

COASTAL BLUE CARBON IN THE GULF OF MEXICO

Lauren Hutchison
Carlota Santos

5/31/2016



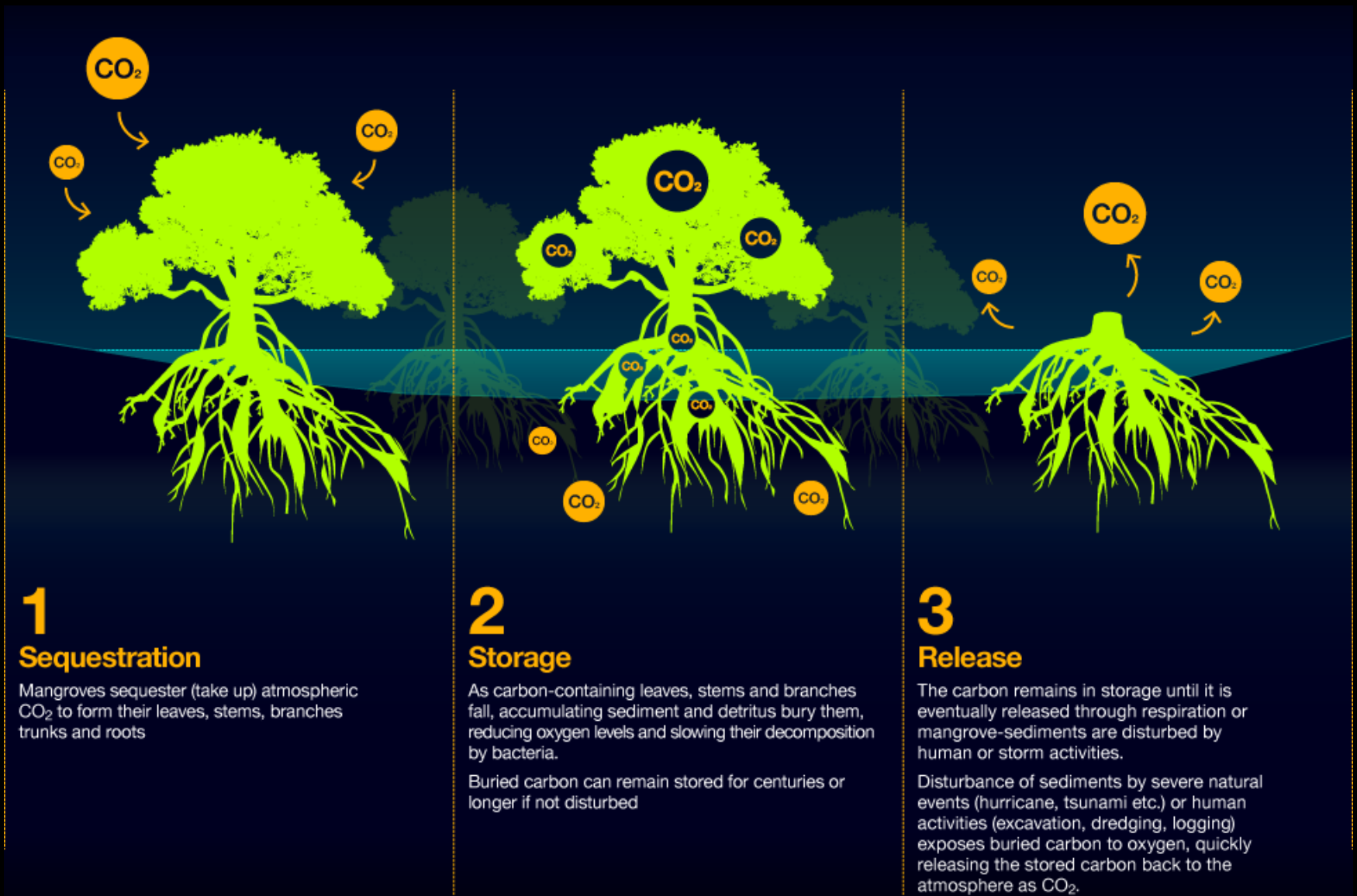
TEXAS A&M
UNIVERSITY
CORPUS
CHRISTI

HARTE
RESEARCH INSTITUTE
FOR GULF OF MEXICO STUDIES

Coastal Blue Carbon Ecosystems



Components Of Blue Carbon



1

Sequestration

Mangroves sequester (take up) atmospheric CO_2 to form their leaves, stems, branches, trunks and roots

2

Storage

As carbon-containing leaves, stems and branches fall, accumulating sediment and detritus bury them, reducing oxygen levels and slowing their decomposition by bacteria.

Buried carbon can remain stored for centuries or longer if not disturbed

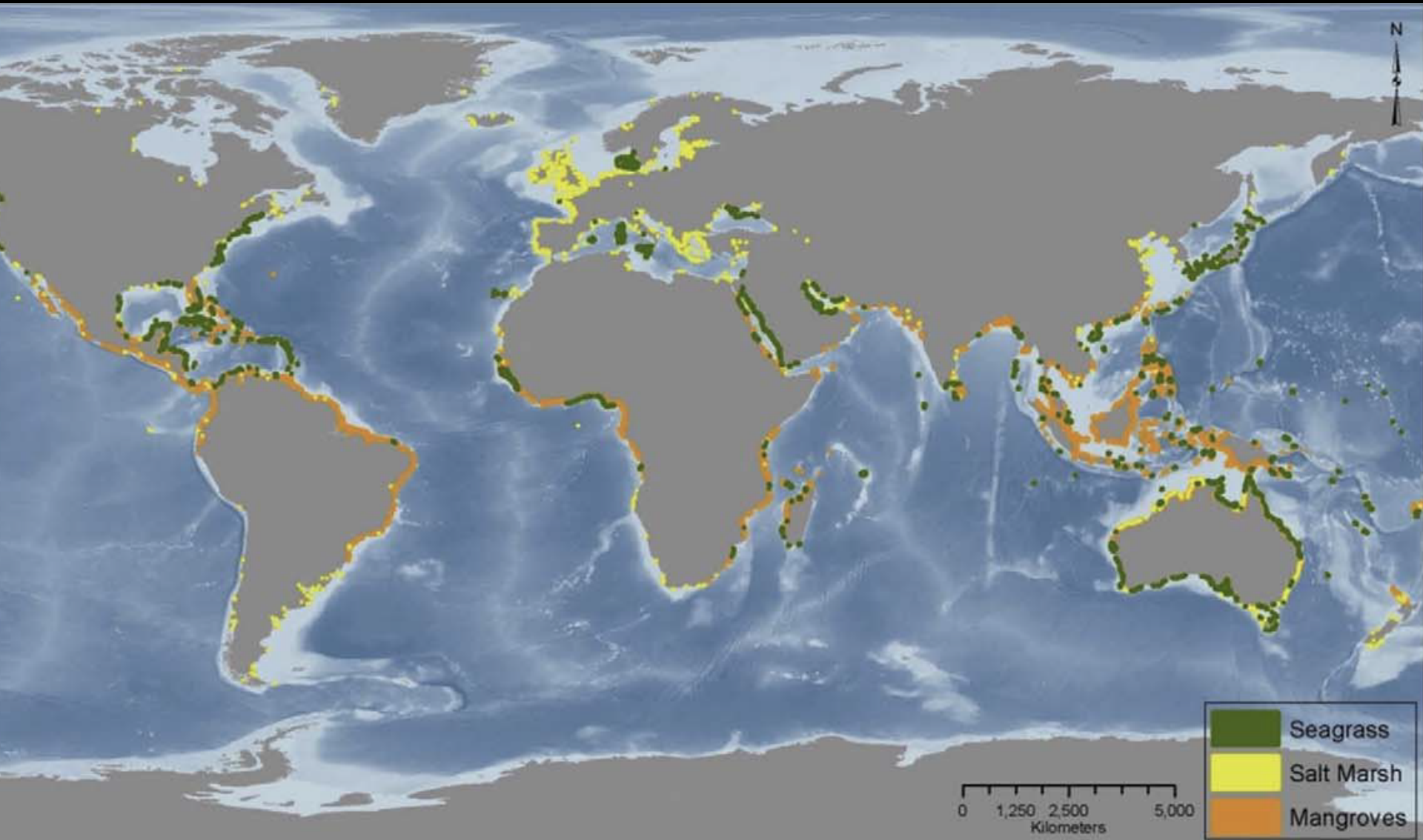
3

Release

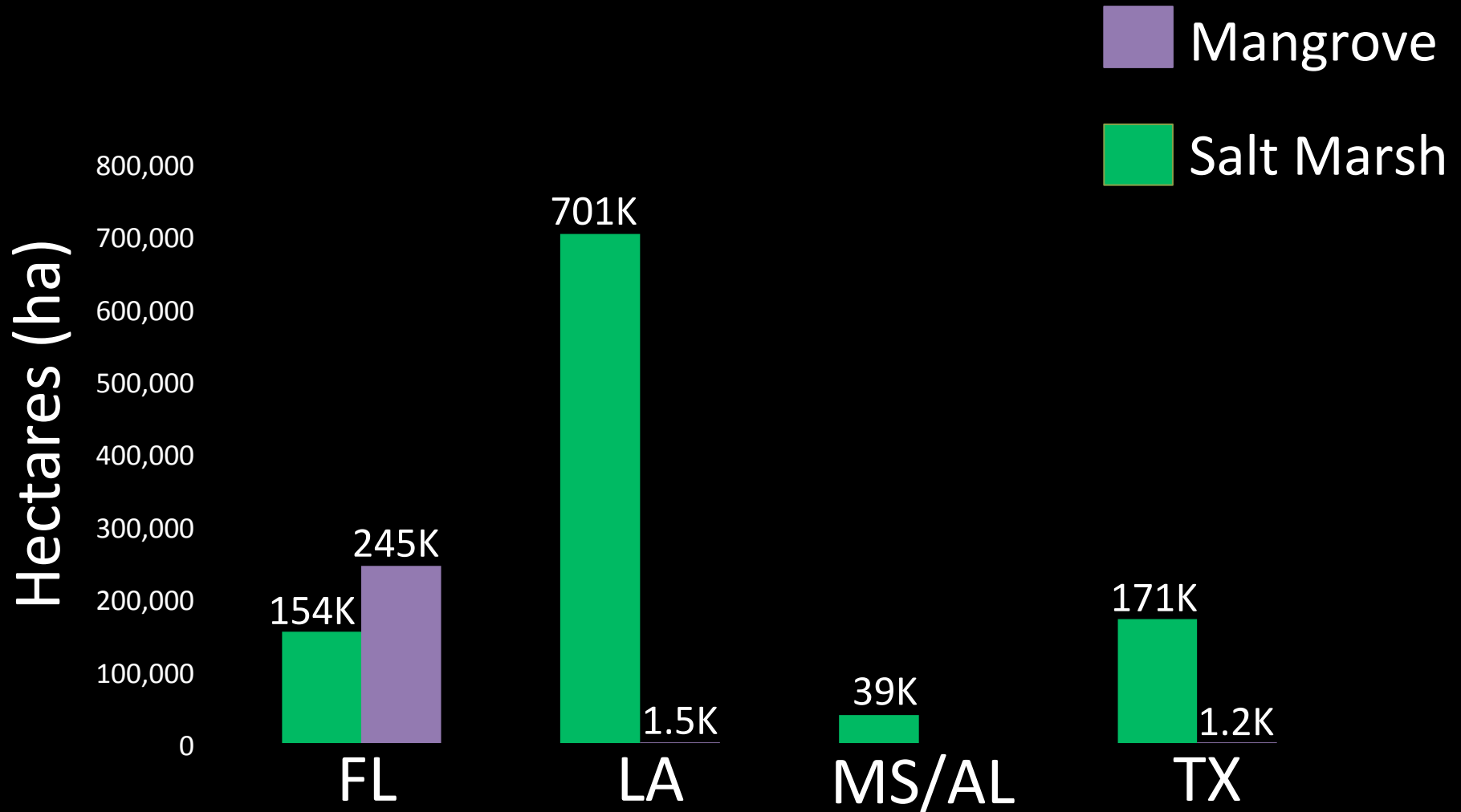
The carbon remains in storage until it is eventually released through respiration or mangrove-sediments are disturbed by human or storm activities.

Disturbance of sediments by severe natural events (hurricane, tsunami etc.) or human activities (excavation, dredging, logging) exposes buried carbon to oxygen, quickly releasing the stored carbon back to the atmosphere as CO_2 .

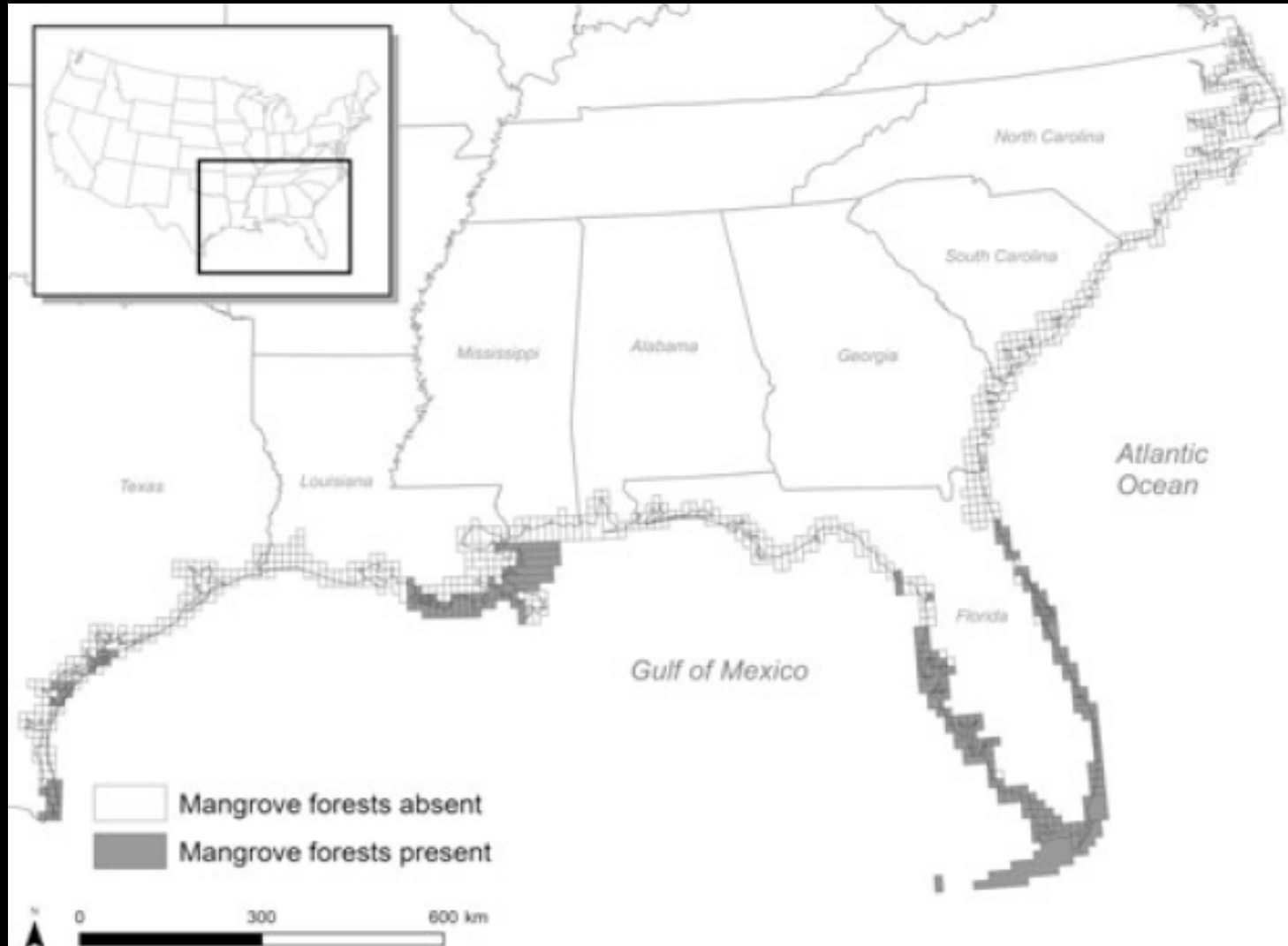
Global Distribution



Northern GOM Distribution



Mangroves Are Migrating Northward in the GOM

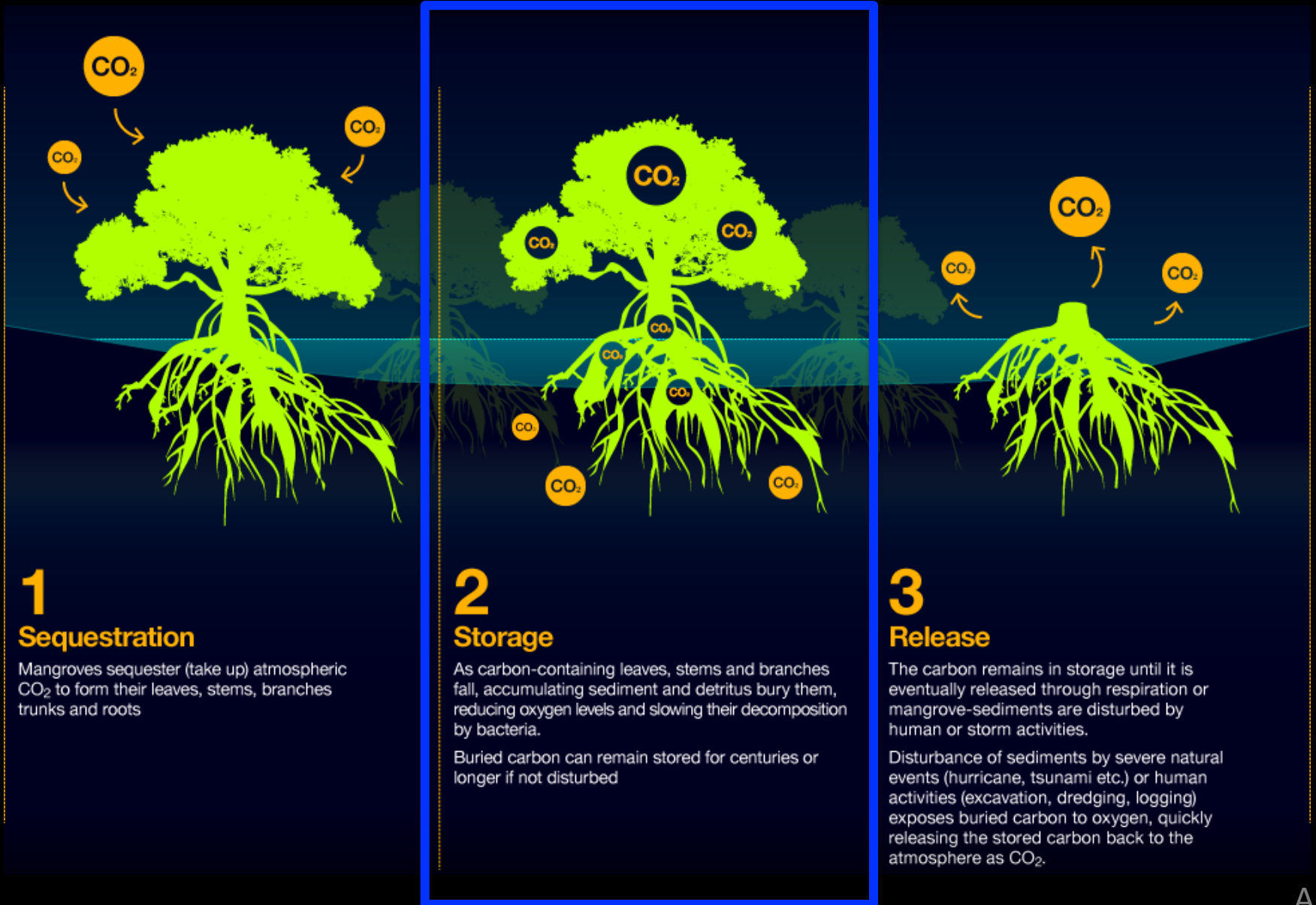


Mangroves Are Expanding In Texas Coastal Wetlands



Mud Island, TX

Components Of Blue Carbon



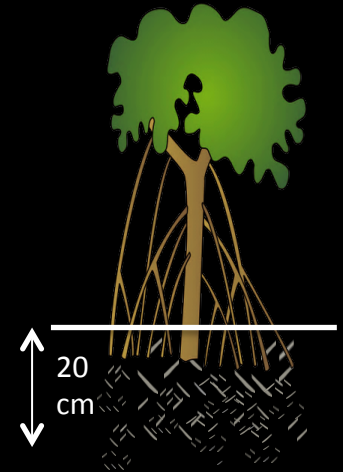
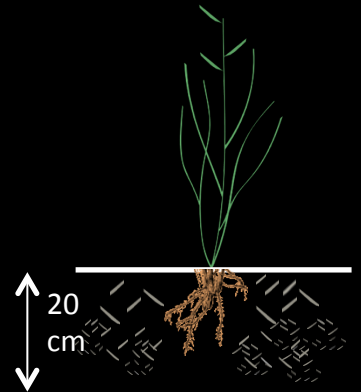
Meta-Analysis

CARBON
STORAGE

Aboveground
Biomass

Belowground
Biomass

Soil
Carbon



Meta-Analysis

- Data was classified 3 ways:



Meta-Analysis

- Data was classified 3 ways:



- Analyses were conducted to determine if **mean**, **one-time**, and **peak** datasets could be combined to create more robust datasets

Meta-Analysis

SALT MARSH



AGB (mean)

BGB (mean + one time)

SC (mean + one time)

MANGROVE



AGB (no data)

BGB (minimal data)

SC (one time)

Meta-Analysis

SALT MARSH



AGB (n = 24)

BGB (n = 34)

SC (n = 44)

MANGROVE



AGB (n = 0)

BGB (n = 14)

SC (n = 38)

Meta-Analysis

SALT MARSH



AGB (n = 24)

BGB (n = 34)

SC (n = 44)

MANGROVE

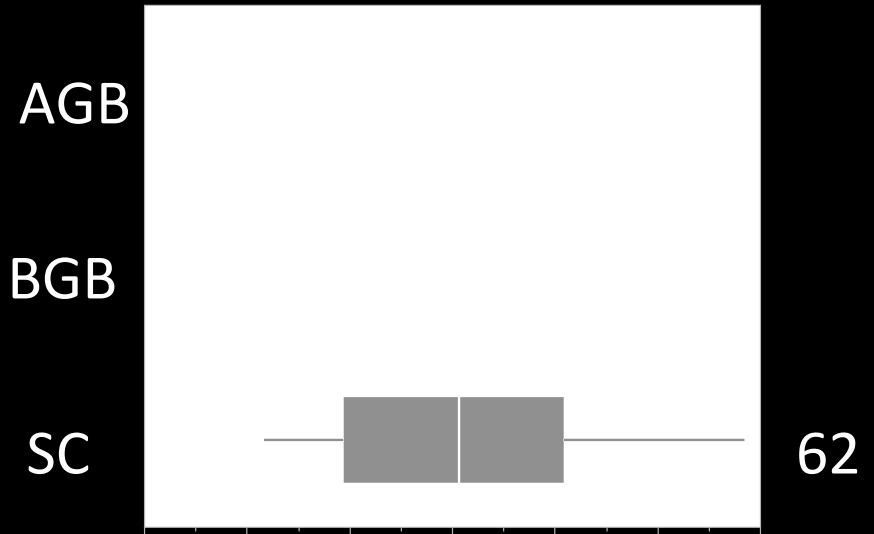
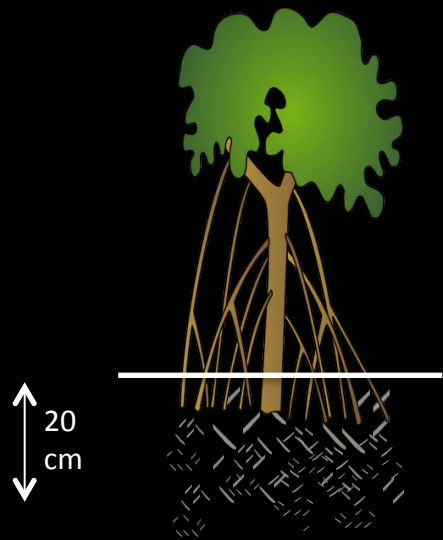
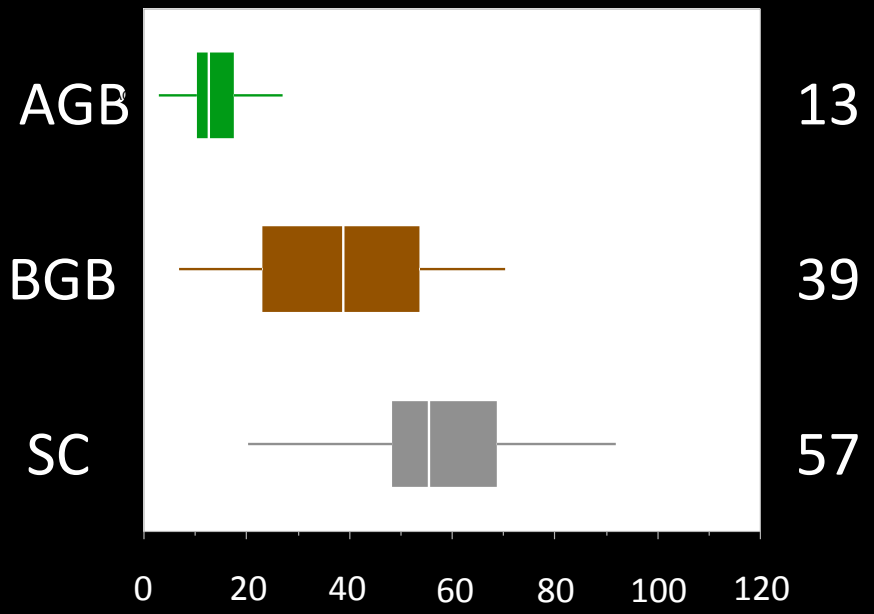
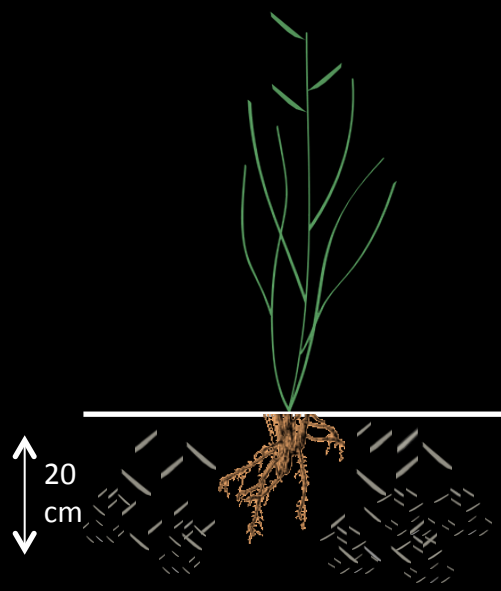


~~AGB (n = 0)~~

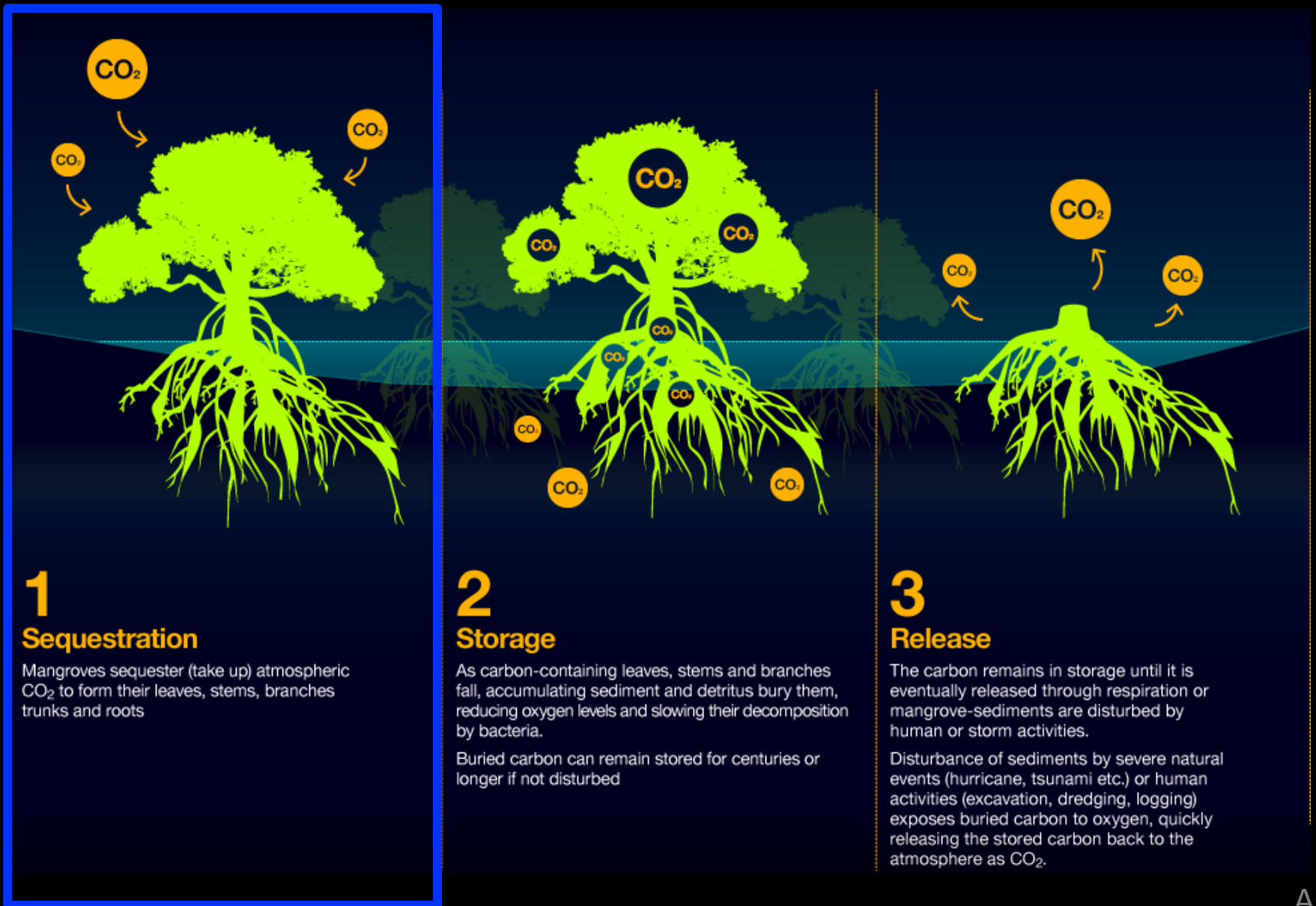
~~BGB (n = 14)~~

SC (n = 38)

CARBON STORAGE (tons C /ha)



Components Of Blue Carbon



1 Sequestration

Mangroves sequester (take up) atmospheric CO_2 to form their leaves, stems, branches, trunks and roots

2 Storage

As carbon-containing leaves, stems and branches fall, accumulating sediment and detritus bury them, reducing oxygen levels and slowing their decomposition by bacteria.

Buried carbon can remain stored for centuries or longer if not disturbed

3 Release

The carbon remains in storage until it is eventually released through respiration or mangrove-sediments are disturbed by human or storm activities.

Disturbance of sediments by severe natural events (hurricane, tsunami etc.) or human activities (excavation, dredging, logging) exposes buried carbon to oxygen, quickly releasing the stored carbon back to the atmosphere as CO_2 .

Carbon Sequestration Rates

State	Salt Marshes (tC /ha /yr)	Mangroves (tC /ha /yr)
LA	2.96	no info
TX	1.40	2.62
MS/AL	1.53	n/a
FL	0.82	1.85

Carbon Sequestration Rates

State	Salt Marshes (tC /ha /yr)	Mangroves (tC /ha /yr)
LA	2.96 (n = 23)	no info
TX	1.40 (n = 5)	2.62 (n = 2)
MS/AL	1.53 (n = 1)	n/a
FL	0.82 (n = 4)	1.85 (n = 11)

Carbon Sequestration Rates

State	Salt Marshes (tC /ha /yr)	Mangroves (tC /ha /yr)
LA	2.96 (n = 23)	no info
TX	1.40 (n = 5)	2.62 (n = 2)
MS/AL	1.53 (n = 1)	n/a
FL	0.82 (n = 4)	1.85 (n = 11)
GOM average	2.4	1.9

Putting a Price on Carbon

Social Cost of Carbon



Putting a Price on Carbon

Social Cost of Carbon



Putting a Price on Carbon

Social Cost of Carbon



\$40/t CO₂

Show me the Money!



$$tC \rightarrow tCO_2$$
$$1tC = 3.67 tCO_2$$

Salt Marsh Carbon Sequestration Values

State	Areal Extent	tC/ha/yr	tCO ₂ /ha/yr	US\$/ha/yr	US\$/yr (Million)
FL	154,104	0.82	3.01	\$120	\$19
LA	701,369	2.96	10.86	\$435	\$305
MS/AL	38,591	1.53	5.62	\$225	\$9
TX	170,680	1.40	5.14	\$206	\$35
TOTAL	1,064,745				\$368

Mangrove Carbon Sequestration Values

State	Areal Extent	tC/ha/yr	tCO ₂ /ha/yr	US\$/ha/yr	US\$/yr (Million)
FL	244,754	1.85	6.79	\$272	\$67
LA	1,399	2.62	9.60	\$384	\$0.54
TX	1,217	2.62	9.60	\$384	\$0.47
TOTAL	247,370				\$68

Value Of Carbon Sequestration In Northern GOM

State	Salt Marsh \$ Million /year	Mangrove \$ Million /year	Total \$ Million /year
FL Gulf Coast	19	67	86
LA	305	0.5	306
MS/AL	9	n/a	9
TX	35	0.5	36
TOTAL	\$368	\$68	\$436

A Few Final Thoughts

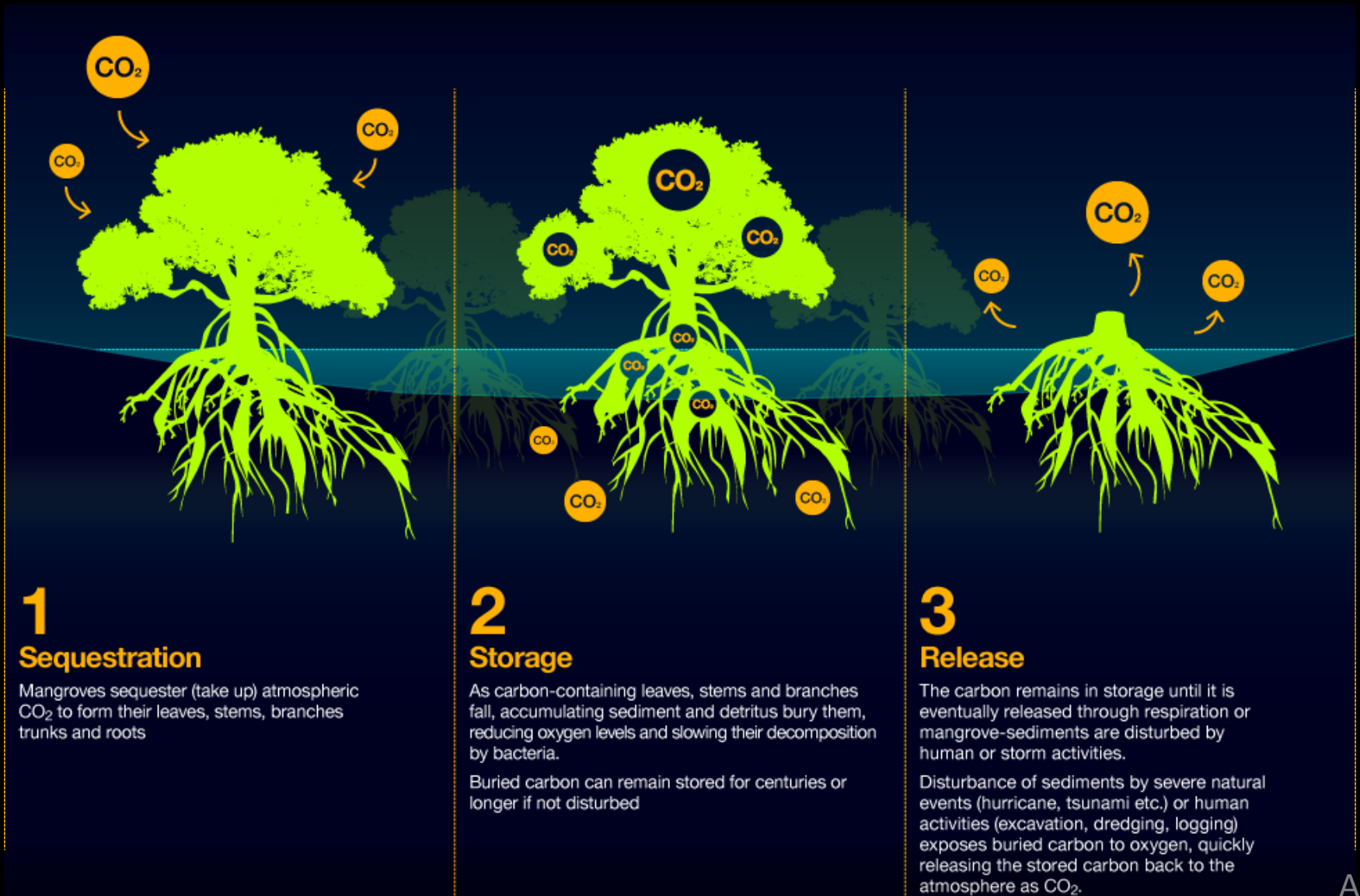
A Few Final Thoughts

- Annual carbon sequestration rates are much less than total carbon stored, yet we tend to only value carbon sequestration potential in decision-making

A Few Final Thoughts

- Annual carbon sequestration rates are much less than total carbon stored, yet we tend to only value carbon sequestration potential in decision-making
- Carbon storage in the soil is estimated to go to at least 1 meter in depth

Components Of Blue Carbon



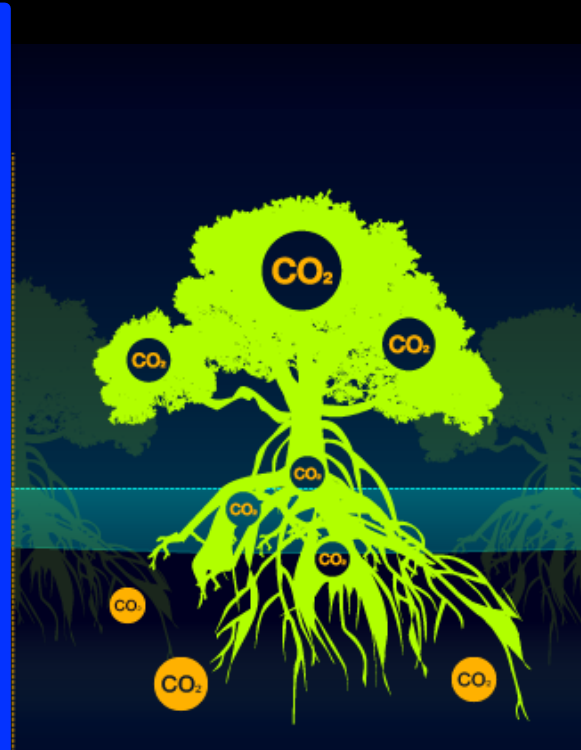
Components Of Blue Carbon



The diagram shows a mangrove tree with its roots extending into the water. Three orange circles labeled CO_2 are positioned above the tree, with arrows pointing downwards towards the canopy, representing the uptake of atmospheric carbon dioxide.

1
Sequestration

Mangroves sequester (take up) atmospheric CO_2 to form their leaves, stems, branches trunks and roots

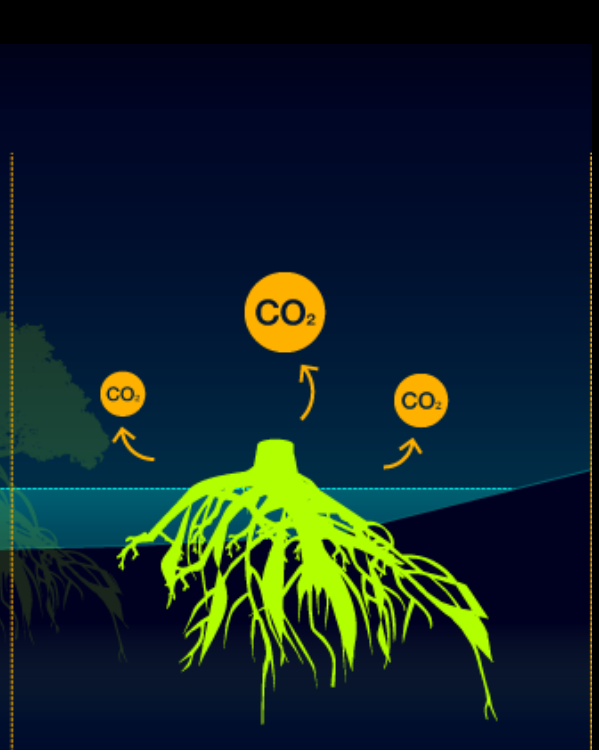


The diagram shows a mangrove tree with its roots extending into the water. Several orange circles labeled CO_2 are positioned around the tree, both above and below the water surface, representing the storage of carbon in the tree's biomass and in the sediment below.

2
Storage

As carbon-containing leaves, stems and branches fall, accumulating sediment and detritus bury them, reducing oxygen levels and slowing their decomposition by bacteria.

Buried carbon can remain stored for centuries or longer if not disturbed



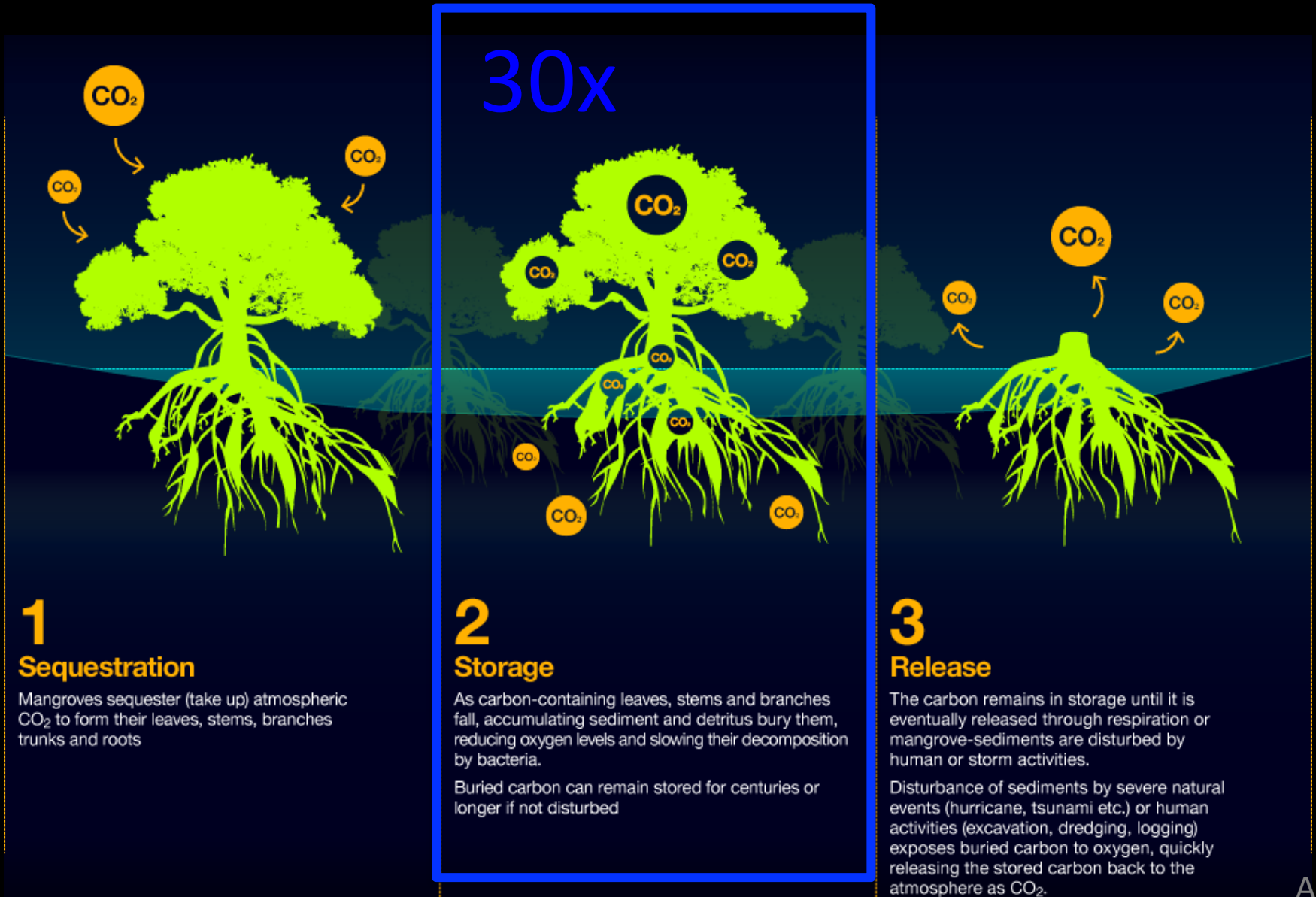
The diagram shows a mangrove tree with its roots extending into the water. Three orange circles labeled CO_2 are positioned above the tree, with arrows pointing upwards away from the tree, representing the release of carbon dioxide back into the atmosphere.

3
Release

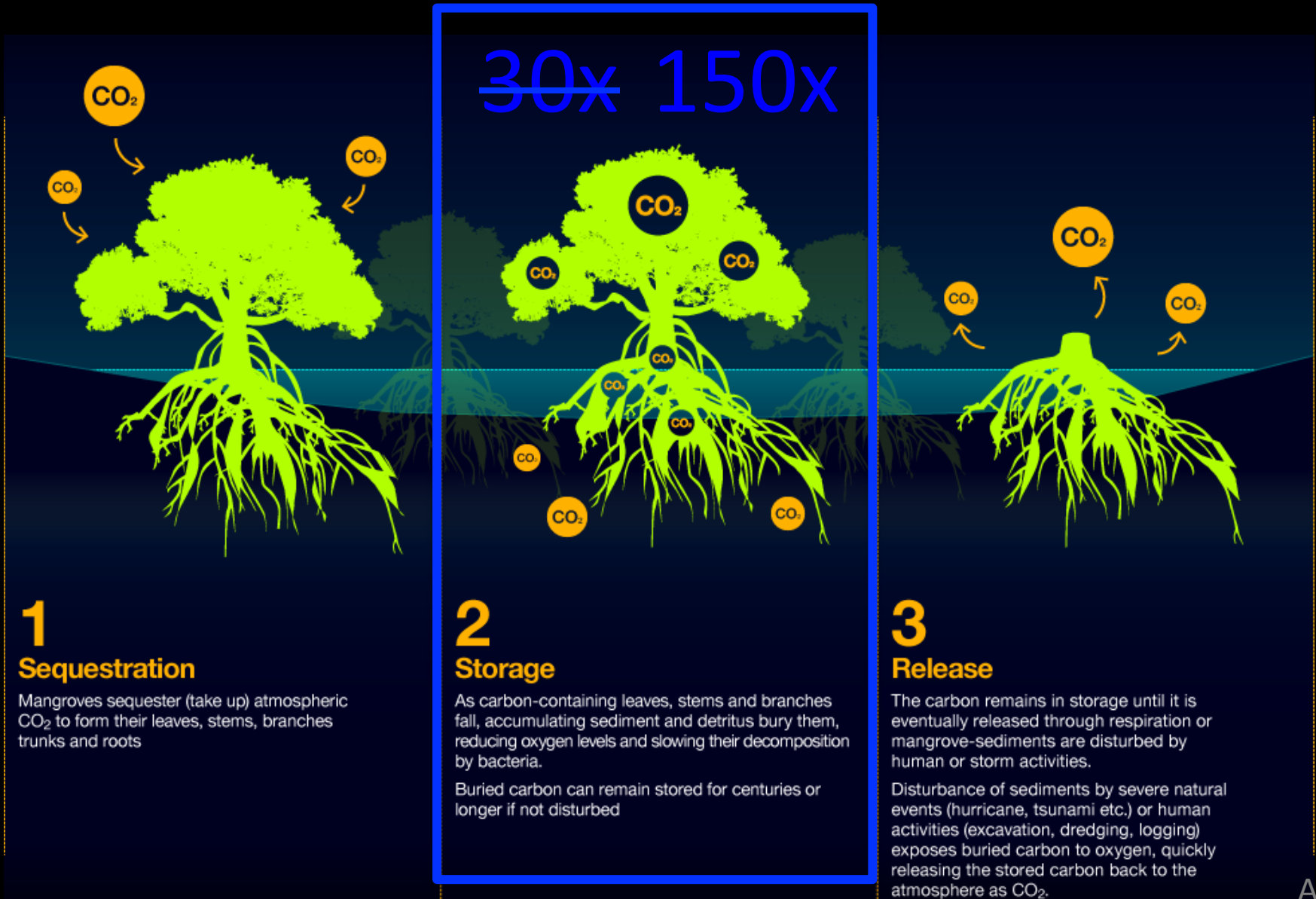
The carbon remains in storage until it is eventually released through respiration or mangrove-sediments are disturbed by human or storm activities.

Disturbance of sediments by severe natural events (hurricane, tsunami etc.) or human activities (excavation, dredging, logging) exposes buried carbon to oxygen, quickly releasing the stored carbon back to the atmosphere as CO_2 .

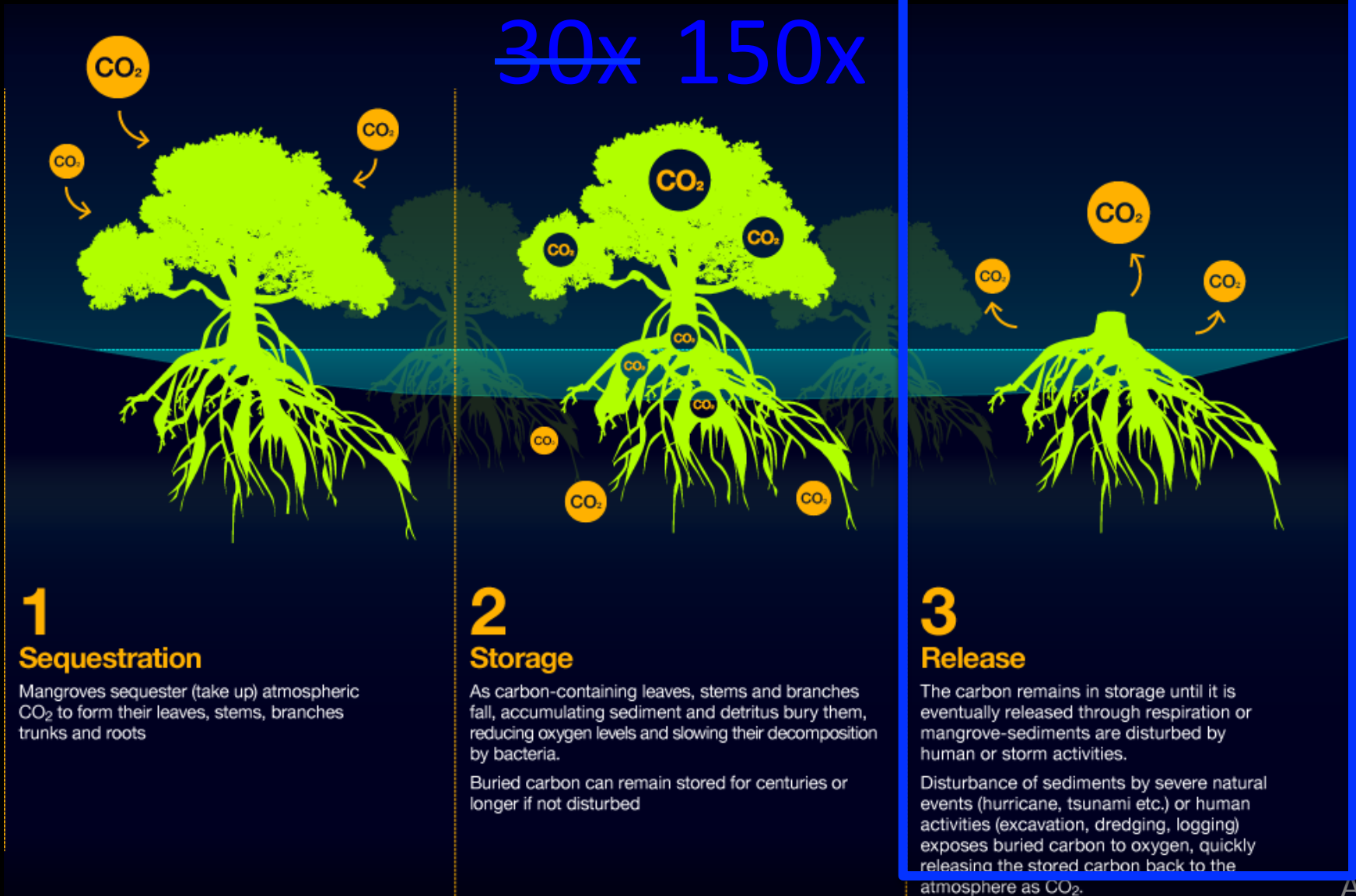
Components Of Blue Carbon



Components Of Blue Carbon



Components Of Blue Carbon



A Few Final Thoughts

- Annual carbon sequestration rates are much less than total carbon stored, yet we tend to only value carbon sequestration potential in decision-making
- Carbon storage in the soil is estimated to go to at least 1 meter in depth
- Need more studies on mangroves (and seagrasses) in the Gulf of Mexico

THANK YOU!

Lauren.Hutchison@tamucc.edu



TEXAS A&M
UNIVERSITY
CORPUS
CHRISTI

HARTE
RESEARCH INSTITUTE
FOR GULF OF MEXICO STUDIES