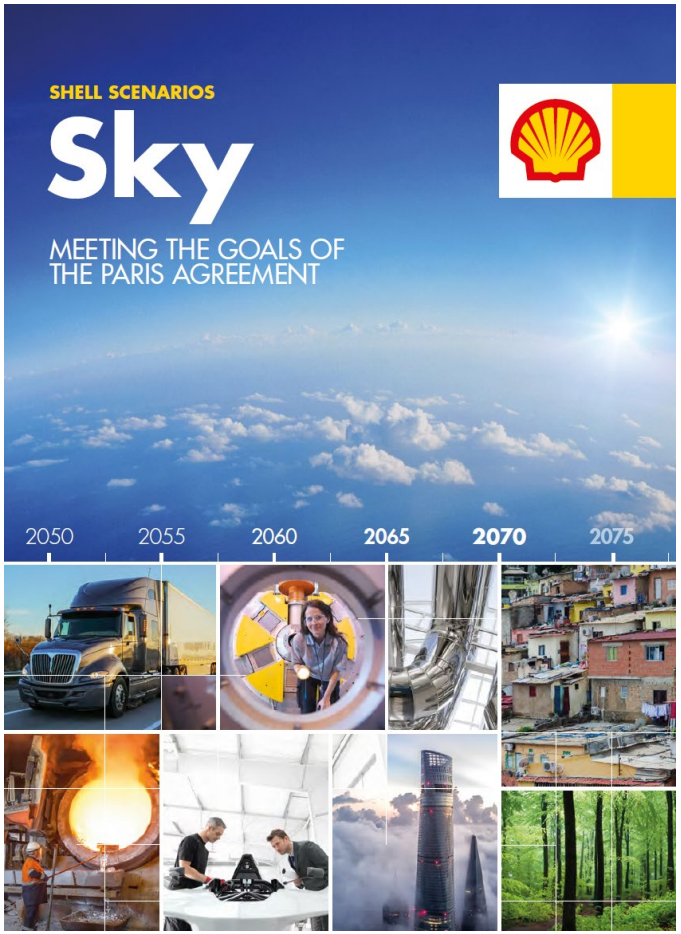
Carruthers and Moss 2018

WHO CARES?

Many companies do!

- Corporate Social Responsibility goals
- Strive for carbon neutrality
- Support mitigation and nature-based solutions
- Examples: Apple, Etsy, Ford, GM, and Royal Dutch Shell





WHO CARES?

Federal Government!

– Biden Administration

BRIEFING ROOM

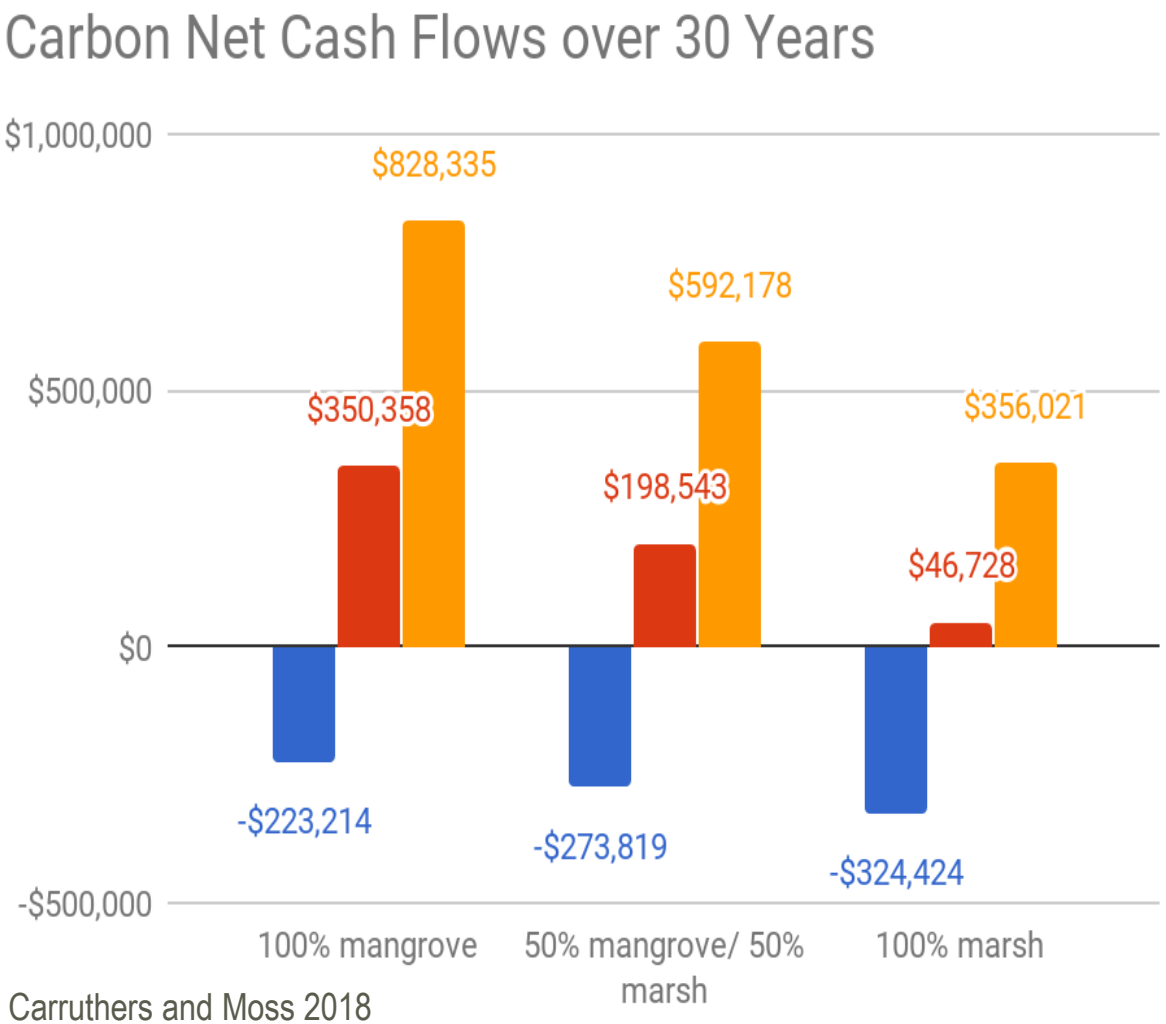
Executive Order on Tackling the Climate Crisis at Home and Abroad

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS

EMPOWERING WORKERS BY ADVANCING CONSERVATION, AGRICULTURE, AND REFORESTATION

Sec. 214. Policy. It is the policy of my Administration to put a new generation of Americans to work conserving our public lands and waters. The Federal Government must protect America's natural treasures, increase reforestation, improve access to recreation, and increase resilience to wildfires and storms, while creating well-paying union jobs for more Americans, including more opportunities for women and people of color in occupations where they are underrepresented. America's farmers, ranchers, and forest landowners have an important role to play in combating the climate crisis and reducing greenhouse gas emissions, by sequestering carbon in soils, grasses, trees, and other vegetation and sourcing sustainable bioproducts and fuels. Coastal communities have an essential role to play in mitigating climate change and strengthening resilience by protecting and restoring coastal ecosystems, such as wetlands, seagrasses, coral and oyster reefs, and mangrove and kelp forests, to protect vulnerable coastlines, sequester carbon, and support biodiversity and fisheries.

BLUE CARBON MARKET



Carruthers and Moss 2018

Voluntary Market

- Investors support coastal restoration
- Others can purchase carbon credits to offset their emissions

- Monitoring costs
- Not mitigation wetlands

CONSIDERATIONS TO MAXIMIZE BLUE CARBON

- **Land Area**
  - Pumping into shallower areas will create more land
- **Dredge Type**
  - Elevation of marsh area variations and use of thin layer dredging
- **Restoration Type**
  - Planting, protecting marsh areas with terraces, etc
- **Permanence**
  - All marsh areas credited for 30 years and maintained for 100 years

BLUE CARBON CERTIFICATION

- Allows beneficial use project to receive carbon credits from the voluntary market
- Quantify net GHG emission reductions from **blue carbon** habitats
- **Blue Carbon** Standards exist:
  - E.g., VM0033 Methodology for Tidal Wetland and Seagrass Restoration

Verified Carbon Standard
A VERRA STANDARD

TIERRA RESOURCES

COASTAL LOUISIANA'S ROLE!

- Conserve and protect our coastal habitats
  - Various benefits (including **blue carbon**!)
- Need to continue to study/assess carbon capture and sink capacity
- Information is important for various programs
  - State of LA Governor's Climate Initiative

Governor John Bel Edwards' Vision

Louisiana will reduce its greenhouse gas emissions to do its part to limit the worst impacts of climate change and improve the welfare of its residents and environment *while* maintaining its position as a world leader in energy, industry, agriculture, forestry, and transportation.

GHG REDUCTION GOALS

By 2025

26-28%

Of 2005 levels

By 2030

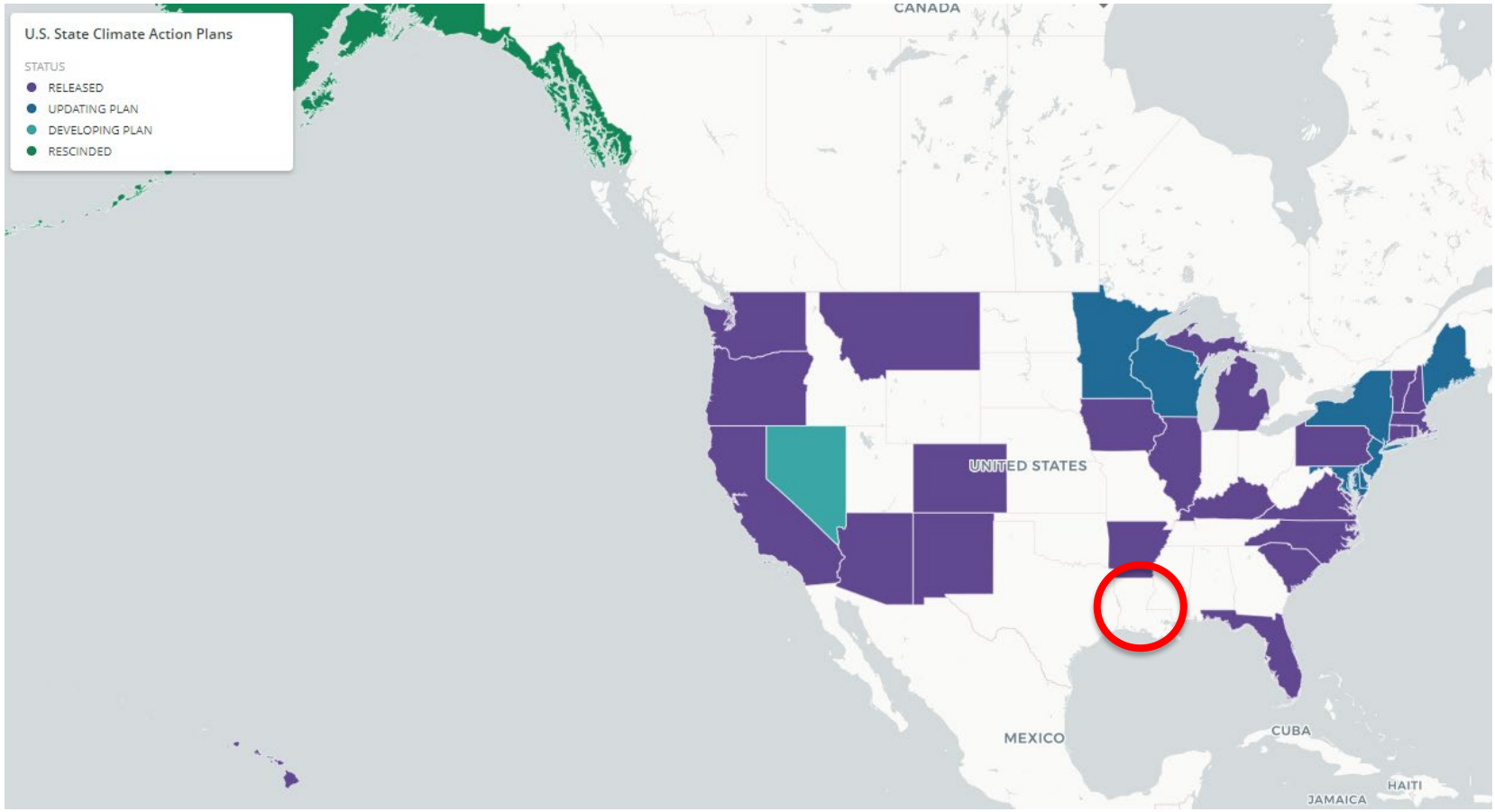
40-50%

Of 2005 levels

By 2050

Net Zero

STATE CLIMATE ACTION PLANS



UPDATING GHG INVENTORY

- D. Dismukes at LSU and team is updating the GHG inventory for 2010
- The coastal carbon sinks should be considered for GHG reduction goals of:
  - 2025
  - 2030
  - 2050
- A new project with LA CPRA and RESTORE Council will help quantify this.

Table 3.1.1-1. Summary of Louisiana's 2005 GHG Emissions.

	Greenhouse Gas	CO_2 Equivalent Emissions MMT	Percent Total Emissions
Energy			
CO_2 from fossil fuel combustion	CO_2	191.32	84.0%
Stationary combustion (non-CO_2)	CH_4	0.18	0.1%
	N_2O	0.42	0.2%
Mobile combustion (non-CO_2)	CH_4	0.06	0.0%
	N_2O	0.92	0.4%
Natural gas & oil systems	CO_2	0.25	0.1%
	CH_4	13.13	5.8%
Coal mining	CH_4	0.04	0.0%
Industrial Processes	CO_2	3.30	1.4%
	N_2O	3.27	1.4%
	HFC, PFC, SF_6	6.85	3.0%
Wastes			
Municipal solid waste	CH_4	0.37	0.2%
Wastewater	CH_4	0.65	0.3%
	N_2O	0.13	0.1%
Agriculture	CH_4	2.76	1.2%
	N_2O	3.68	1.6%
Land-use Change & Forestry	CH_4	0.17	0.1%
	N_2O	0.13	0.1%
	CO_2	-13.02	
Total Gross CO_2		227.66	100.00%
Total Net CO_2		214.64	

McDaniels et al. 2010

ACKNOWLEDGEMENTS

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Thank you!
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