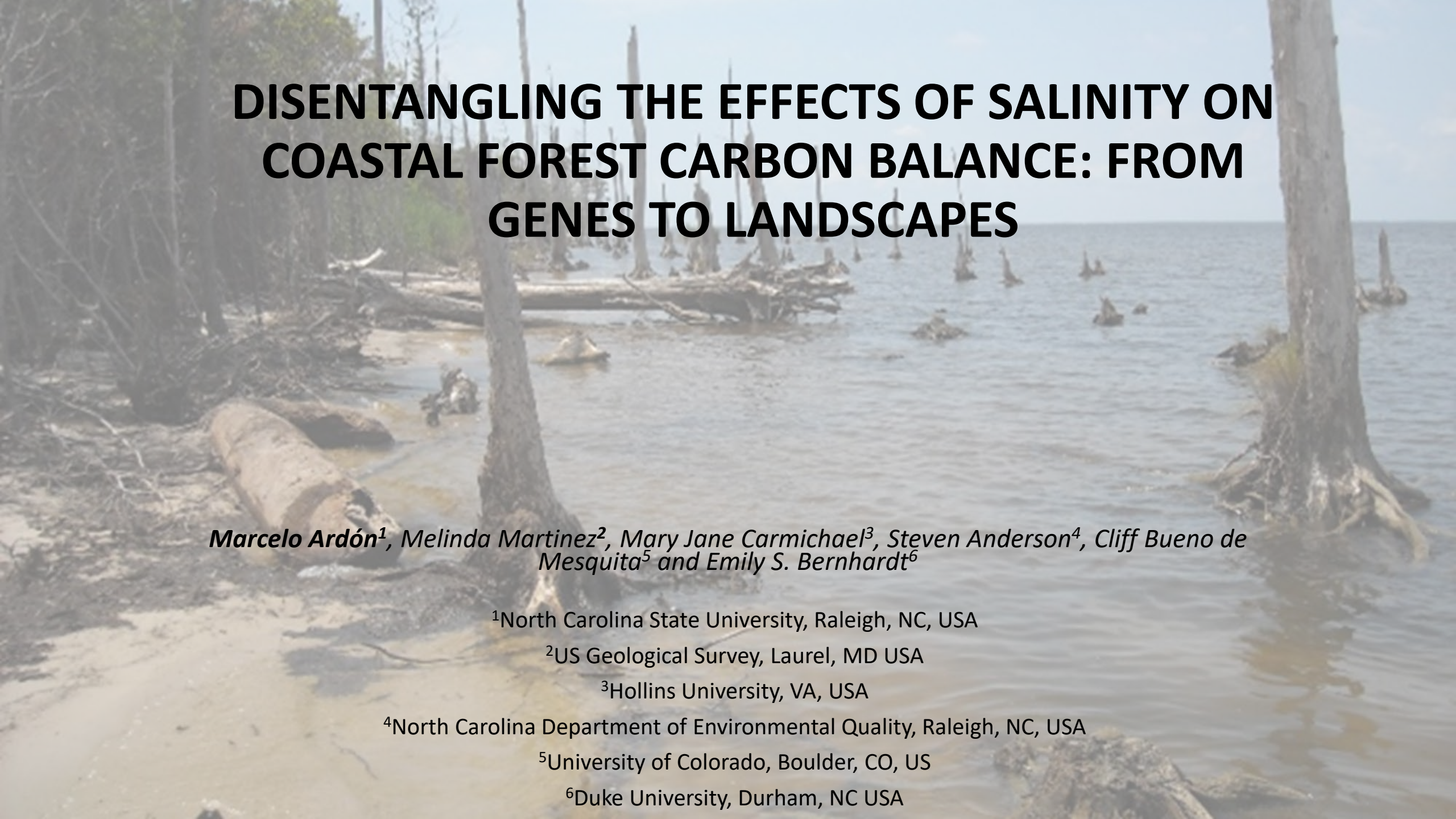

DISENTANGLING THE EFFECTS OF SALINITY ON COASTAL FOREST CARBON BALANCE: FROM GENES TO LANDSCAPES

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- •Thomas Booton (MS student)
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- •Mollie Gaines (Postdoc)

- Past lab members
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  - •Steve Anderson (MS student)
  - •Louise Armstrong (MSc)
  - •Gillian Gunderson (MSc)
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  - •Patrick Korn, MSc
- Collaborators
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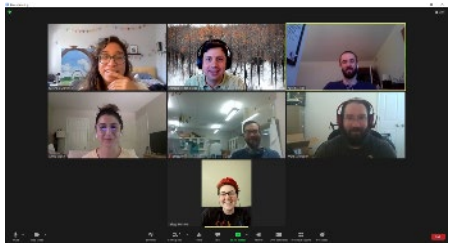
2007

2011

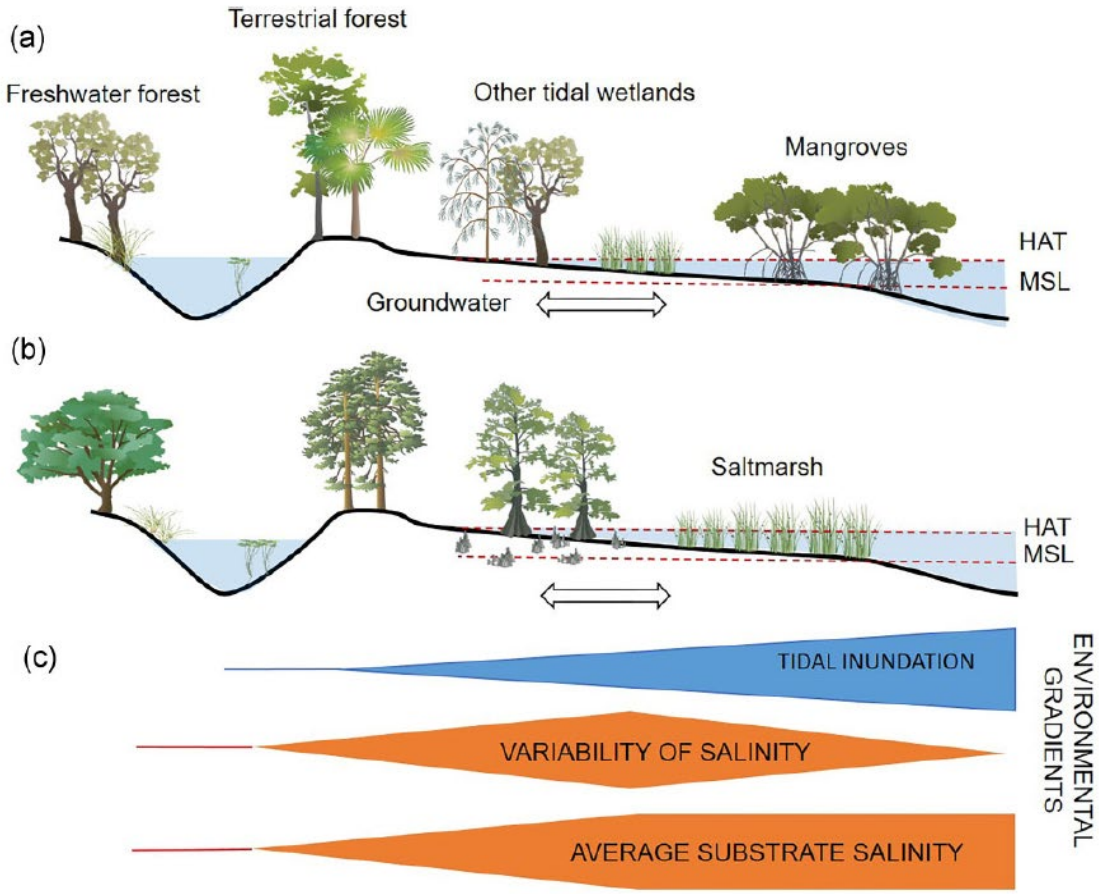
2016

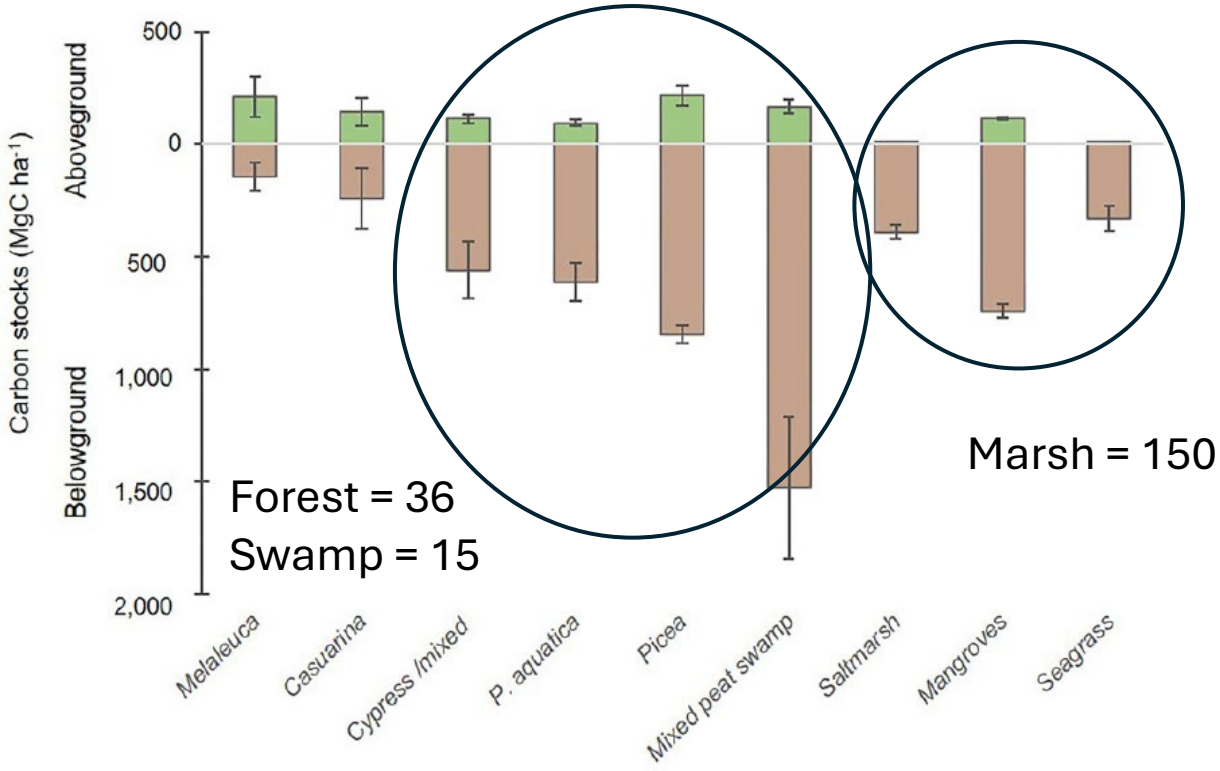


2021

2023

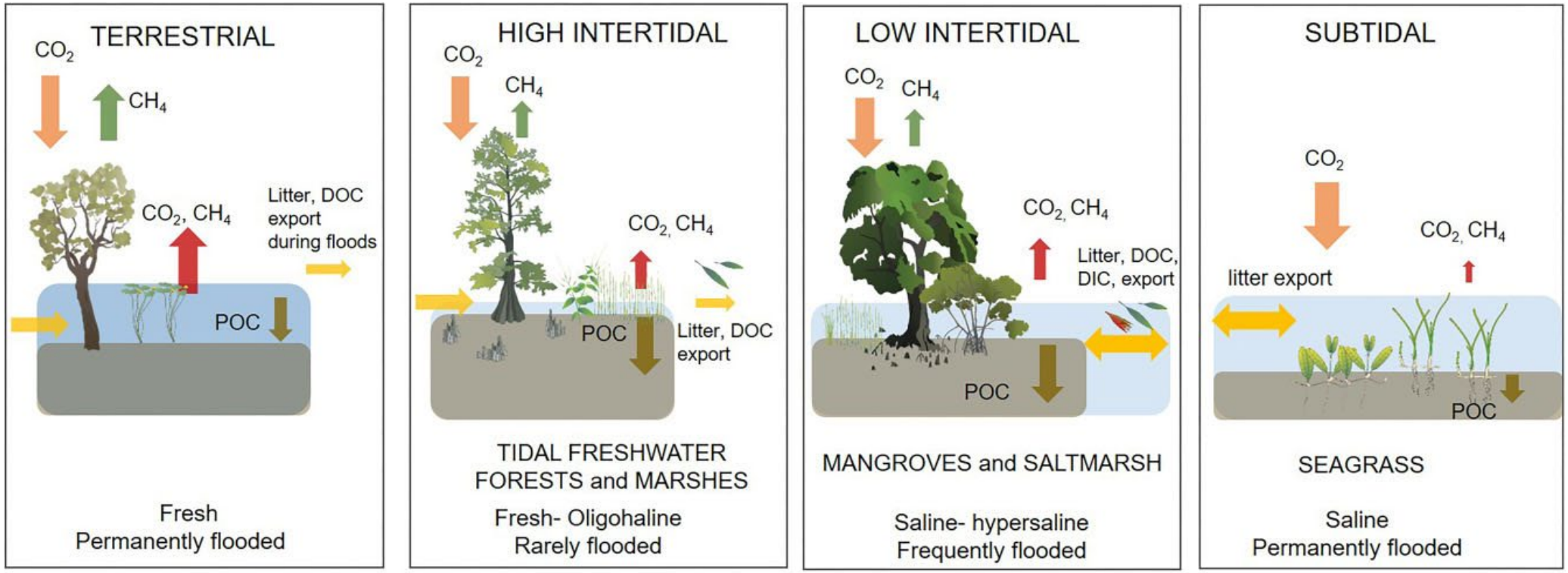
All tidal wetlands are blue carbon





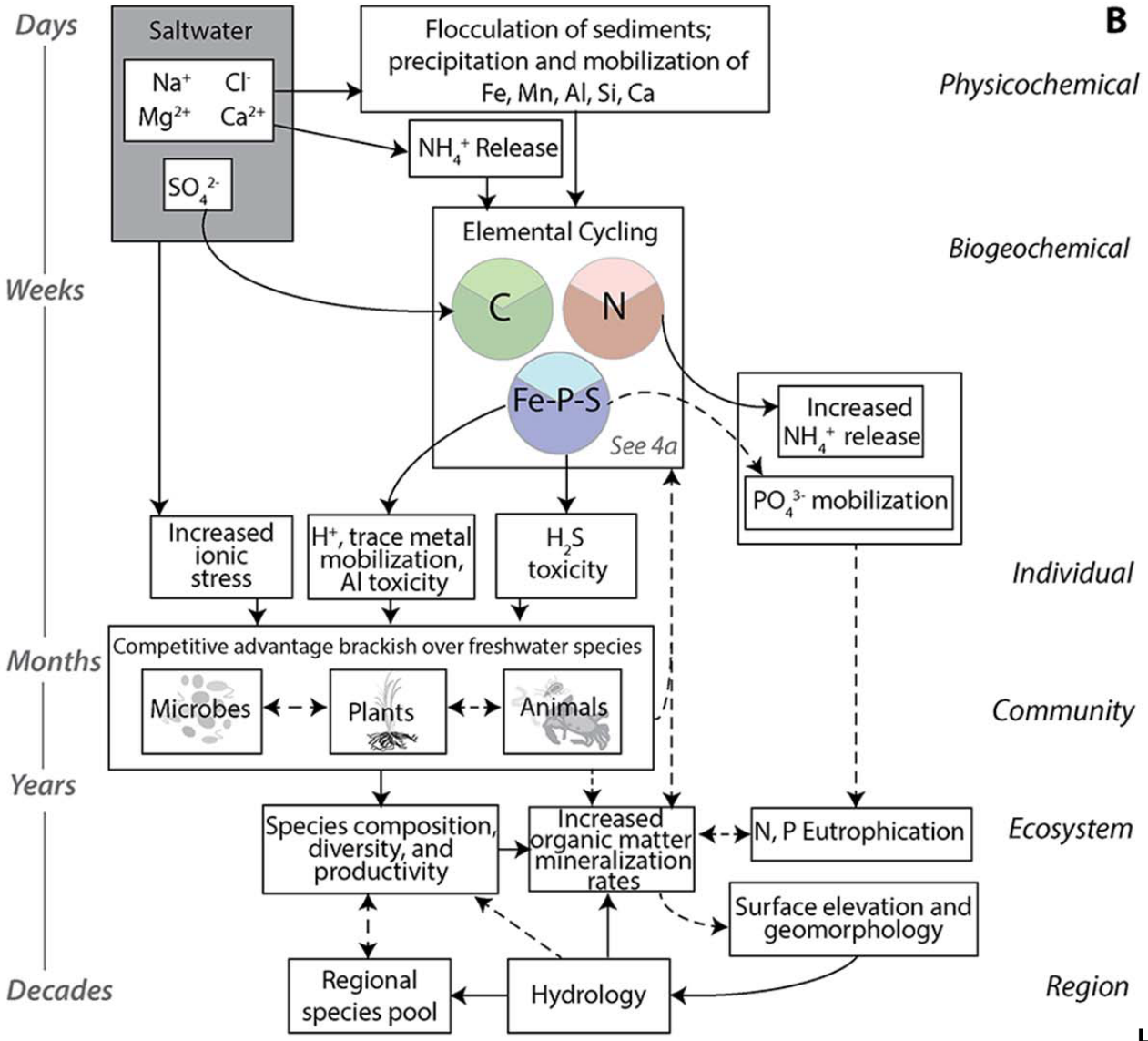
Adame et al. 2024

How do flooding and salinity affect the carbon balance of coastal forested wetlands?



Adame et al. 2024

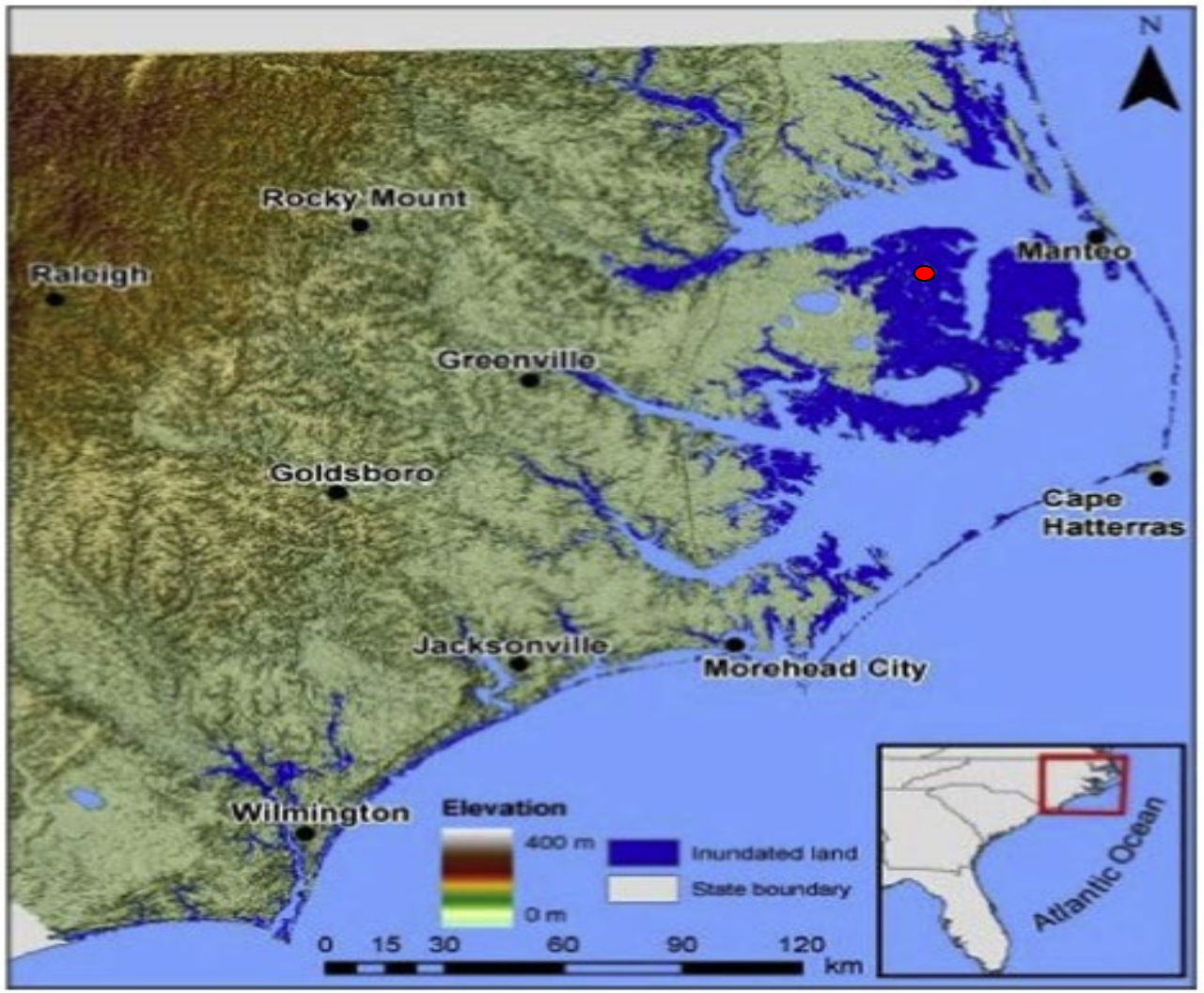
Effects of salinity vary across time and space



Herbert et al. 2015 *Ecosphere*

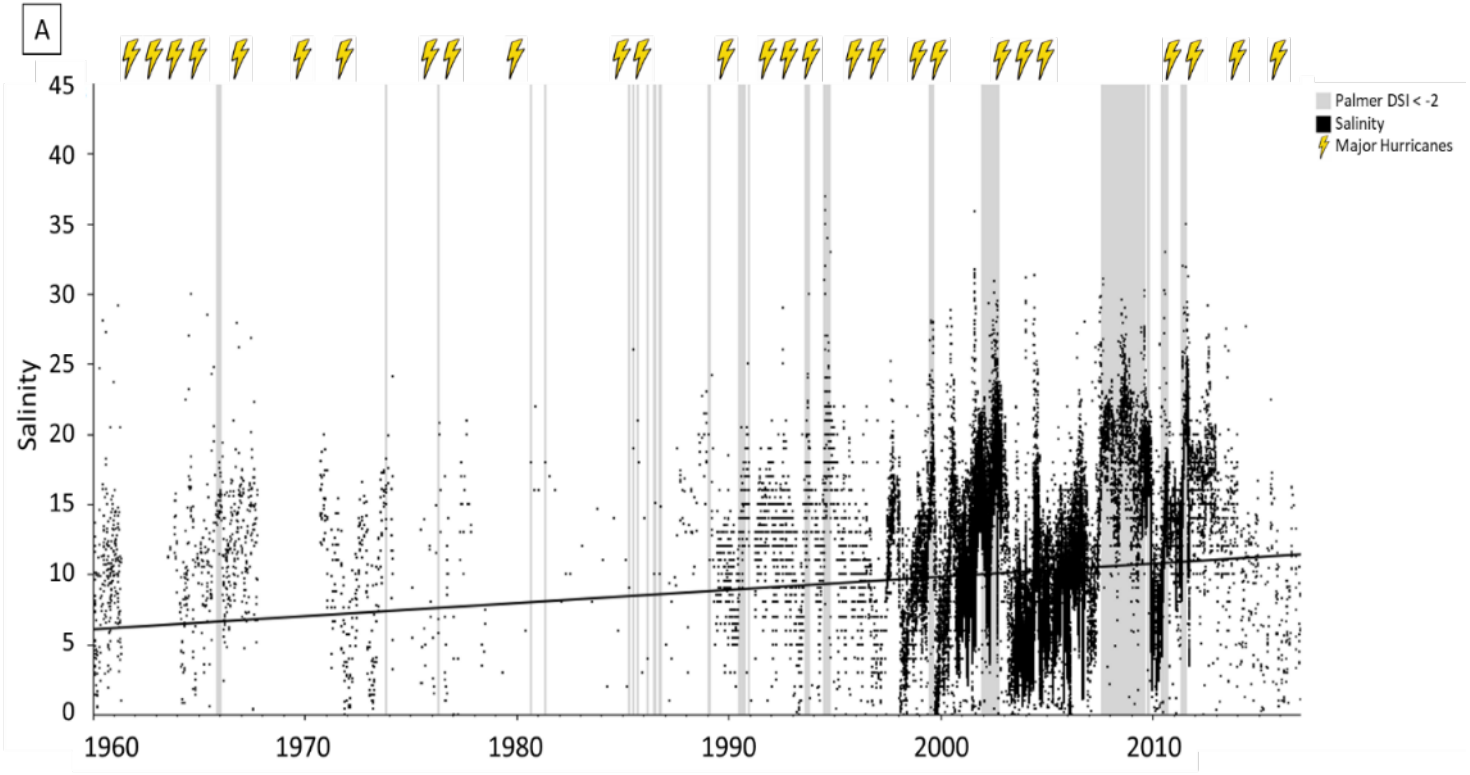
Sea Level Rise

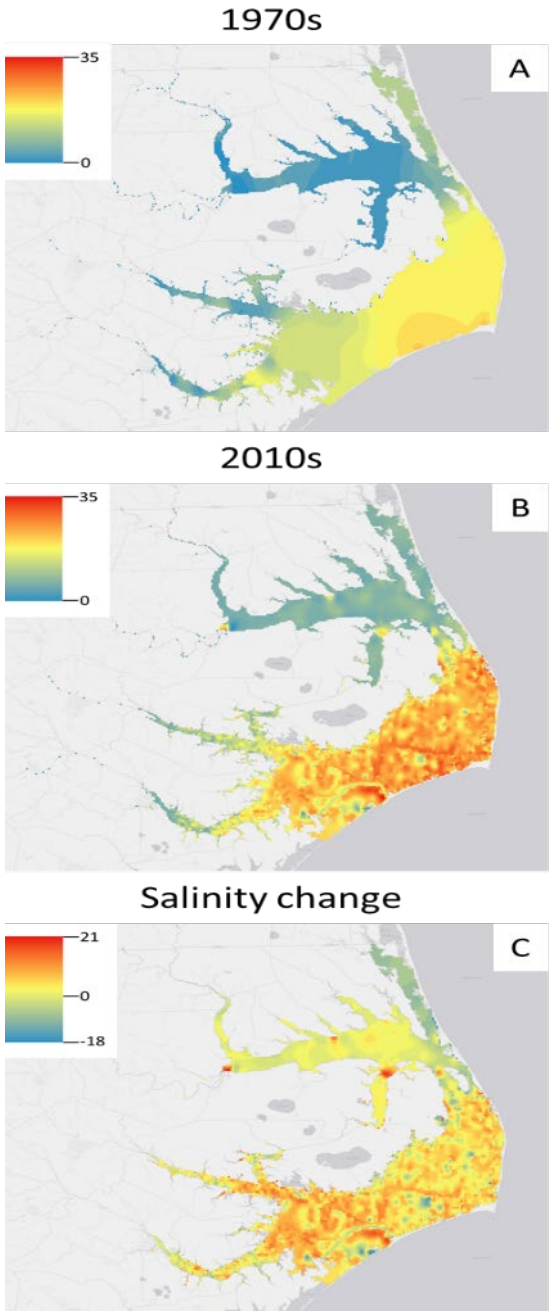
Projections:
5900 km^2 are vulnerable
to SLR of 1.1 m by 2100



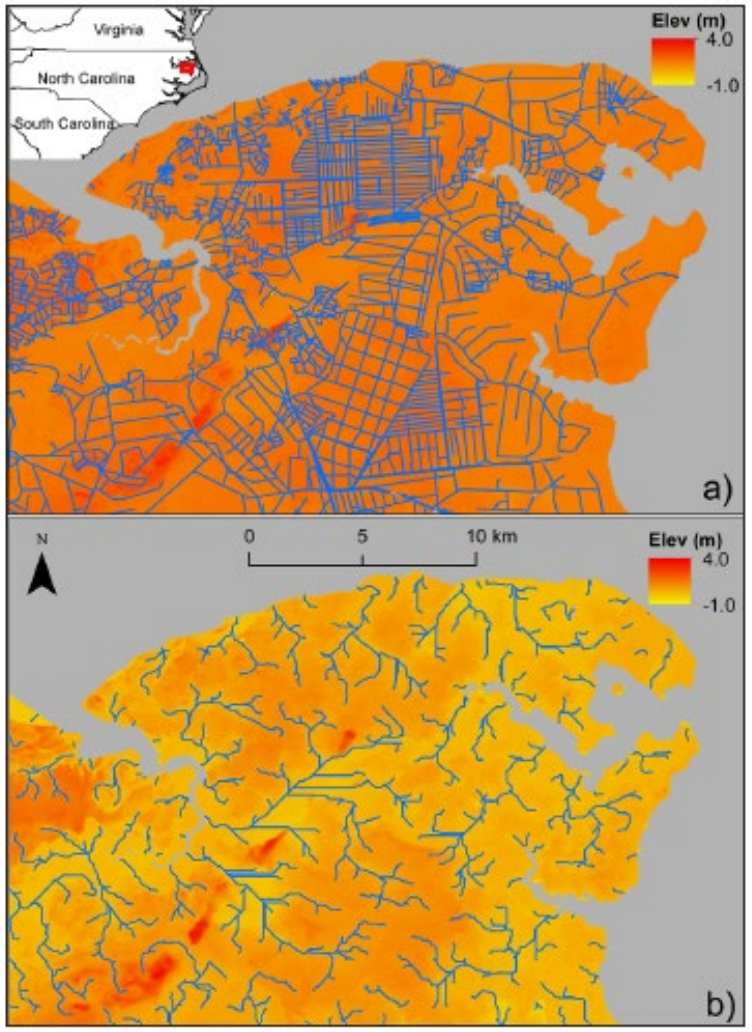
Poulter et al. 2009

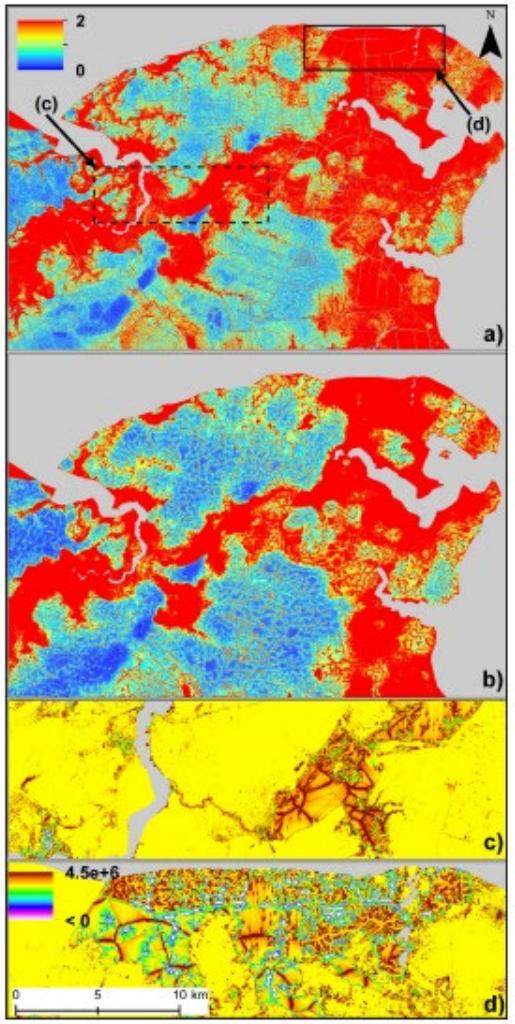
Salinity in the sounds has been increasing





Ditches increase vulnerability to saltwater intrusion

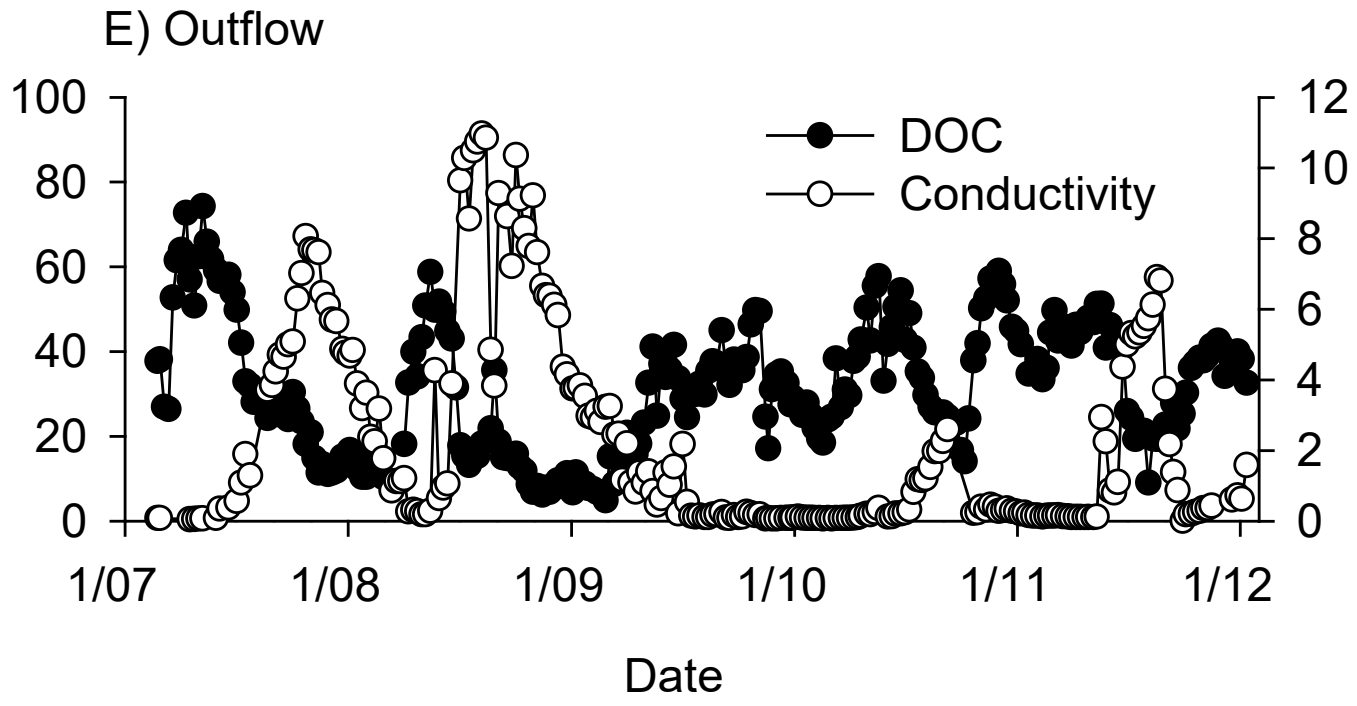


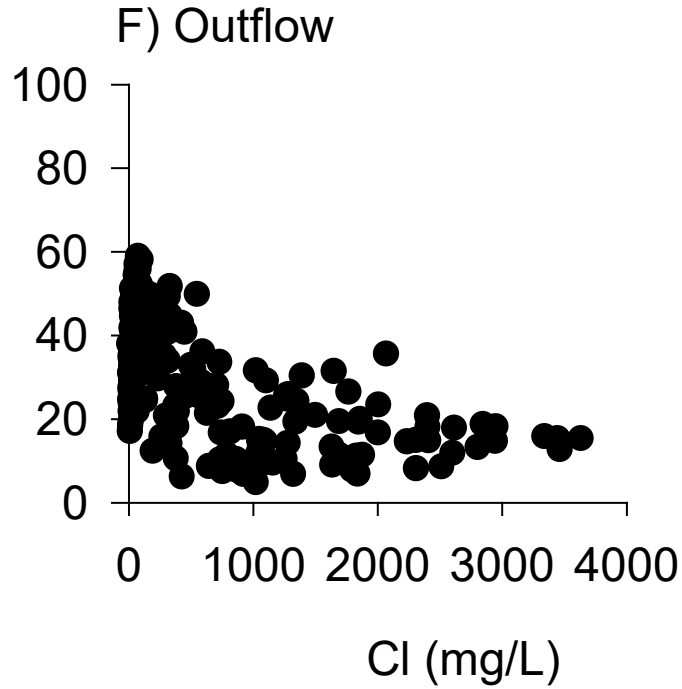


Bhattachan et al. 2018. *Elementa*

Ghost forests

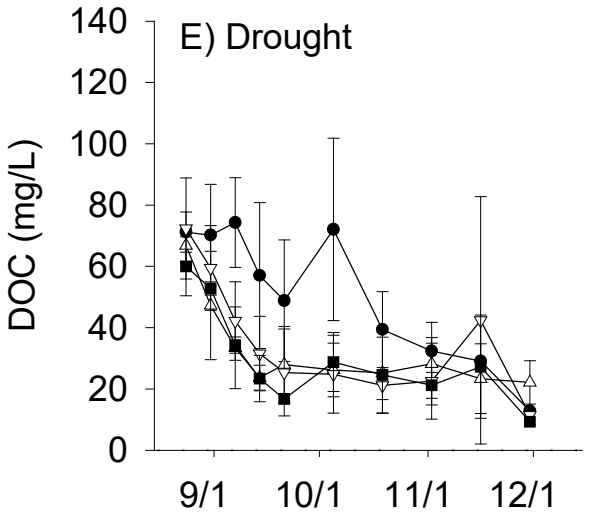
Salinity and drought reduce DOC by 50%

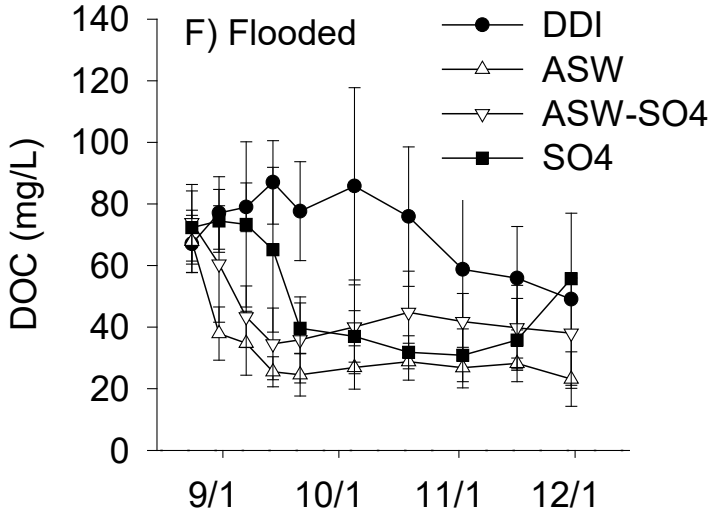


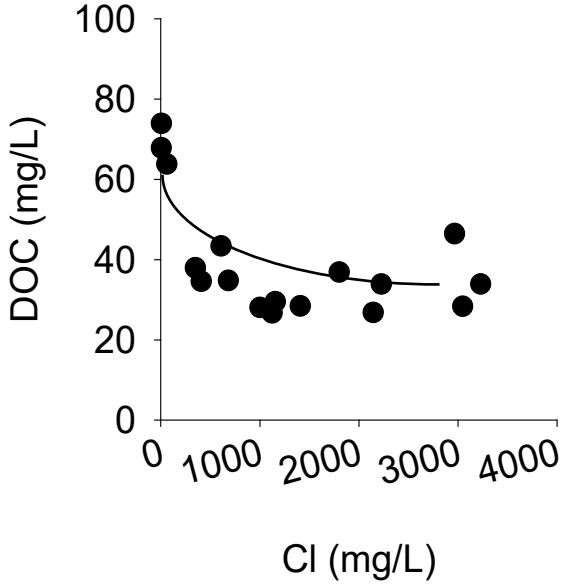


Ardón et al. 2016 *Biogeochemistry*

- Drought 20% decline
- Saltwater 29% decline
- Drought + saltwater 49%

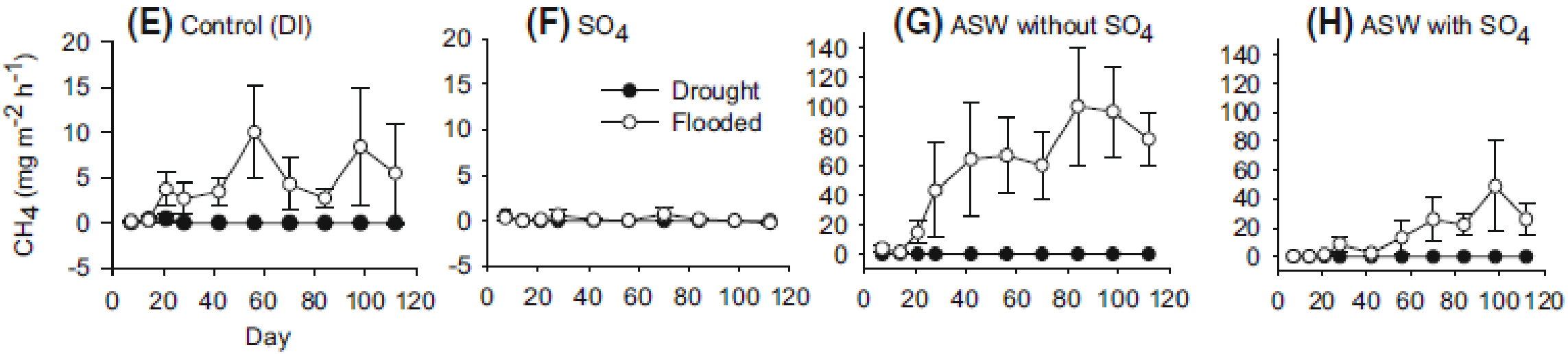






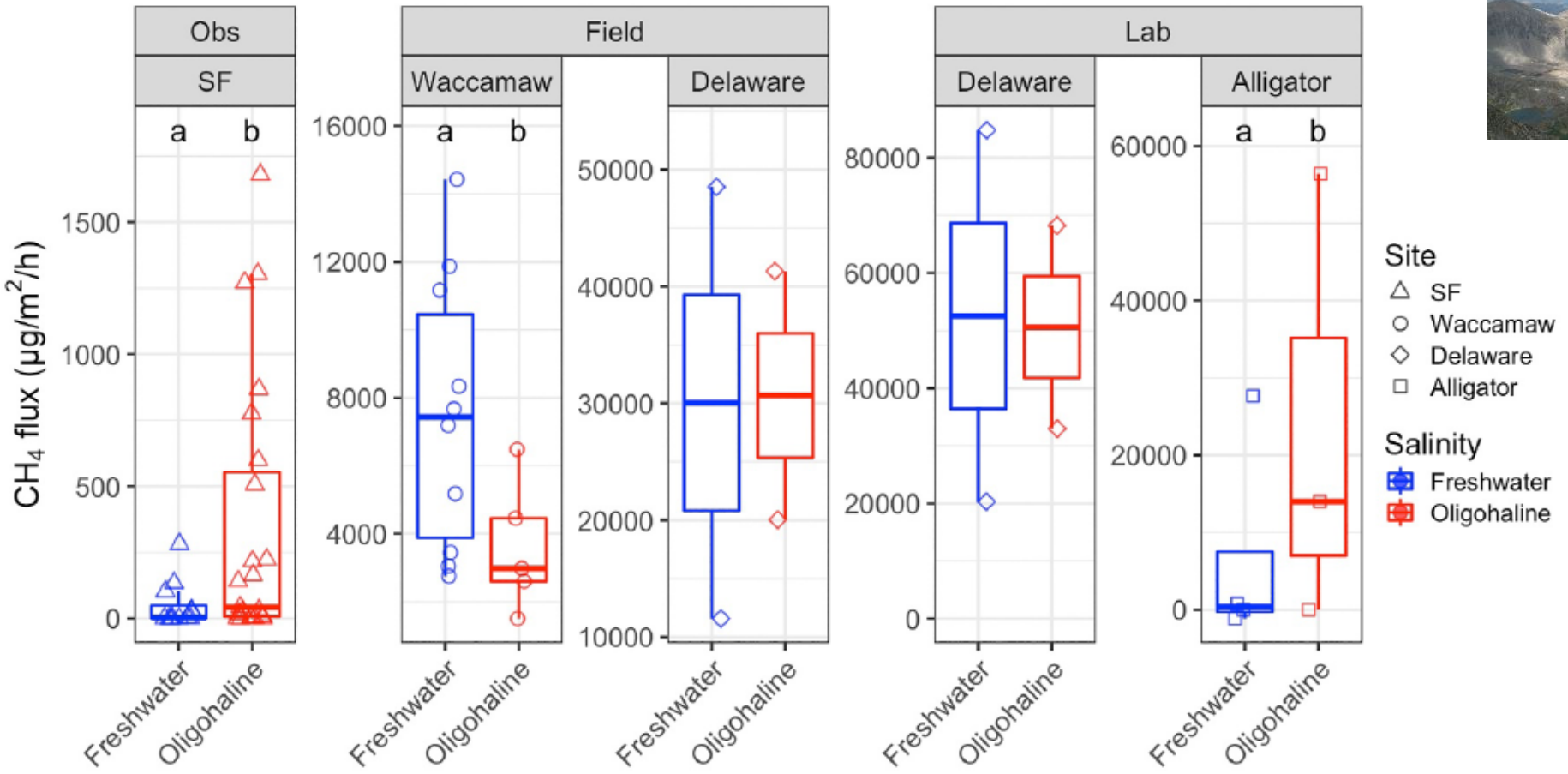
Ardón et al. 2016 *Biogeochemistry*

Salinity increased methane by 300%



Ardón et al. 2018. *Biogeochemistry*

Methane can increase with increasing salinity

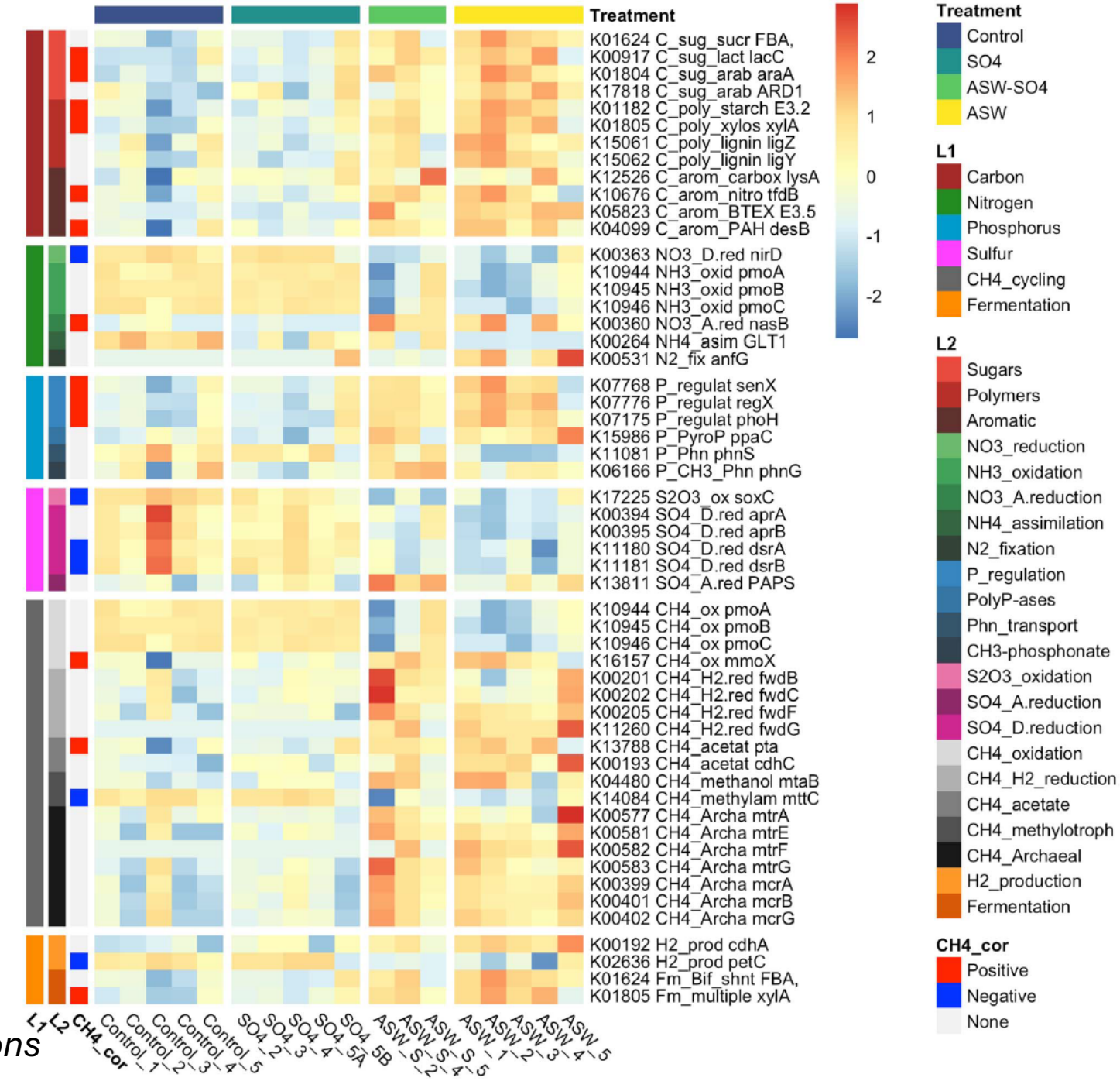


Bueno de Mesquita et al. 2024 *JGR-Biogeosciences*

Microbial communities get less diverse with salinity

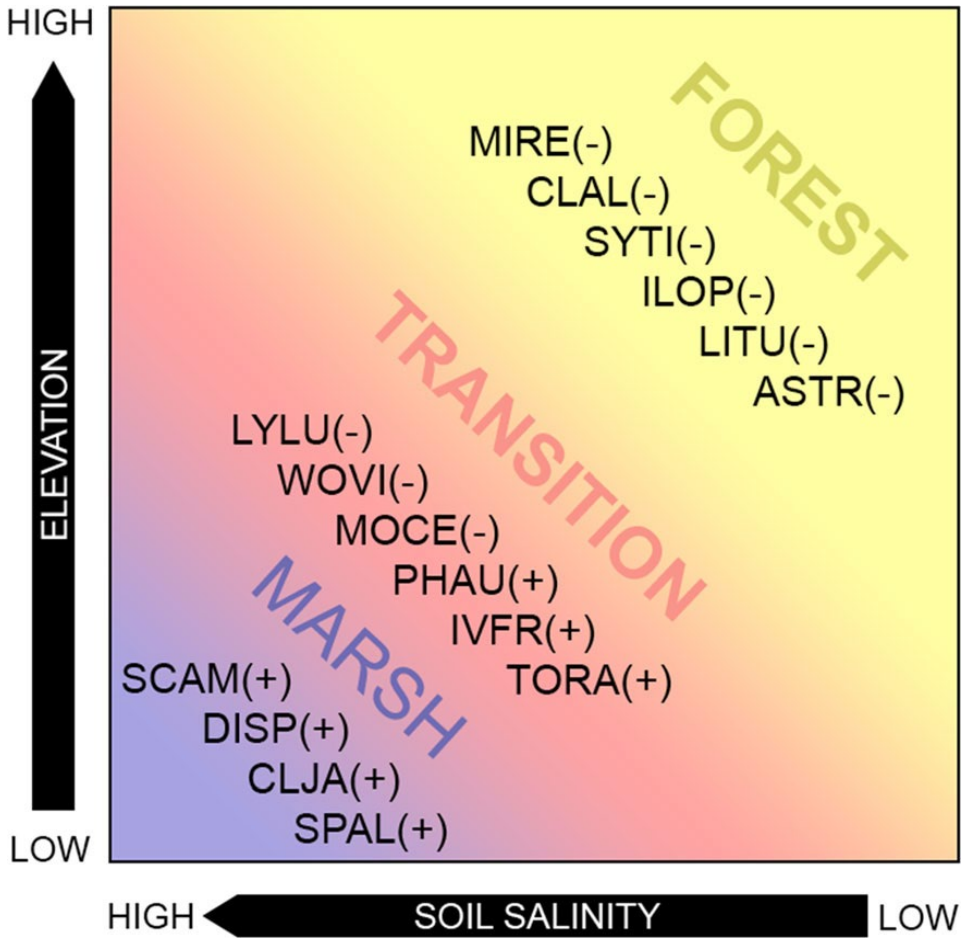
Bueno de Mesquita et al. 2024 *JGR Biogeosciences*

- 19 genes relative abundance were correlated with CH_4 fluxes
- Ions and not sulfate altered microbial communities



Bueno de Mesquita et al. 2024 *ISME Communications*

Vegetation changes along salinity gradients



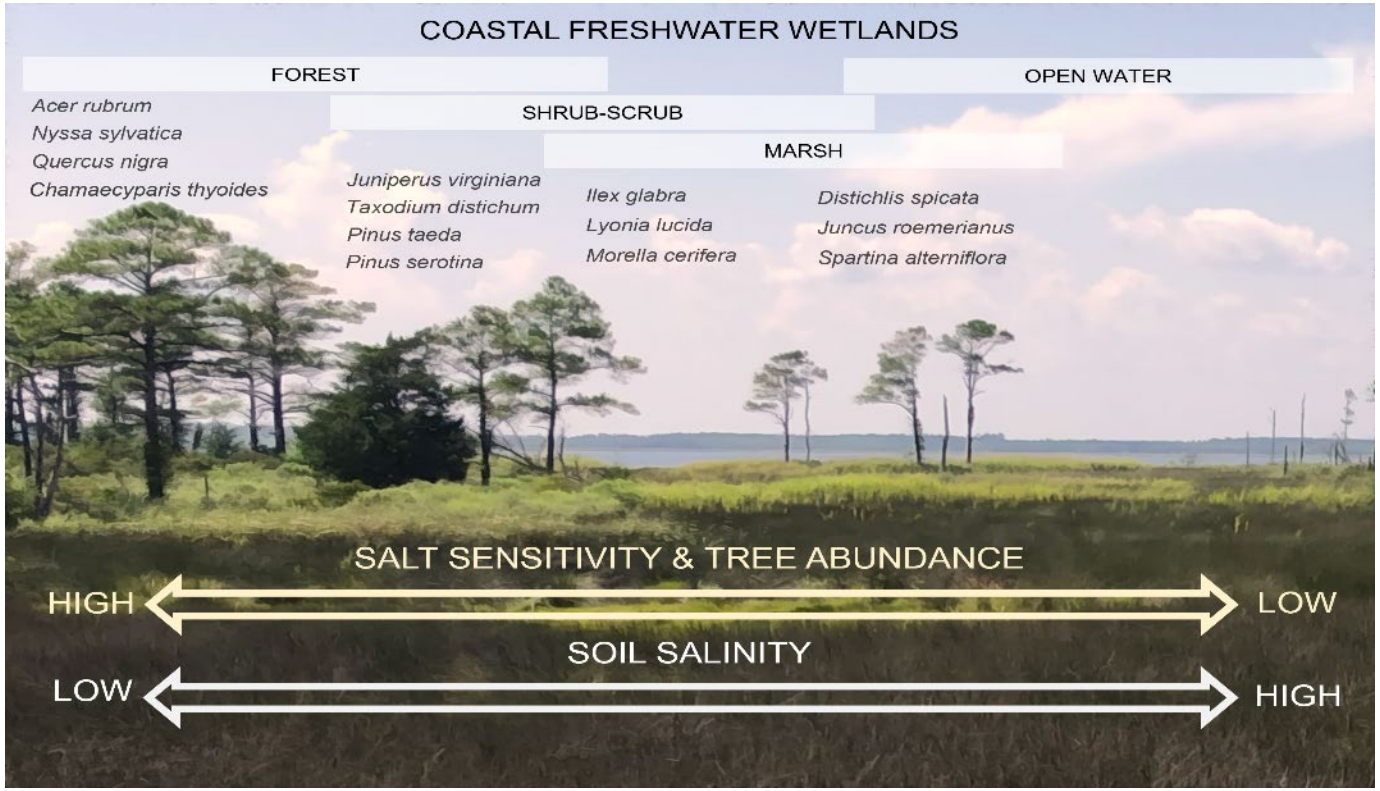
Partridgeberry

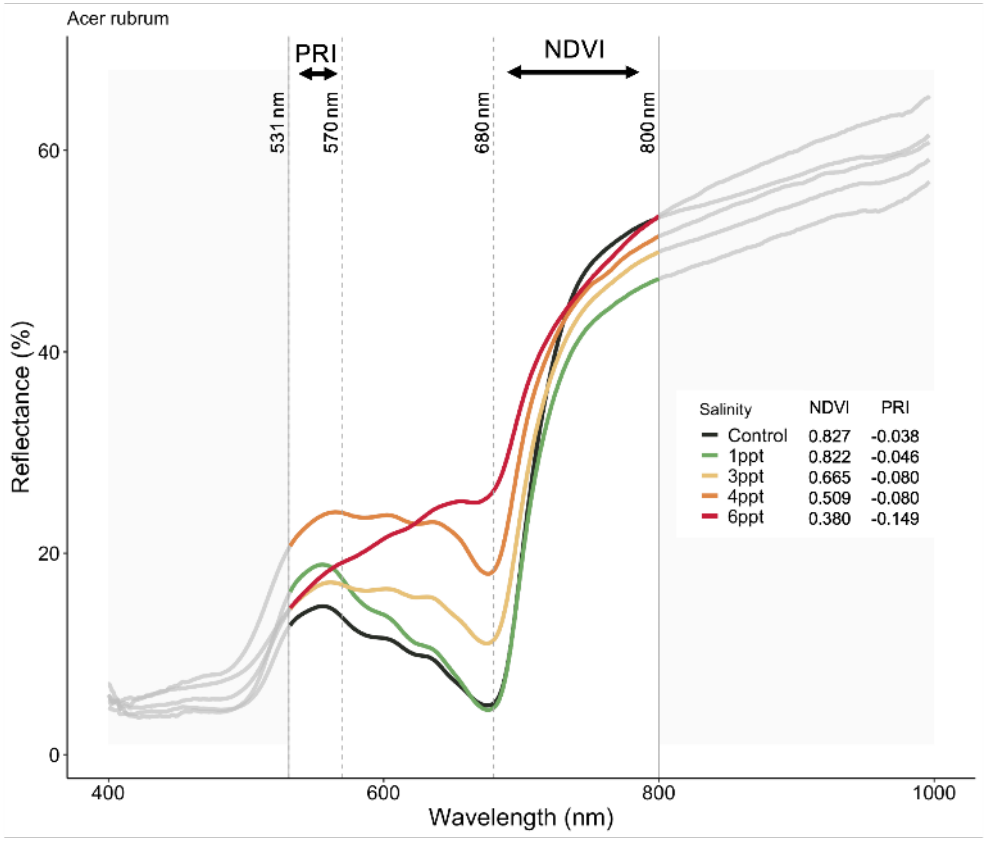
Southern wax myrtle

Sporobolus alterniflorus

Anderson et al. 2021 *Plant Ecology*

Leaves turn less green when experiencing salinity

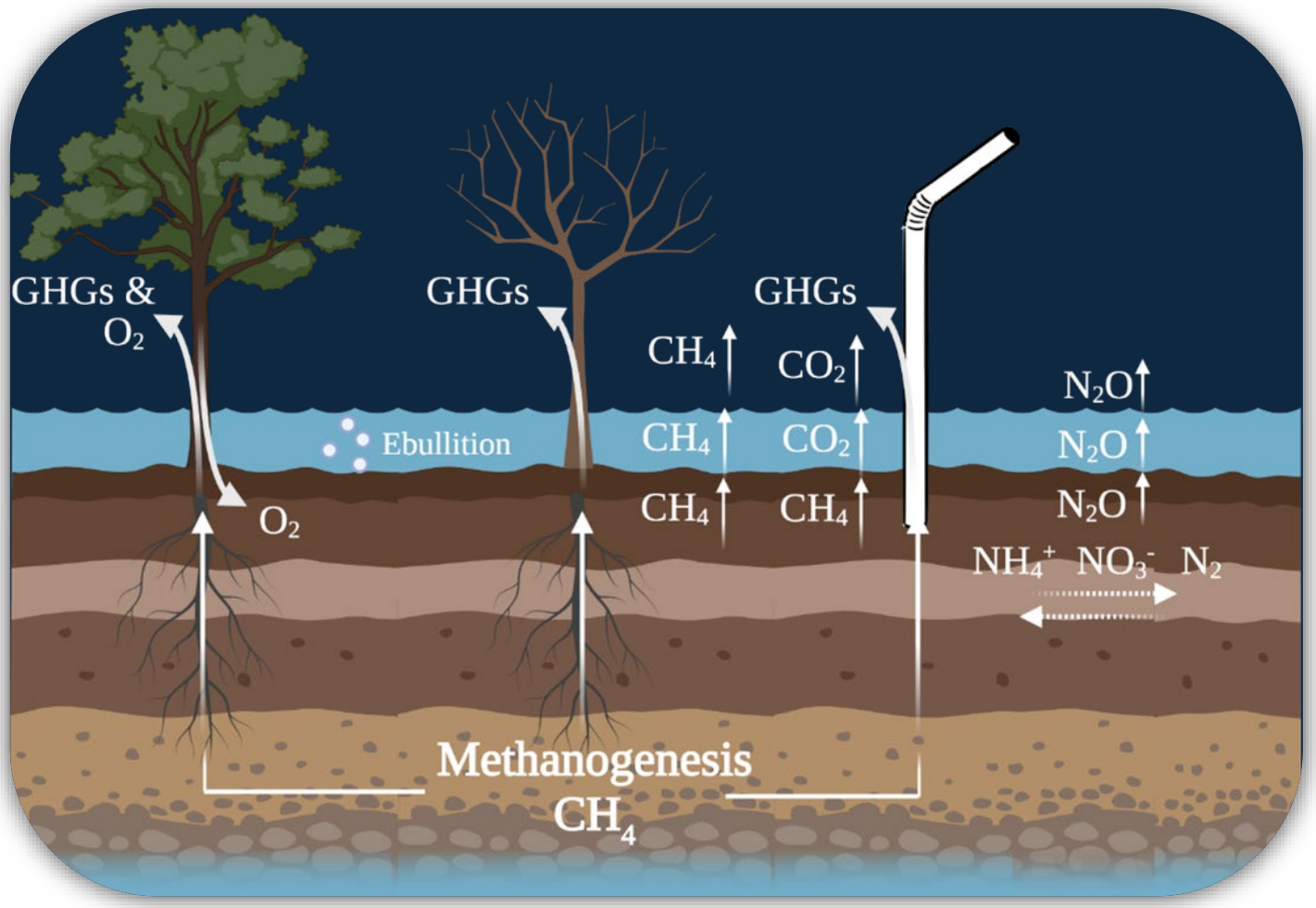




Anderson et al. 2024 *Forests*

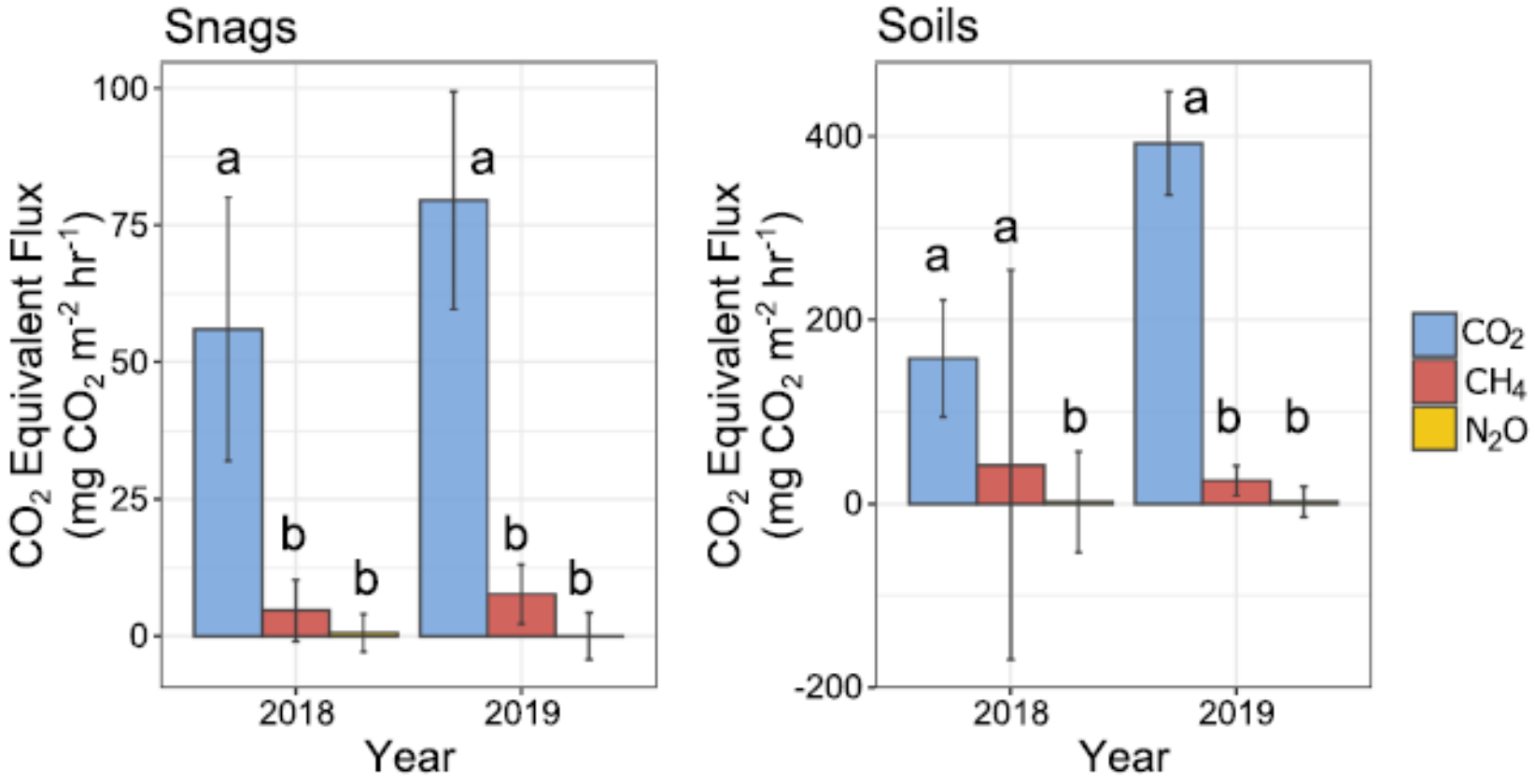
“*A tree is a passage between earth and sky*” R. Powers

Melinda Martinez



Art by M. Martinez

Trees emit 25% of soil emissions



Martinez and Ardon 2021. *Biogeochemistry*

CH_4 is oxidized as it moves through snags

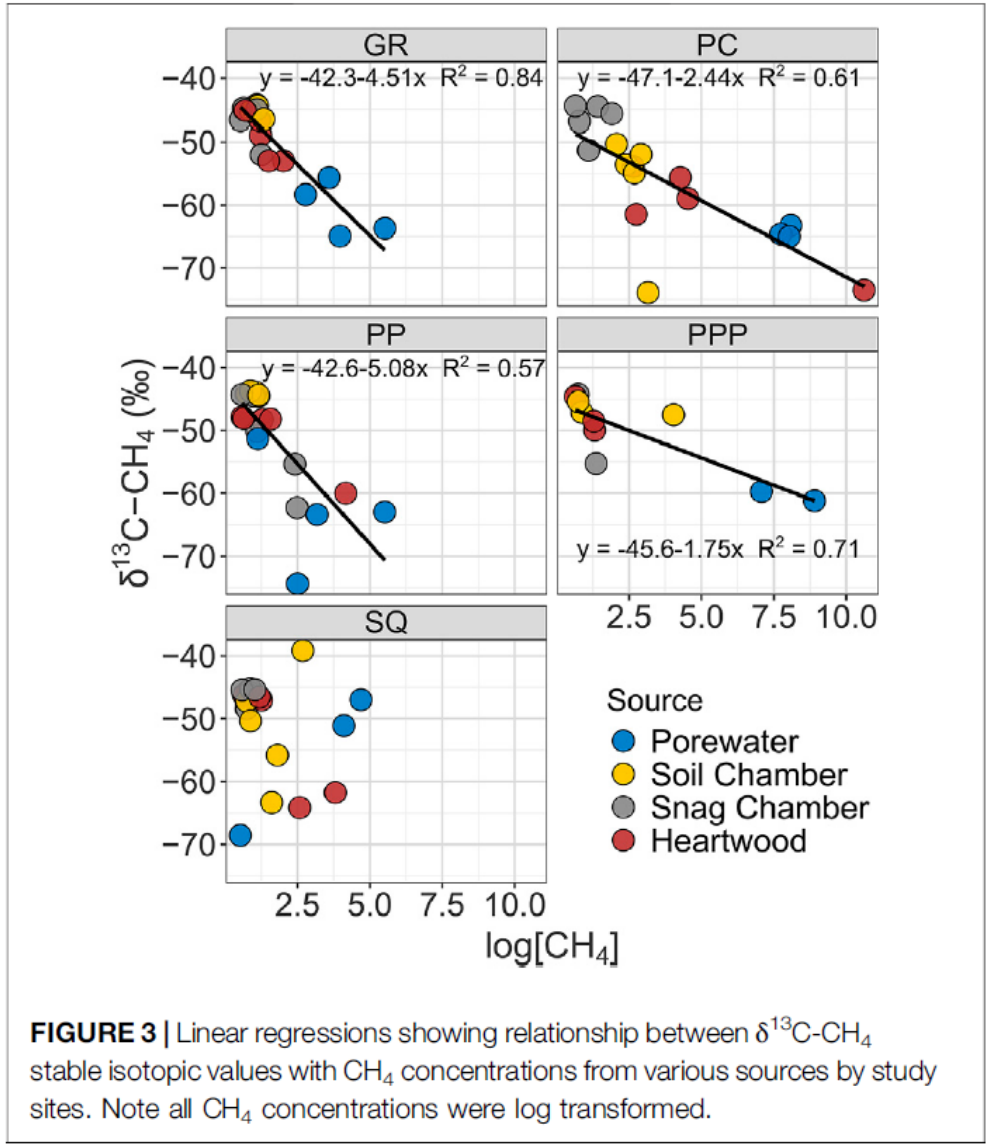


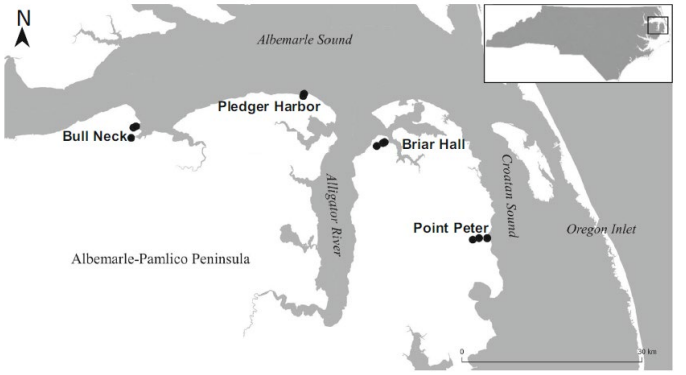
FIGURE 3 | Linear regressions showing relationship between δ^{13}C-CH_4 stable isotopic values with CH_4 concentrations from various sources by study sites. Note all CH_4 concentrations were log transformed.

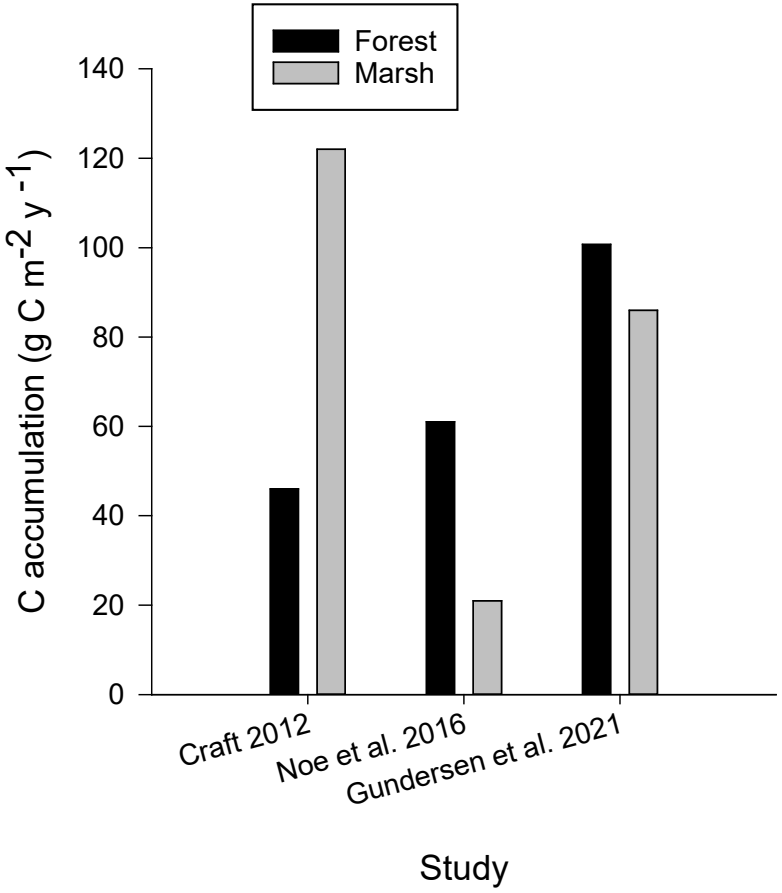
Martinez et al. 2022. *Frontiers in Environmental Science*

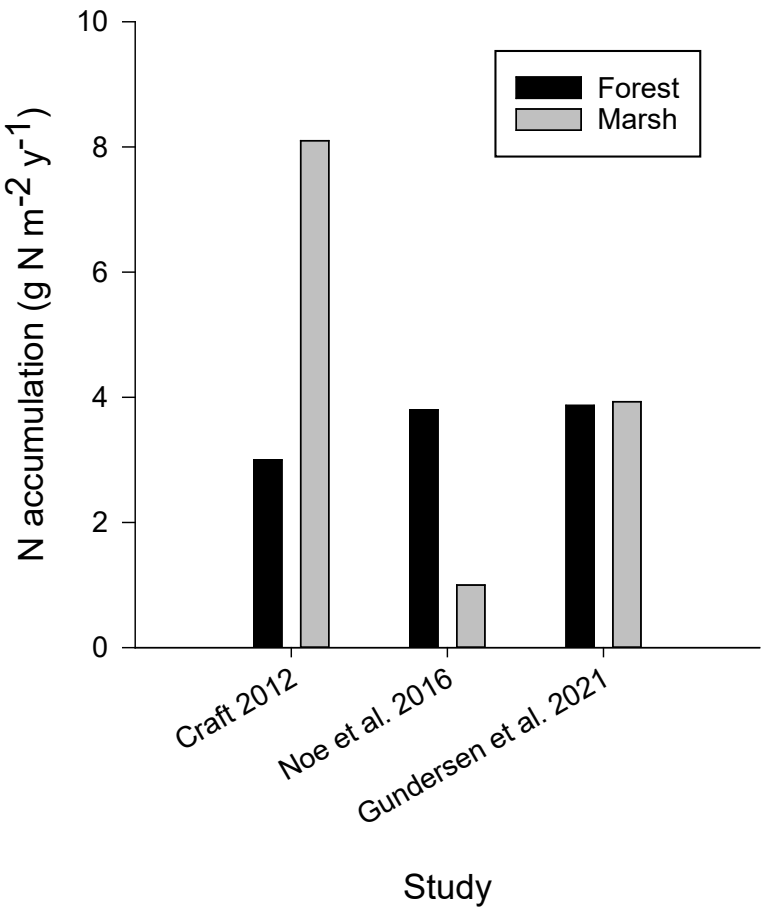
Microbial communities in snags were mostly methanotrophs

Carmichael et al. 2024 *Current Microbiology*

Who accumulates more C and N?



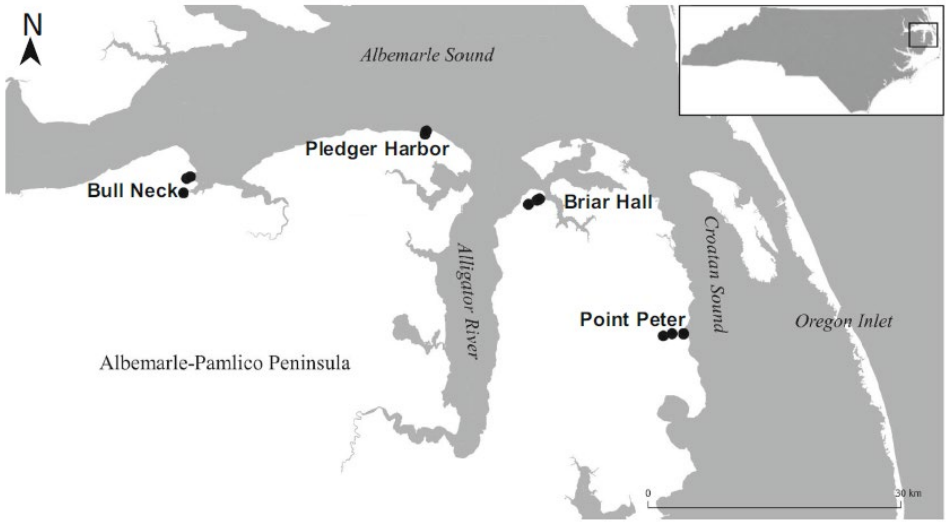




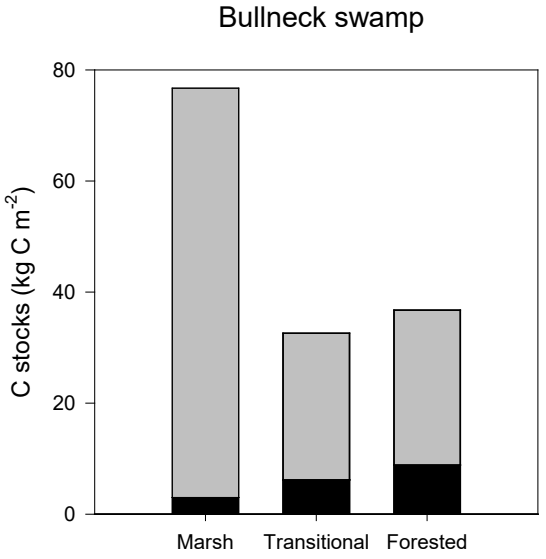
Gillian Gundersen

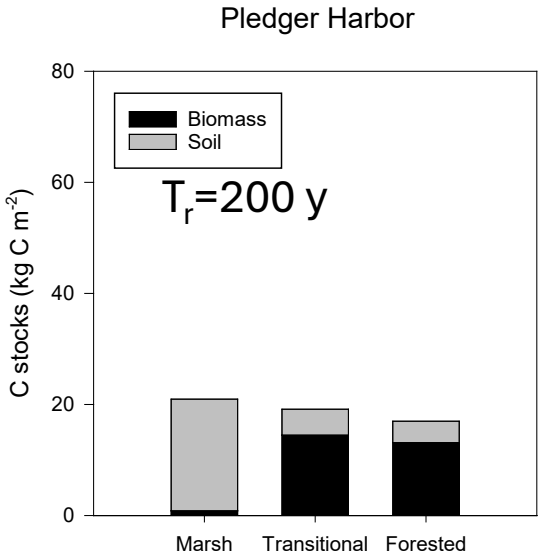
Gundersen et al. 2021. *Estuaries and Coasts*

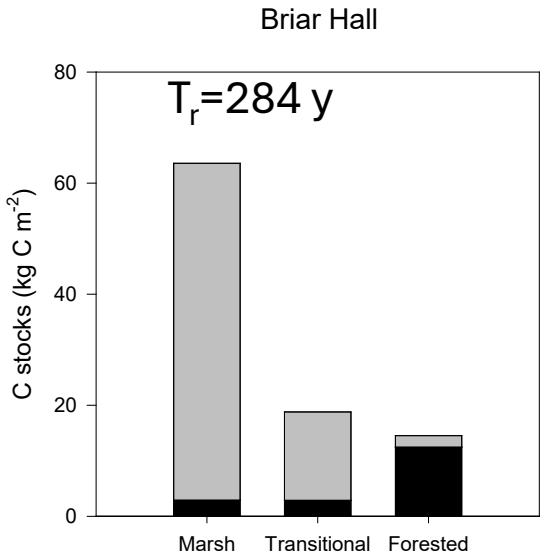
If these forests are lost, it would take 200-600 years to replace that C

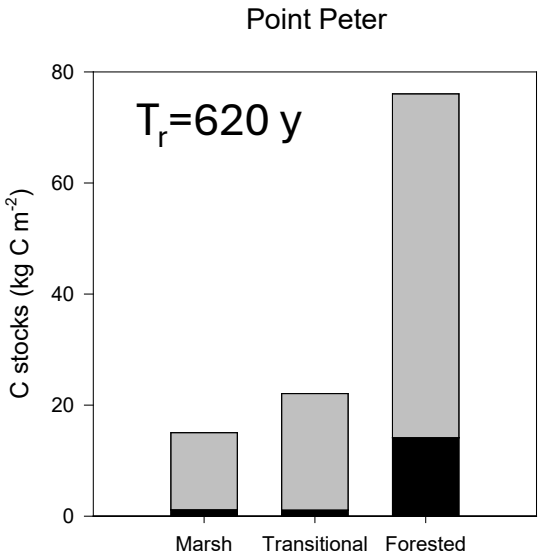


- Gundersen et al. 2021 and Smart et al. 2020
- C stocks of marshes vs forests

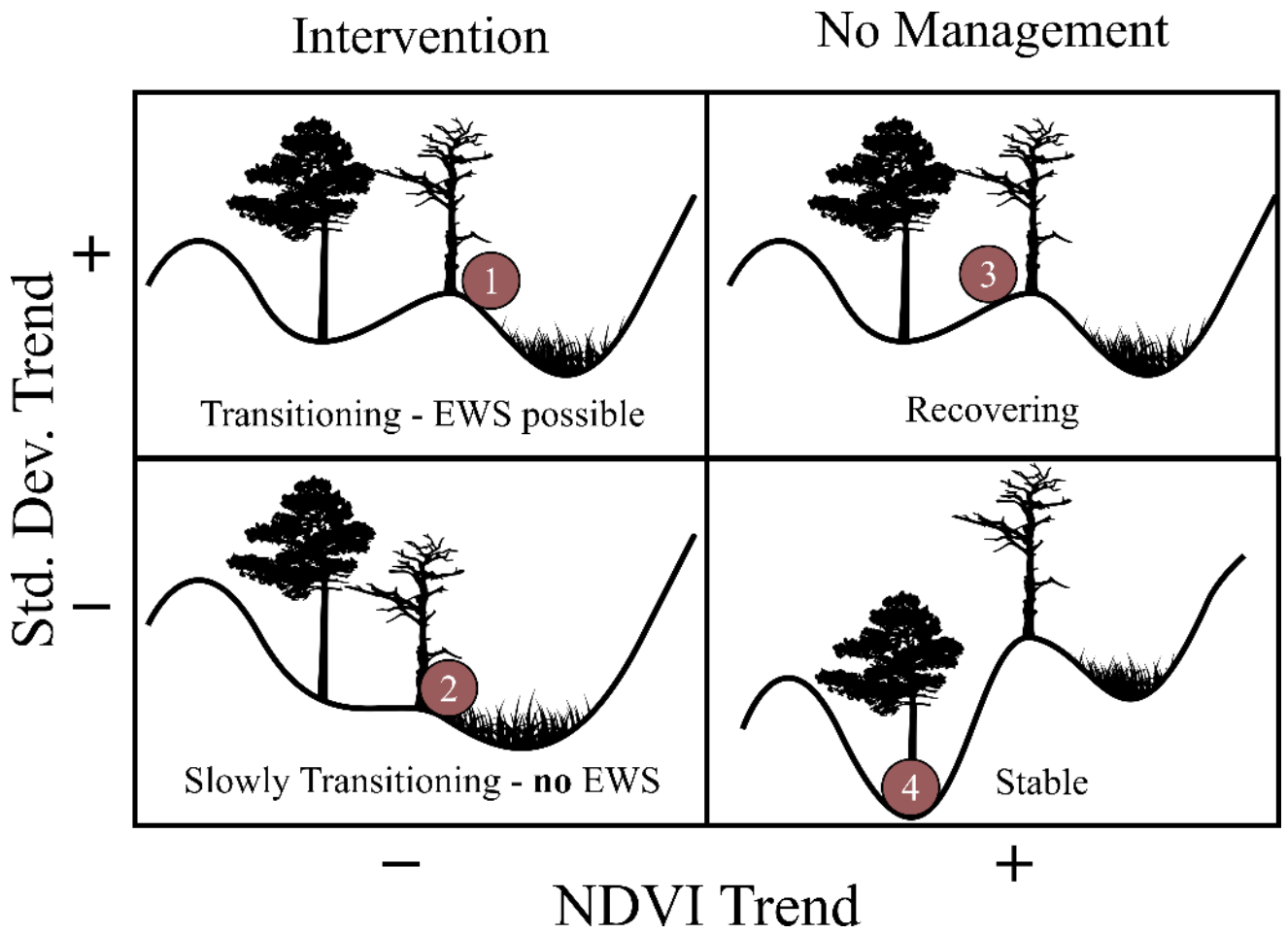






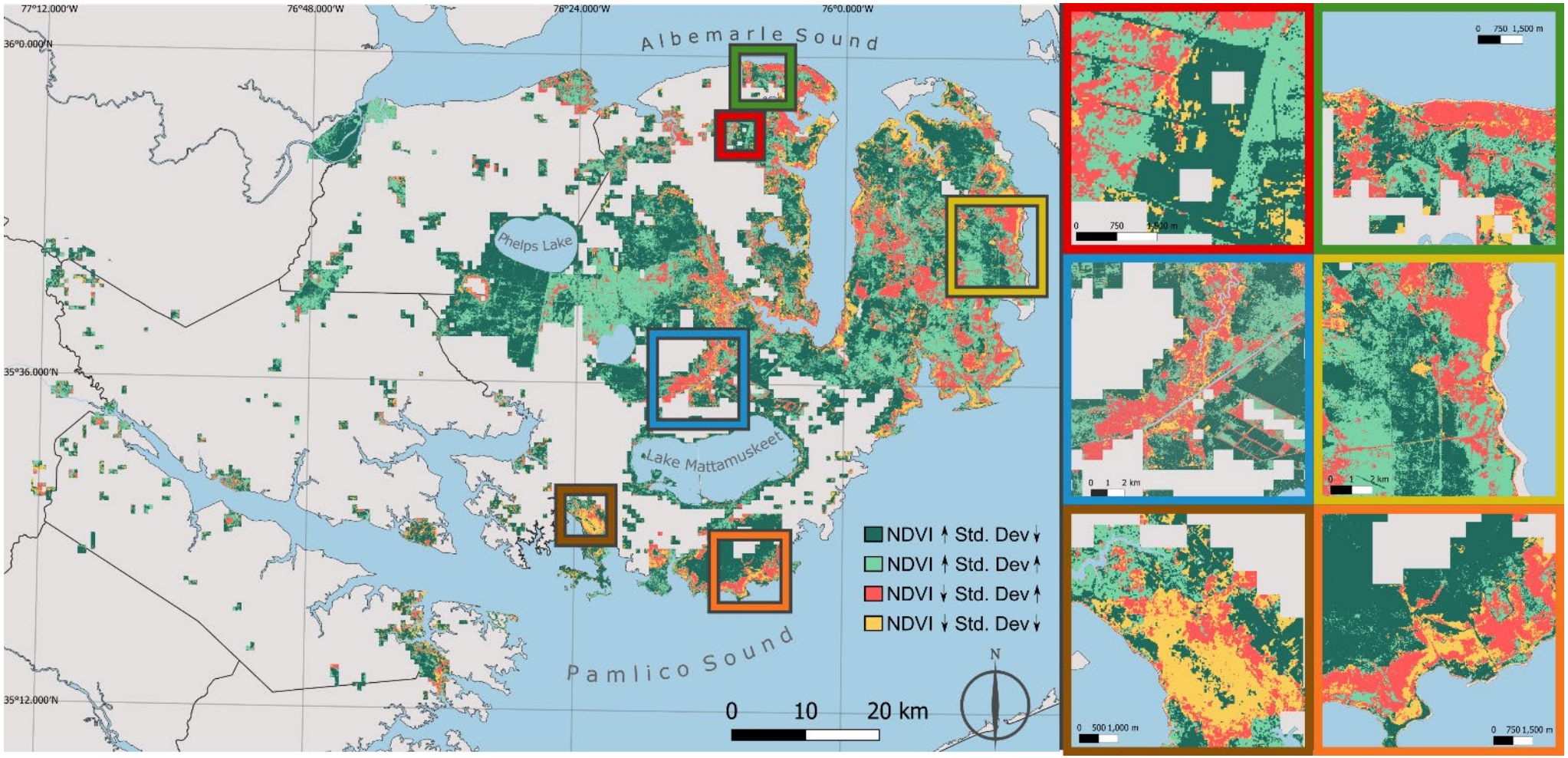


Using the trajectory of change to identify windows of opportunity for management



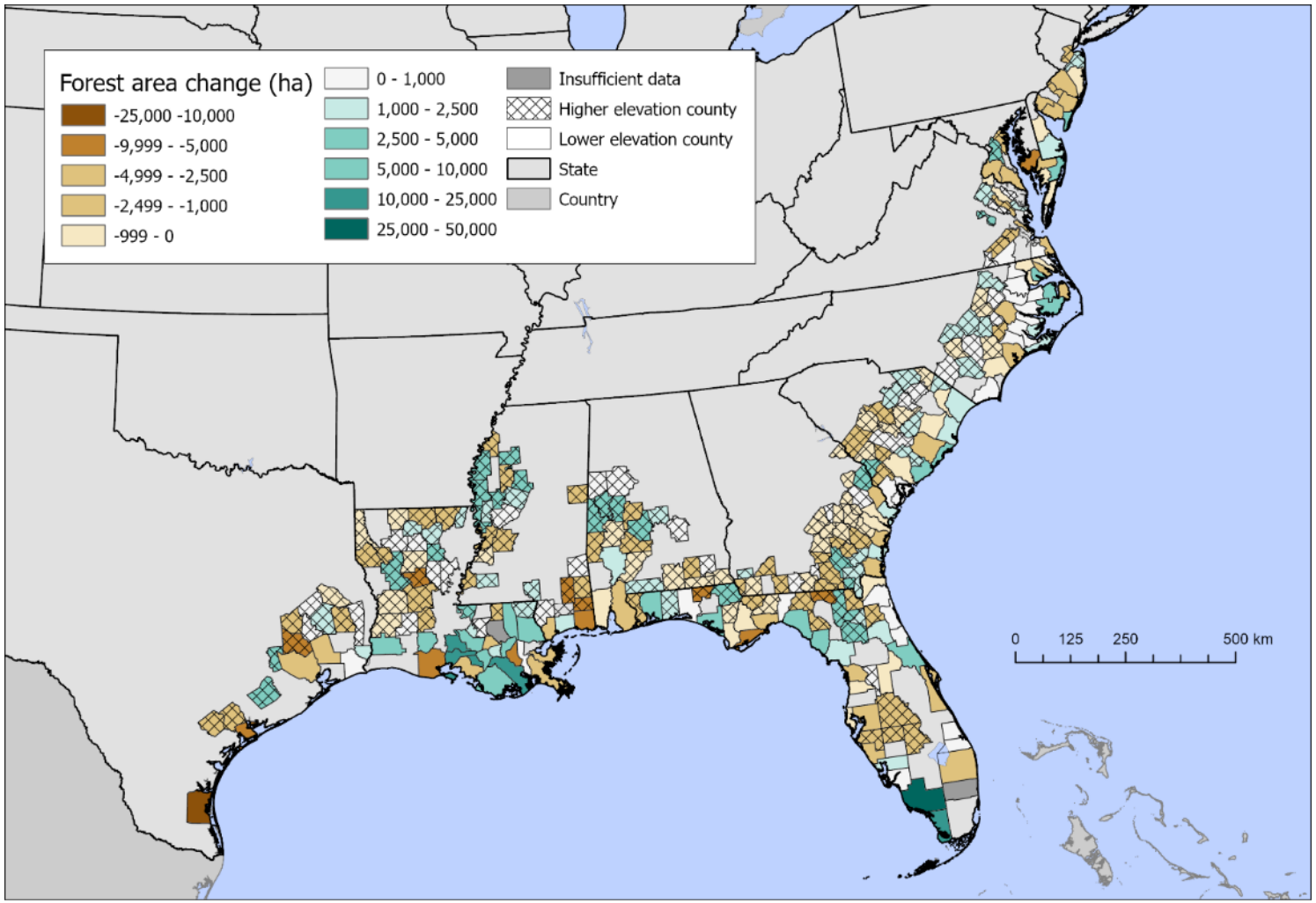
Martinez et al. 2024 *Ecosystems*

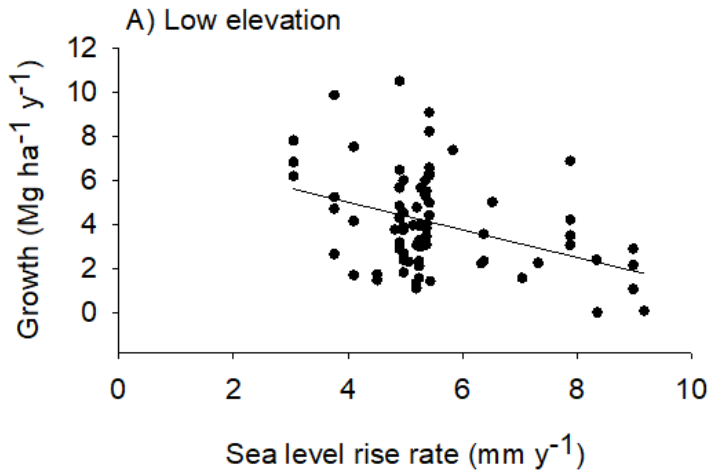
Mapping forest change trajectories to help prioritize management

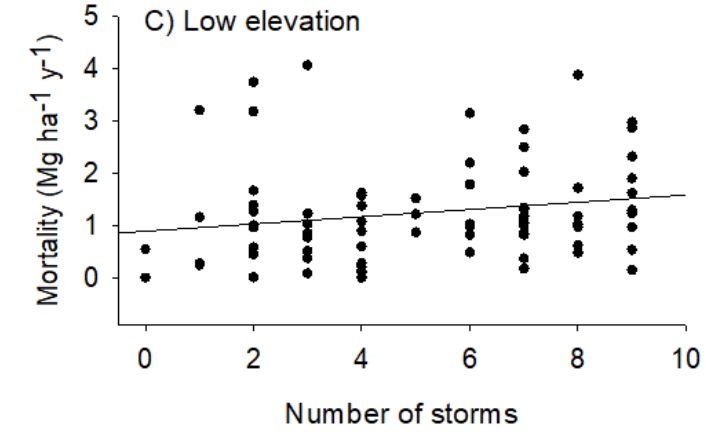


Martinez et al. 2024 *Ecosystems*

SLR and storms affect tree growth and mortality

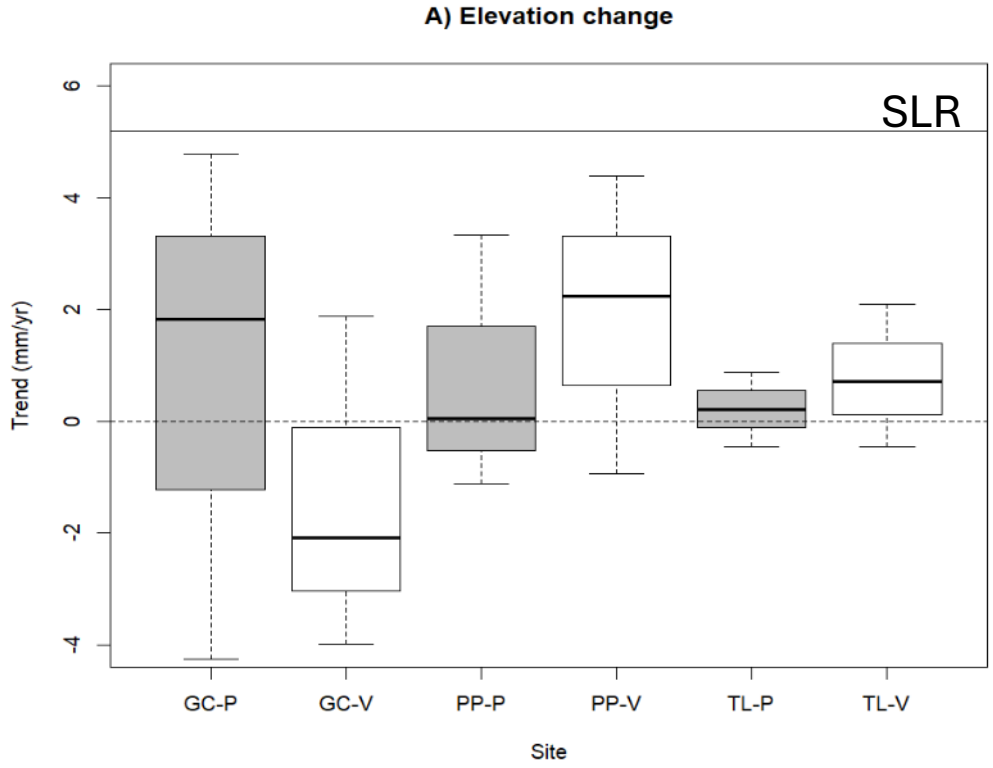


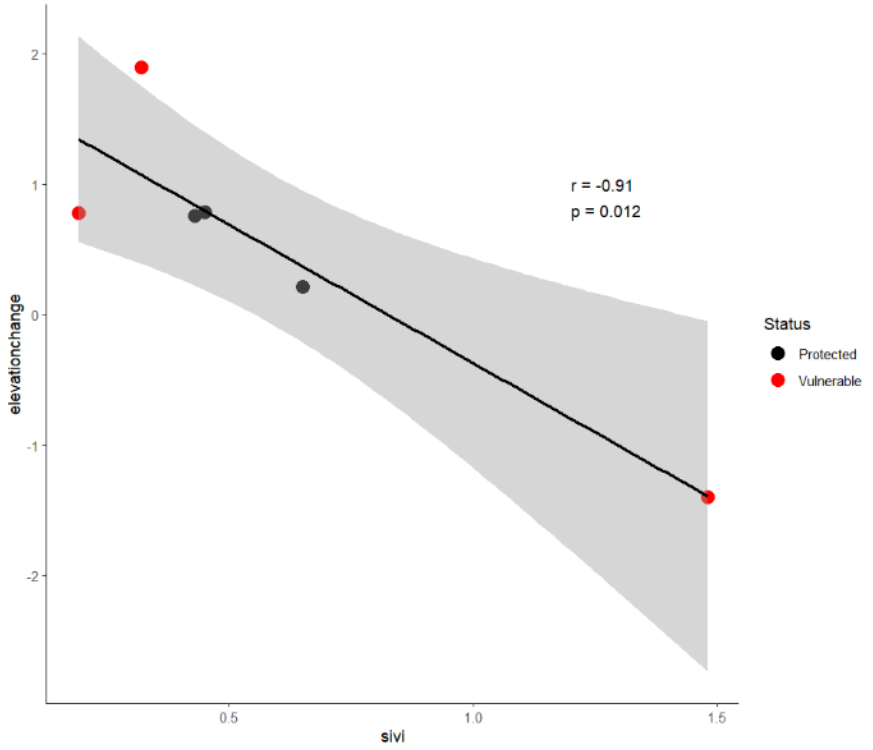




Ardón et al. 2025 *PLOS Climate*

Saltwater intrusion vulnerability leads to elevation loss





Ardón et al. in prep

Conclusions

- Coastal forests are vulnerable to salinity, flooding, and storms
- Salinity can increase CH_4 fluxes
- Snags can both release GHG and reduce CH_4
- Storms and sea level rise alter tree growth at large scales
- Salinity can alter soil elevation gains
- Need more studies!

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