Apr 5th, 4:15 PM - 4:30 PM

Hydrodynamic regime determines the magnitude of surface sediment 'blue carbon' stocks in British Columbia eelgrass meadows

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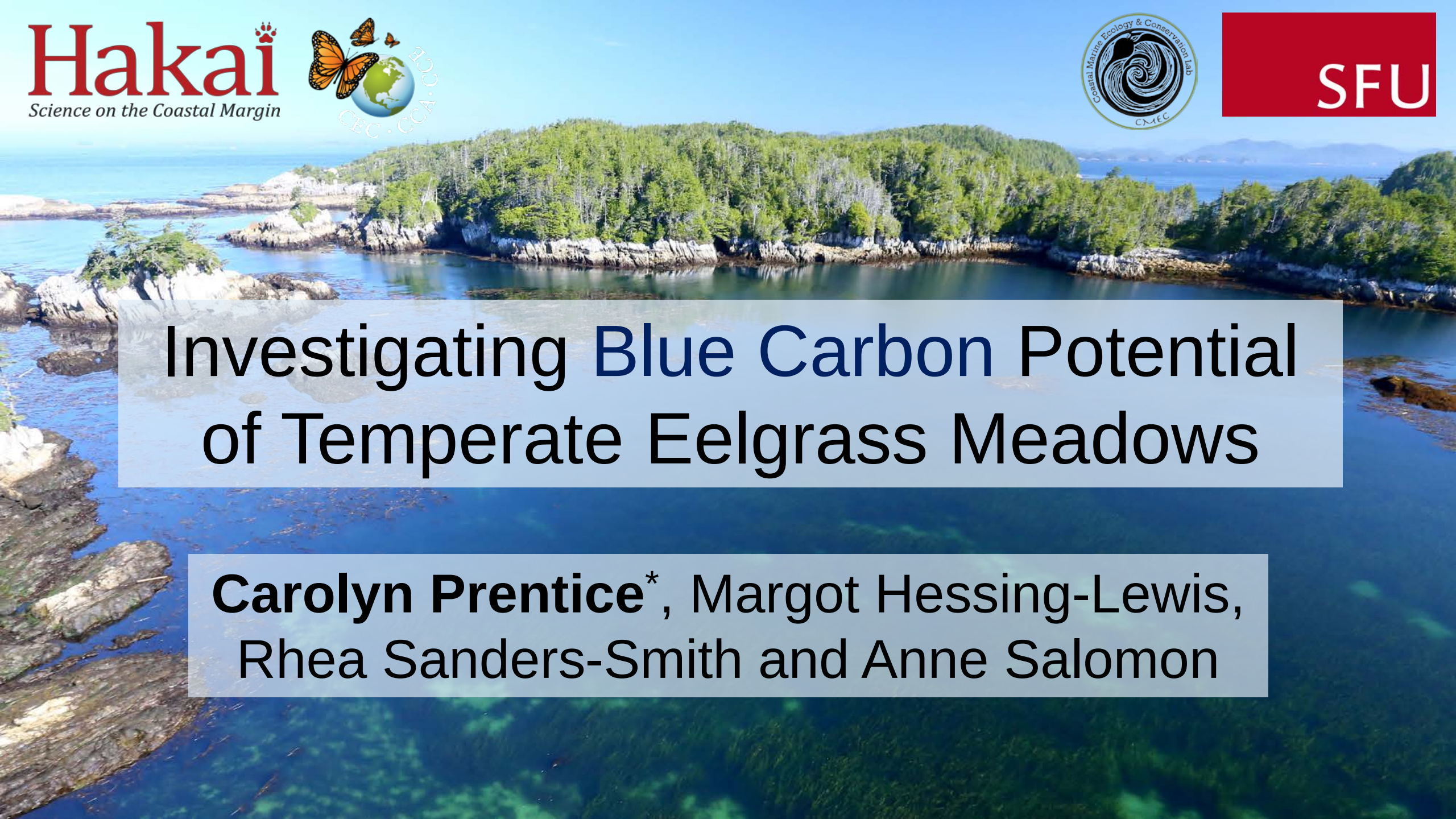


Investigating Blue Carbon Potential of Temperate Eelgrass Meadows

Carolyn Prentice*, Margot Hessing-Lewis, Rhea Sanders-Smith and Anne Salomon

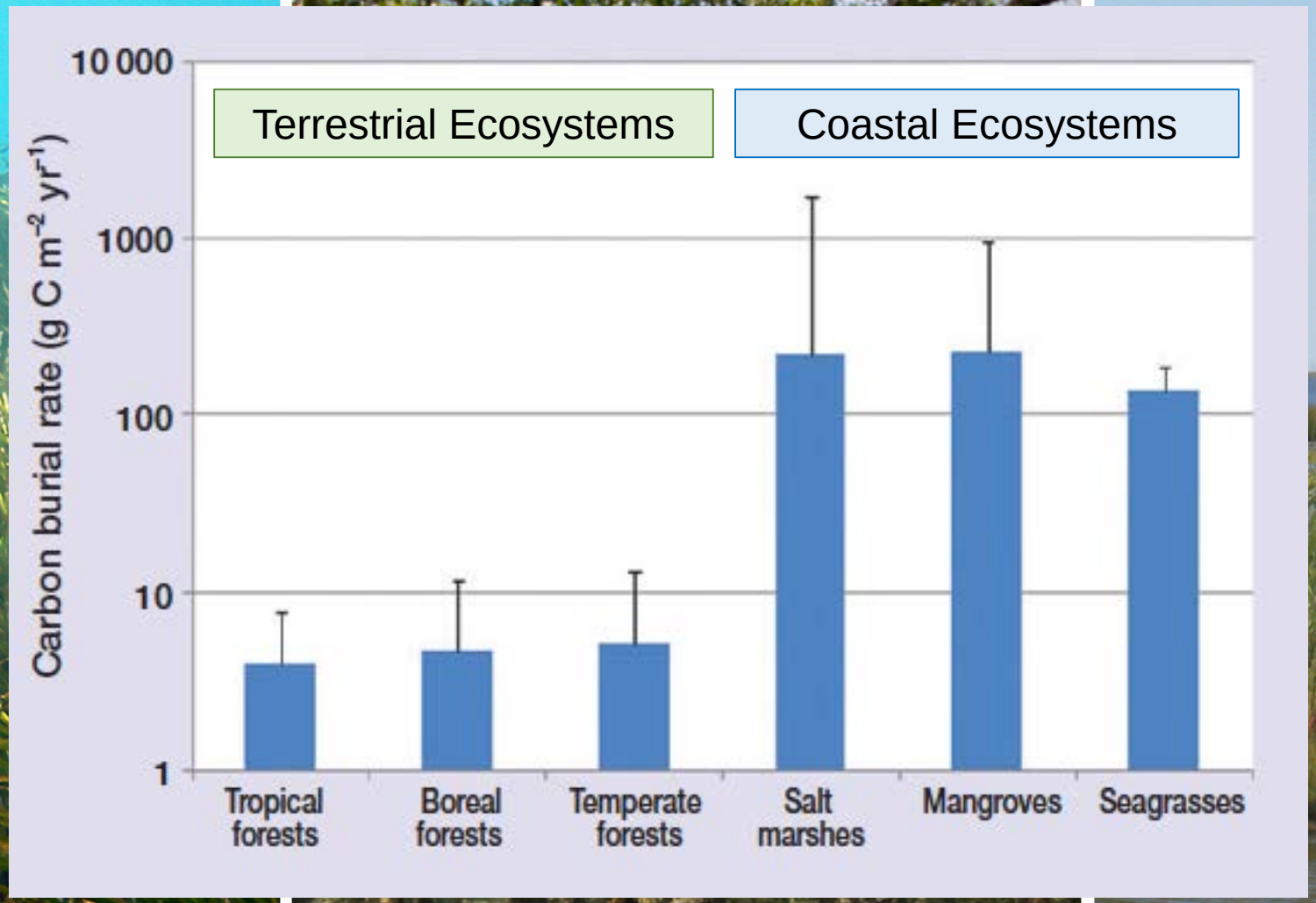
Terrestrial ‘Green Carbon’

Coastal ‘Blue Carbon’

NOAA

Dale Gerhard

https://www.saveposidoniaproject.org



(McLeod et al 2011)

UNEP

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IUCN

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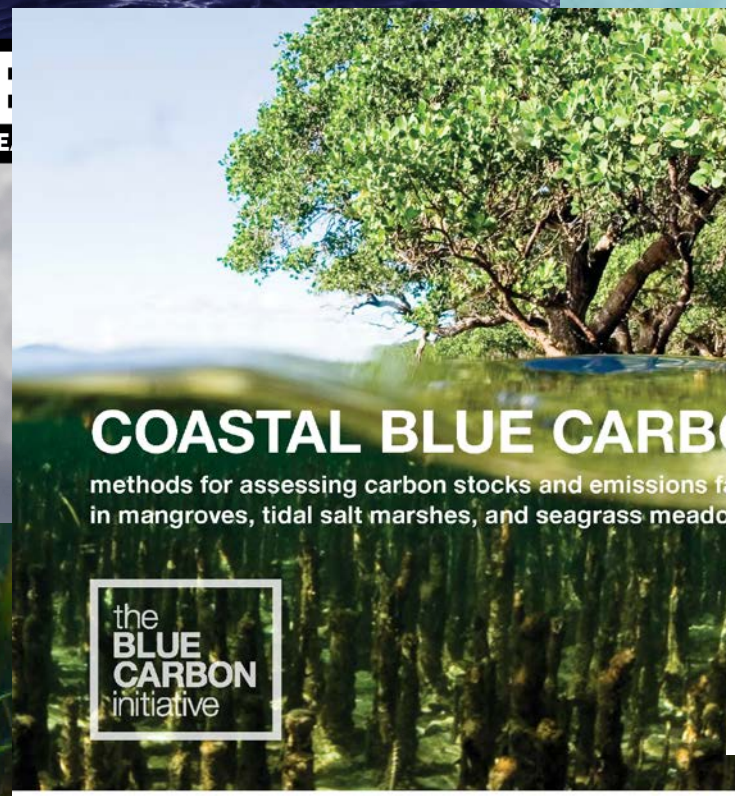
BLUE

THE ROLE OF HE



COASTAL BLUE CARB

methods for assessing carbon stocks and emissions f

in mangroves, tidal salt marshes, and seagrass meado

the BLUE CARBON initiative

CONSERVATION INTERNATIONAL

IUCN

VCS

METHODOLOGY: VCS Version 3

METHODOLOGY FOR TIDAL WETLAND AND SEAGRASS RESTORATION

RESTORE AMERICA'S ESTUARIES

Title	Methodology for Tidal Wetland and Seagrass Restoration
Version	2013-1205
Date of Issue	27 January 2014
Type	Methodology
Sectoral Scope	14. Agriculture Forestry and Oth Project category: ARR + RWE
Prepared By	Silvestrum, University of Marylan Smithsonian Environmental Rese Virginia
Contact	Silvestrum Dr. Igino Emmer Dorpsstraat 4, 1546 LJ, Jisp, The Email: igino.emmer@silvestrum. Tel: +31 653699610 Restore America's Estuaries Mr. Stephen Emmett-Mattox 2020 14th St. North, Suite 210 Arlington, VA 22201, USA Email: sem@estuaries.org Tel: +1 720-300-3139

WMO UNEP

INTERGOVERNMENTAL PANEL ON climat

2013 Supplement t

the 2006 IPCC Guidelin

National Greenhouse

Inventories: Wetlan

Methodological Guidance on Lan

Wet and Drained Soils, and Cons

Wetlands for Wastewater Treat

Task Force on National Greenhouse Gas Inventories

IUCN

National Blue Carbon Policy Assessment Framework

Towards effective management of coastal carbon ecosystems

$

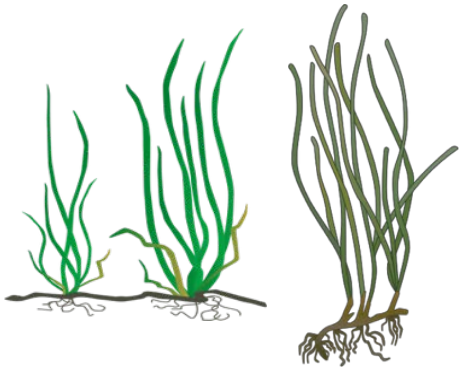
Regional and species biases for seagrass blue carbon data

Zostera marina

?

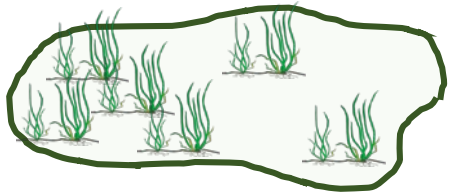
McLeod et al. 2011; Fourqurean et al. 2012; Lavery et al. 2013

Many factors can influence blue carbon potential



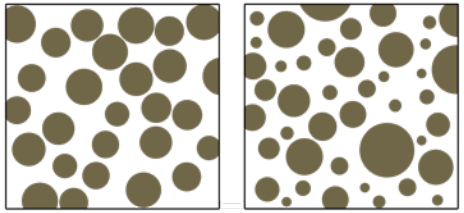
Seagrass Species & Structural Complexity

(Gillis et al. 2017; Samper-Villarreal et al. 2016)



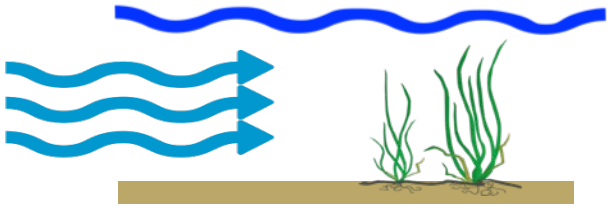
Meadow Size, Patchiness and Position Within Meadow

(Ricart et al. 2015; 2017; Oreska et al. 2017)



Sediment Characteristics

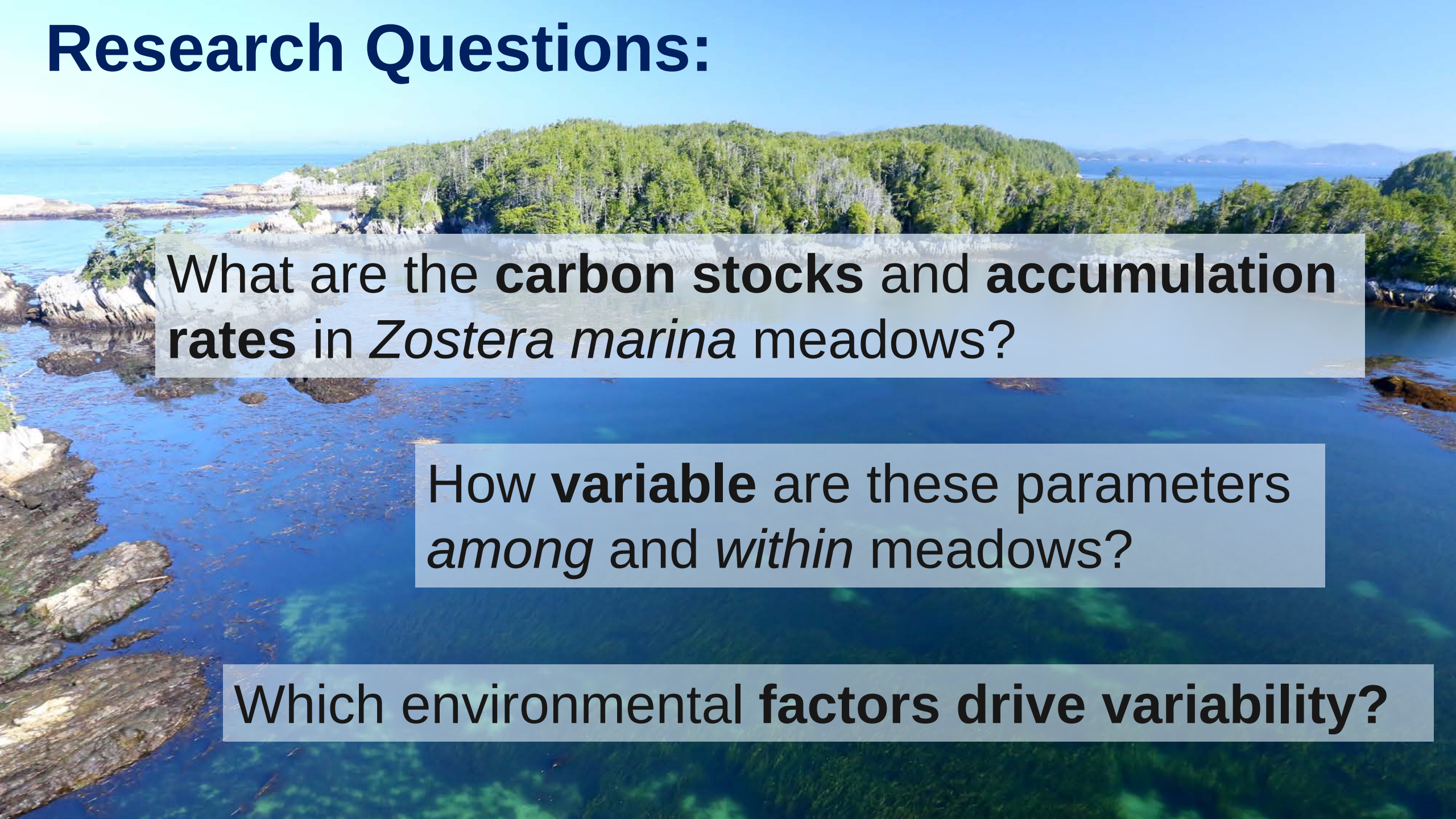
(Dahl et al. 2016; Rohr et al. 2016; Gullstrom et al. 2017)



Depth, Wave Height & Exposure

(Serrano et al. 2014; Samper-Villarreal et al. 2016; Mazarrasa et al. 2017)

Research Questions:



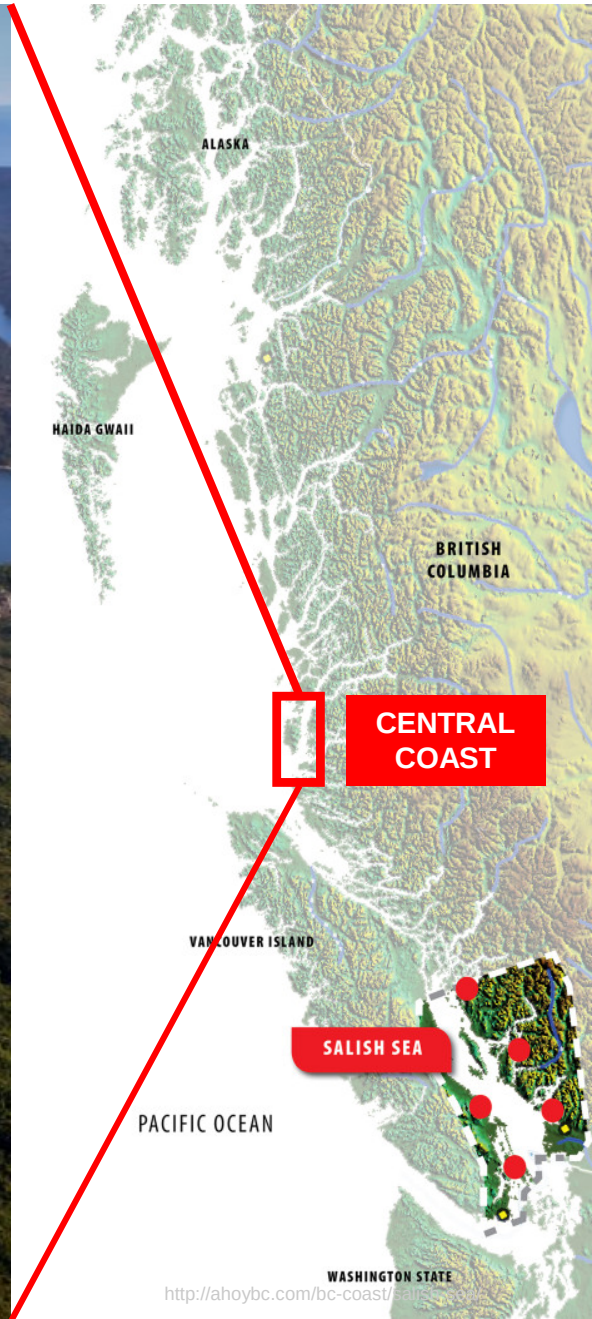
What are the **carbon stocks** and **accumulation rates** in *Zostera marina* meadows?

How **variable** are these parameters *among* and *within* meadows?

Which environmental **factors drive variability?**

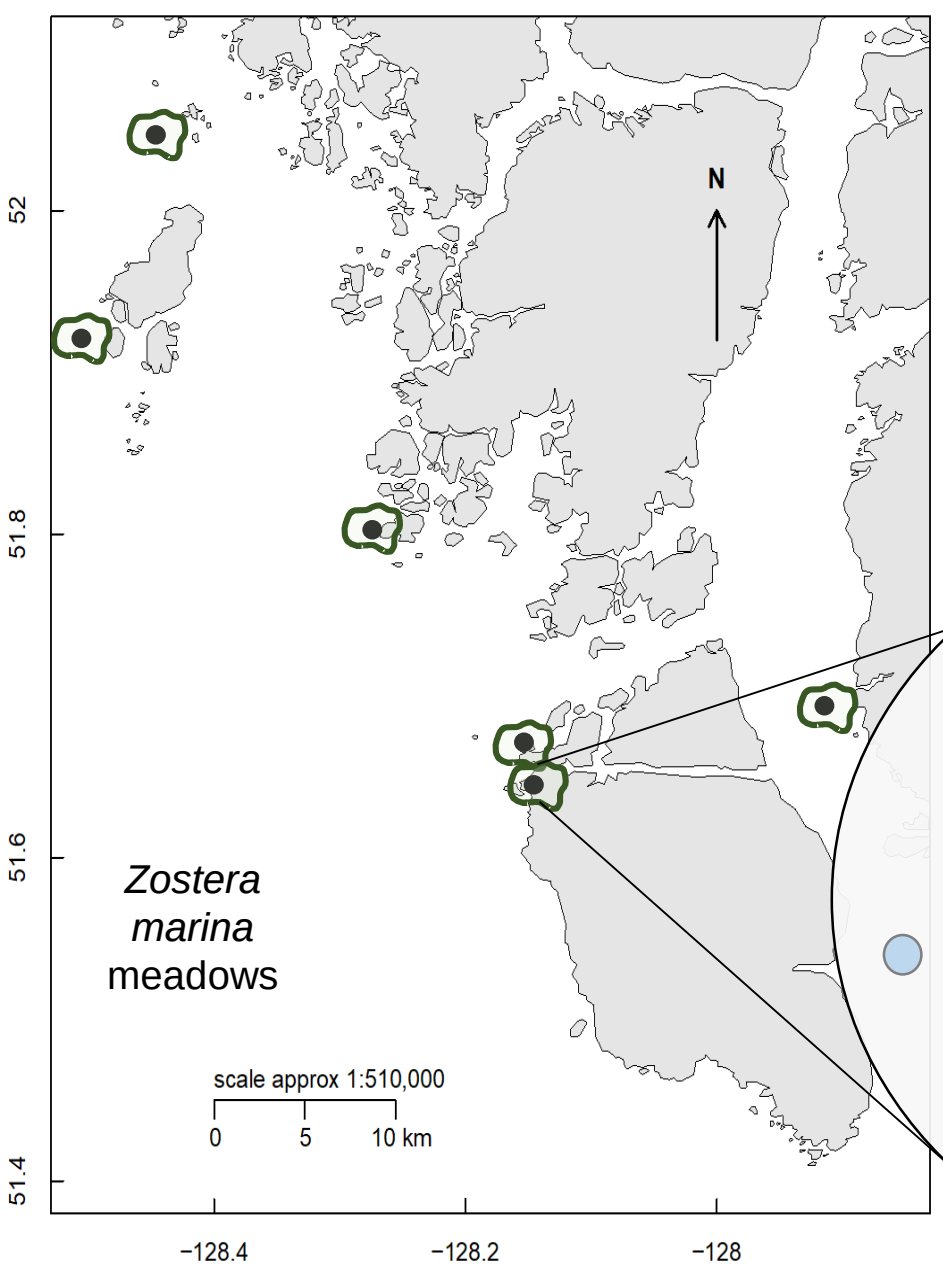
Study Region: Central Coast of British Columbia, Canada

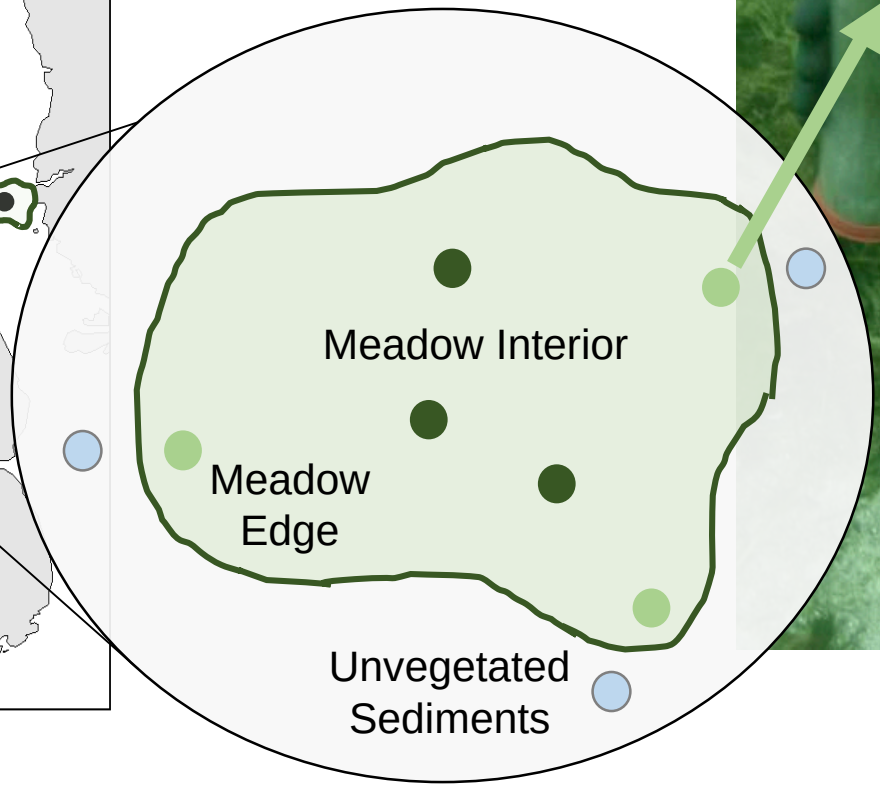
Keith Holmes



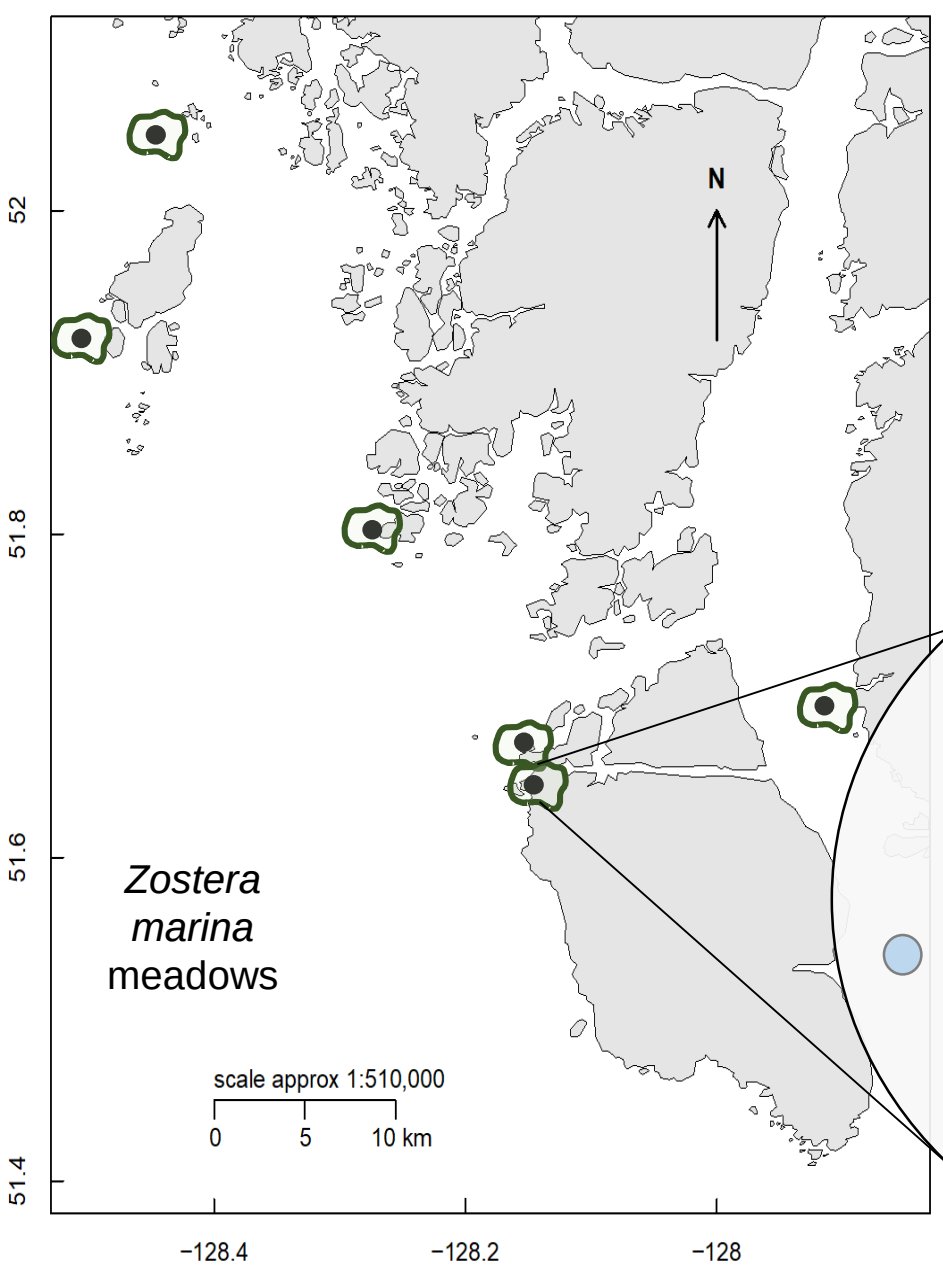
http://ahoybc.com/bc-coast/

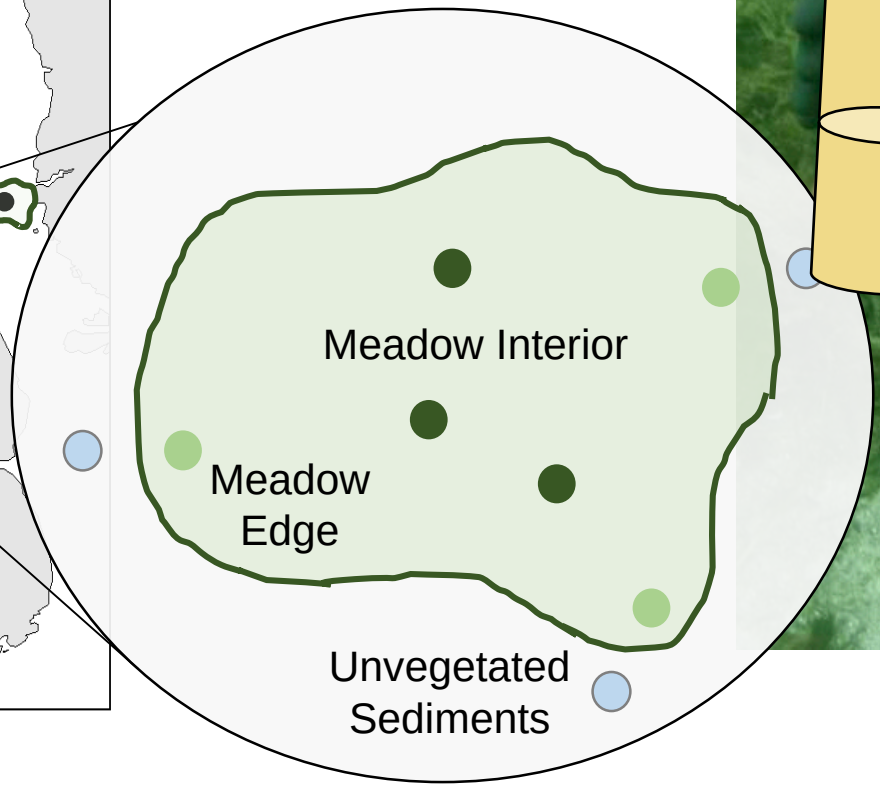
We collected sediment cores & calculated organic carbon stocks

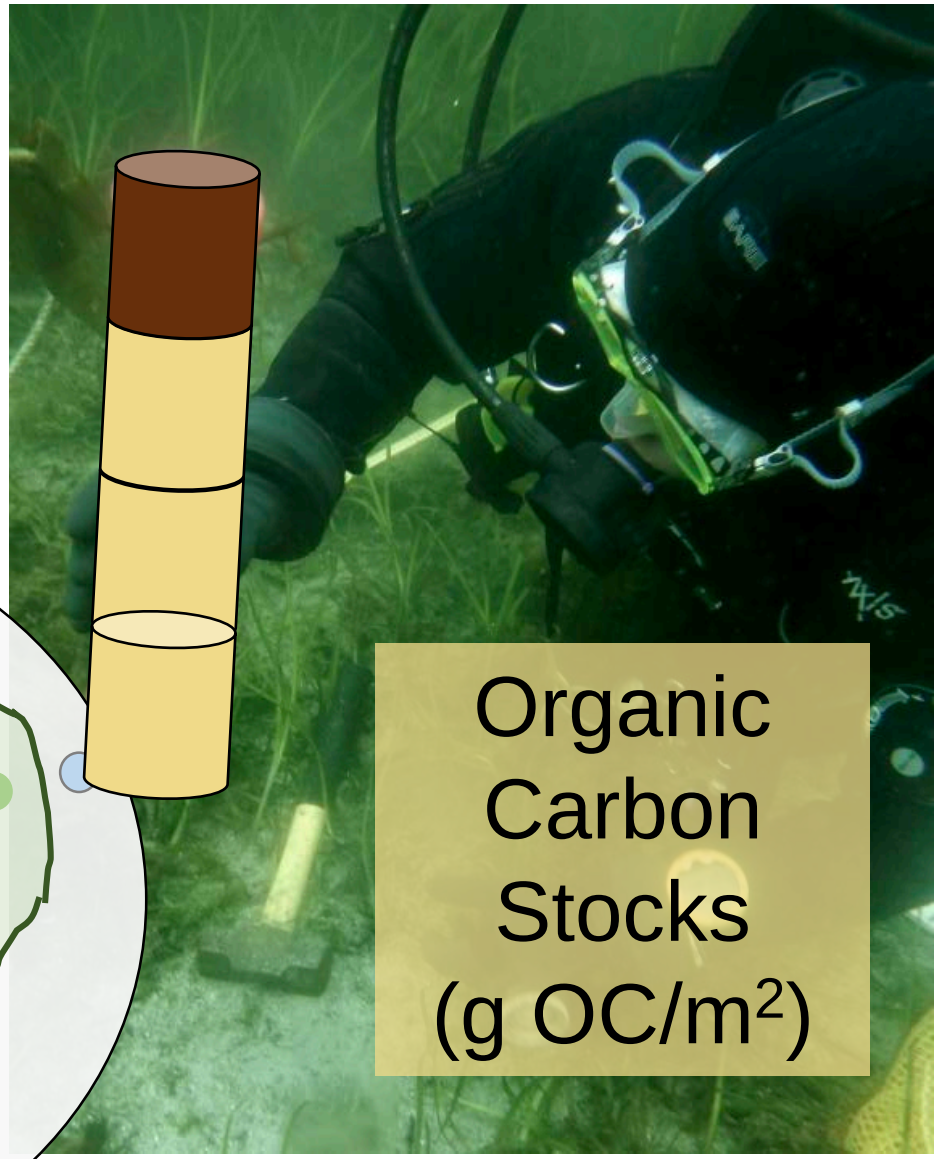




We collected sediment cores & calculated organic carbon stocks



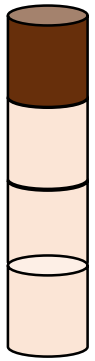


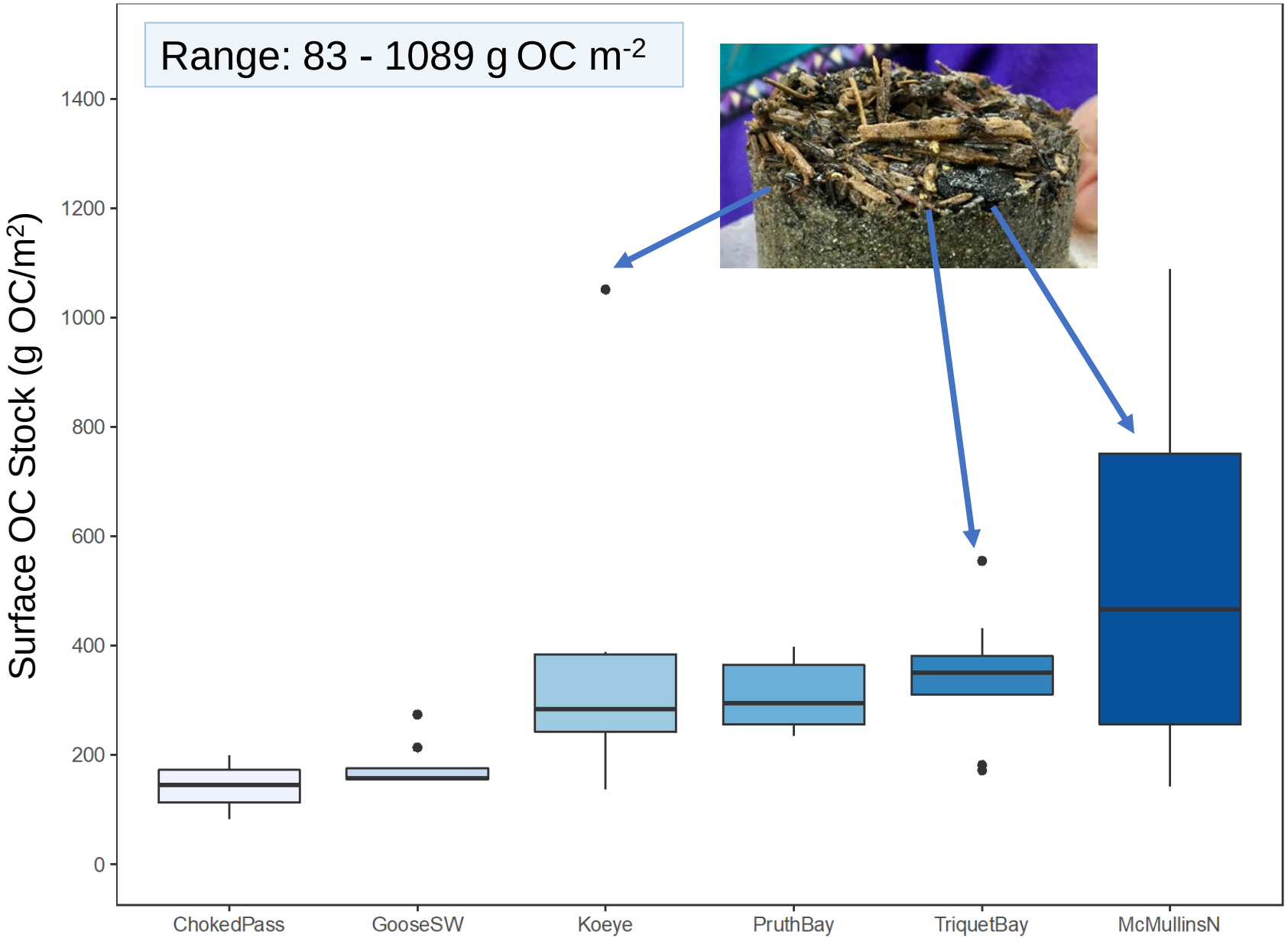




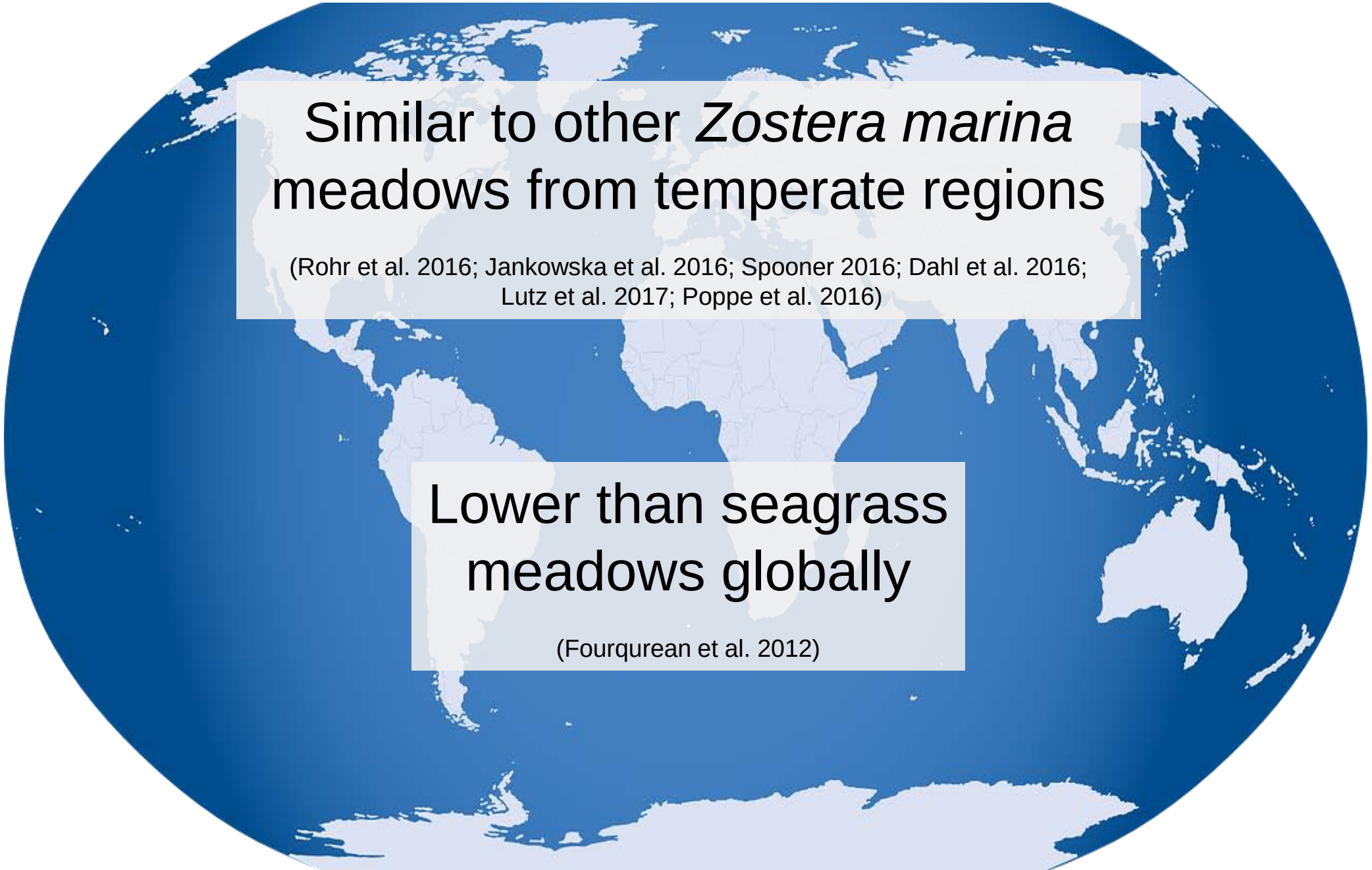



We observed high variability in carbon stocks among sites





How do these carbon stocks compare with existing data?



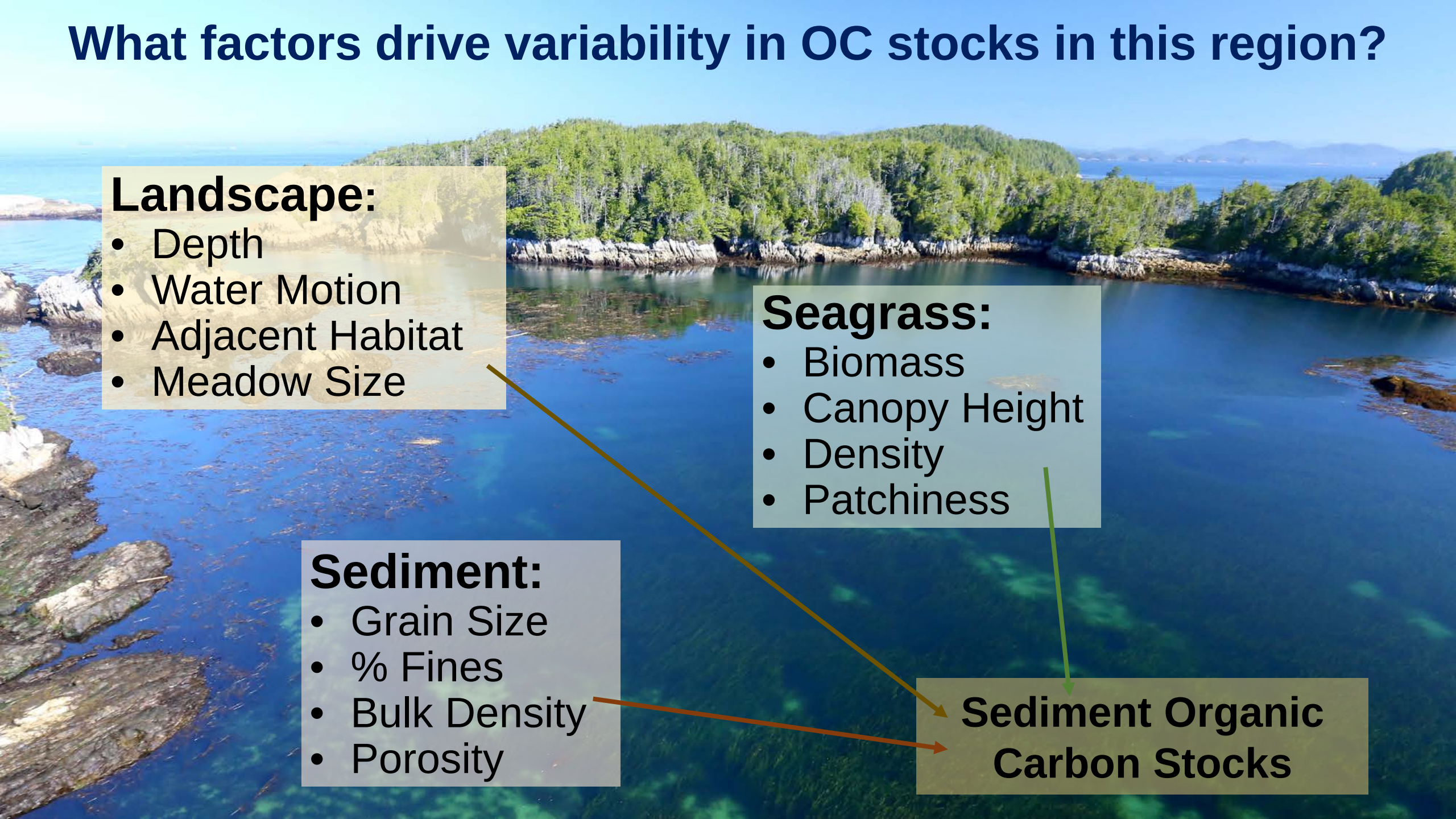
Similar to other *Zostera marina* meadows from temperate regions

(Rohr et al. 2016; Jankowska et al. 2016; Spooner 2016; Dahl et al. 2016; Lutz et al. 2017; Poppe et al. 2016)

Lower than seagrass meadows globally

(Fourqurean et al. 2012)

What factors drive variability in OC stocks in this region?



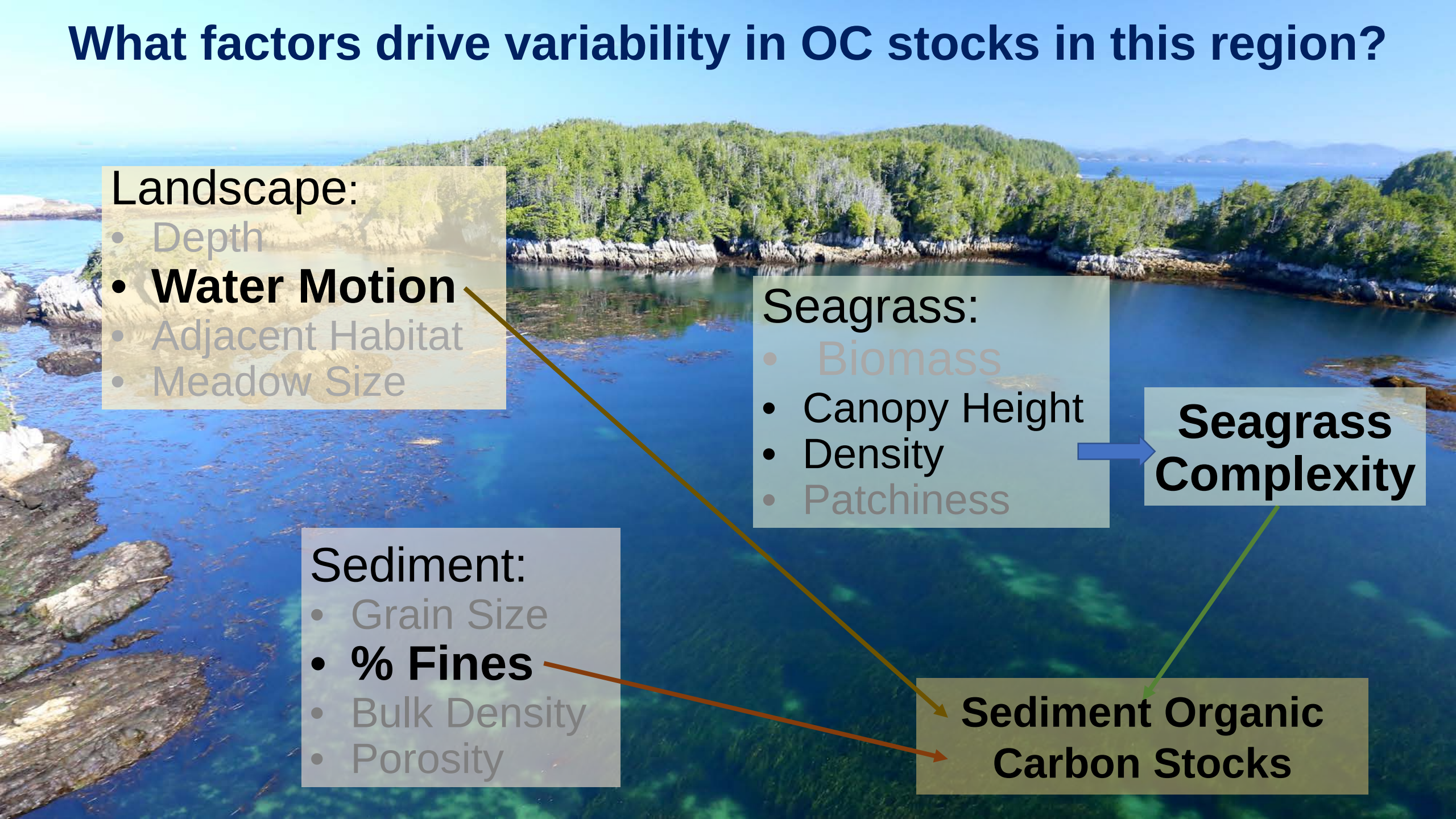
Landscape:
- Depth
- Water Motion
- Adjacent Habitat
- Meadow Size

Seagrass:
- Biomass
- Canopy Height
- Density
- Patchiness

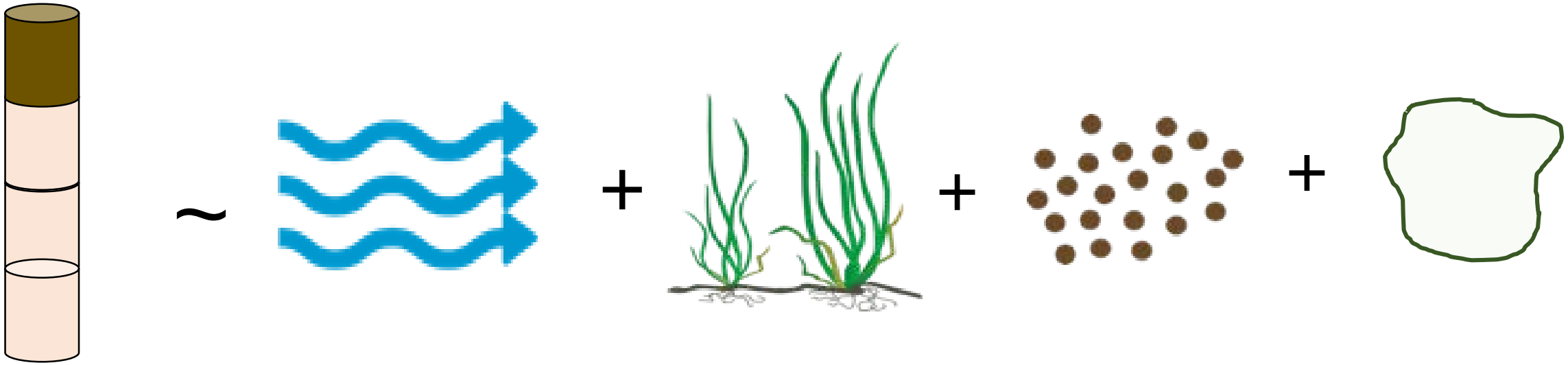
Sediment:
- Grain Size
- % Fines
- Bulk Density
- Porosity

Sediment Organic Carbon Stocks

What factors drive variability in OC stocks in this region?



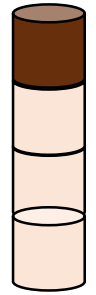
We ran generalized linear mixed effects models…

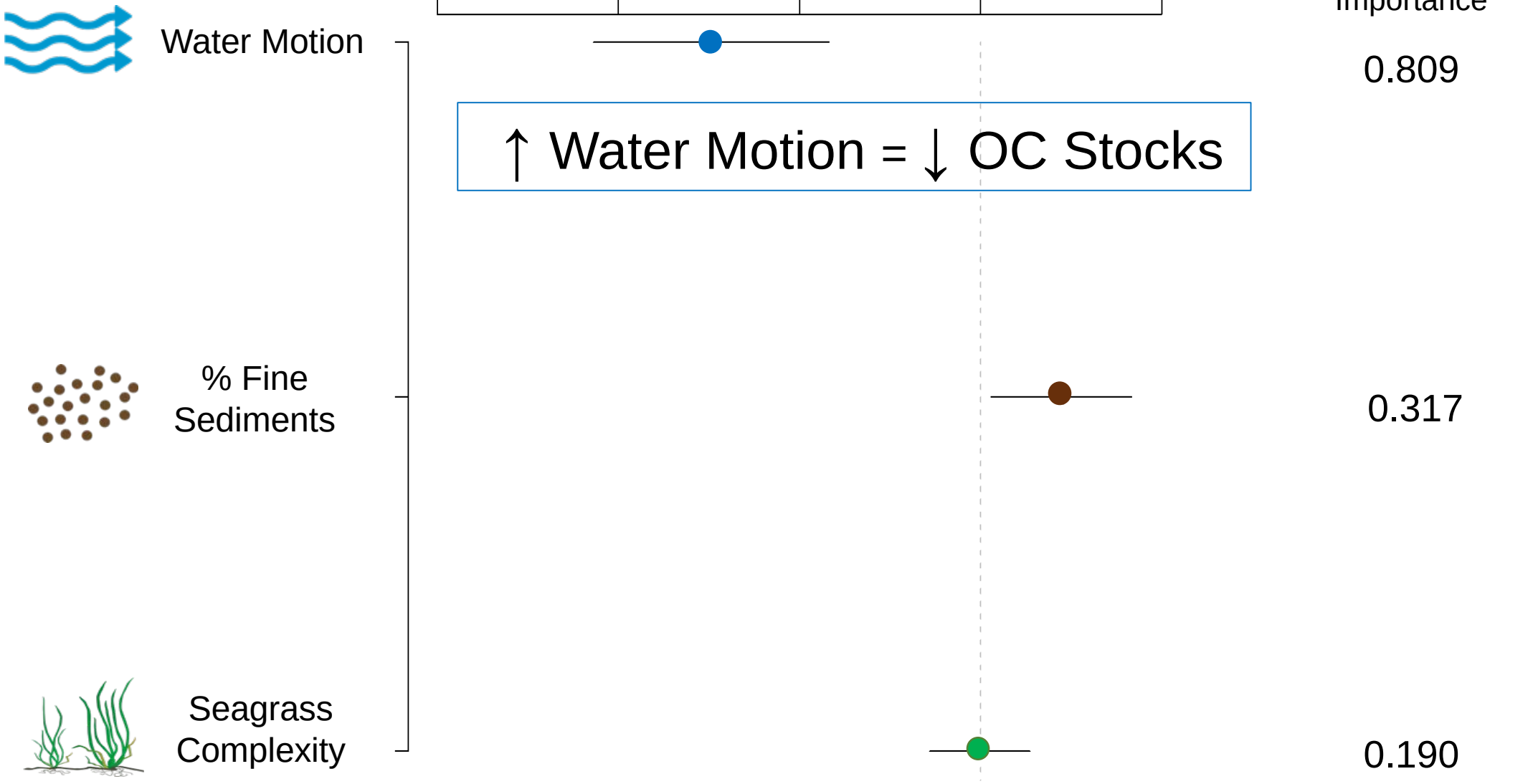


Carbon Stocks ~ Water Motion + Seagrass Complexity + % Fine Sediments + Random effect of meadow

…and compared candidate models using **model selection** (AIC_c values)

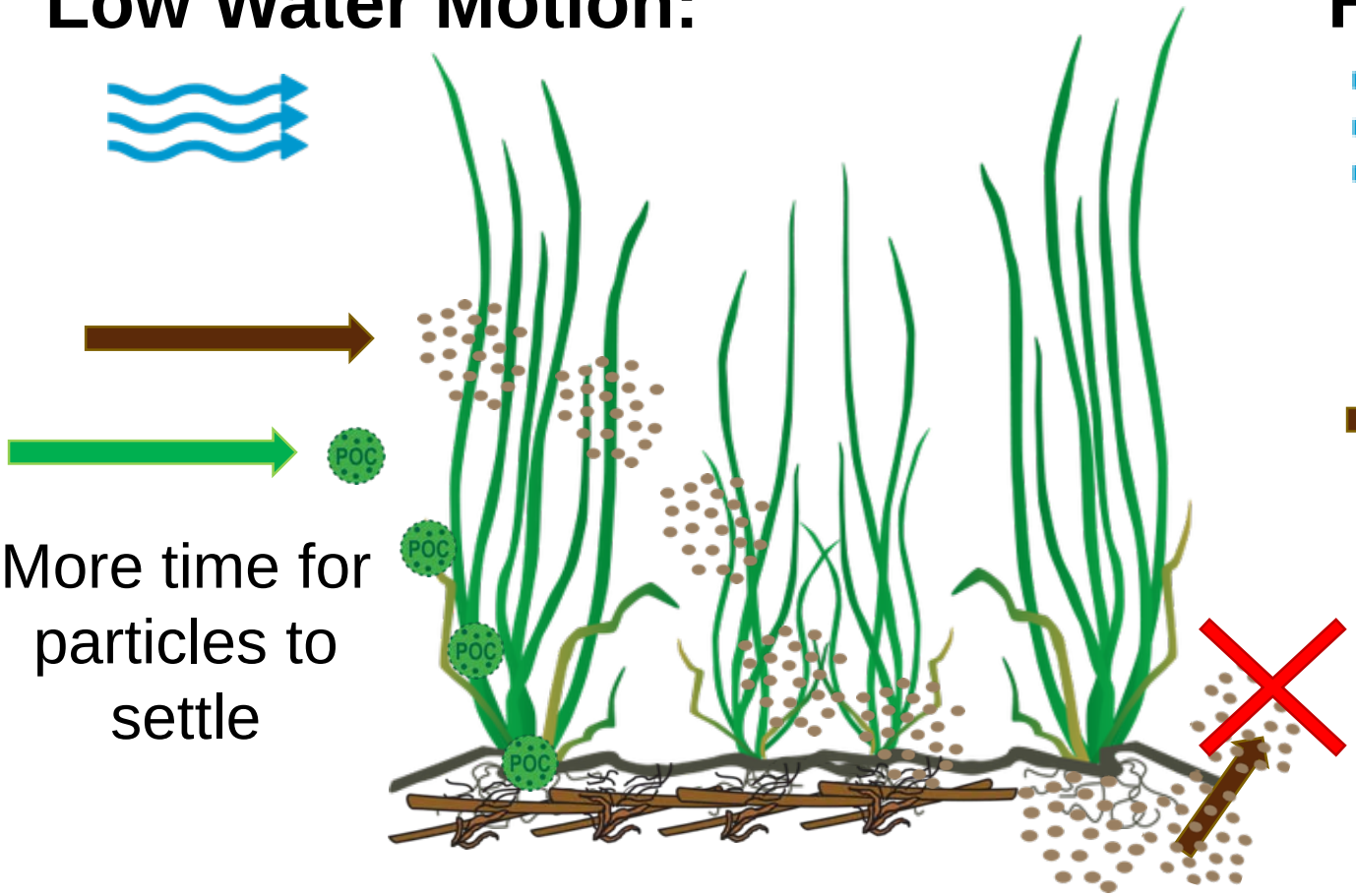
Water motion explained the most variation in surface carbon stocks





Why might water motion be important?

Low Water Motion:

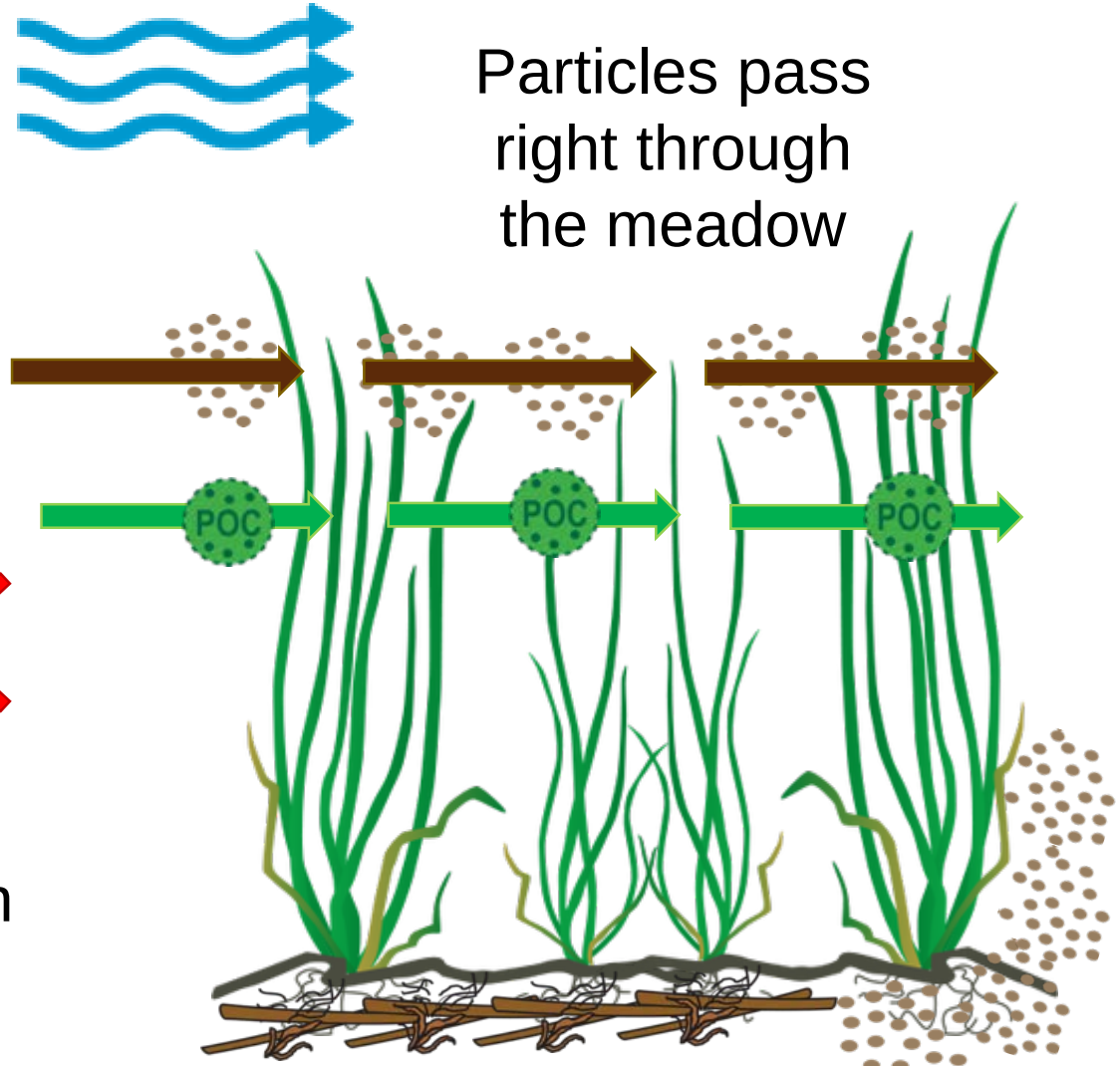


More time for particles to settle

Less resuspension and erosion

High Water Motion:

Particles pass right through the meadow

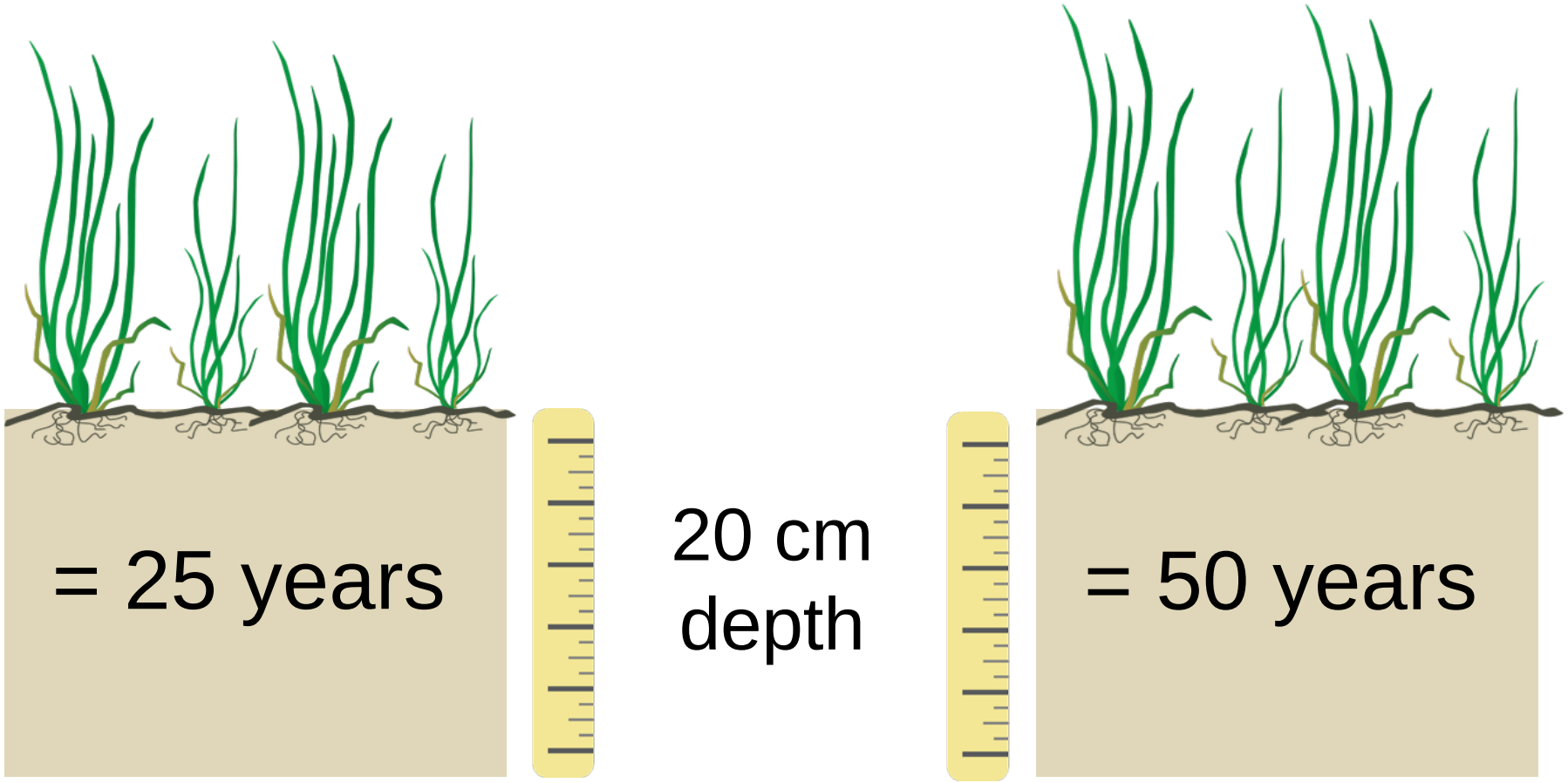


More resuspension

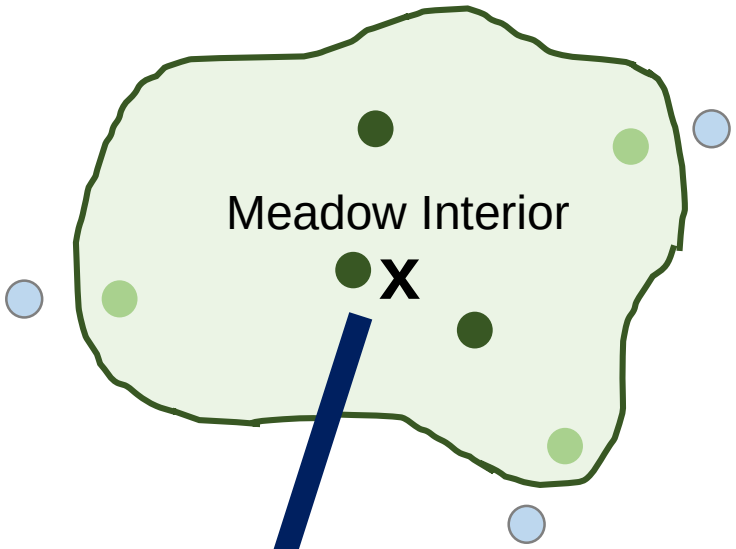
(Samper-Villarreal et al. 2016; Mazarrasa et al. 2017)

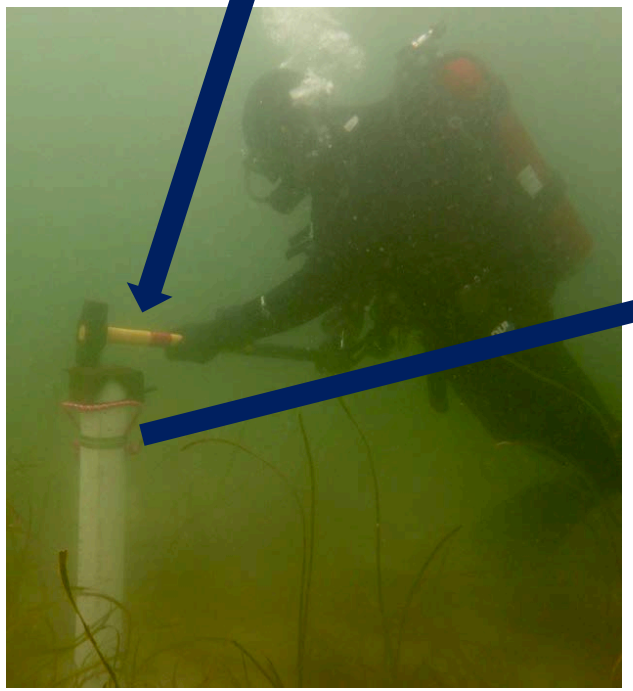
Carbon stocks don’t tell the whole story!

Stocks at a **given depth** could have accumulated over **different time periods**…



We also calculated carbon accumulation rates in each meadow





^{210}Pb Analyses

↓

Sediment Accumulation Rate (g/m^2*year)

×

% Organic Carbon (OC)

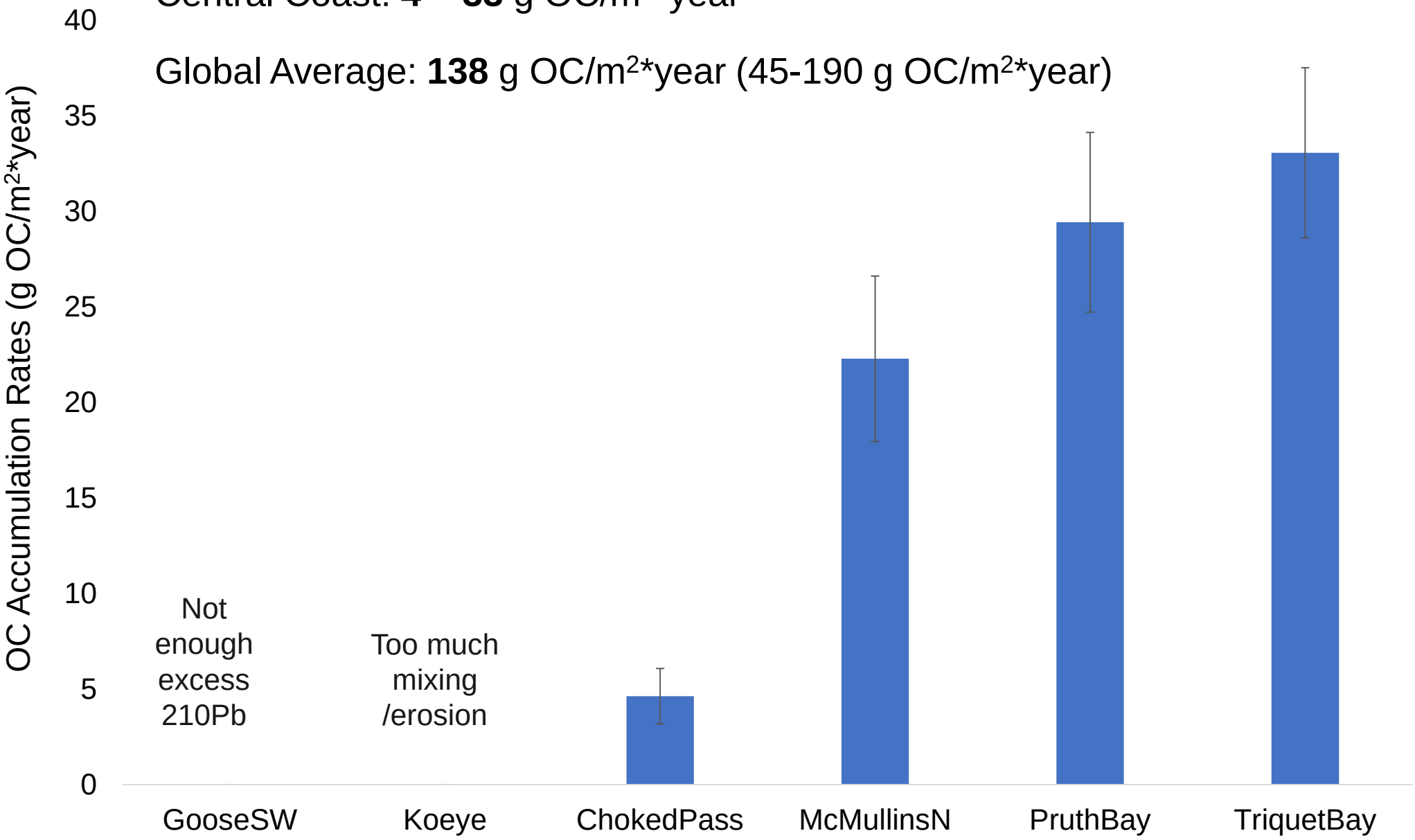
=

OC Accumulation Rate (g OC/m^2*year)

Carbon accumulation rates also varied among meadows

Central Coast: **4 – 33** g OC/m^2*year

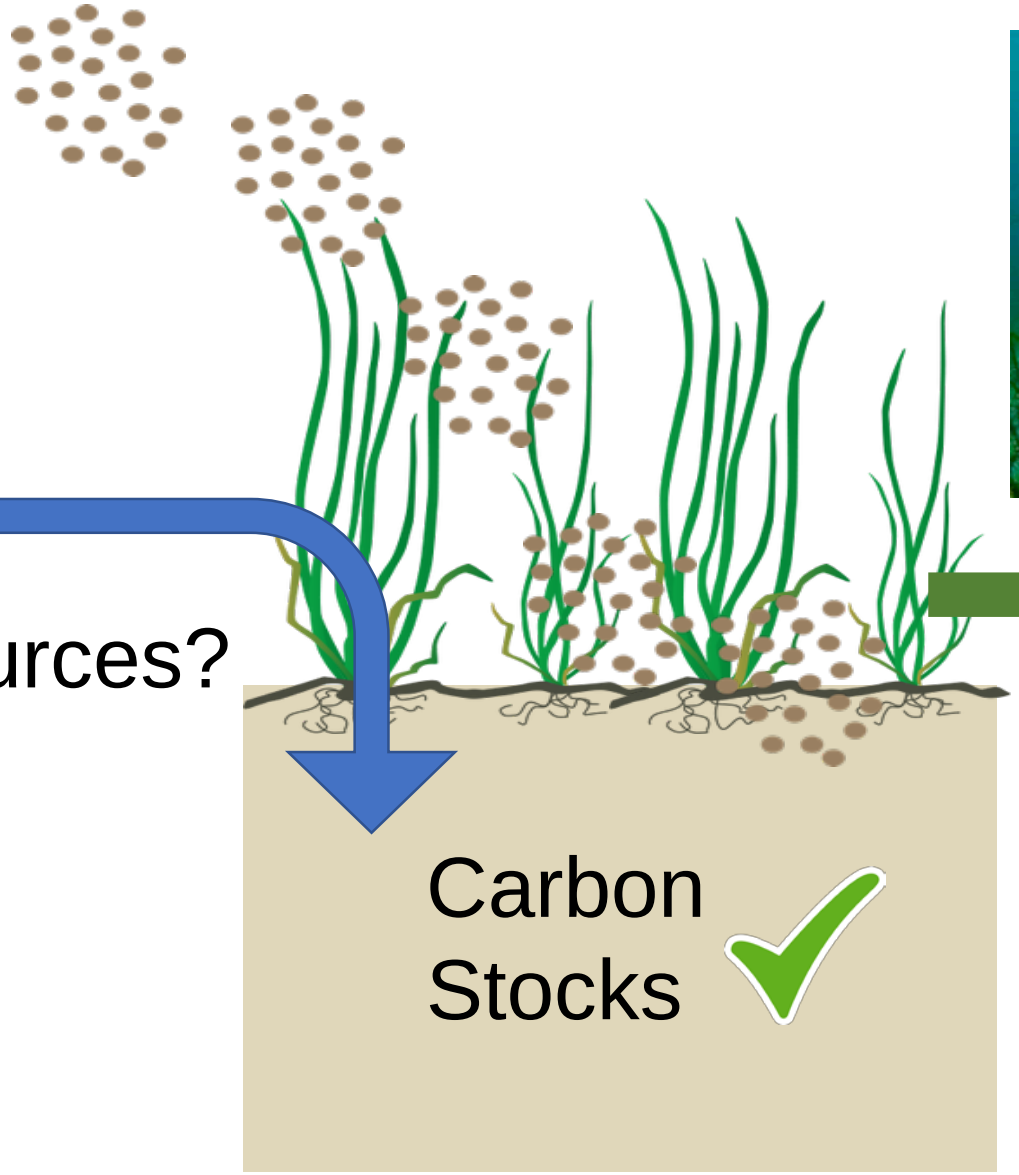
Global Average: **138** g OC/m^2*year (45-190 g OC/m^2*year)



Next Steps: Where did you **come from** where did you **go** (carbon)?

Carbon Accumulation Rates ✓

Carbon Sources?



Carbon Stocks ✓

Fate of exported seagrass biomass?

Take Home Messages

Seagrass carbon stocks can be **highly variable** along a **short stretch of coastline**

Low water motion may indicate areas of **high OC storage potential**

BC values are **similar** to other **temperate regions,** *but* **lower** than **global estimates** for seagrasses

Thank You!

Tula Foundation –
Hakai Institute

Commission for
Environmental
Cooperation

Simon Fraser University –
School of Resource and
Environmental Management

Coastal Marine Ecology
and Conservation Lab

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