2/20/2024

Water Institute Symposium

SOURCES OF WATER IN SALT MARSHES: DETANGLING DRIVERS OF NUTRIENT PROCESSING, AND PLANT PRODUCTIVITY

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Introduction

- Highly productive ecosystems, provide critical services for coastal ecology

- Hot spots for nutrient processing

Salt marshes exist at the terrestrial-marine interface

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Introduction

- Climate change projected to further hypoxic conditions

- Wetlands are very vulnerable to system changes

Anthropogenic activity has led to eutrophic conditions in coastal waterways and marsh degradation

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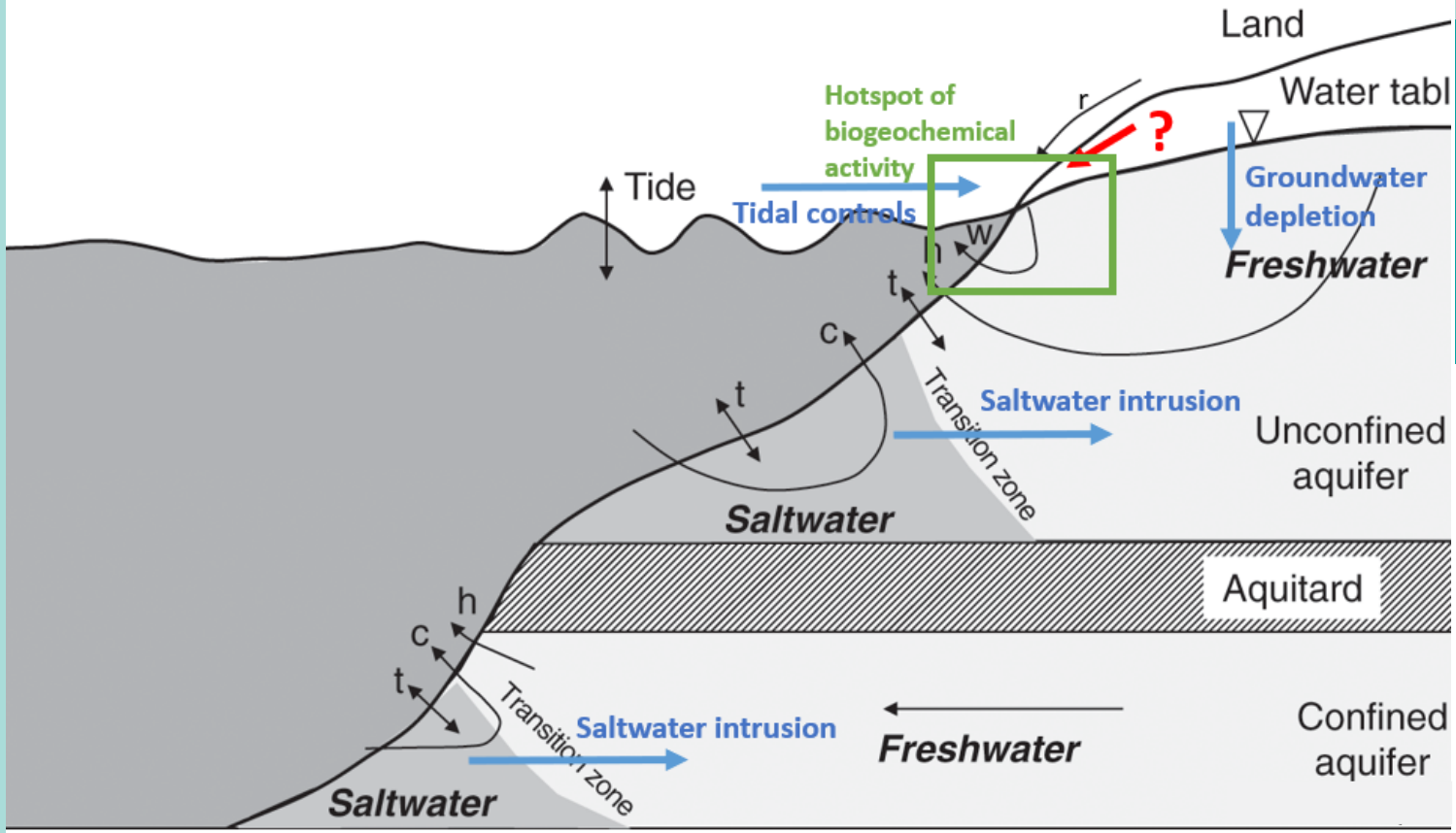
Introduction

- Surface water inputs are generally considered dominant in estuaries

- Estuaries in Mediterranean climates often lack significant surface water inputs year round



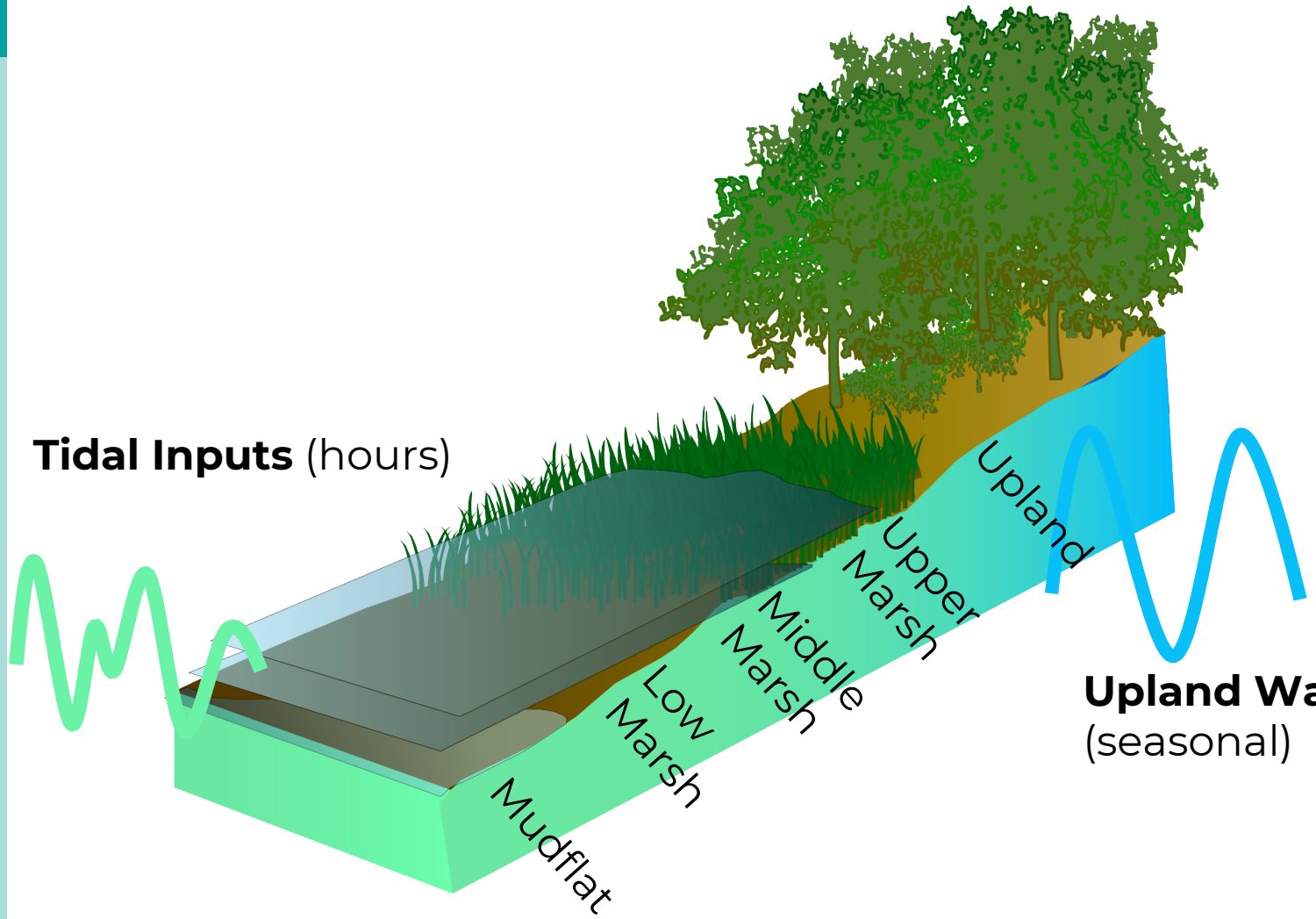
Adapted from M. Zimmer

Anthropogenic activity has led to eutrophic conditions in coastal waterways and marsh degradation

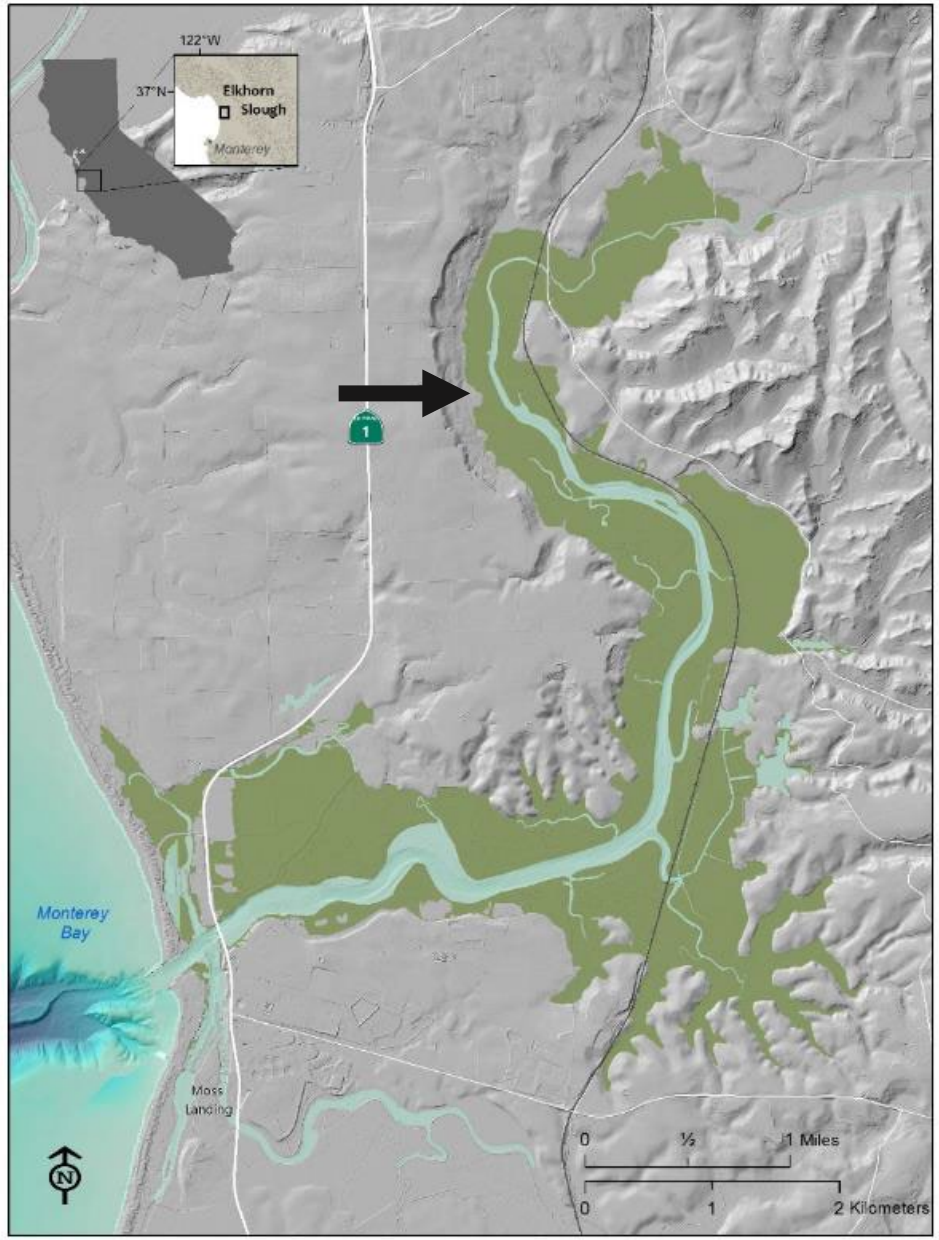
- **Role of seasonally variable shallow flow paths are poorly understood**

Introduction

How do seasonal changes in shallow upland freshwater inputs impact salt marsh hydrology and plant productivity?



Adapted from E. Grande

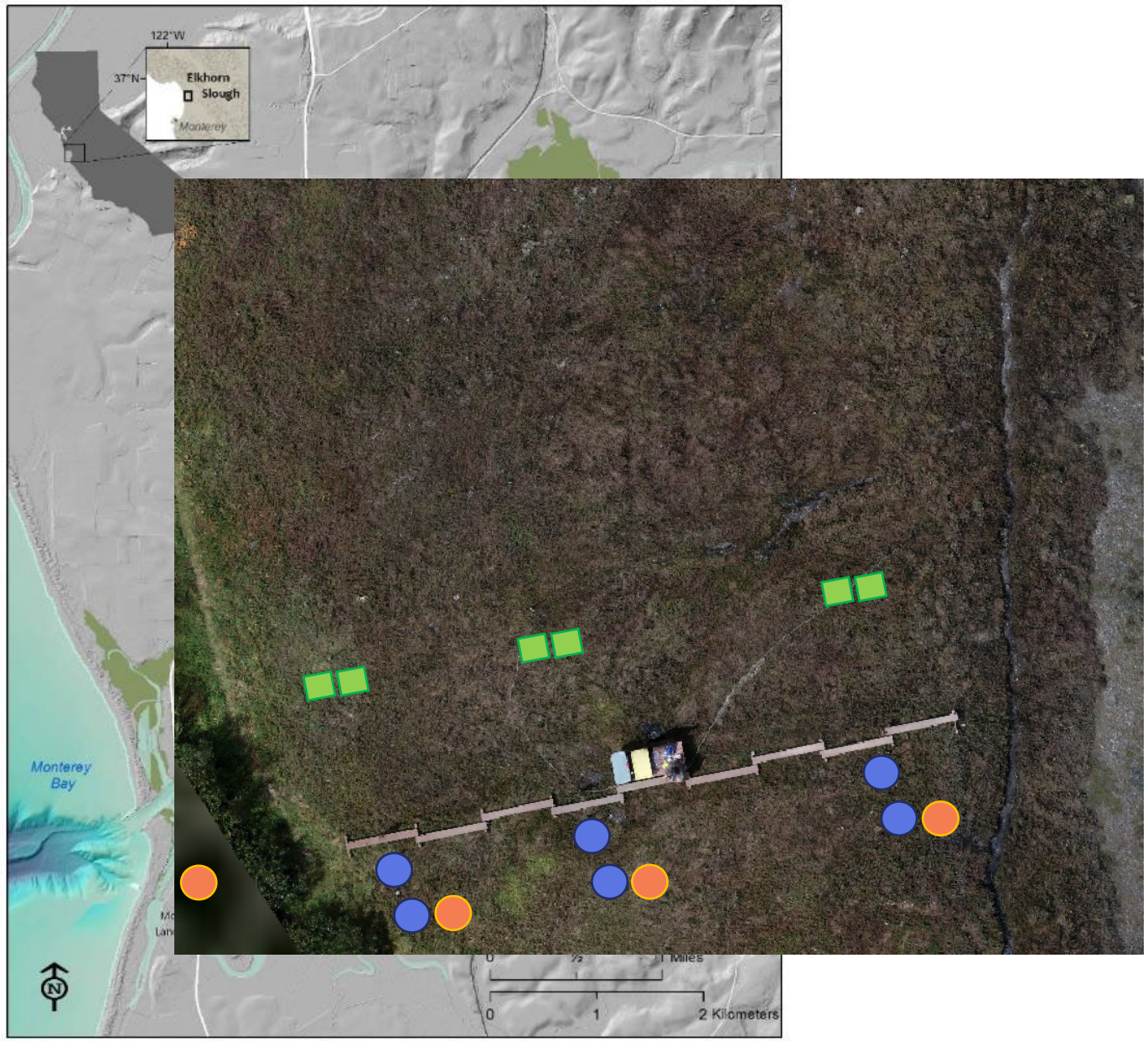


Methods

Elkhorn Slough National Estuarine Research Reserve

Monterey Bay, CA

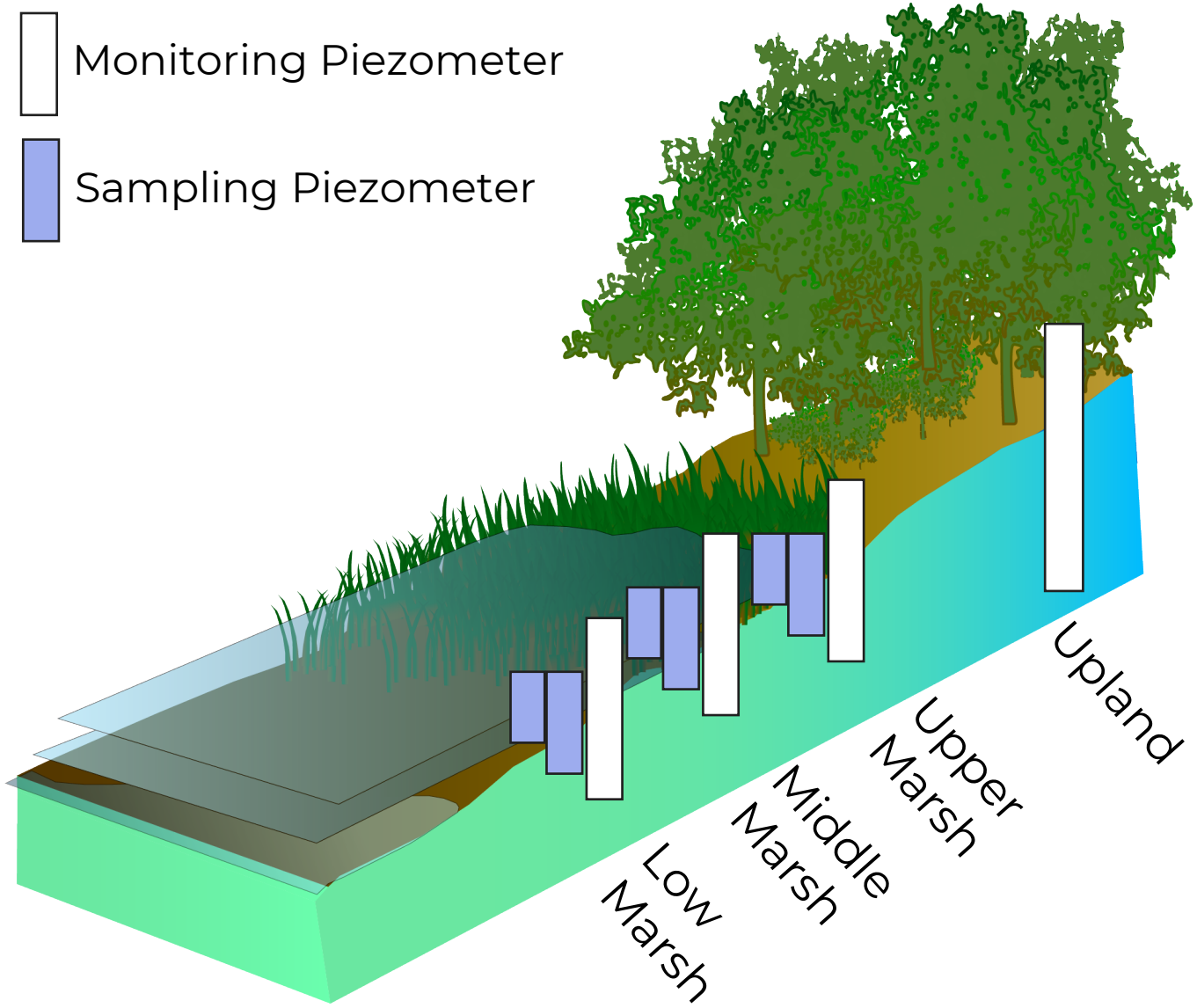
Methods



Elkhorn Slough National Estuarine Research Reserve
Monterey Bay, CA

- Sampling Cup (10 cm, 30 cm)
- Piezometer (70 cm, 250 cm)
- Vegetation survey plot

Methods



Sampling set up along marsh to hillslope transition

Subsurface Characterization

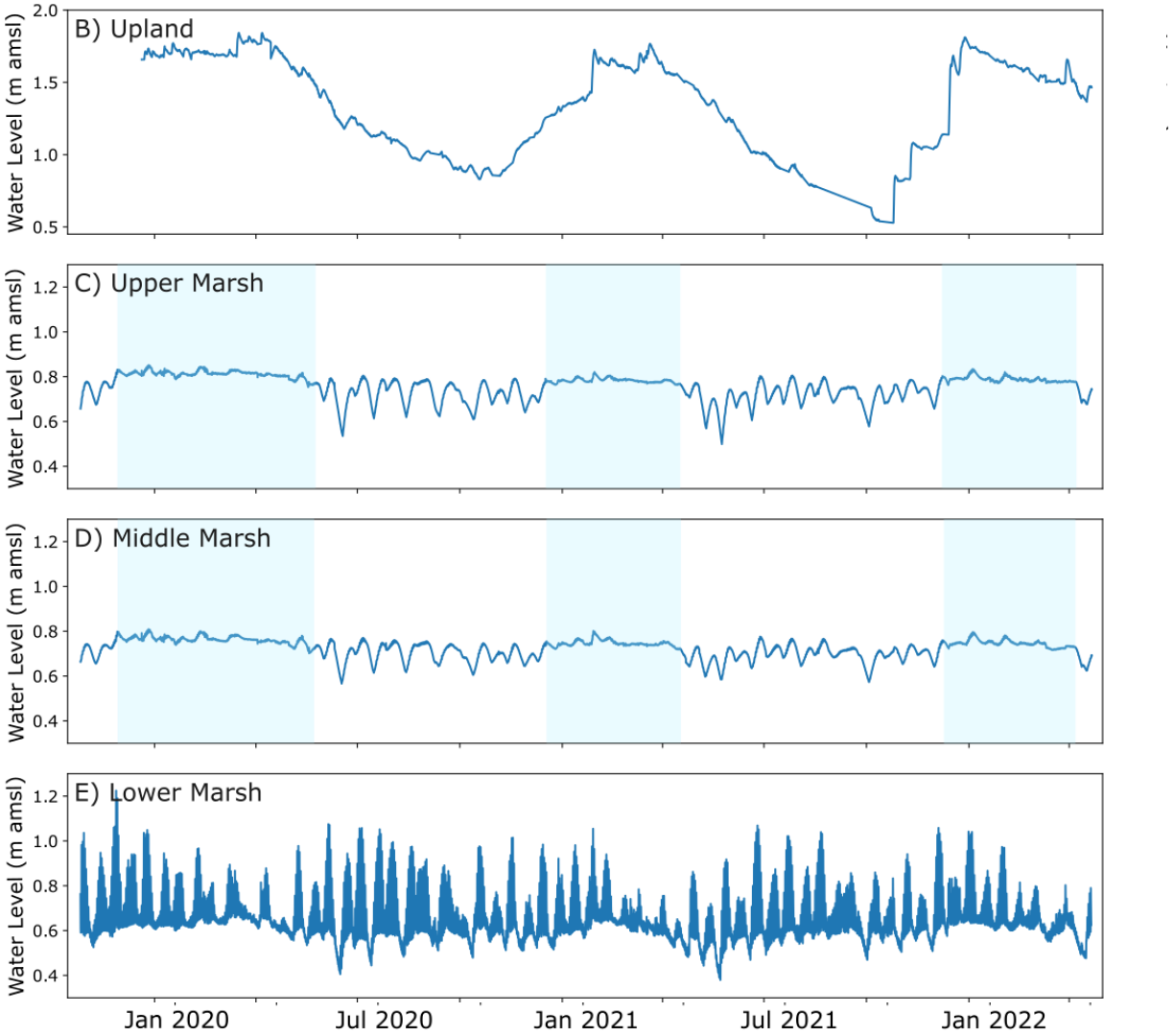
Water Level

Pore Water Quality

Vegetation Activity

Results

Hydrology



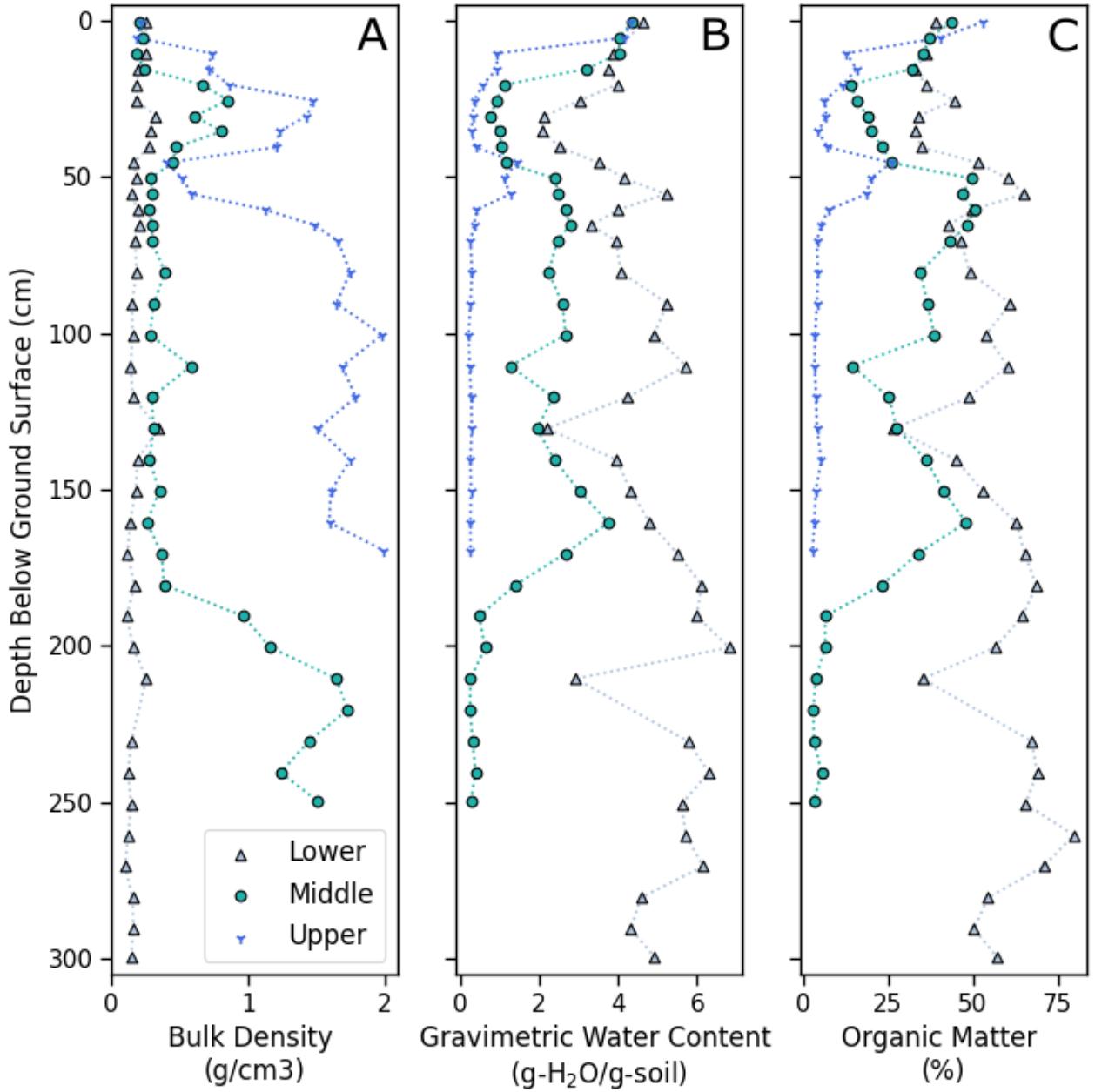
Upper & middle marsh have a muted tidal water level response during wet season

No tidal dampening seen when upland water level is low

Hydrologic connection between upland and marsh during wet season

Results

Subsurface Structure



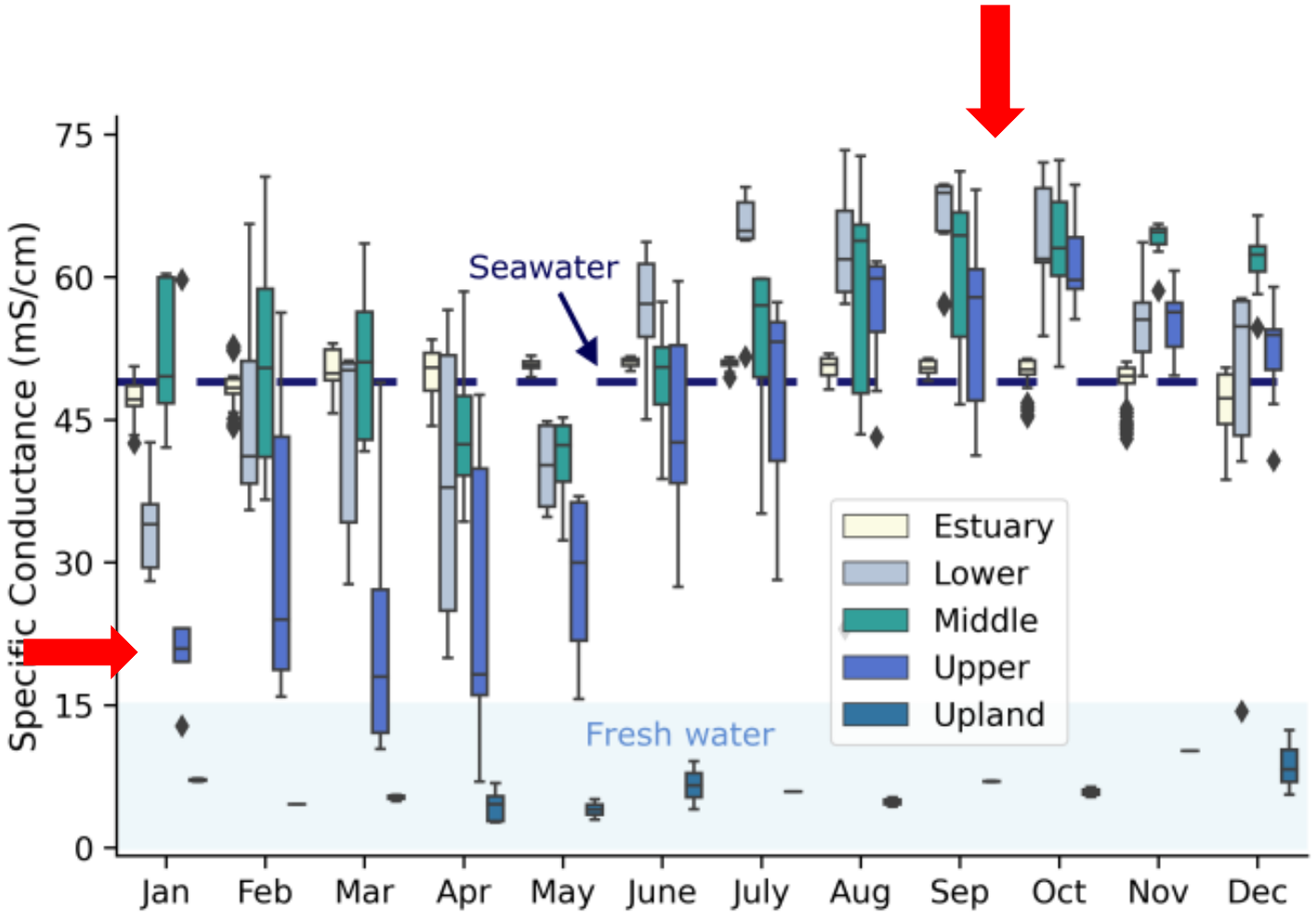
Water stored in slower flowpaths between upland and marsh

More mobile water/drainage in lower marsh

Upper marsh has less drainage at depth compared to middle & lower marsh

Results

Porewater Conductivity



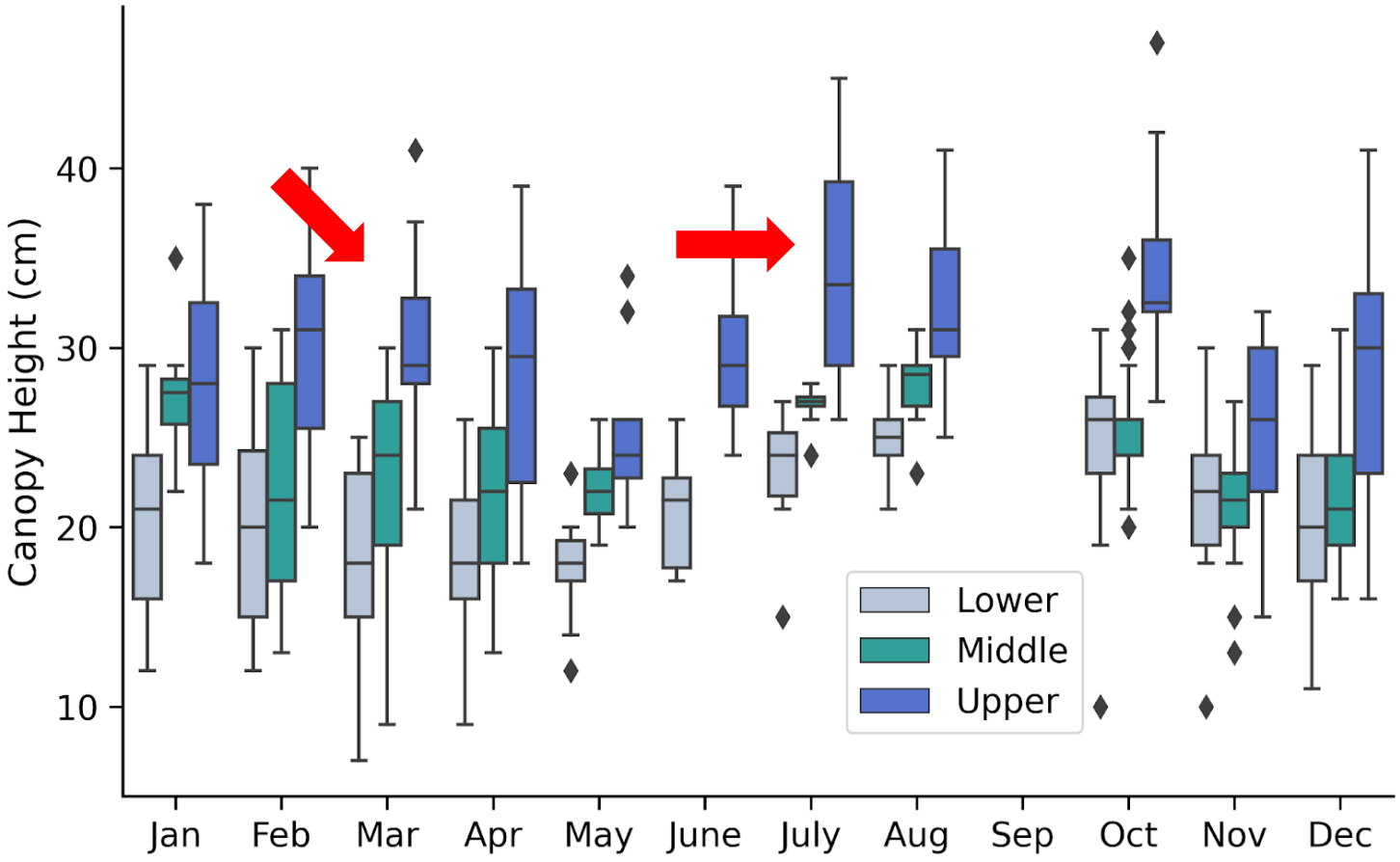
Upper marsh has lowest conductivity during wet season

Freshwater input to salt marsh during winter and spring seasons

Hypersalinity during dry season

Results

Vegetation



Upper marsh position has highest canopy height every season

Increase in upper marsh canopy height seen in early spring while middle and lower marsh remain low

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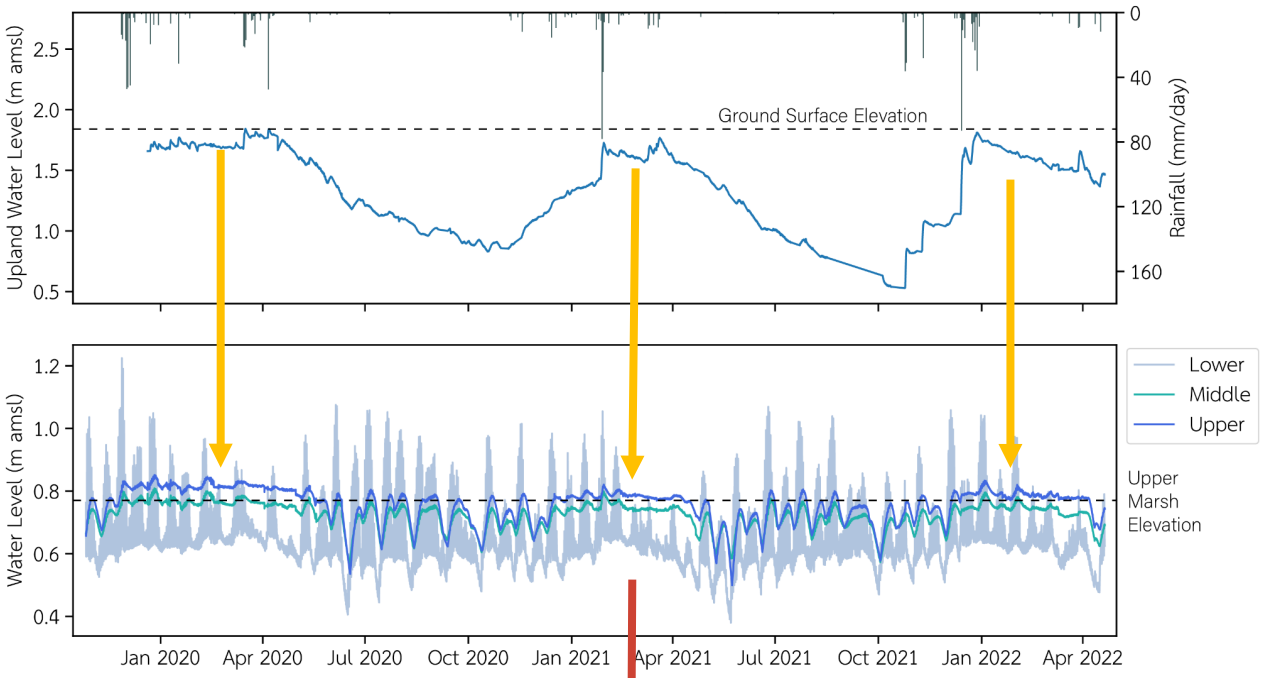
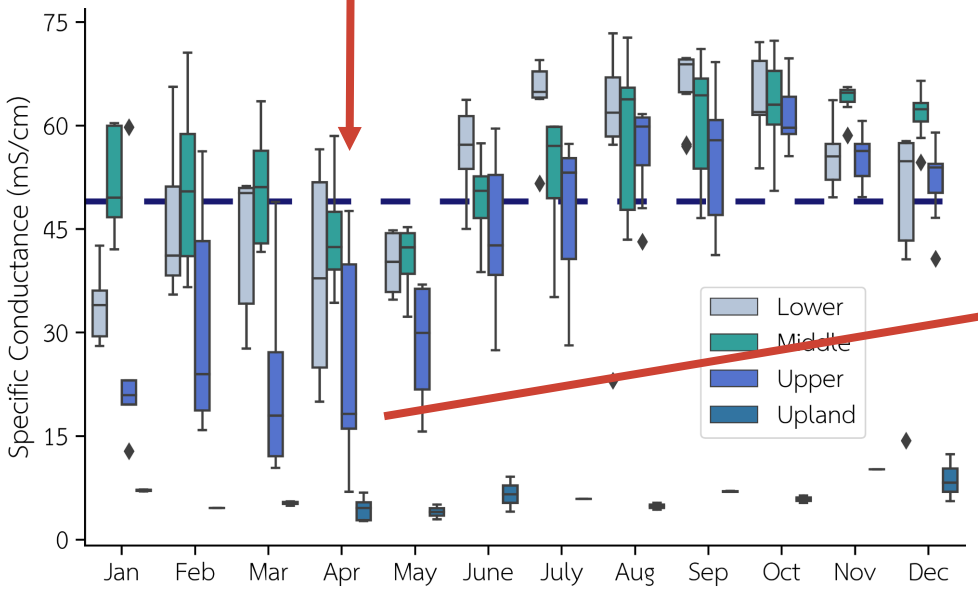
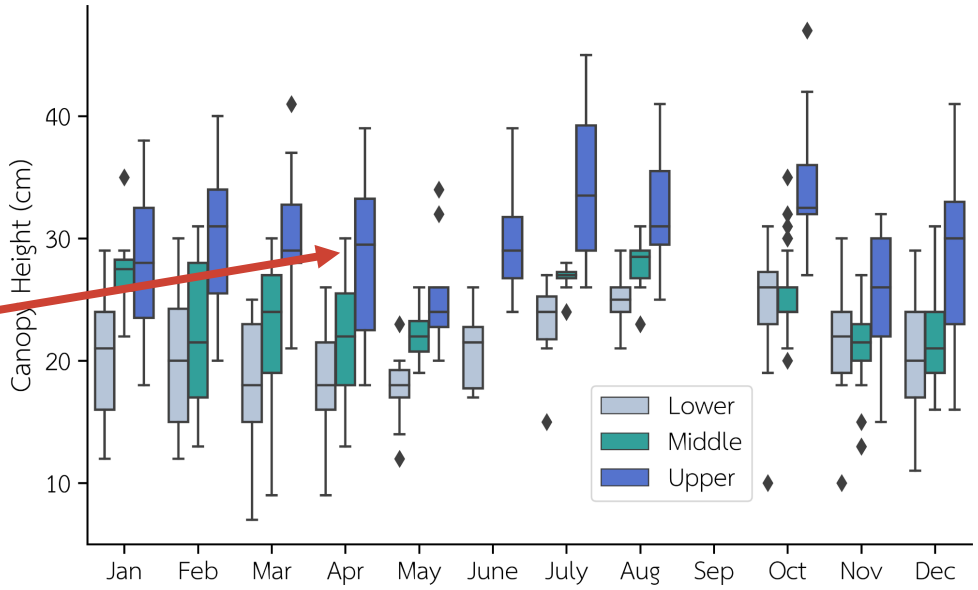
Results

Synthesis



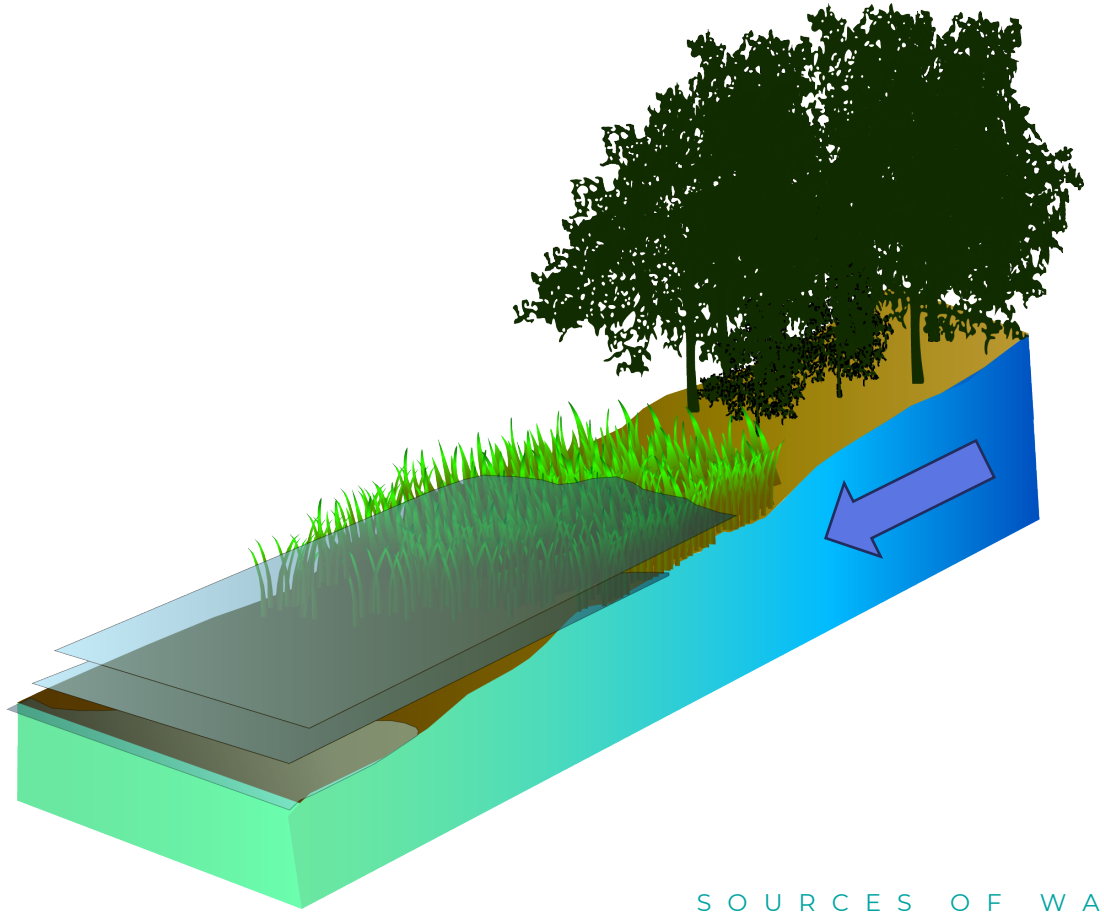




In an estuary lacking significant surface freshwater inputs, how do seasonal changes in shallow upland freshwater inputs impact salt marsh hydrology?

Wet Season

1.Hydrologic connection between upland & marsh



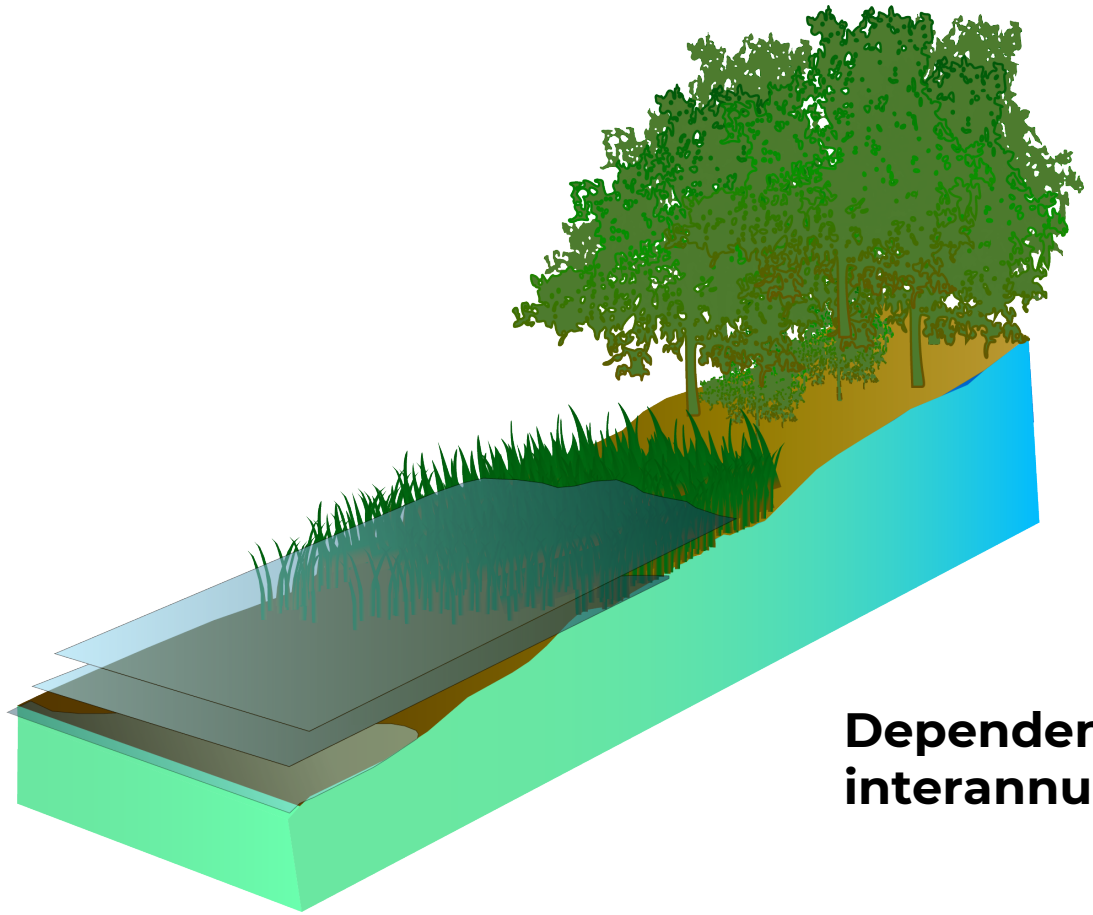
Summary

Wet Season

In an estuary lacking significant surface freshwater inputs, how do seasonal changes in shallow upland freshwater inputs impact salt marsh hydrology?

Dry Season

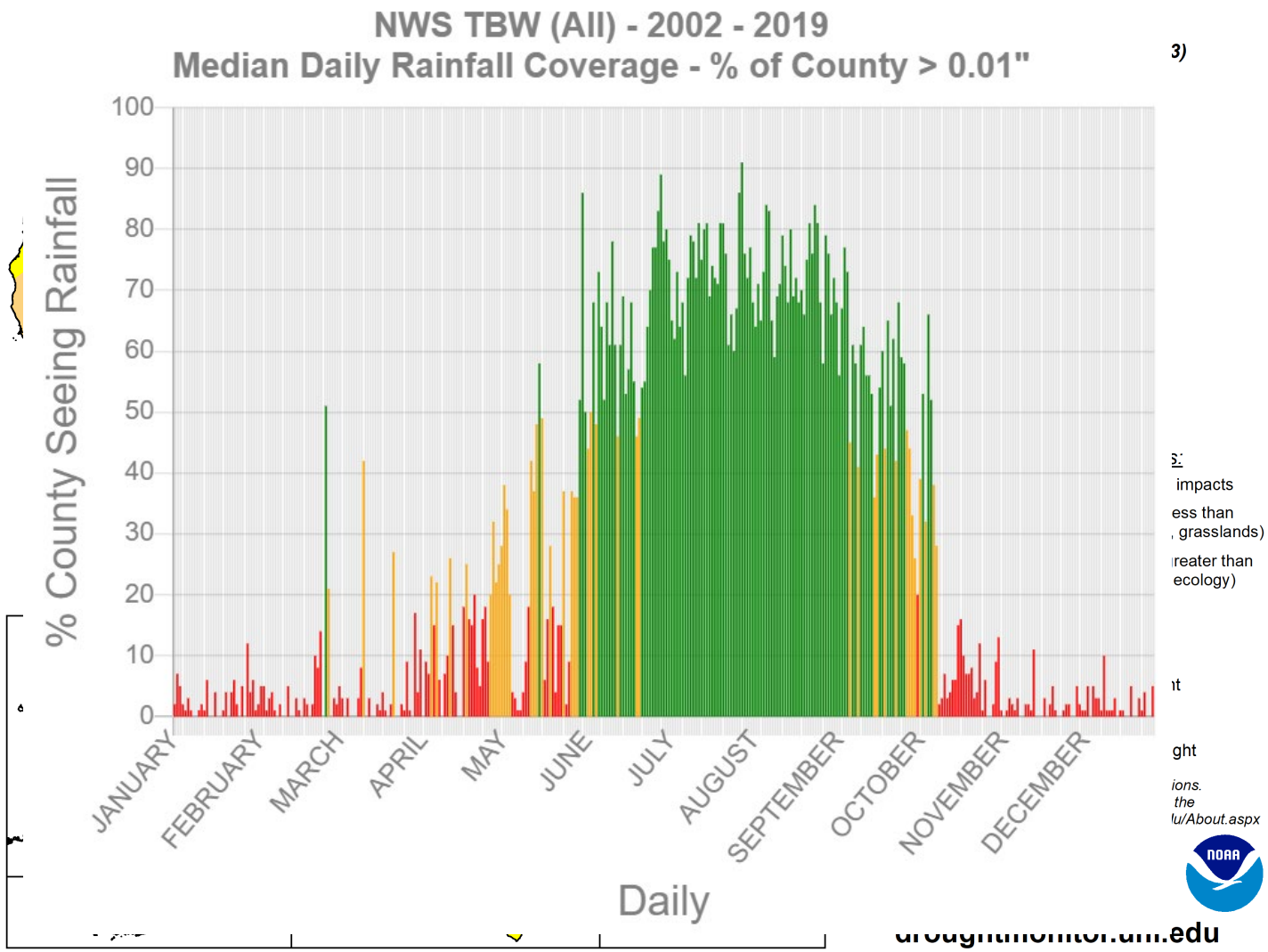
1.Hydrologically disconnected



Summary

Dry Season

Dependence on upland water storage, and interannual precipitation



Summary

Implications for Florida

Freshwater is an important driver of vegetation health and can mitigate salinity stress

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Thank you!!

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