

Seagrass Blue Carbon Stocks in the Indian River Lagoon, Florida

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St. Johns River
Water Management District



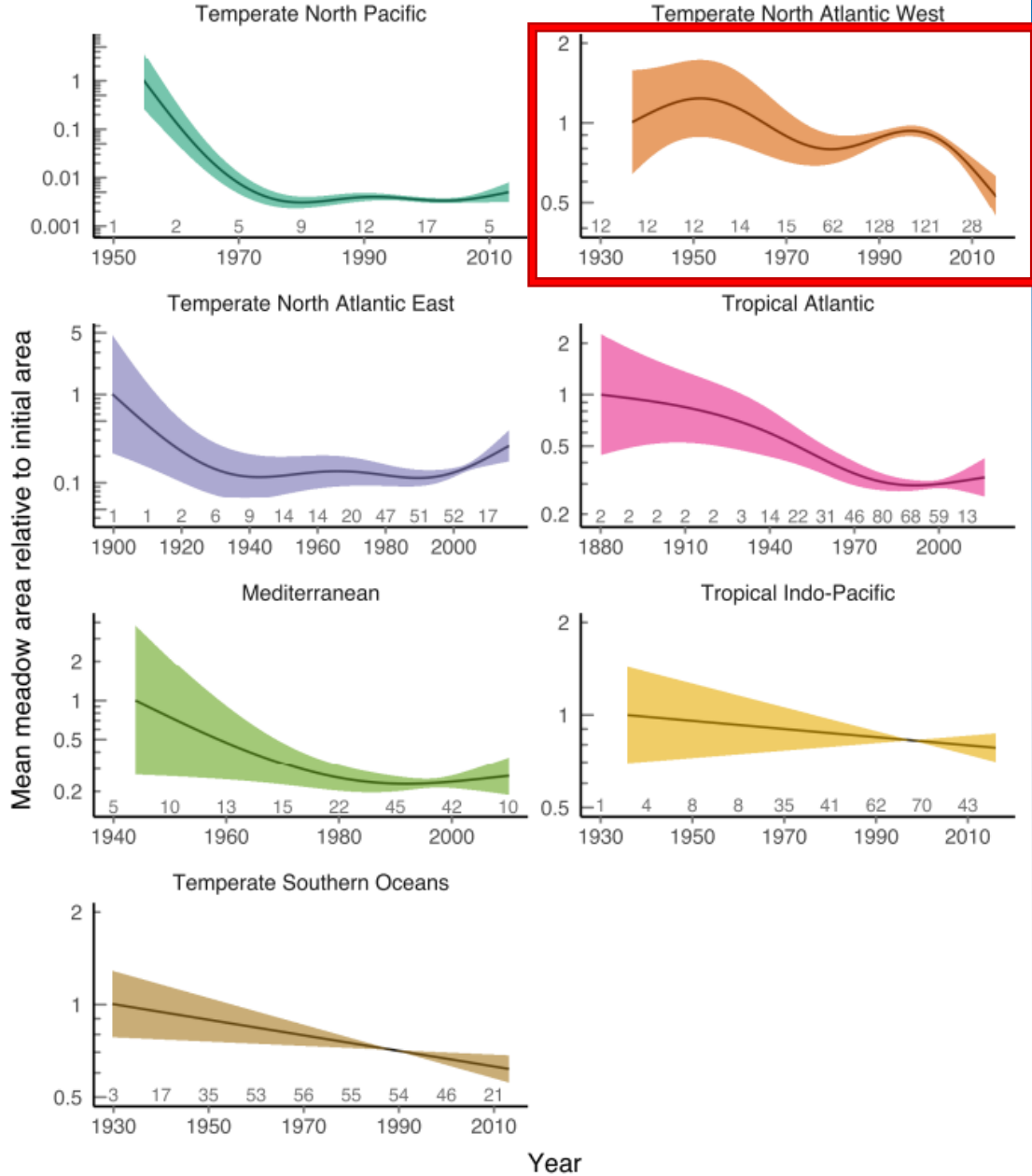
- **Foundation Species**

Provides habitat for many associated species and fulfills important ecosystem services in the coastal zone

- **Ecosystem Services**

- Fisheries habitat
- Food source
- Sediment stabilization
- Wave energy attenuation
- Nutrient cycling
- Carbon storage

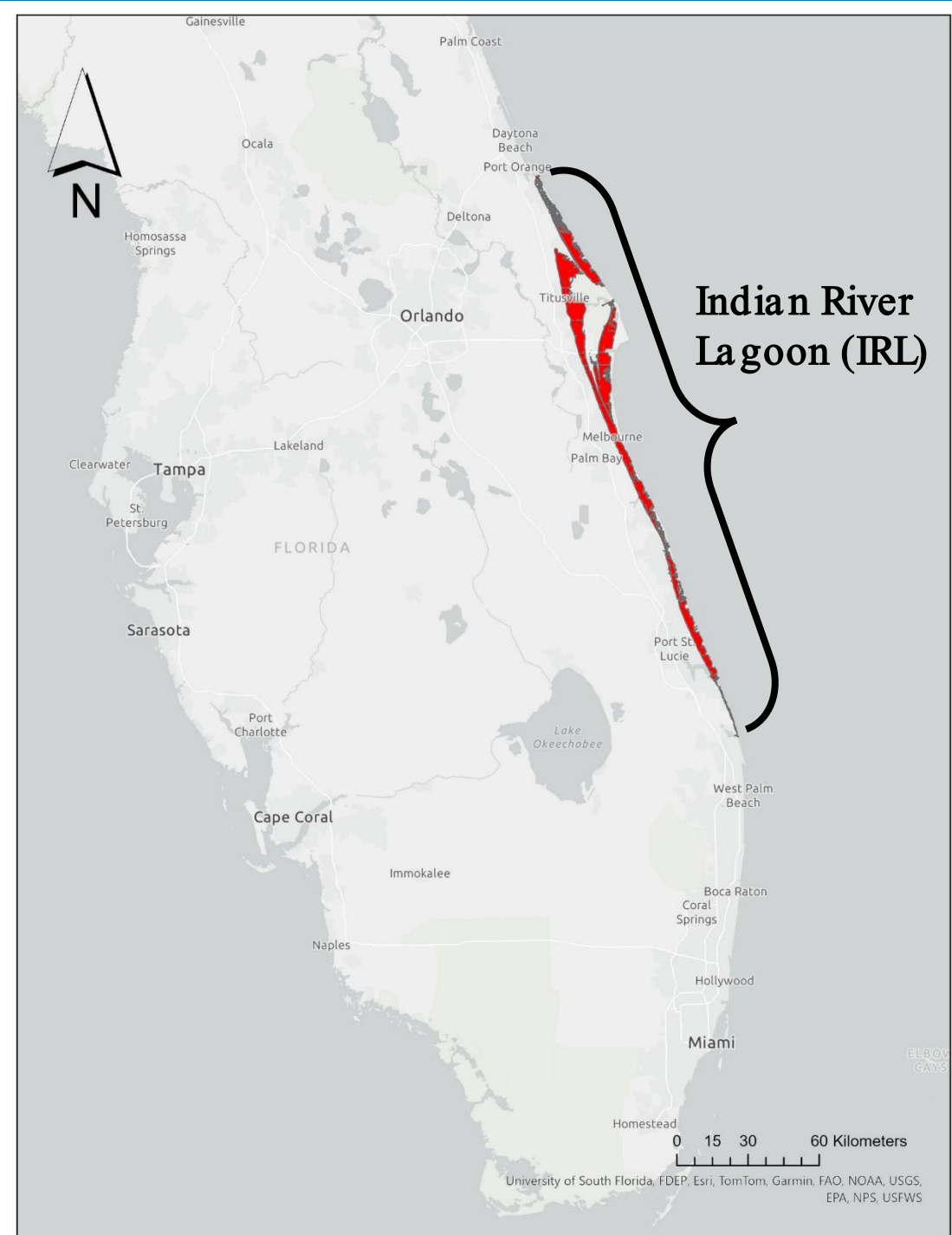




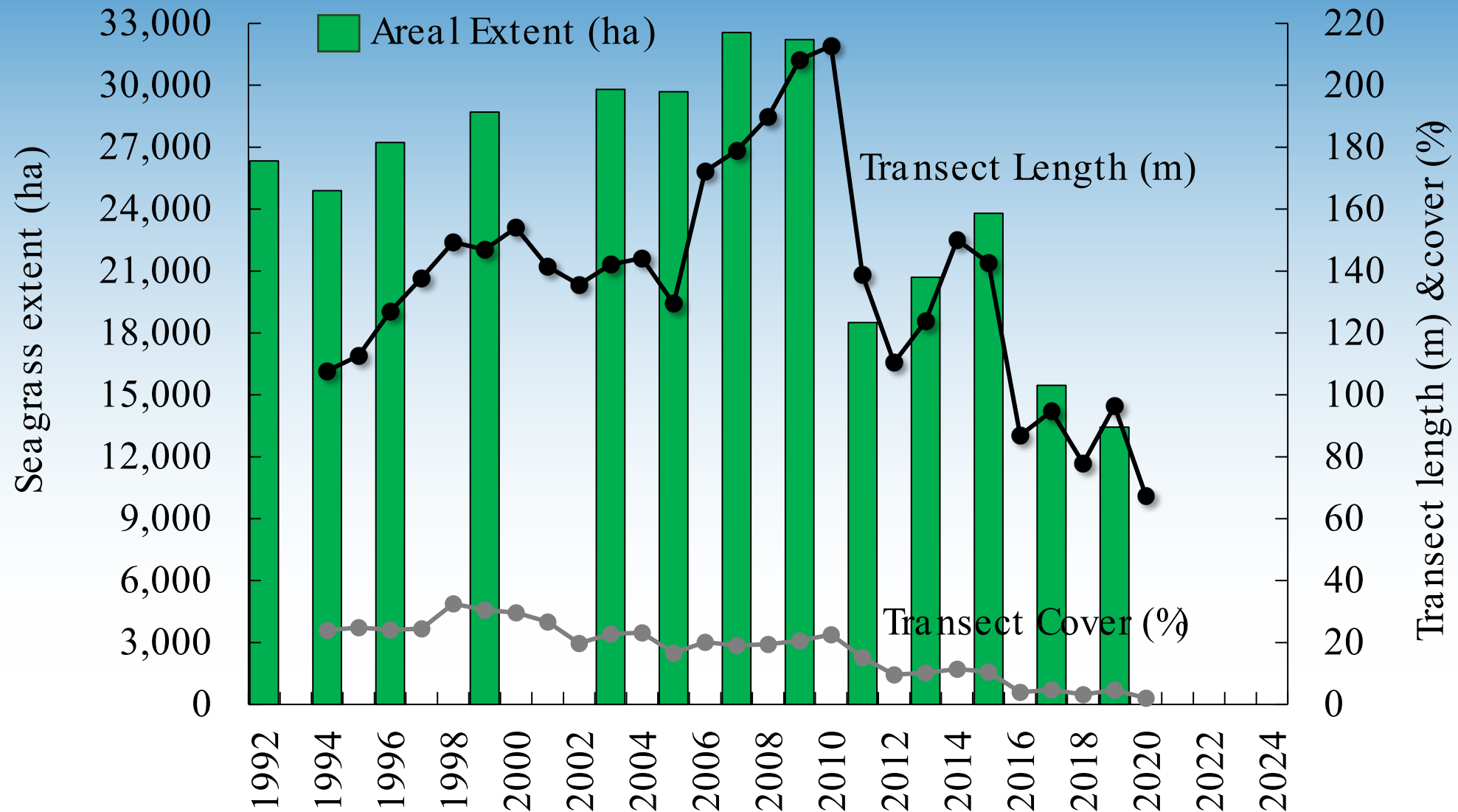
Dunic et al. 2020

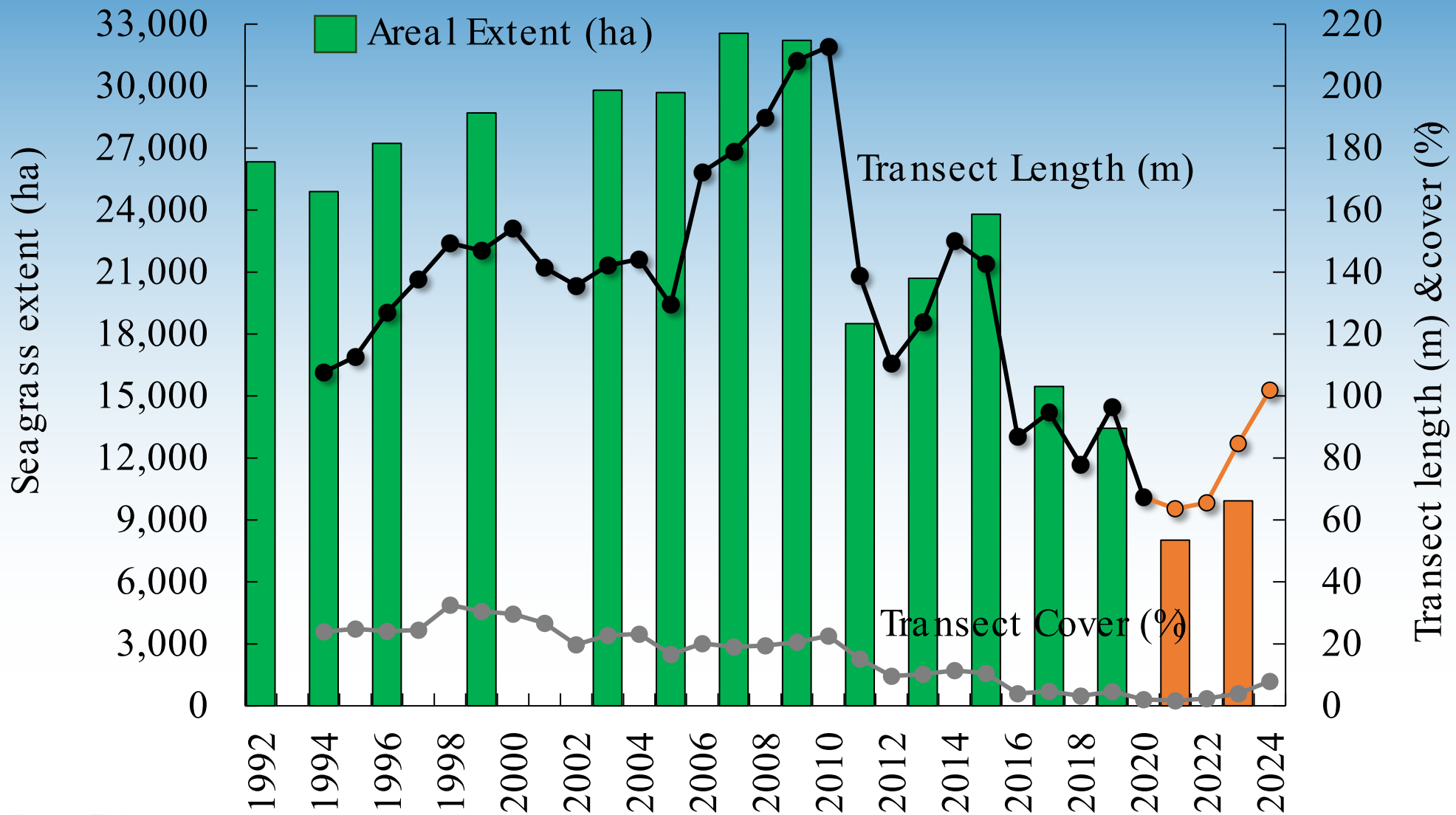


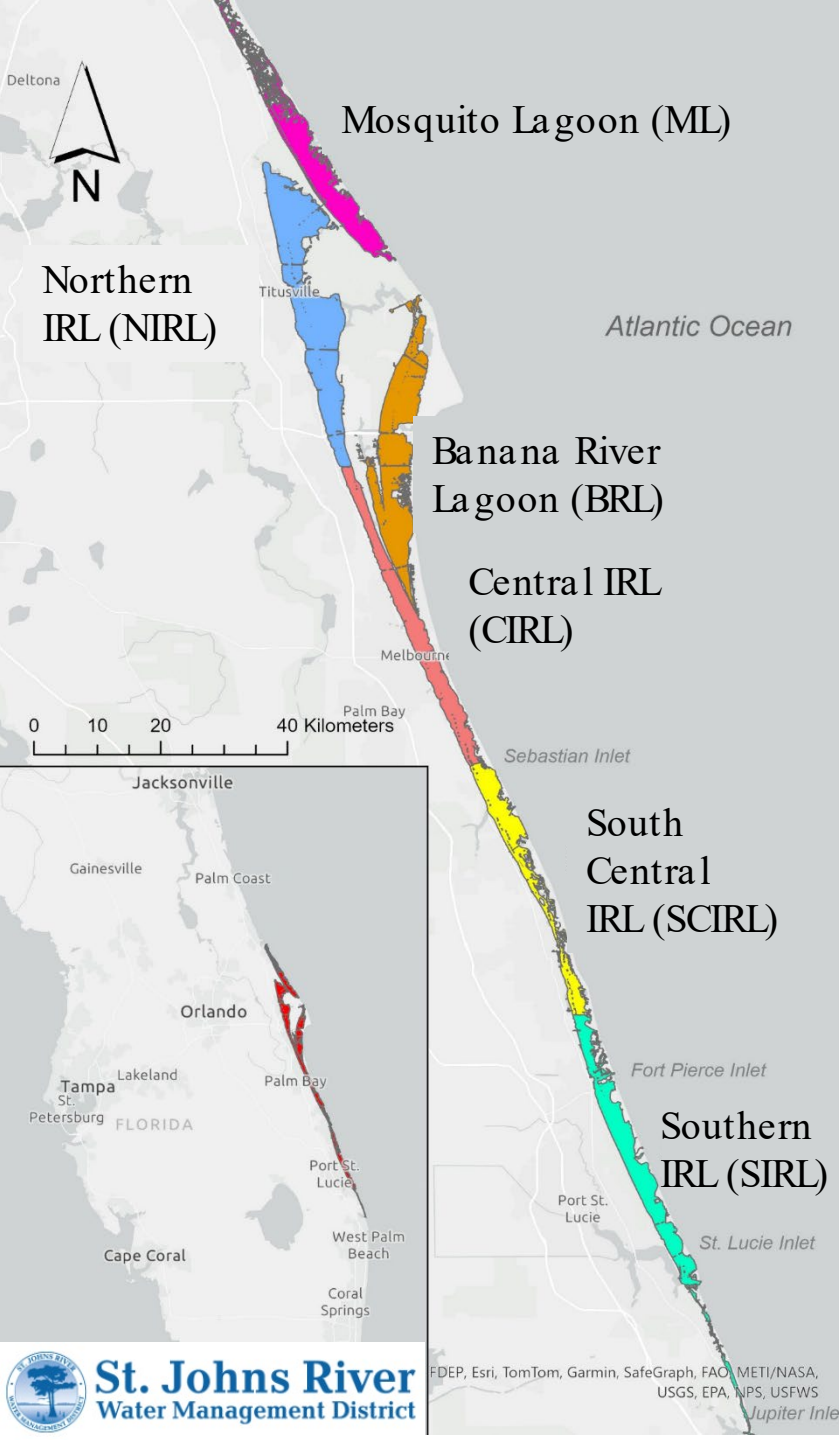
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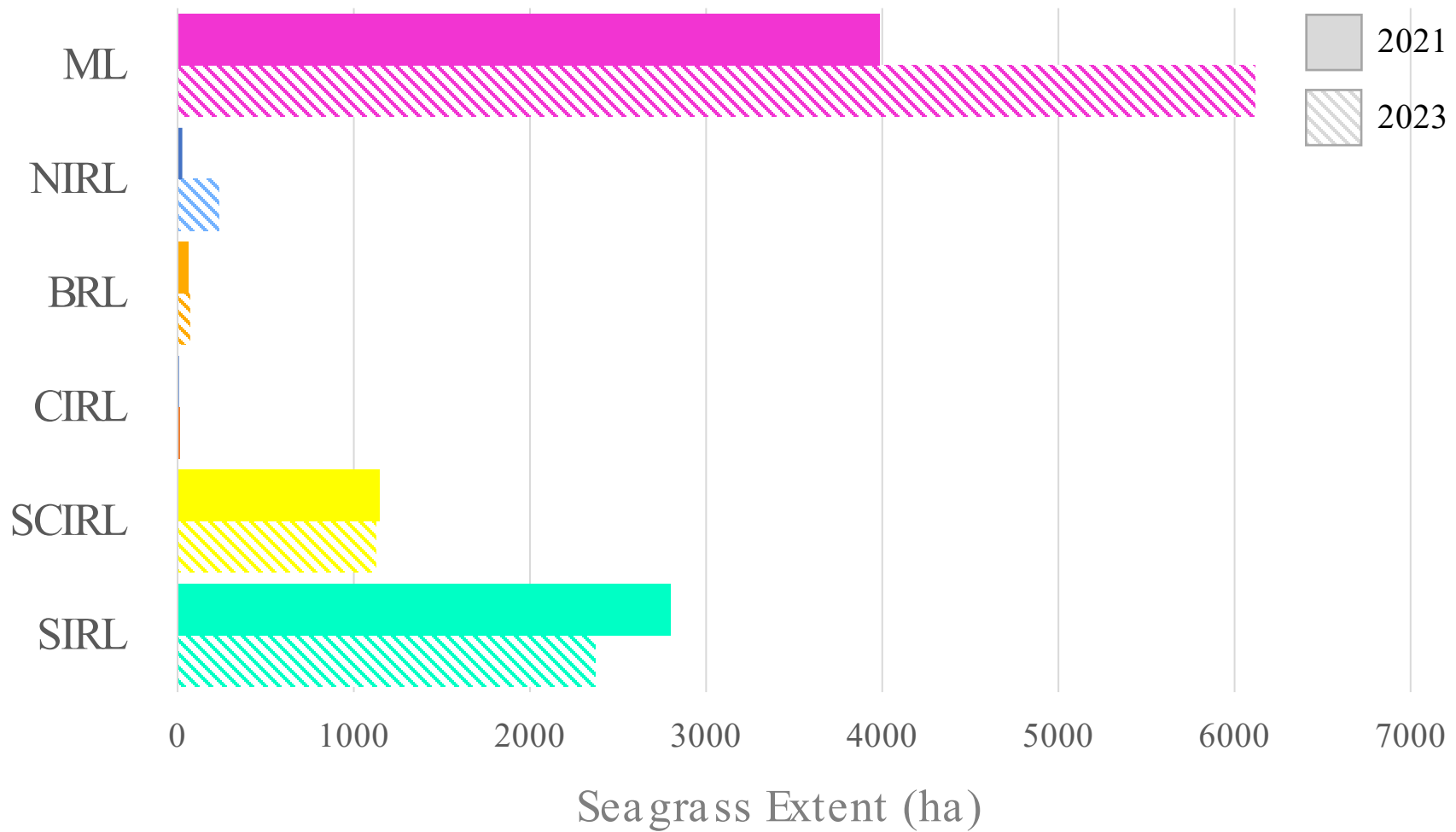
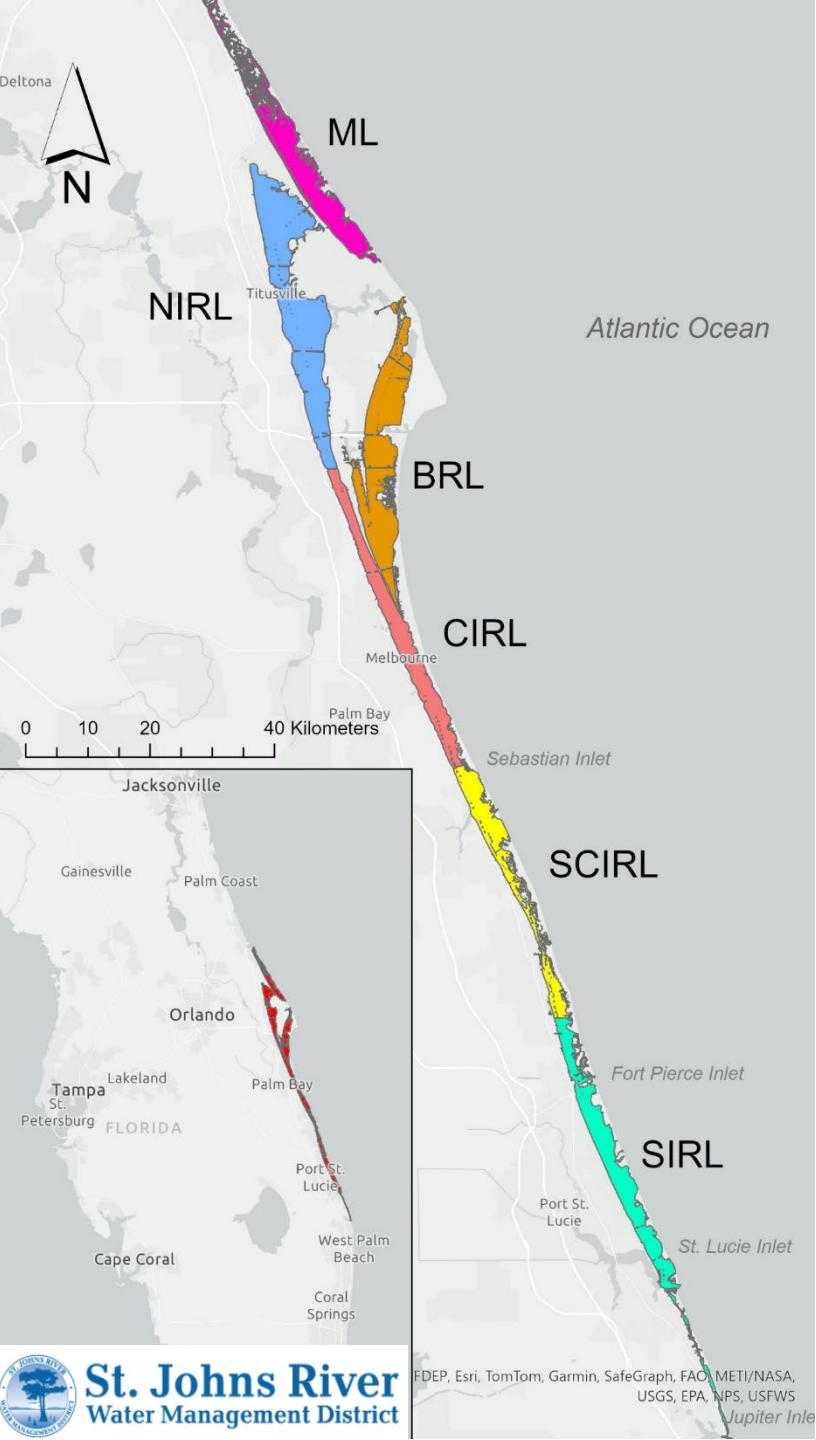


58% decline in Indian River Lagoon seagrass extent since 2009



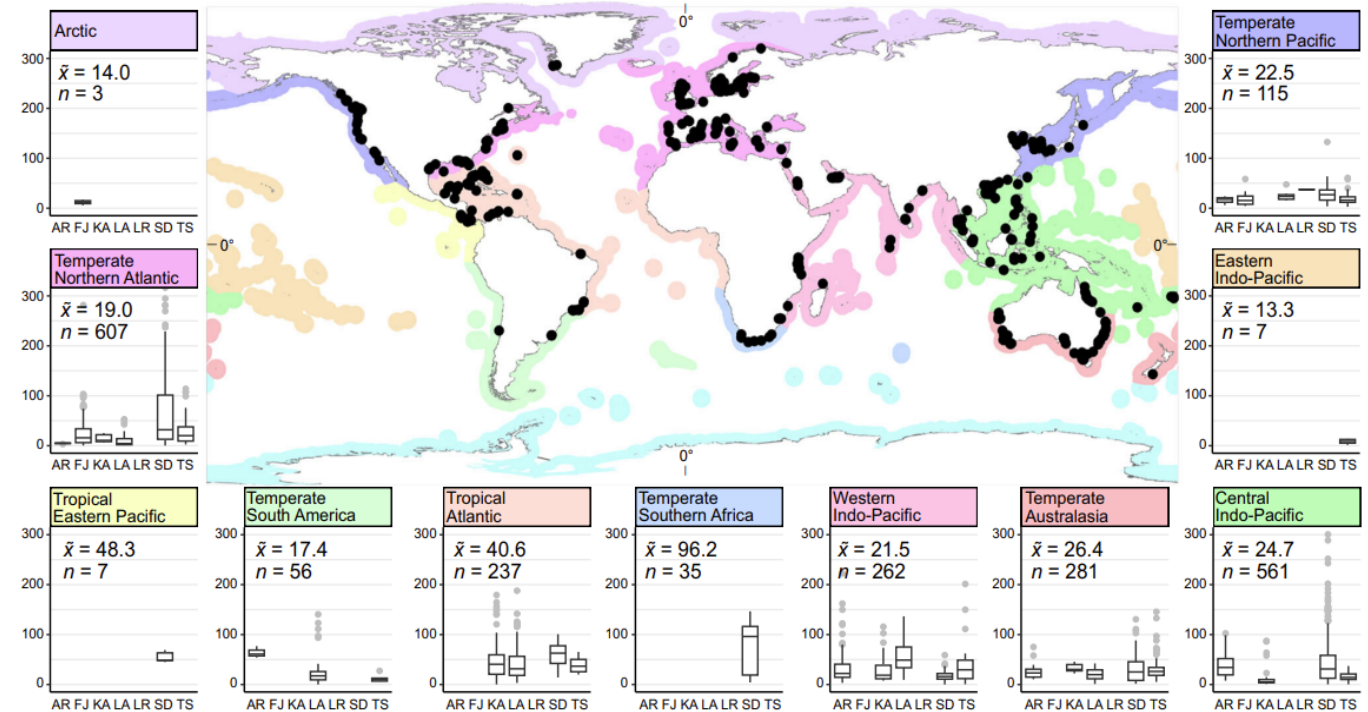
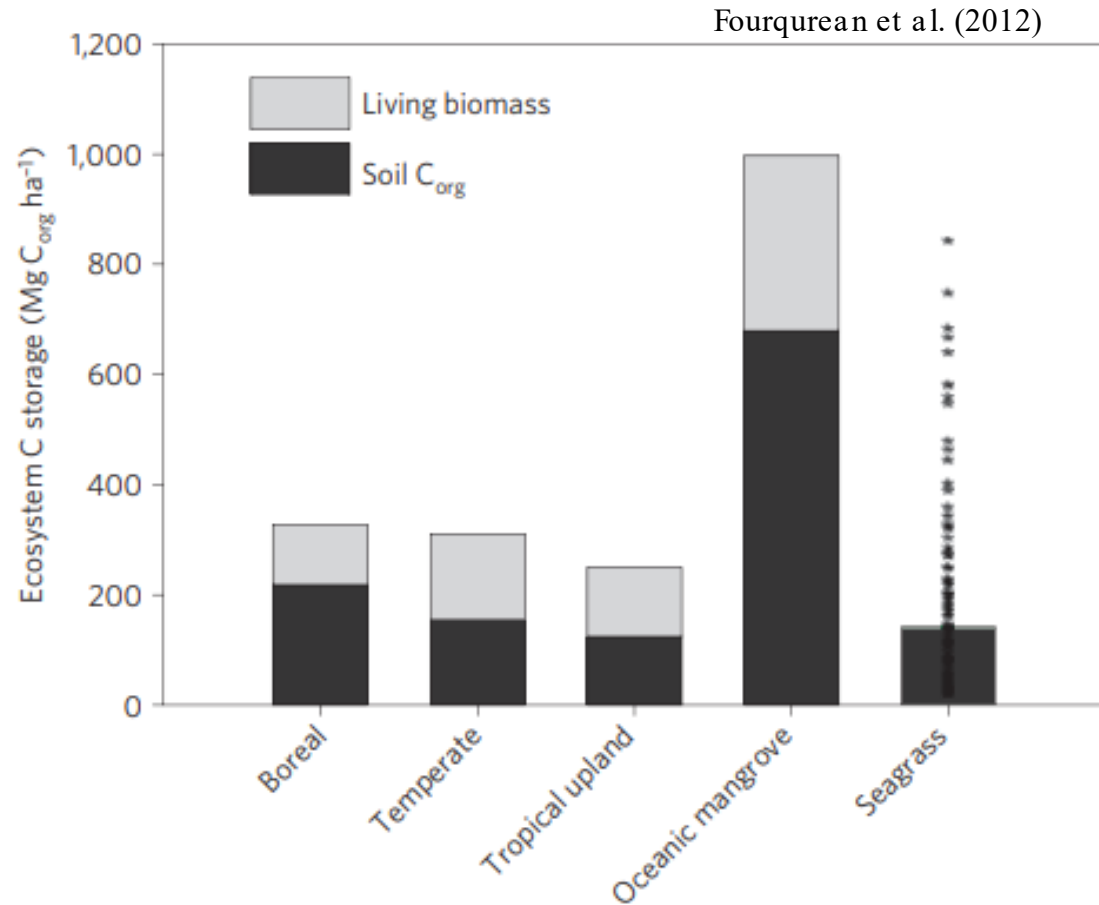






Seagrass C stocks

The median global soil C_{org} stock estimate is $24.2 \text{ Mg } C_{org} \text{ ha}^{-1}$
 The mean global soil C_{org} stock estimate is $37.7 \text{ Mg } C_{org} \text{ ha}^{-1}$



Krause et al. (2025)

The median global soil C_{org} stock estimate is $33.2 \text{ Mg } C_{org} \text{ ha}^{-1}$
 The mean global soil C_{org} stock estimate is $36.8 \text{ Mg } C_{org} \text{ ha}^{-1}$

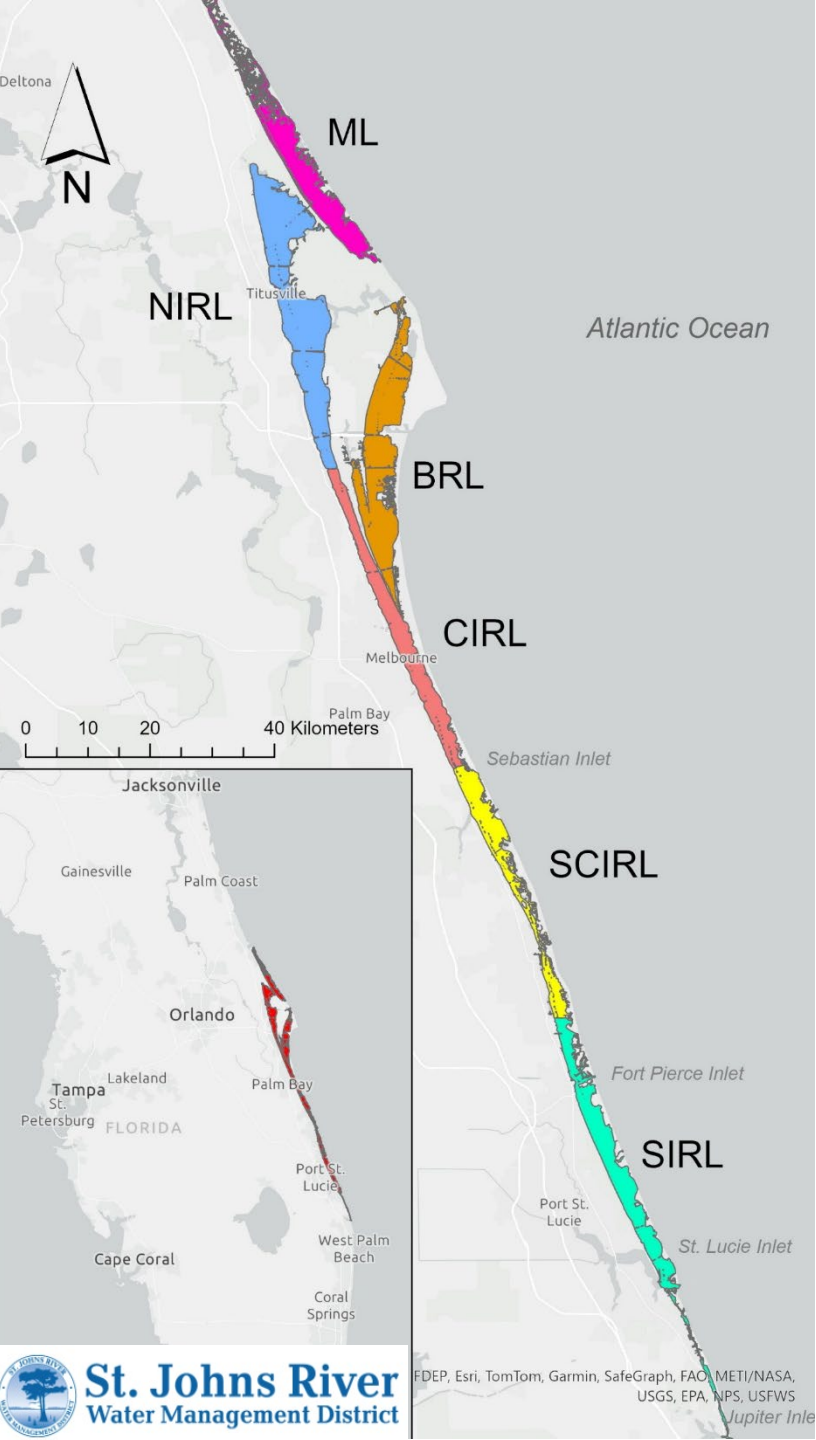
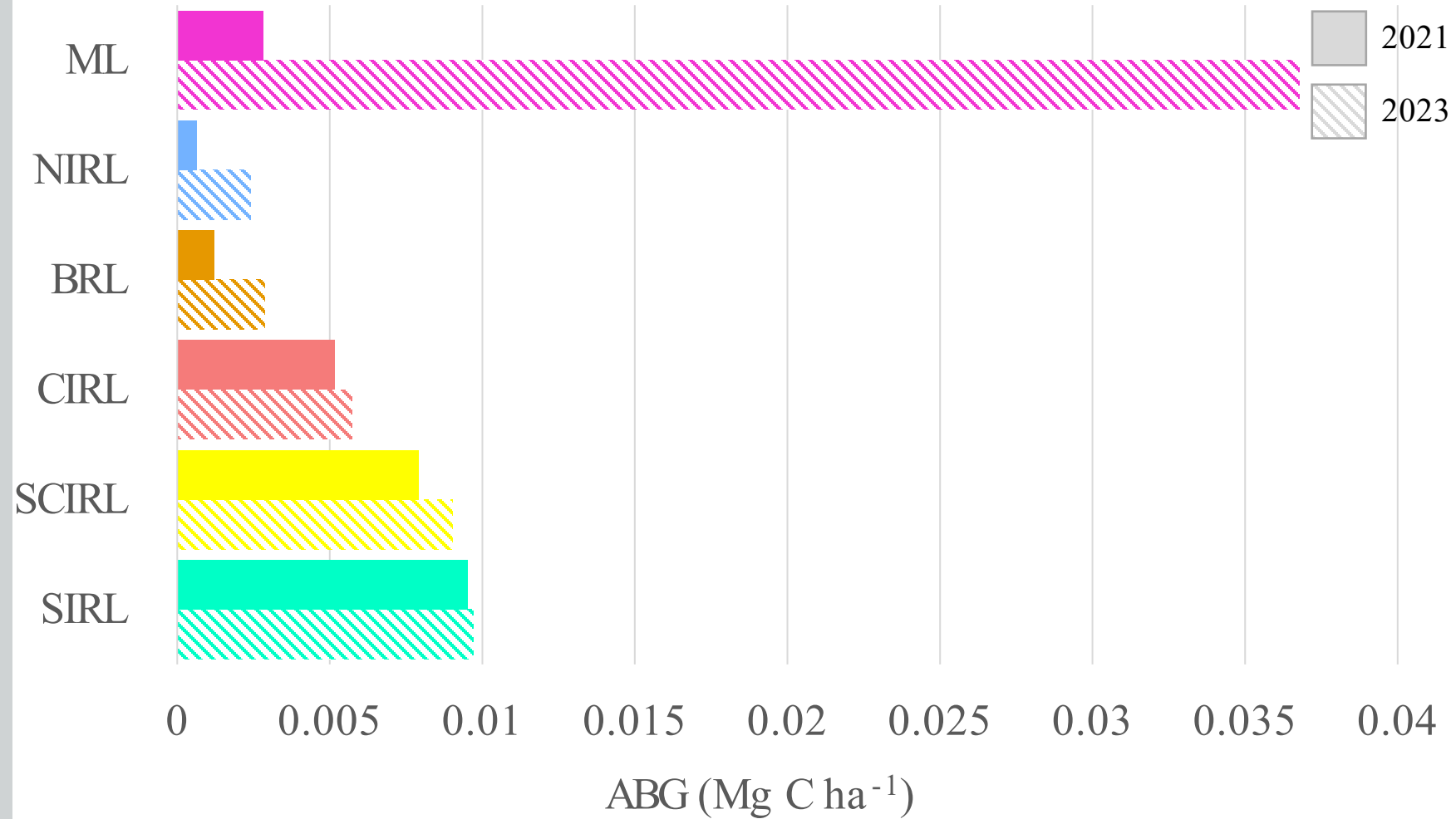


Table 1 | Summary of collected data on seagrass biomass and soil properties from the global data set.

	<i>n</i>	Range	Median	Mean $\pm$ 95% CI
Above-ground biomass (Mg (C _{org}) ha ⁻¹)	251	0.001-5.548	0.264	0.755 $\pm$ 0.128
Below-ground biomass (Mg (C _{org}) ha ⁻¹)	251	0.001-17.835	0.540	1.756 $\pm$ 0.375
Total seagrass biomass (Mg (C _{org}) ha ⁻¹)	251	0.001-23.382	1.000	2.514 $\pm$ 0.489
Soil C _{org} (percentage of dry weight)	2,535	0-48.2	1.8	2.5 $\pm$ 0.1
	3,561	0-48.2	1.4	2.0 $\pm$ 0.1
DBD (g (dry weight) ml ⁻¹)	2,484	0.06-2.35	0.92	1.03 $\pm$ 0.02

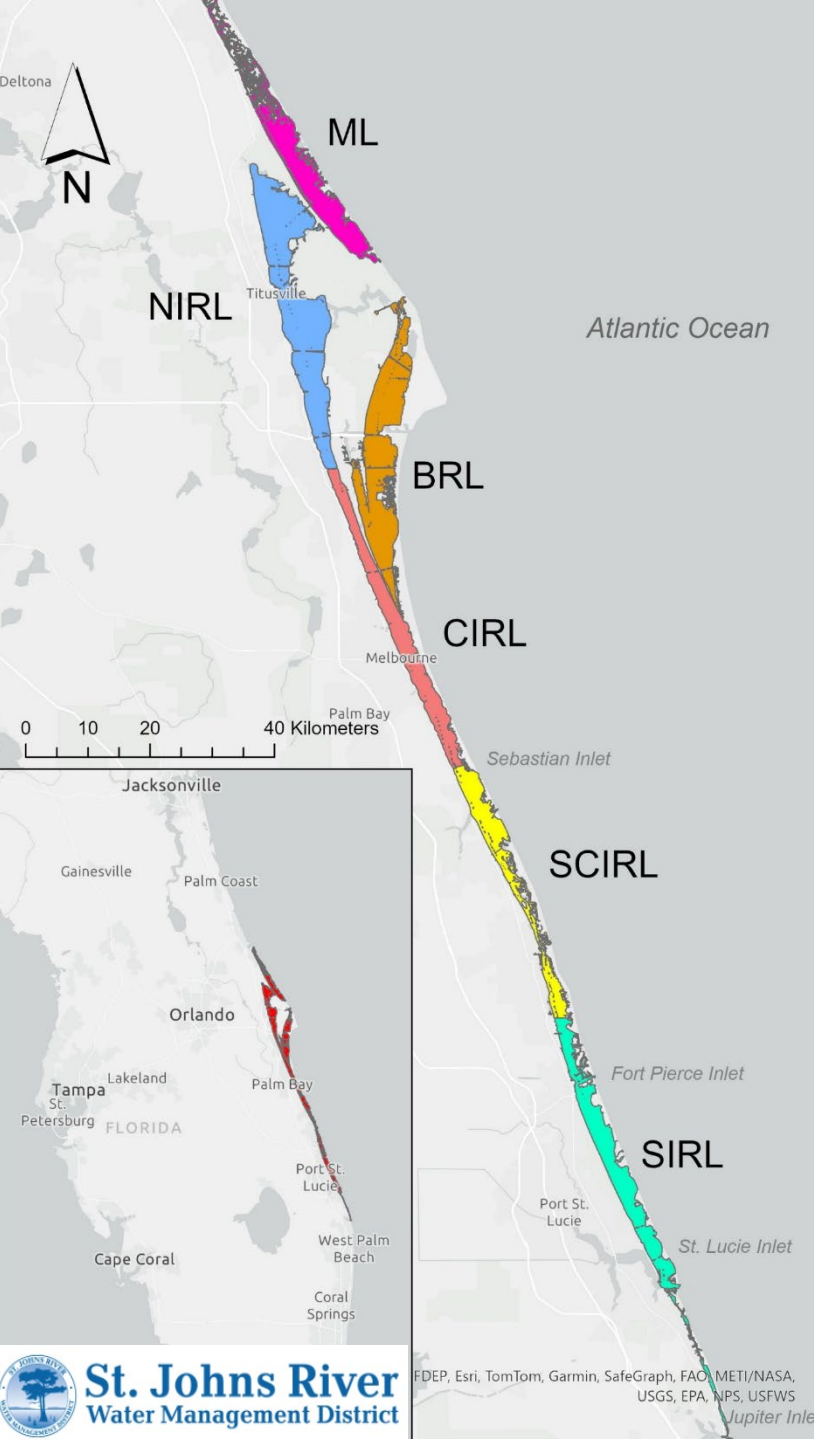
Values in bold include estimates based on statistical relationships with other variables.

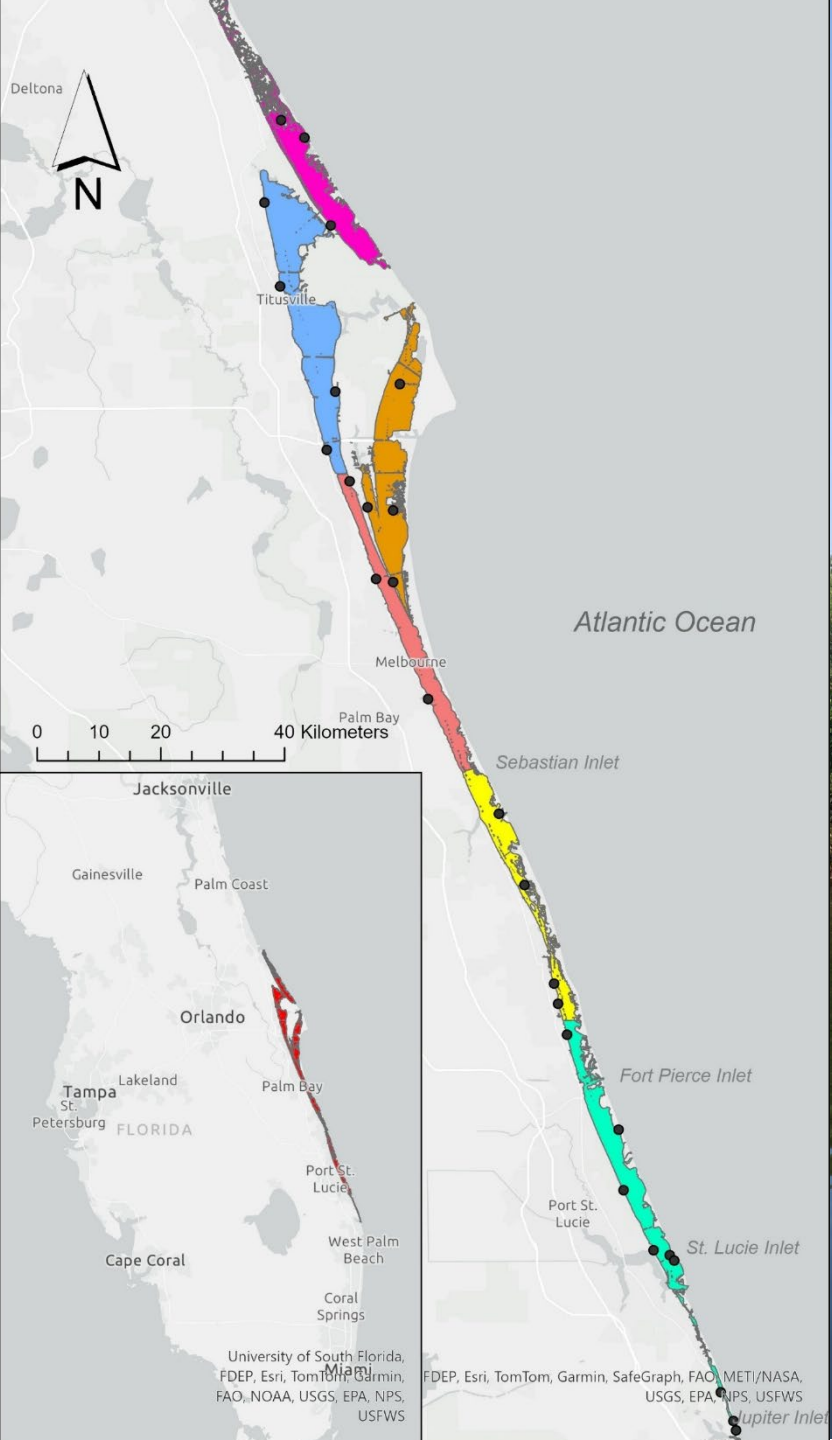
Fourqurean et al. (2012)



Main Question –

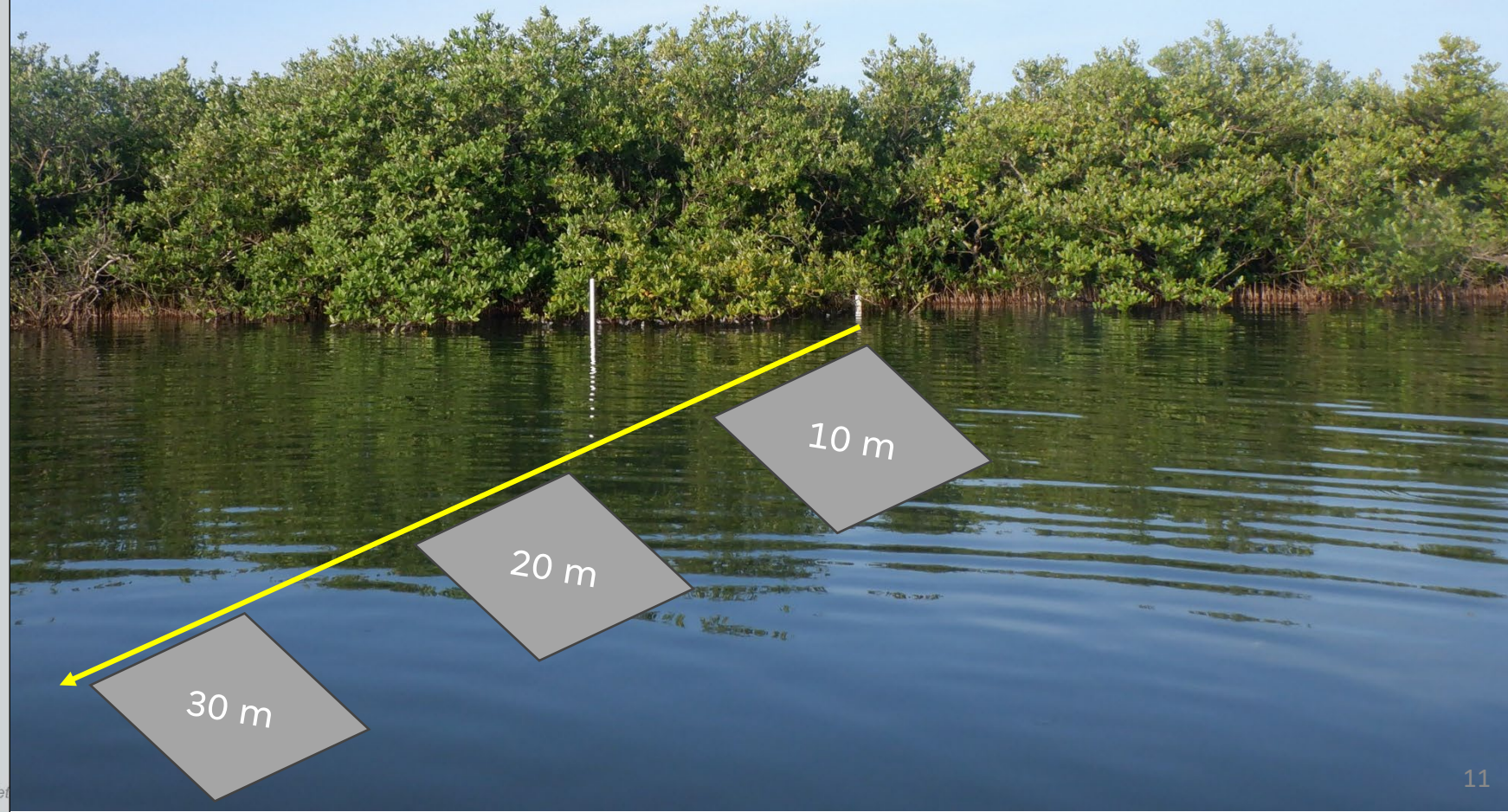
What is the current belowground Cstock in the Indian River Lagoon?





Main Question –

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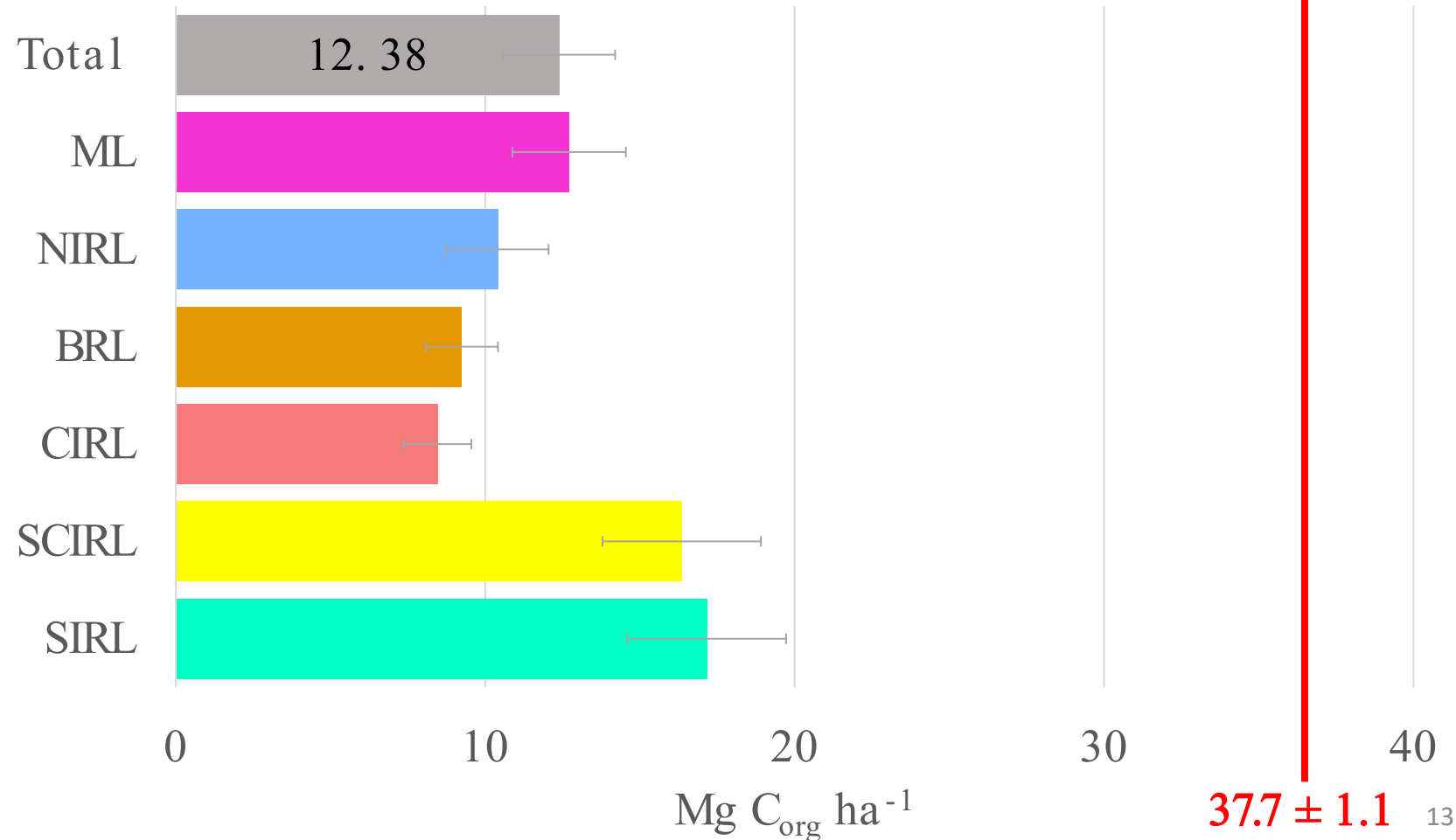
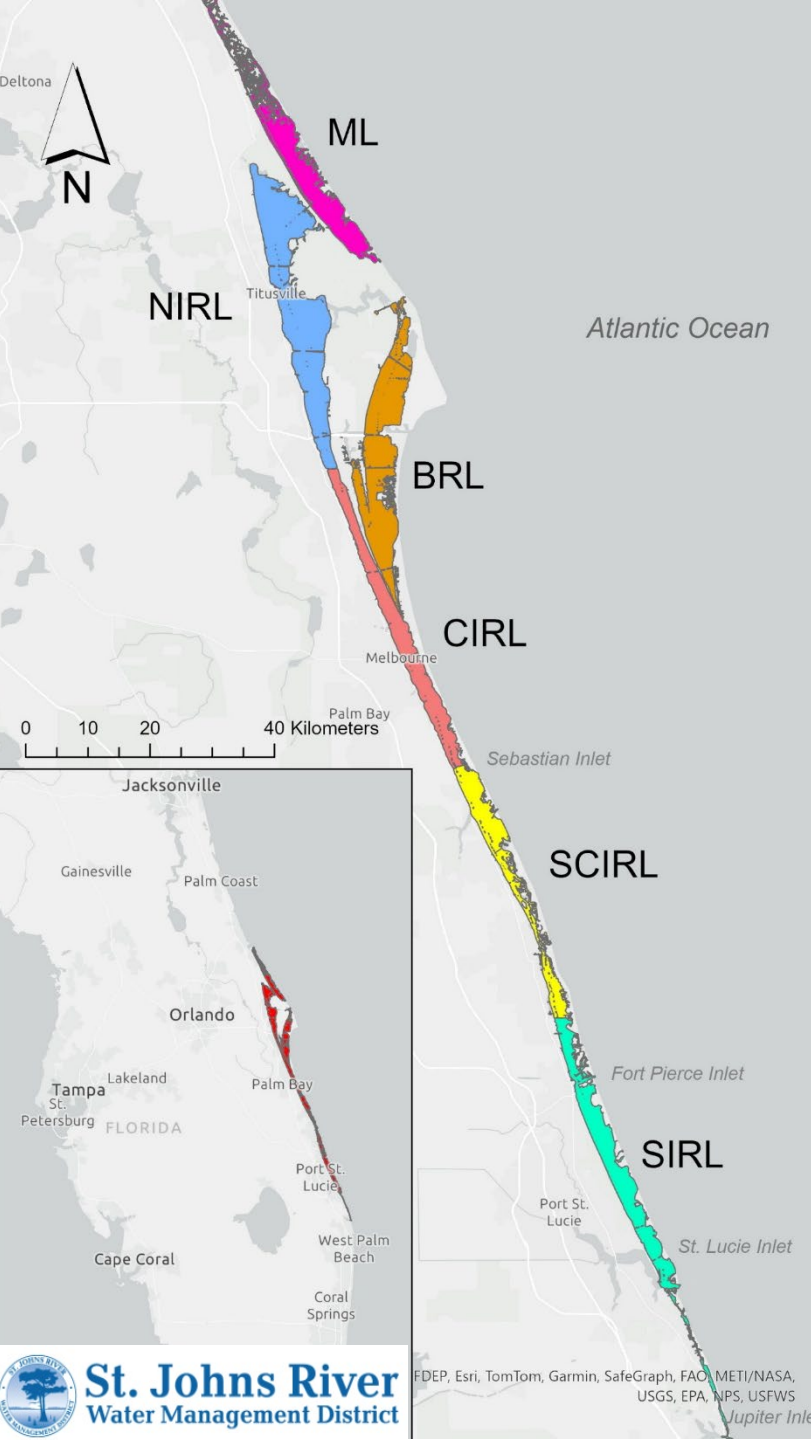
Sample Collection

- *In situ* seagrass estimates - %cover, height, shoots
- Porewater @ 10 cm for salinity, NH_4^+ , NO_3^- , TP
- Soil Cores – ≤ 30 cm, sub-sectioned into 5 cm
 - Organic Matter Content
 - Bulk Density
 - Total C
 - Total Inorganic C
 - Total N
- Grain Size Cores – 10 cm depth
- Water Quality from monthly ambient sampling

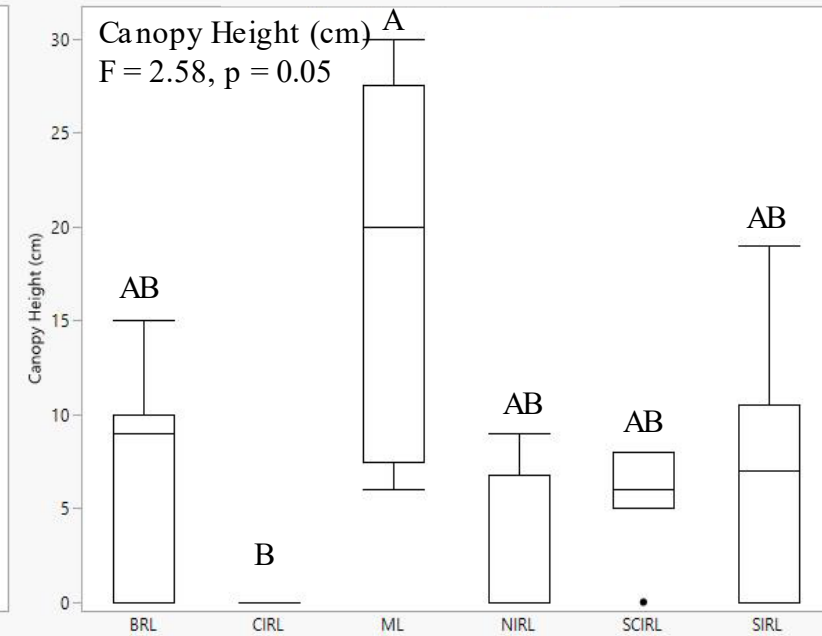
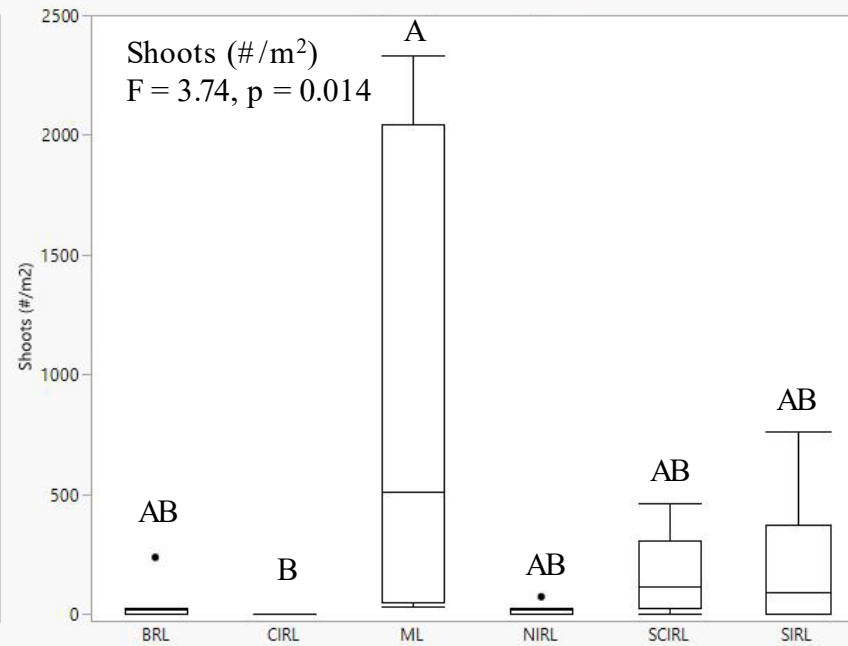
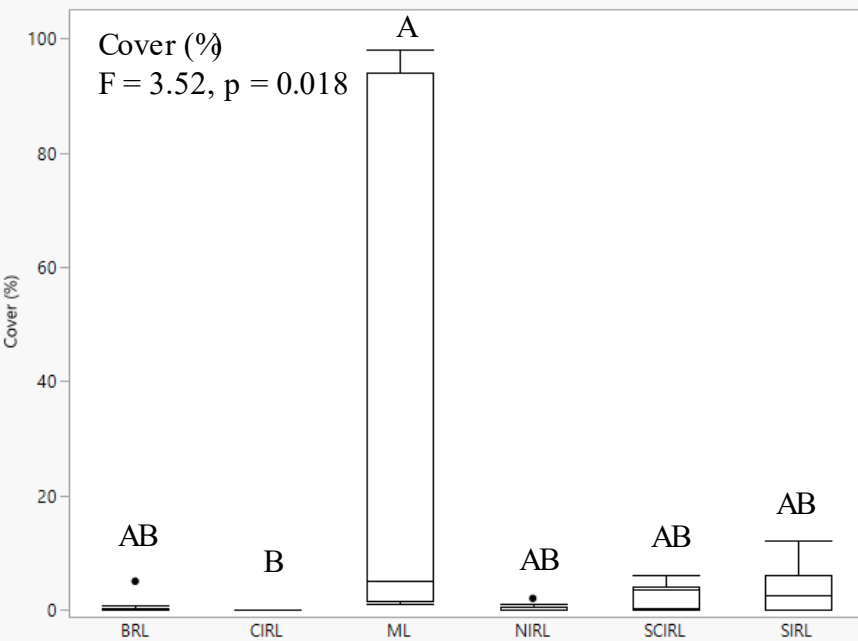


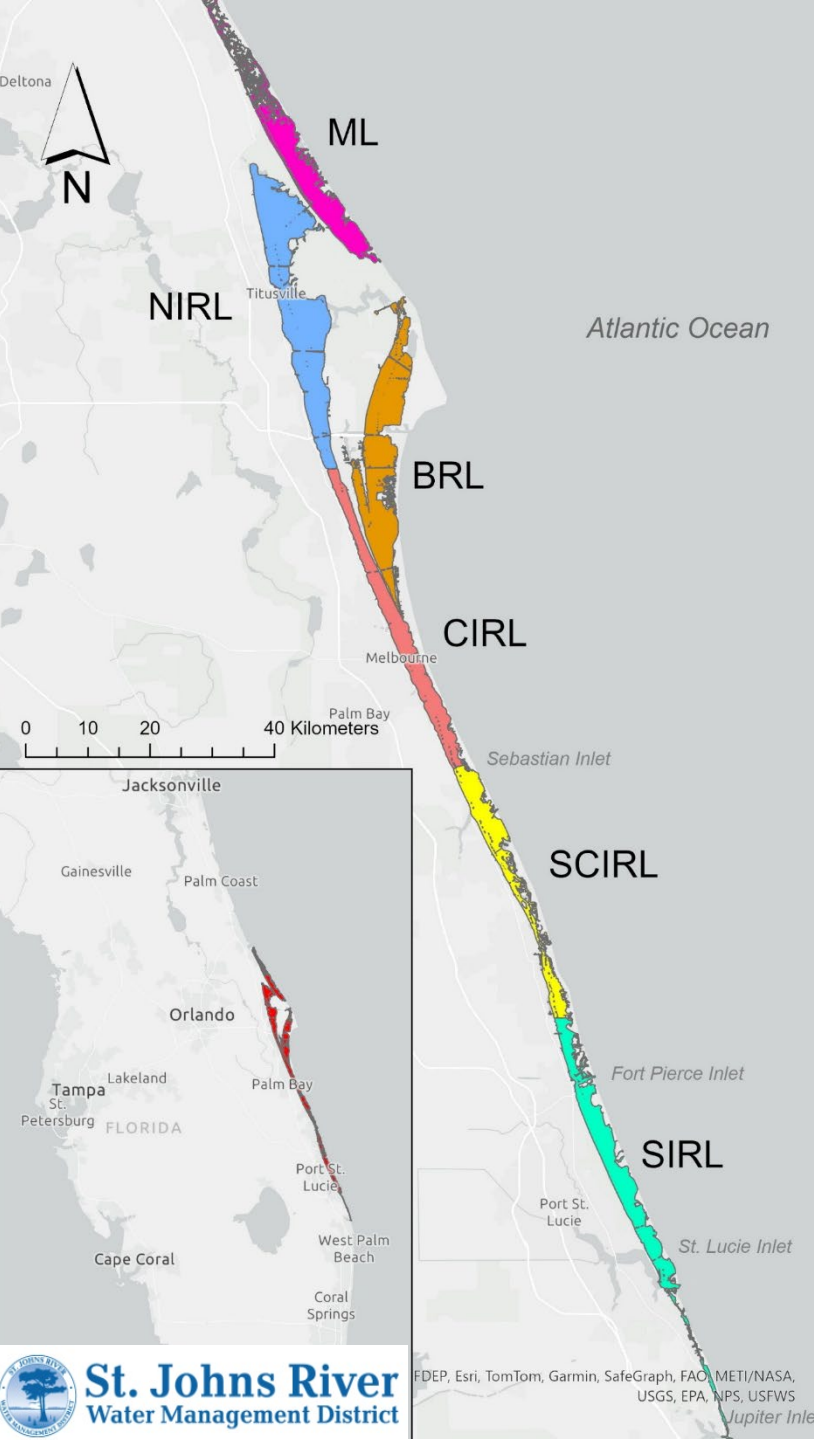
IRL sediment C stock

What is the current belowground C stock in the Indian River Lagoon?

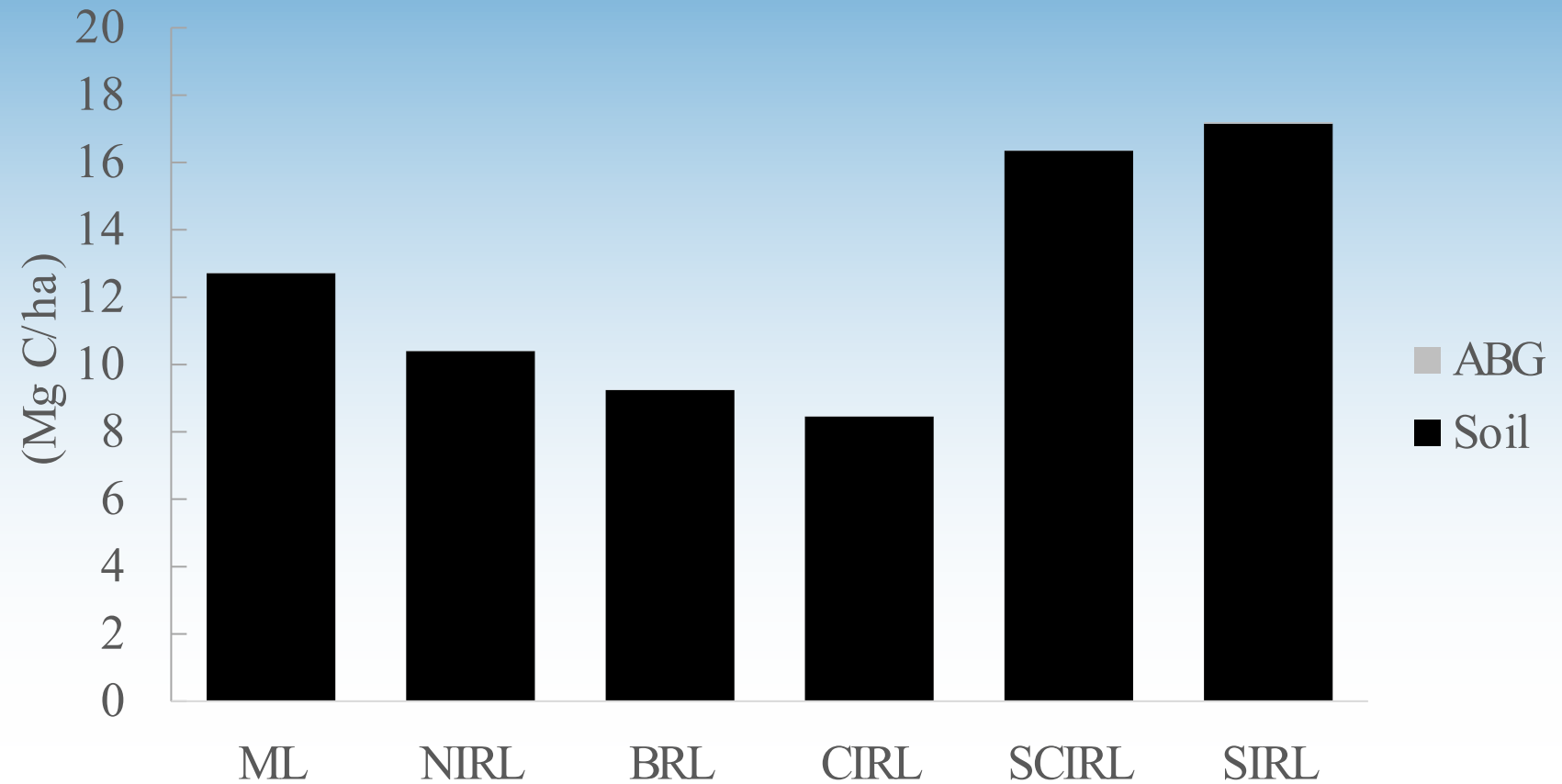


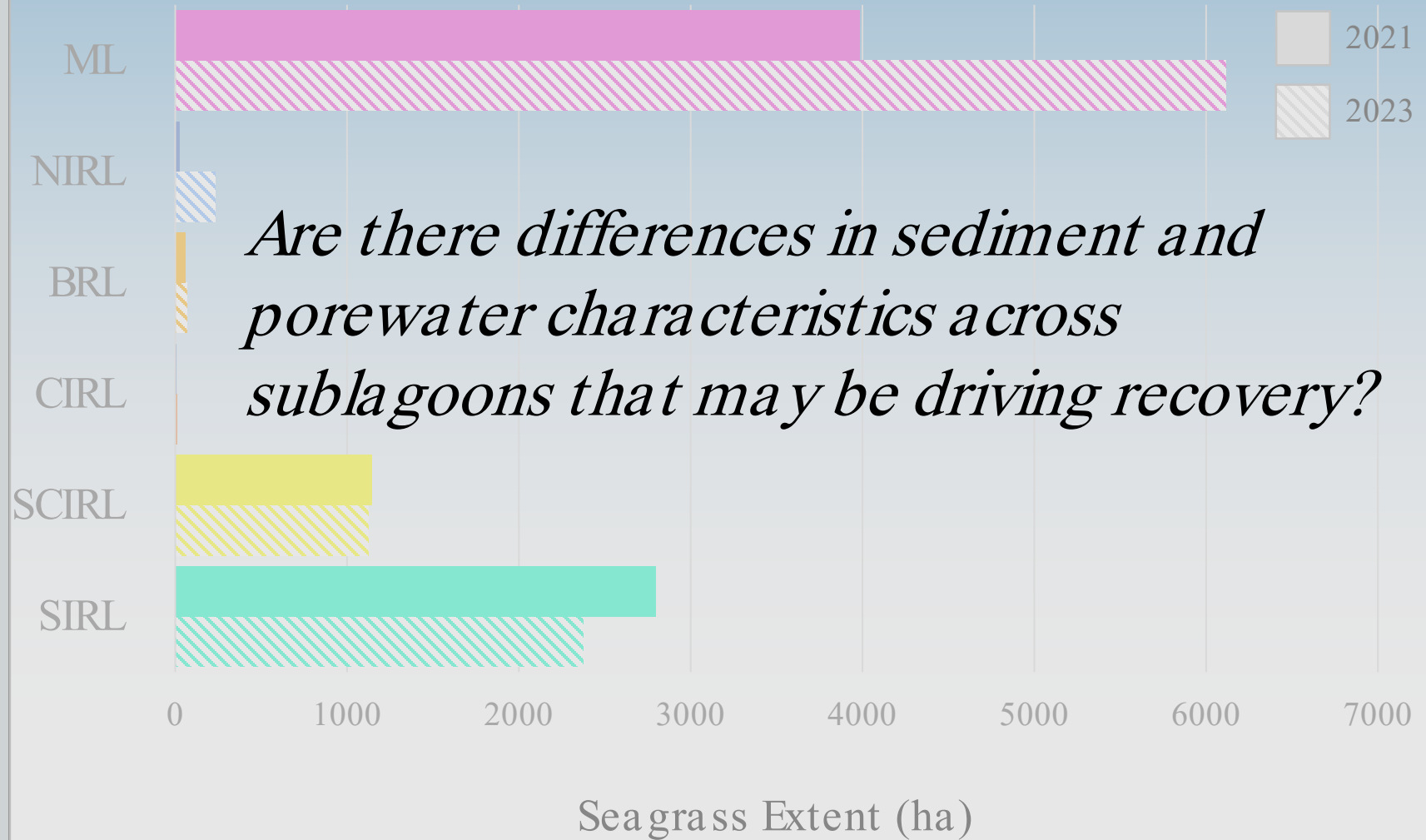
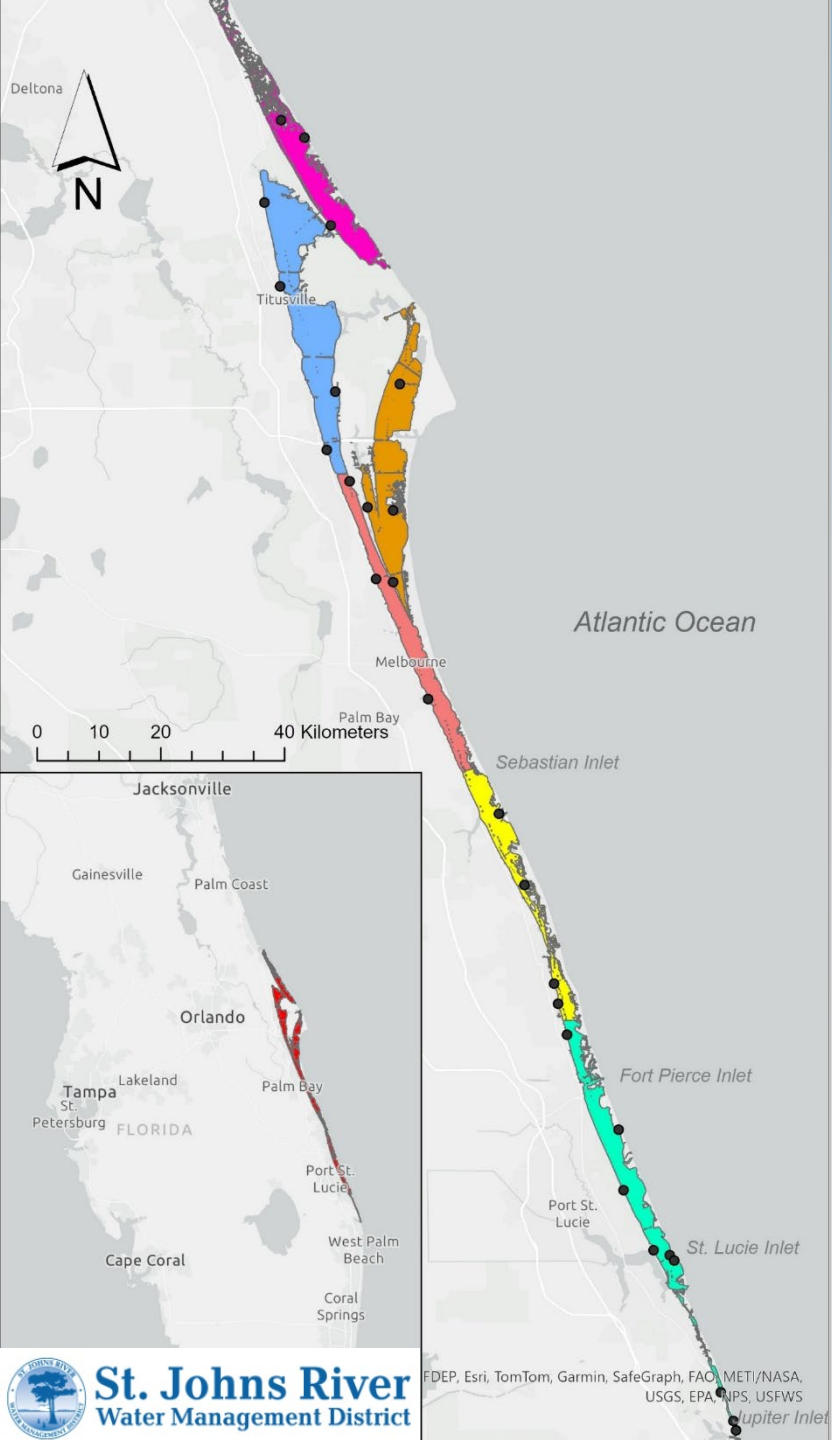
Seagrass Coverage



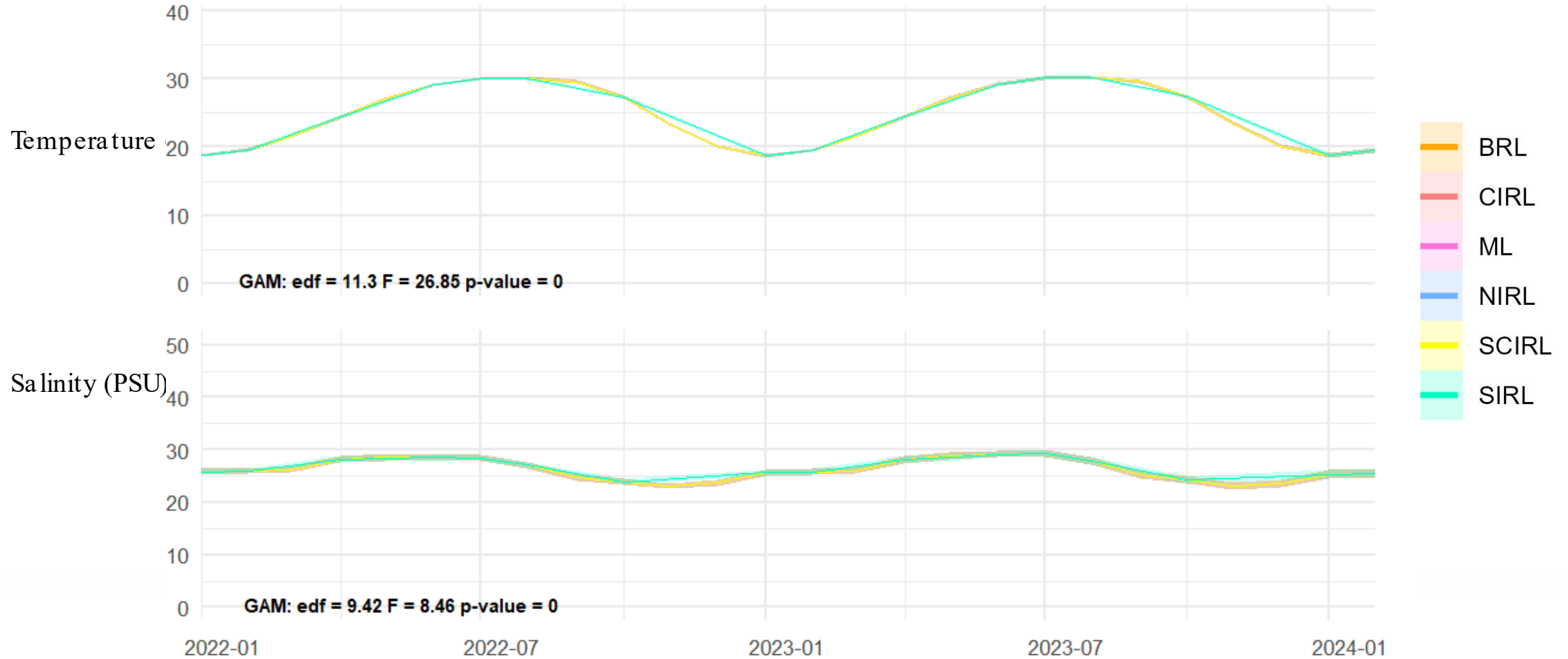


Total IRL C stock

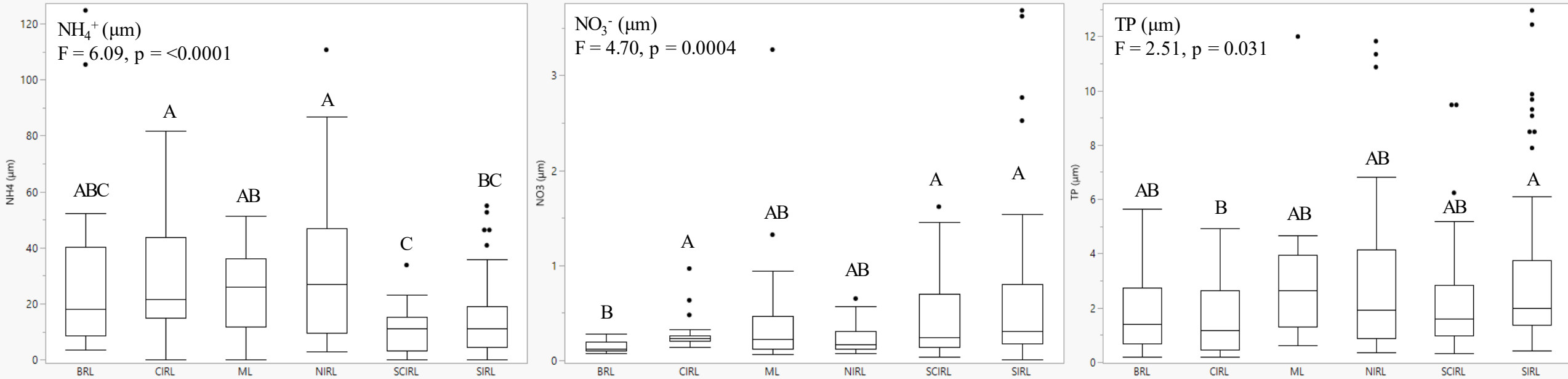




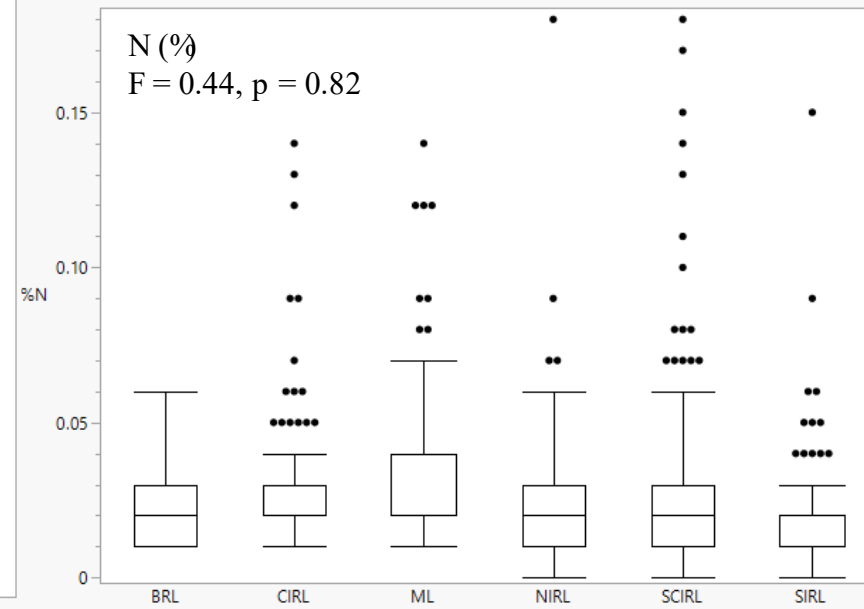
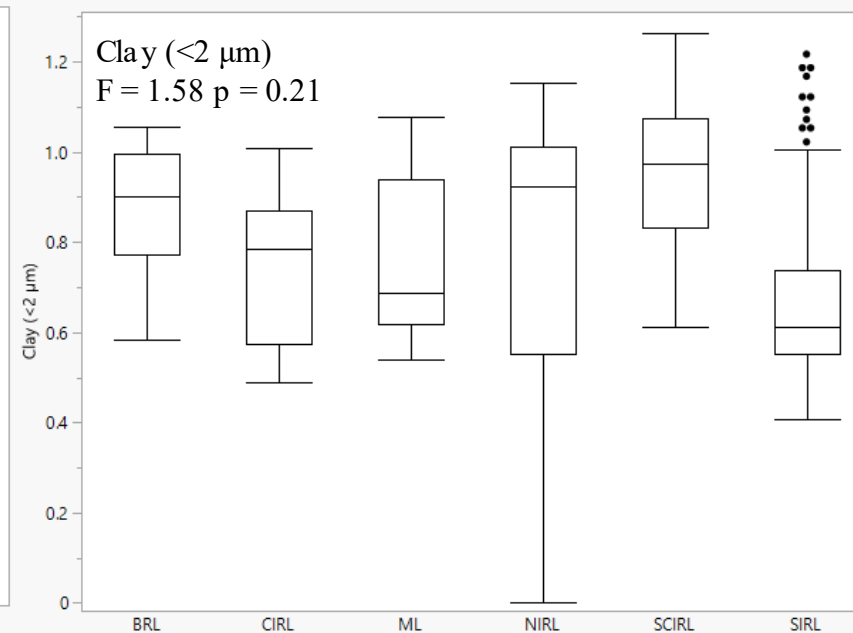
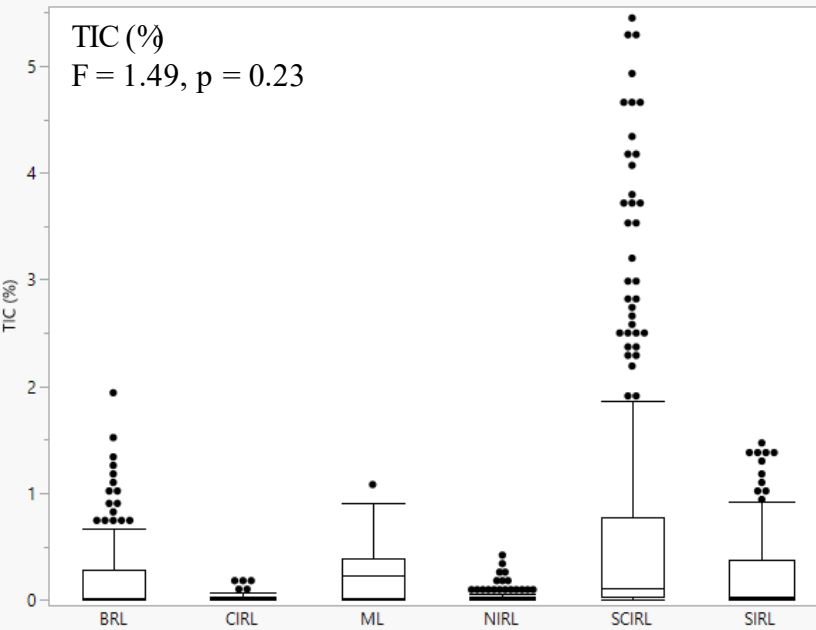
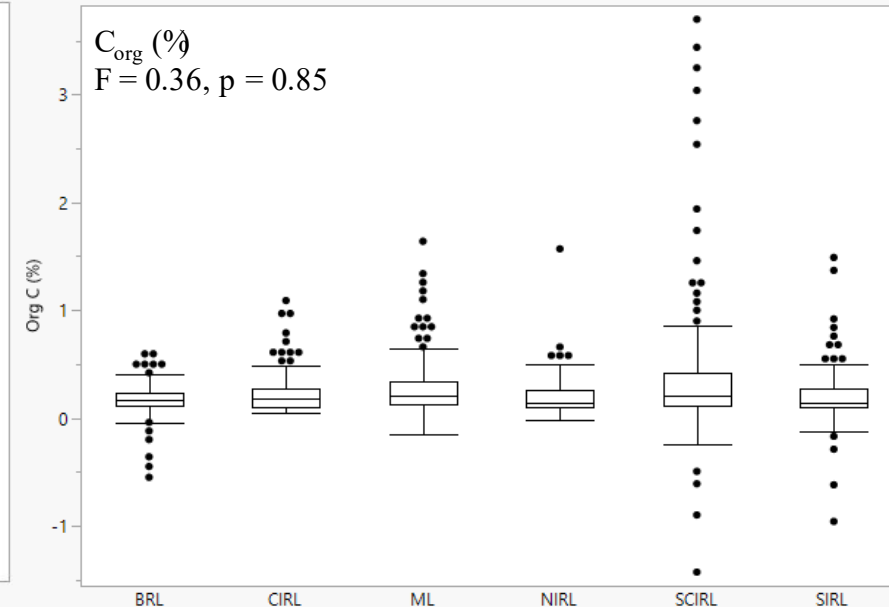
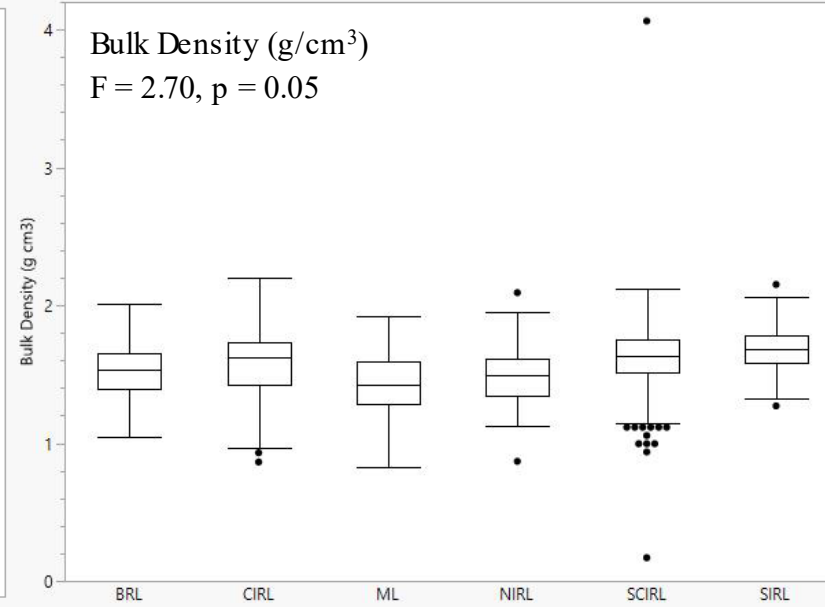
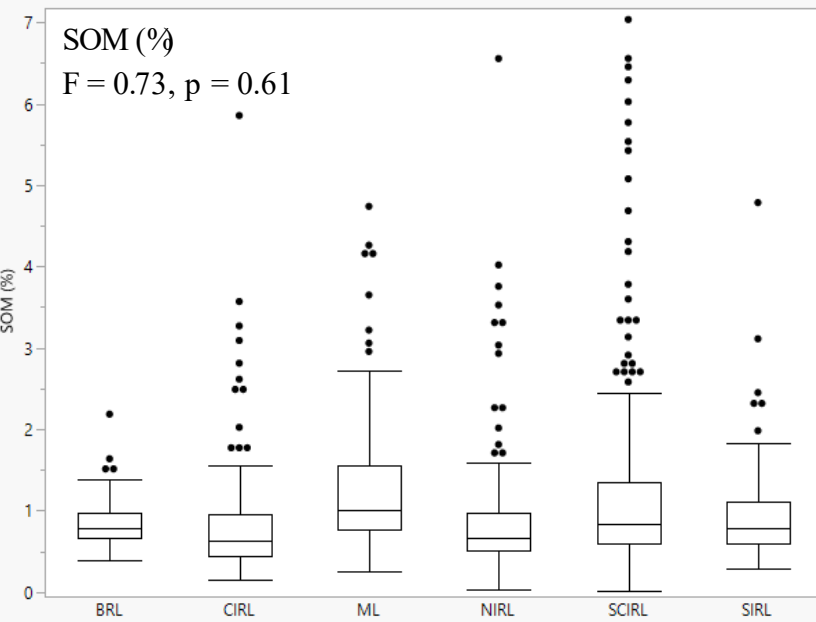
Water Quality



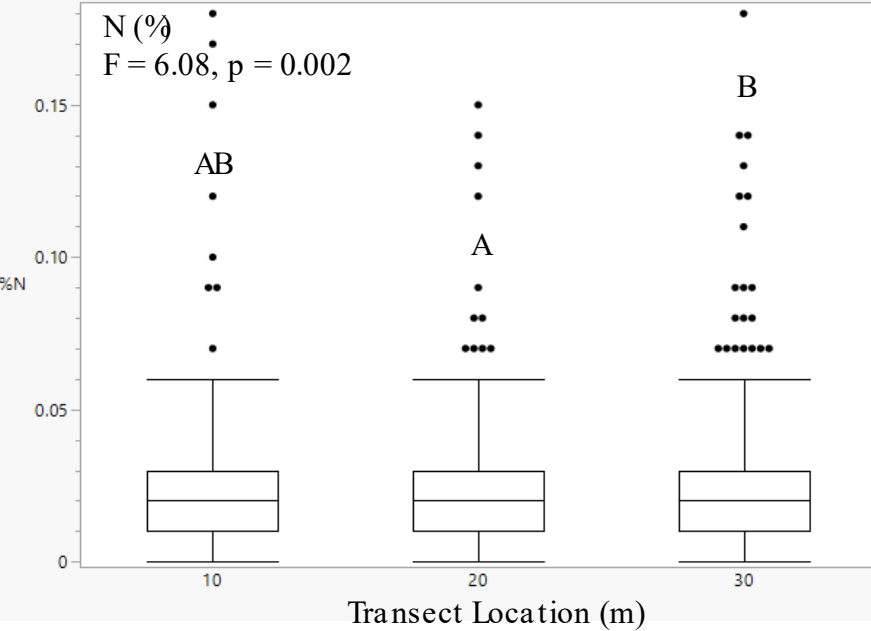
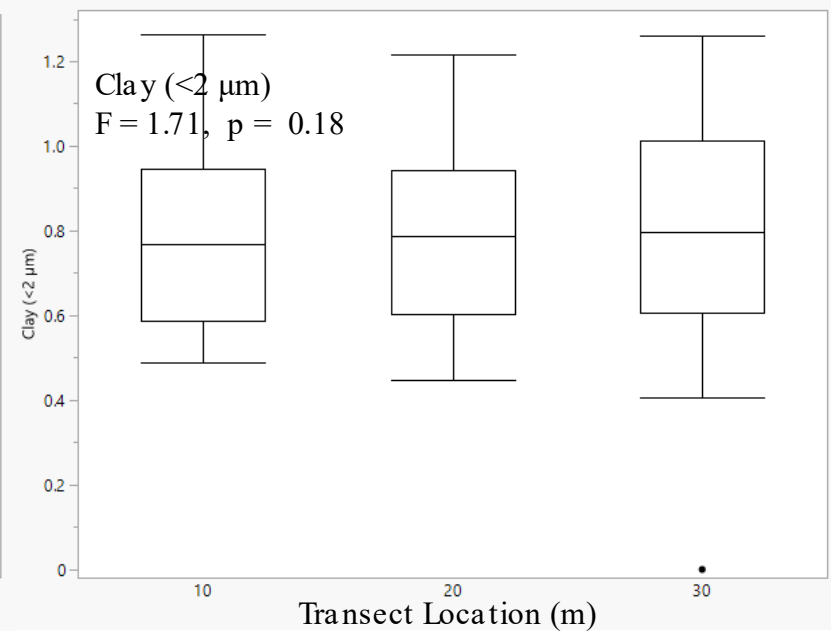
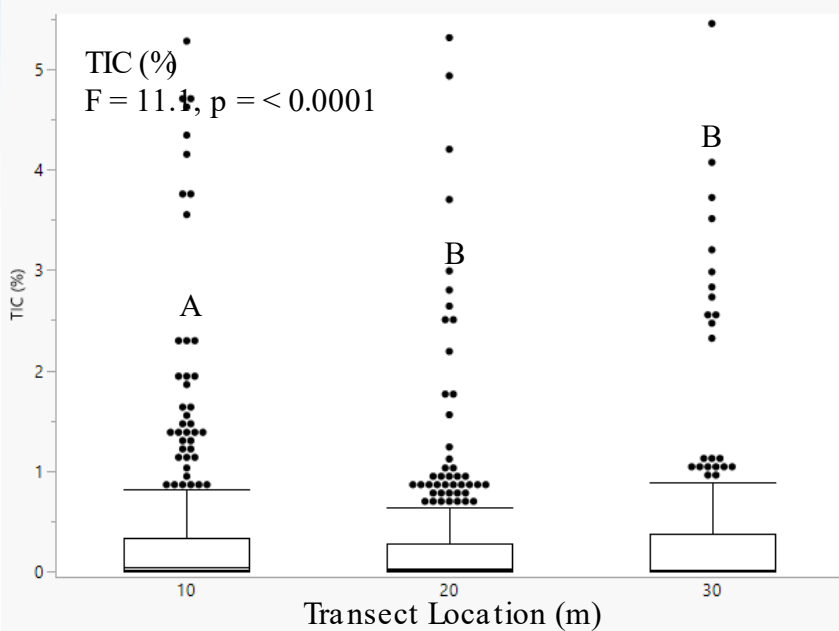
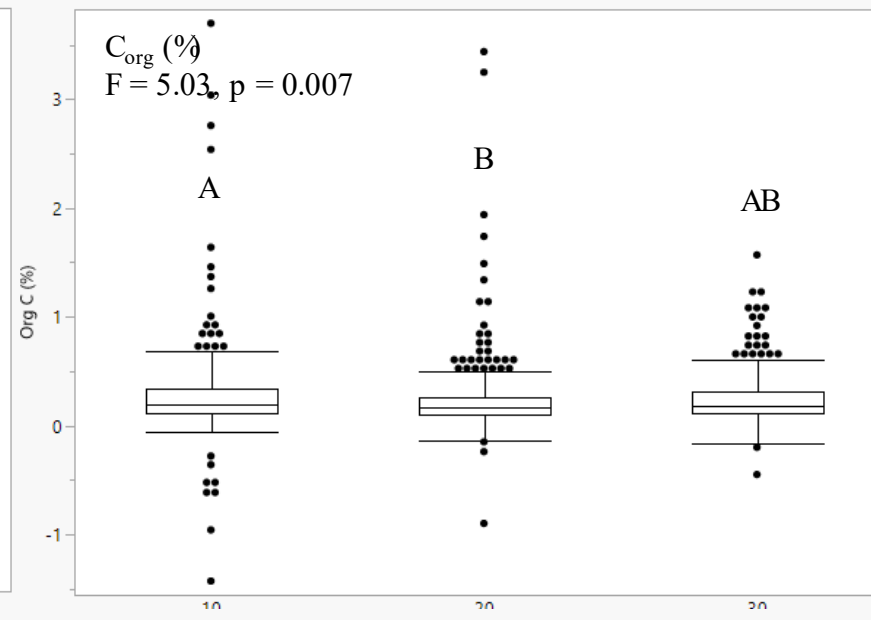
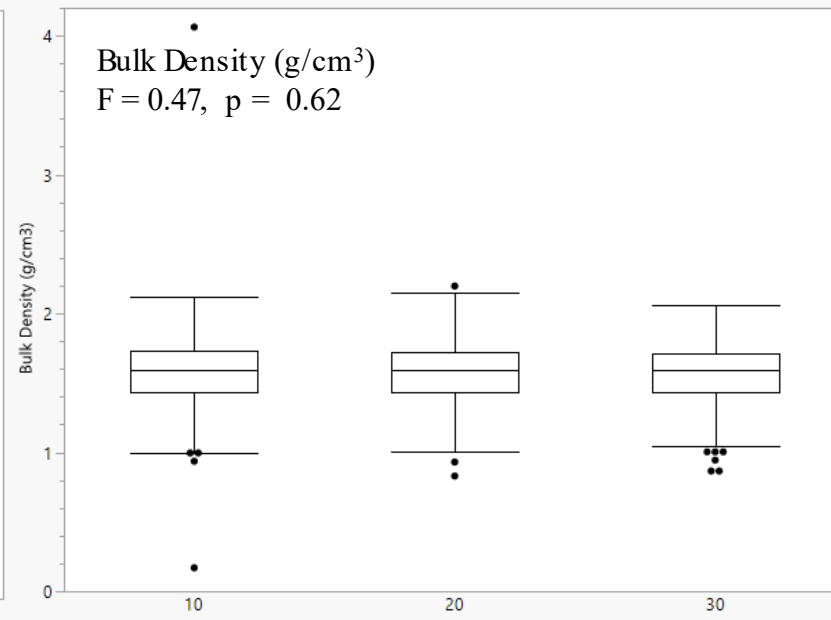
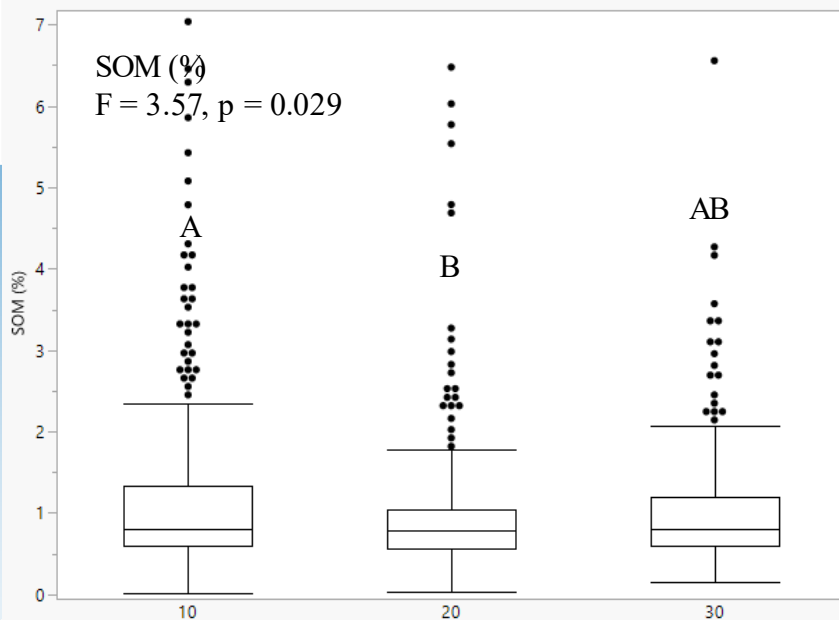
Sediment Porewater Nutrients



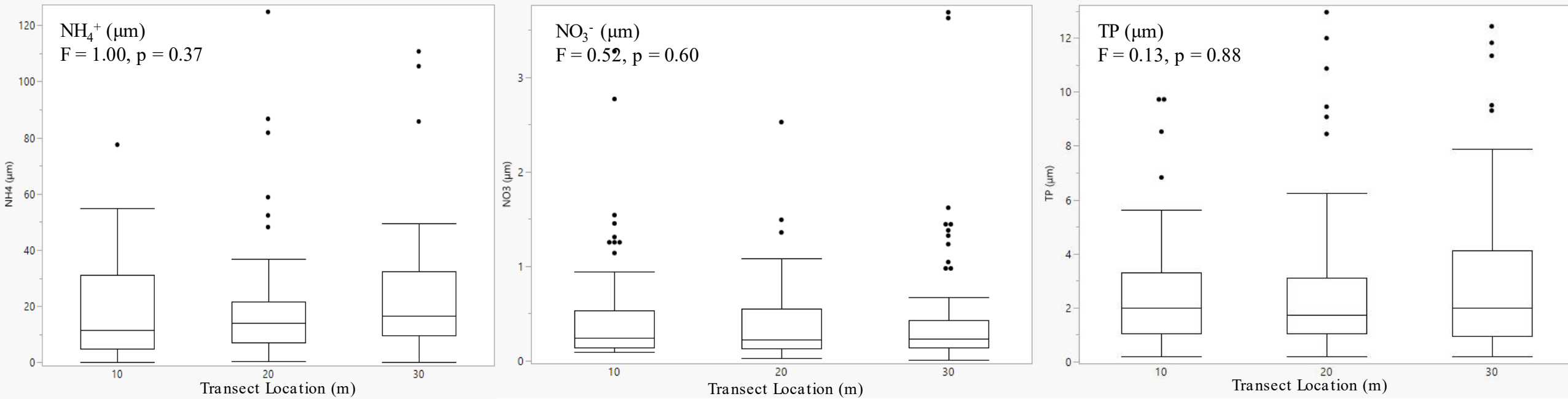
Sediment Characteristics



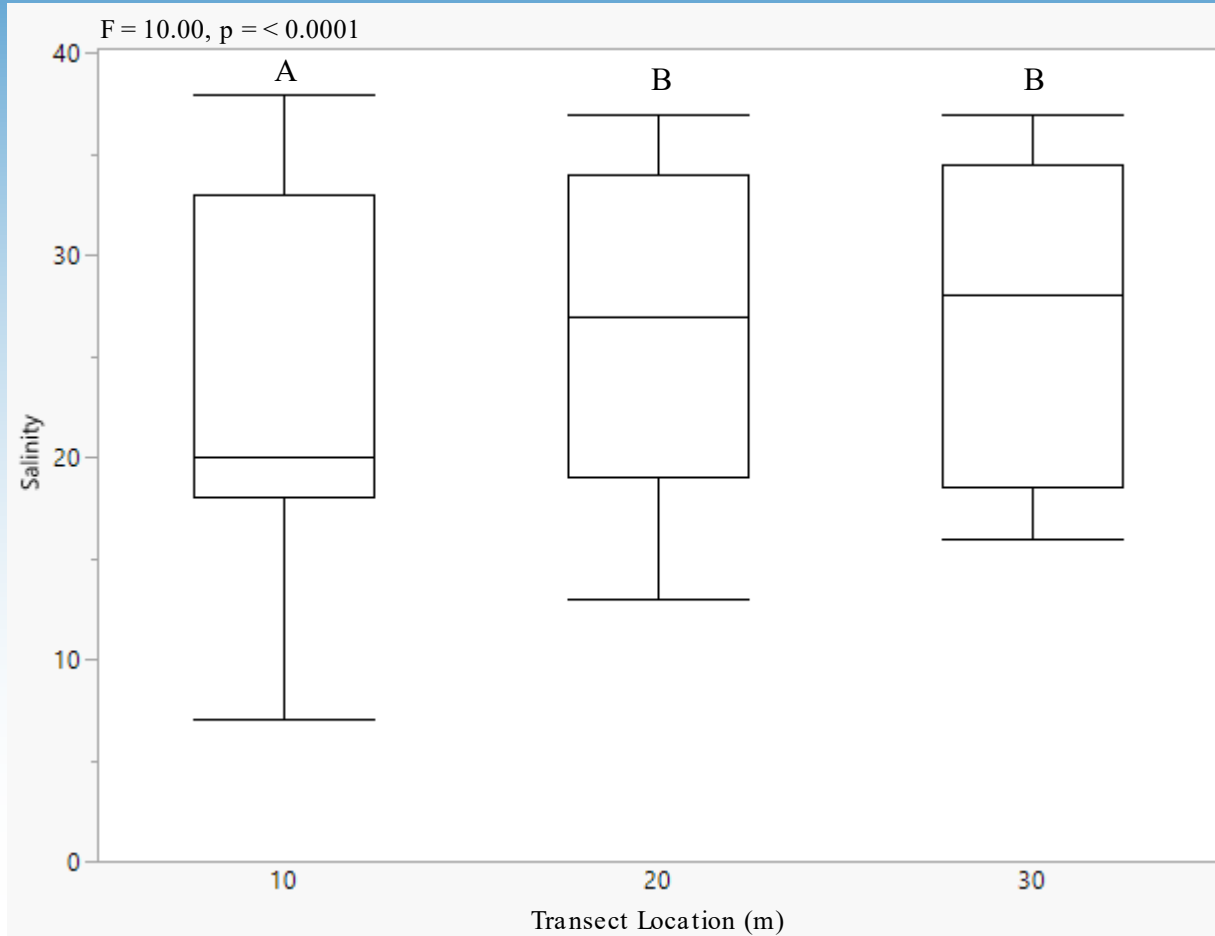
Sediment Characteristics



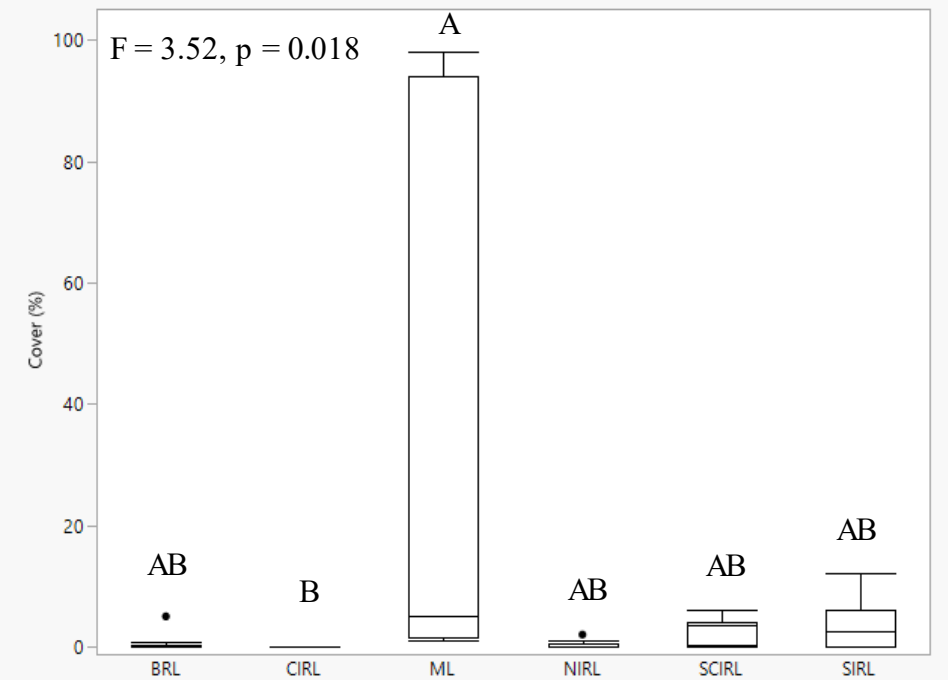
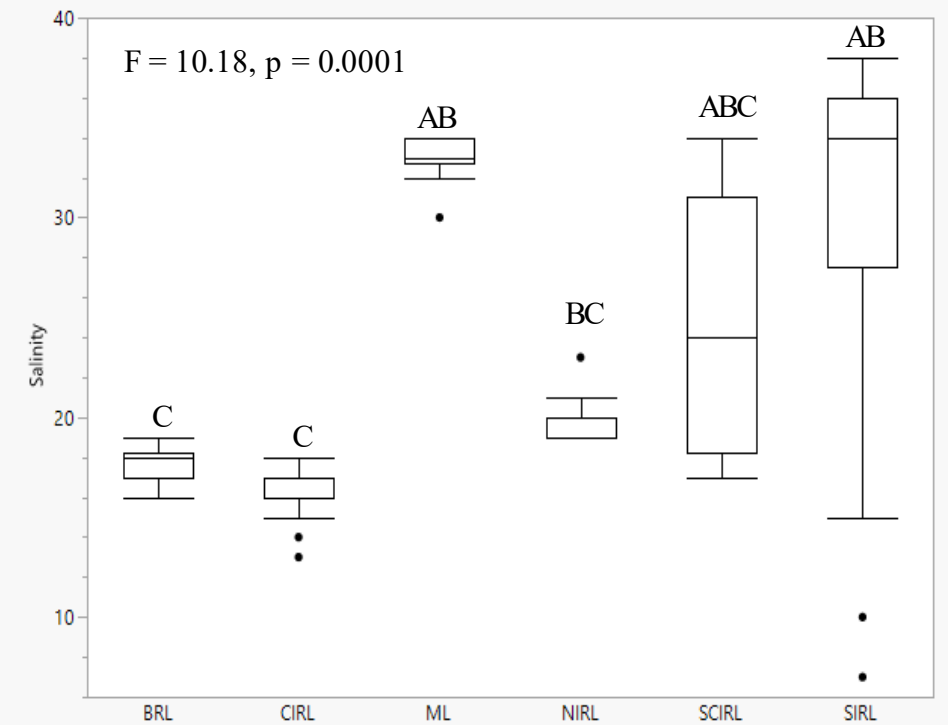
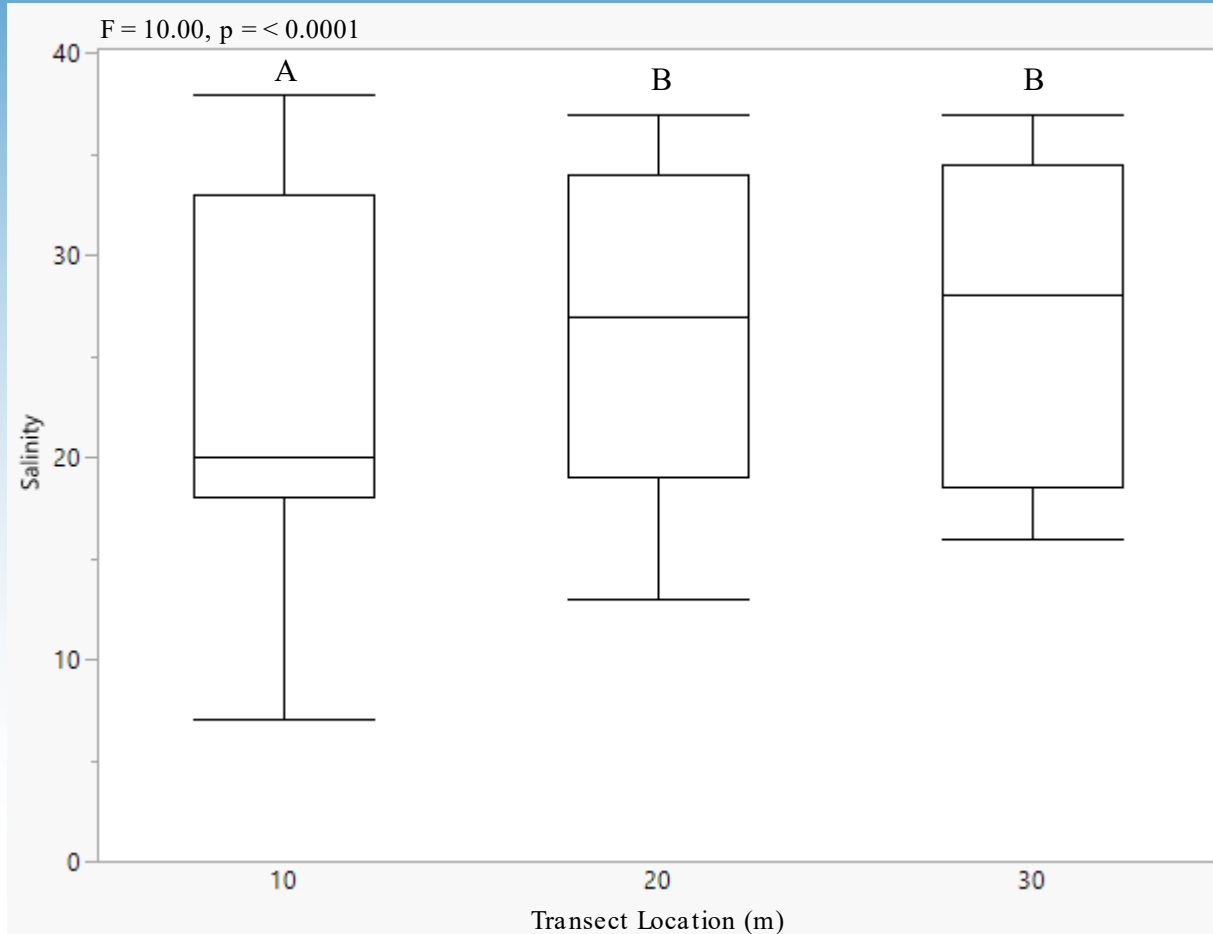
Sediment Porewater Nutrients

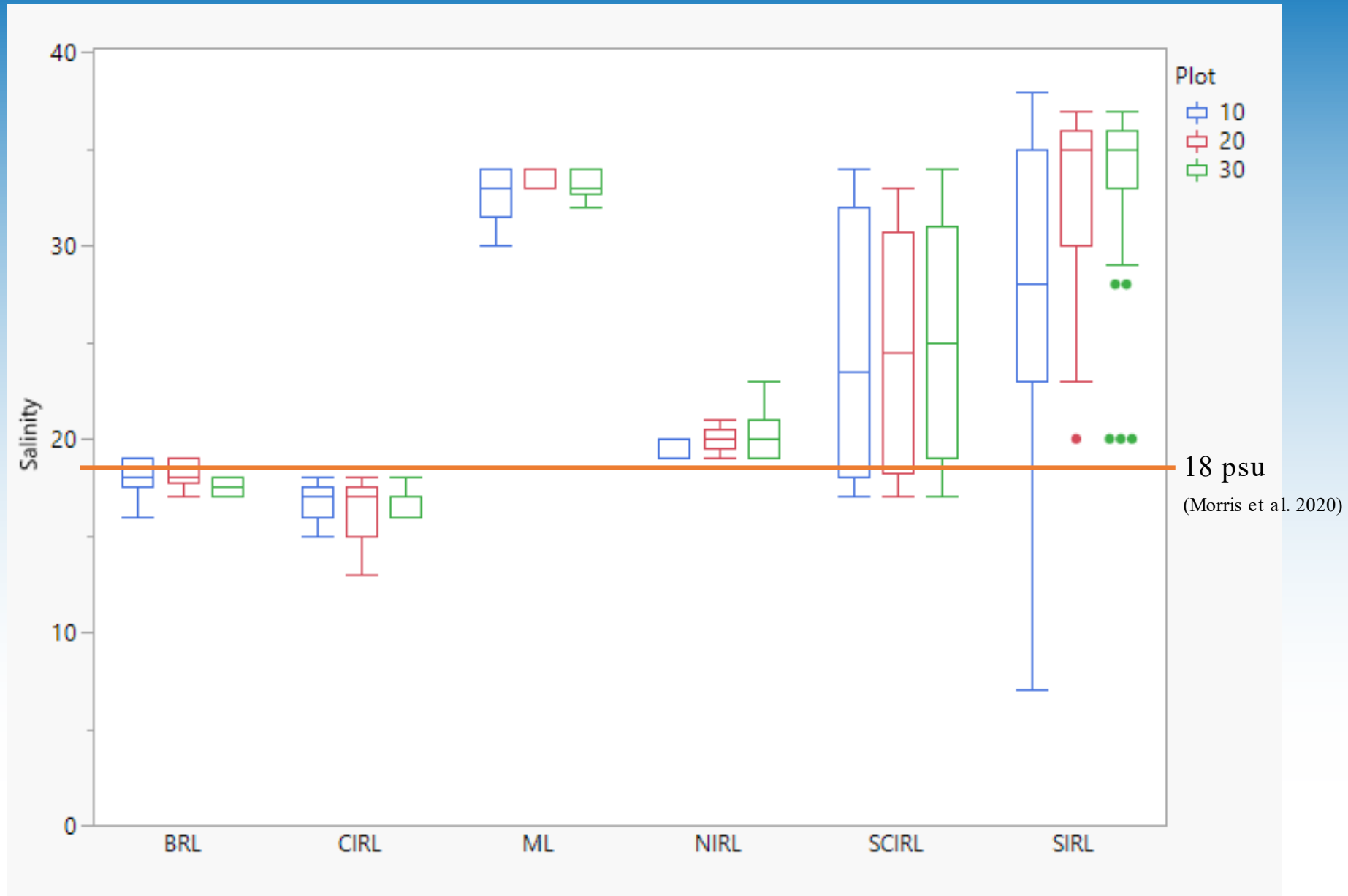


Porewater Salinity



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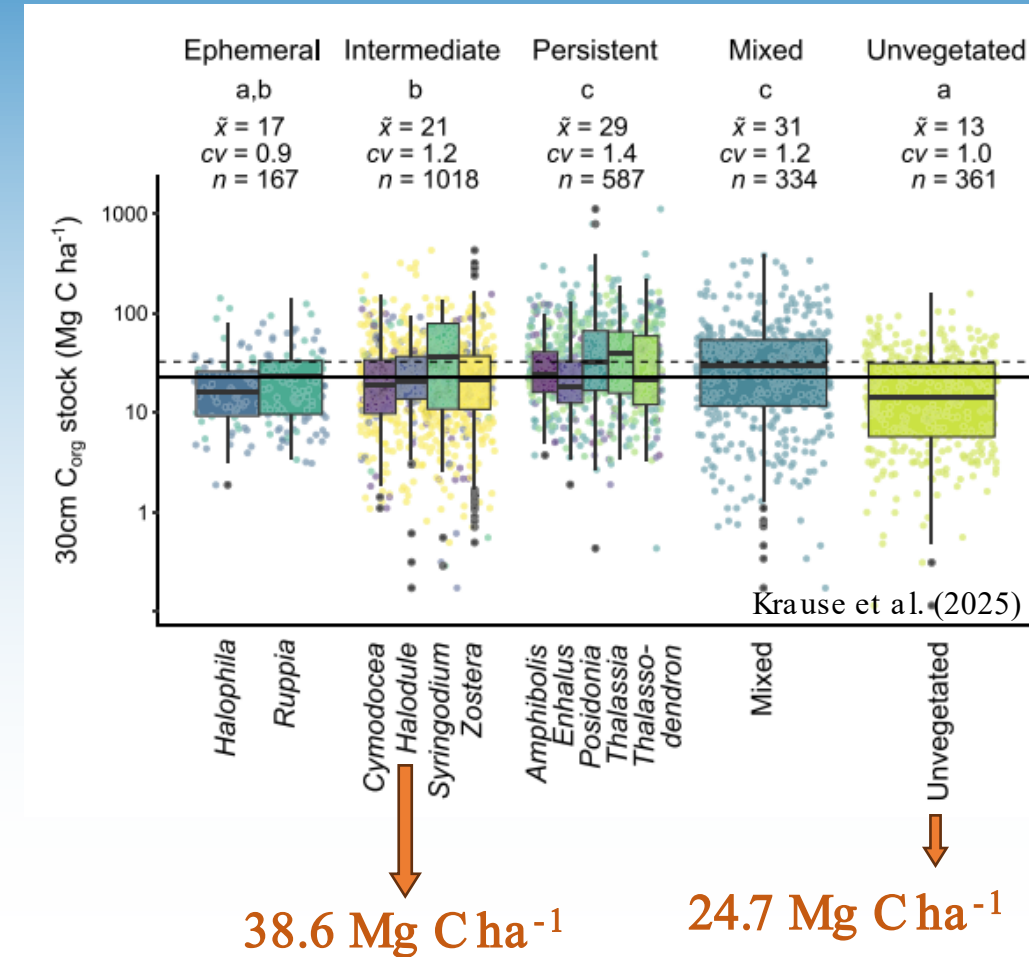




Conclusions + Future Work

Conclusions

- Current mean IRL C stock = $12.72 \text{ Mg C ha}^{-1}$
 - Range: $7.98 - 14.52 \text{ Mg C}_{\text{org}} \text{ ha}^{-1}$
- *Significant spatial and temporal variability* in sediment and porewater characteristics across sublaagoons
 - Significant differences in porewater salinity were observed across sublaagoons and plots
 - Sediment characteristics, including organic matter content and bulk density, varied significantly across plots
 - Nutrient concentrations in porewater, particularly NH_4^+ and NO_3^- , varied across plots



Conclusions + Future Work

Future Work

- Fine-Scale Monitoring of Porewater Salinity
 - Seed bank analysis + germination studies
- Quantifying Sediment Stability
- Subregional Restoration Planning



Questions?



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