Current research findings for GA marsh accretion, long-term health, and SLR

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Coastal Advisory Council
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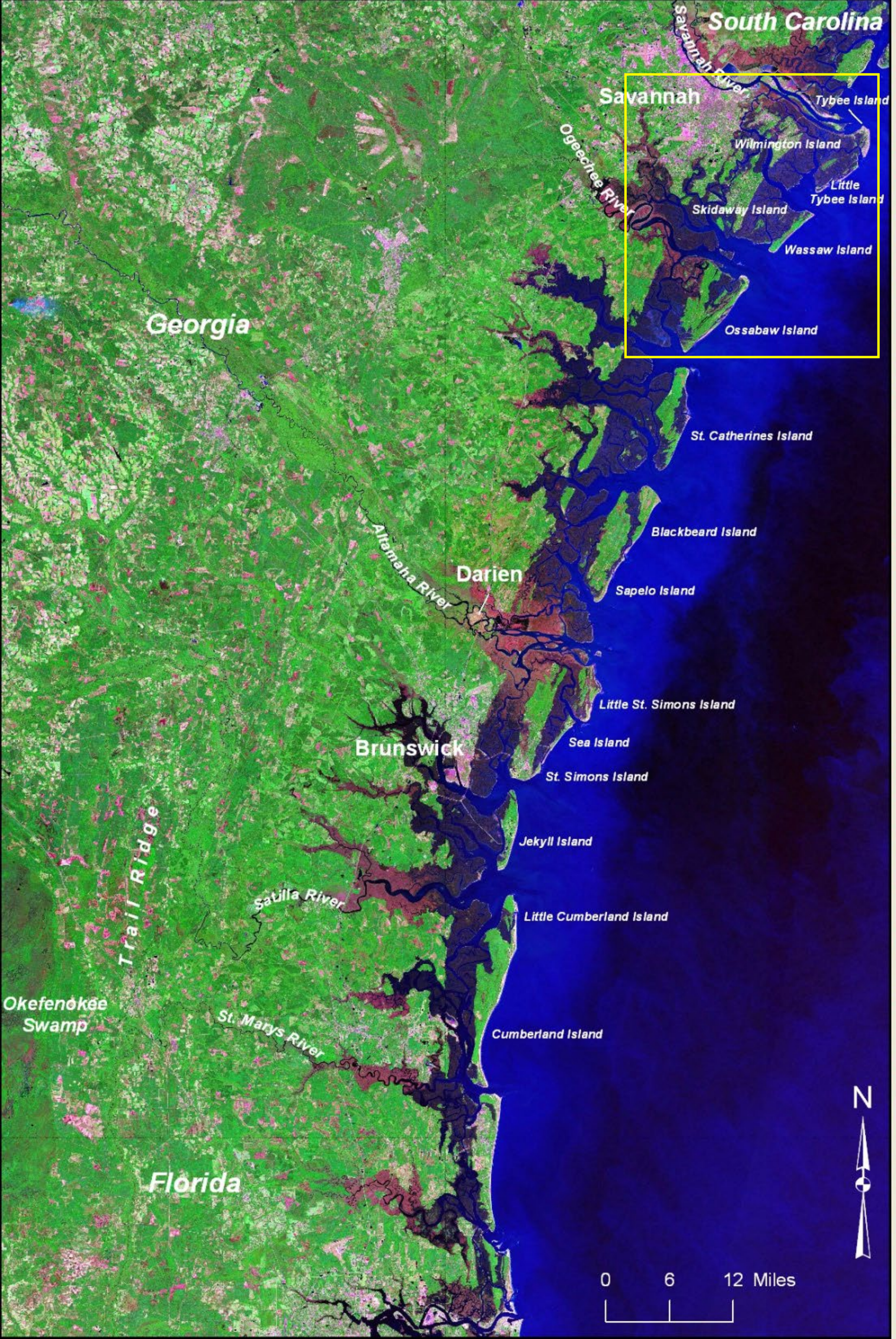
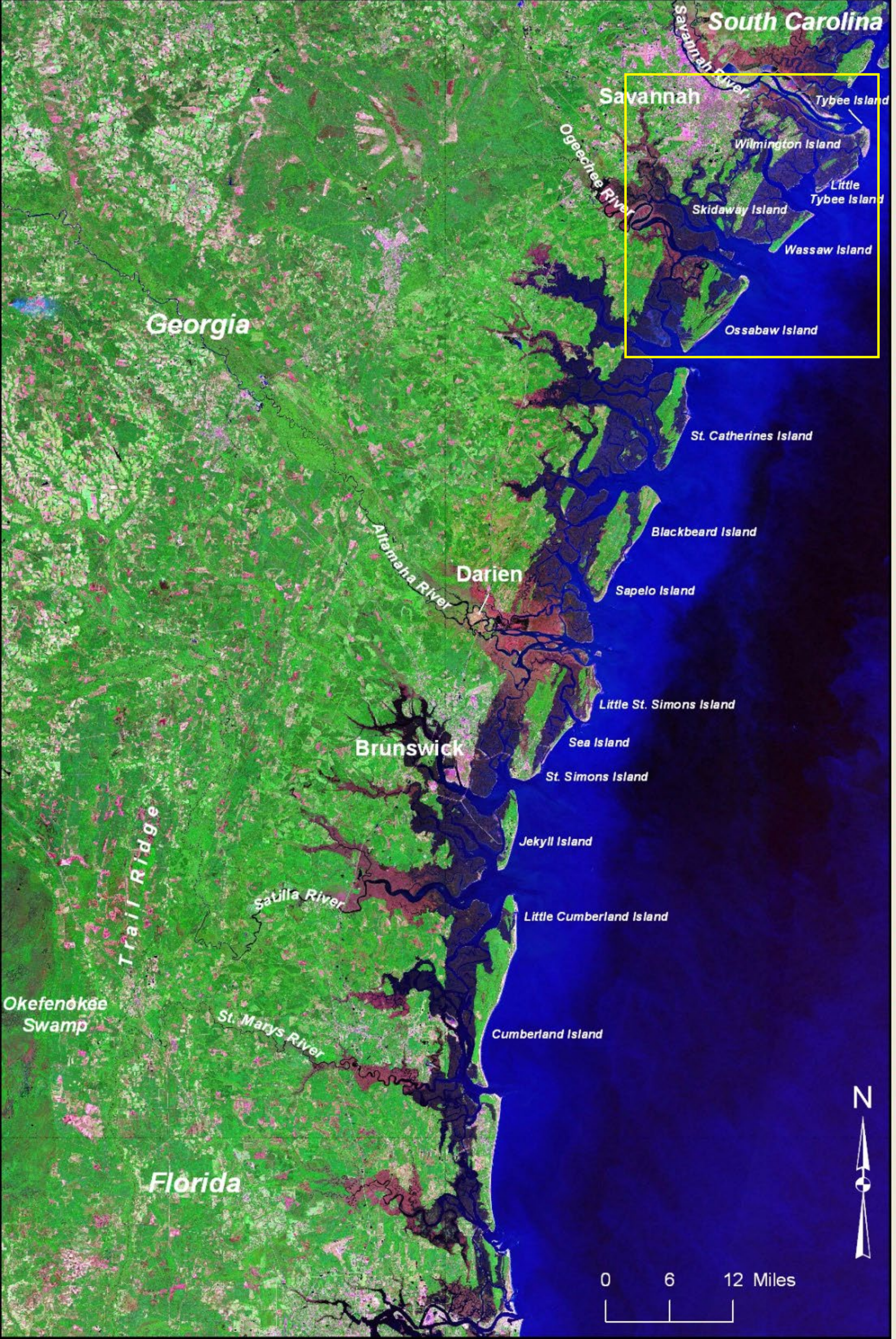
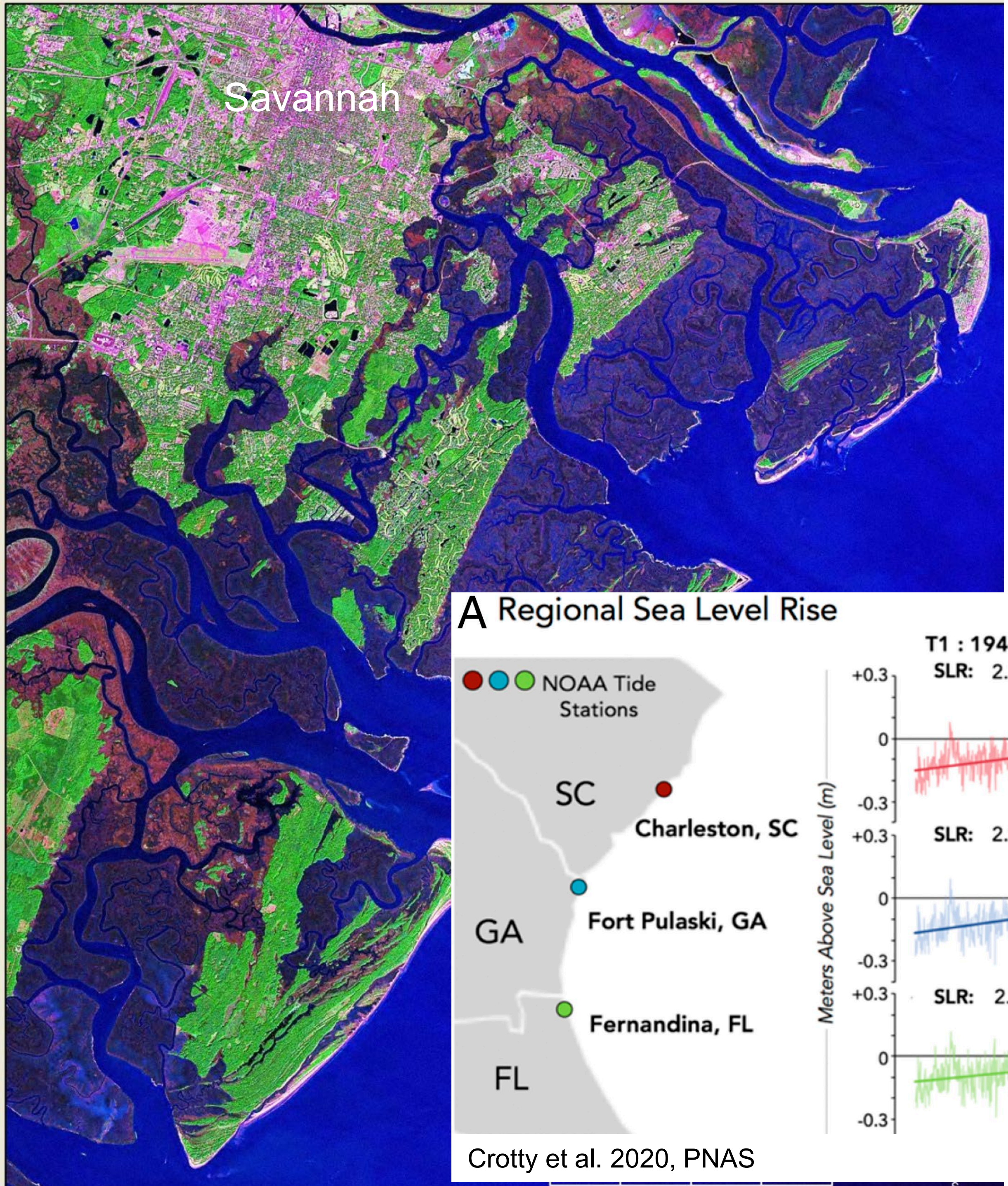


- 3-m tidal range
- High suspended sediment concentrations
- Extensive marshes
- Dynamic channel networks
- 3.5 mm/y sea level rise

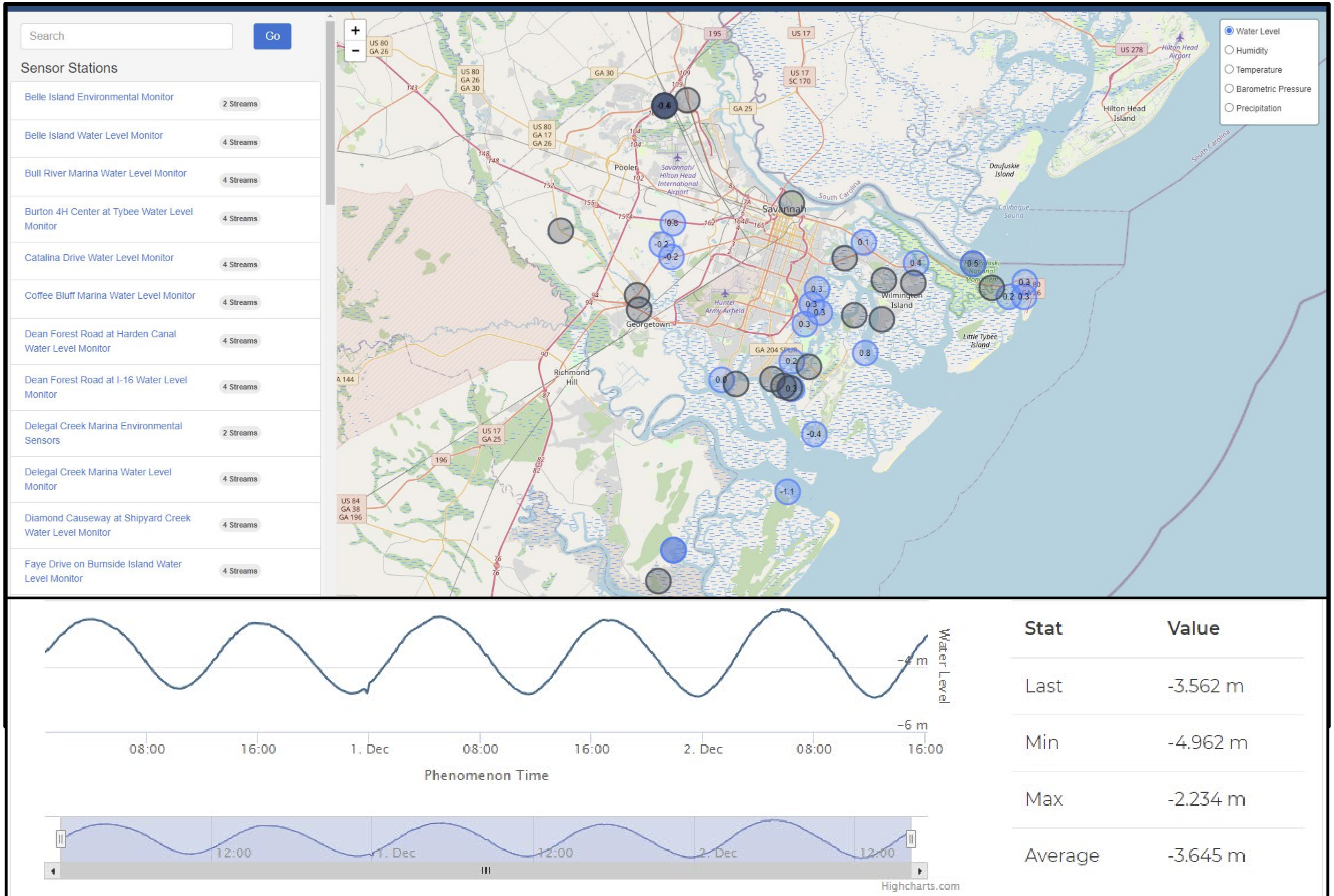


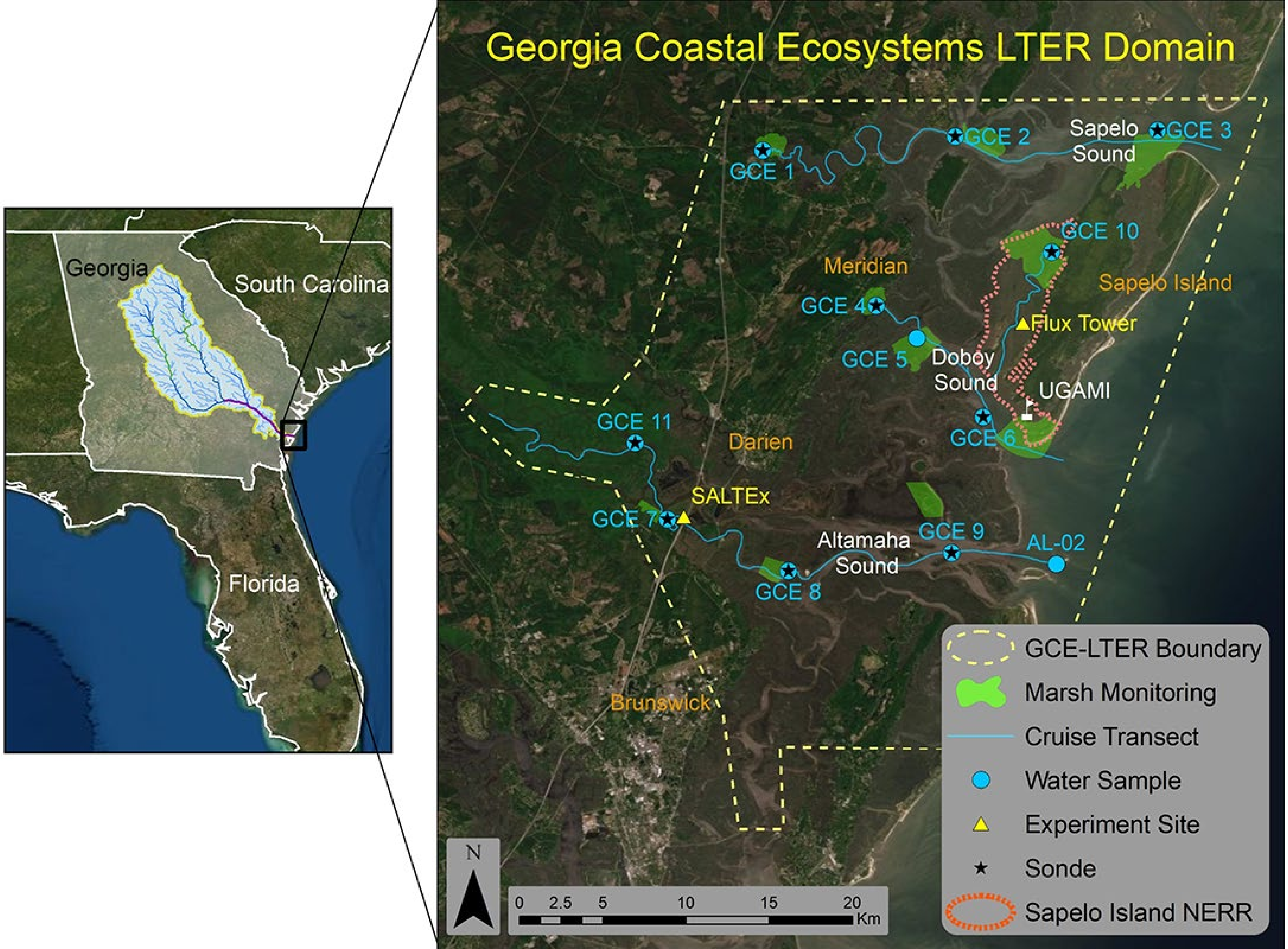


- 3-m tidal range
- High suspended sediment concentrations
- Extensive marshes
- Dynamic channel networks

Crotty et al. 2020, PNAS

Hyperlocal Sea Level Rise Monitoring – GaTech (Russ Clark)





The GCE-LTER is an ongoing project started in 2000.

Ongoing Fall monitoring

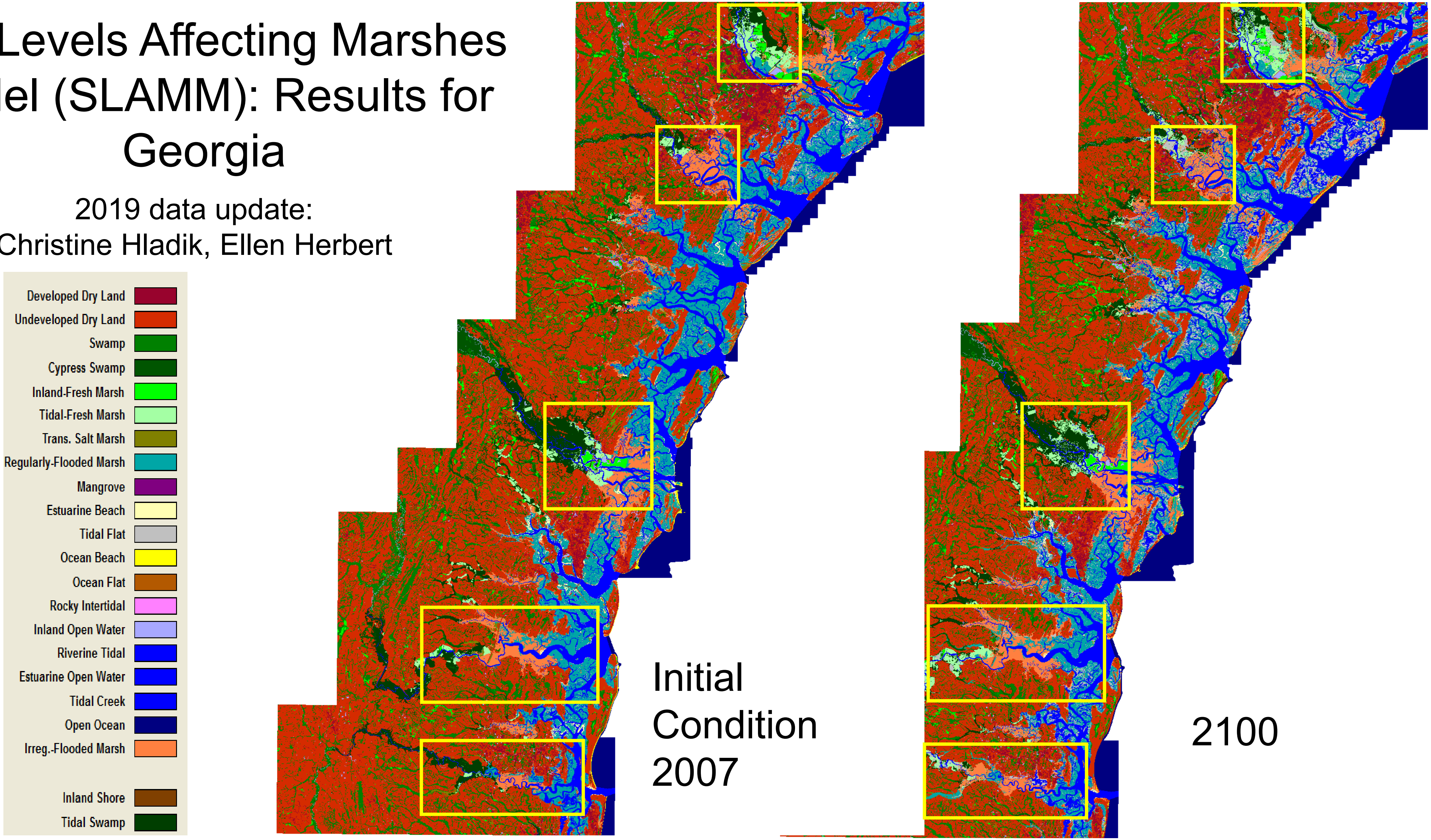
- external drivers of change
- long-term pattern in the estuary and marsh
- Process studies

GCE 4 – disturbance

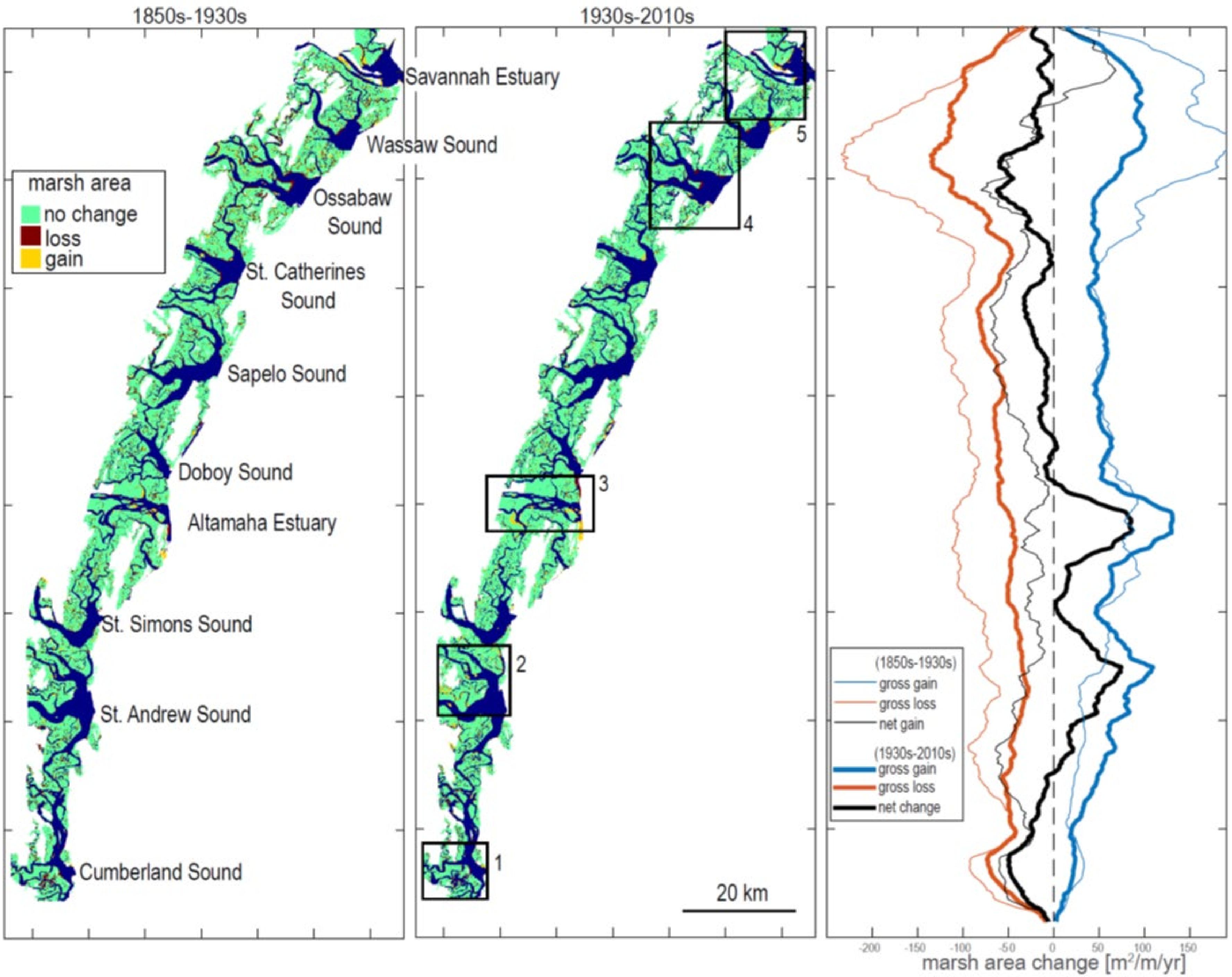
- Wrack
- Snails
- Slumping
- hogs

Sea Levels Affecting Marshes Model (SLAMM): Results for Georgia

2019 data update:
Christine Hladik, Ellen Herbert

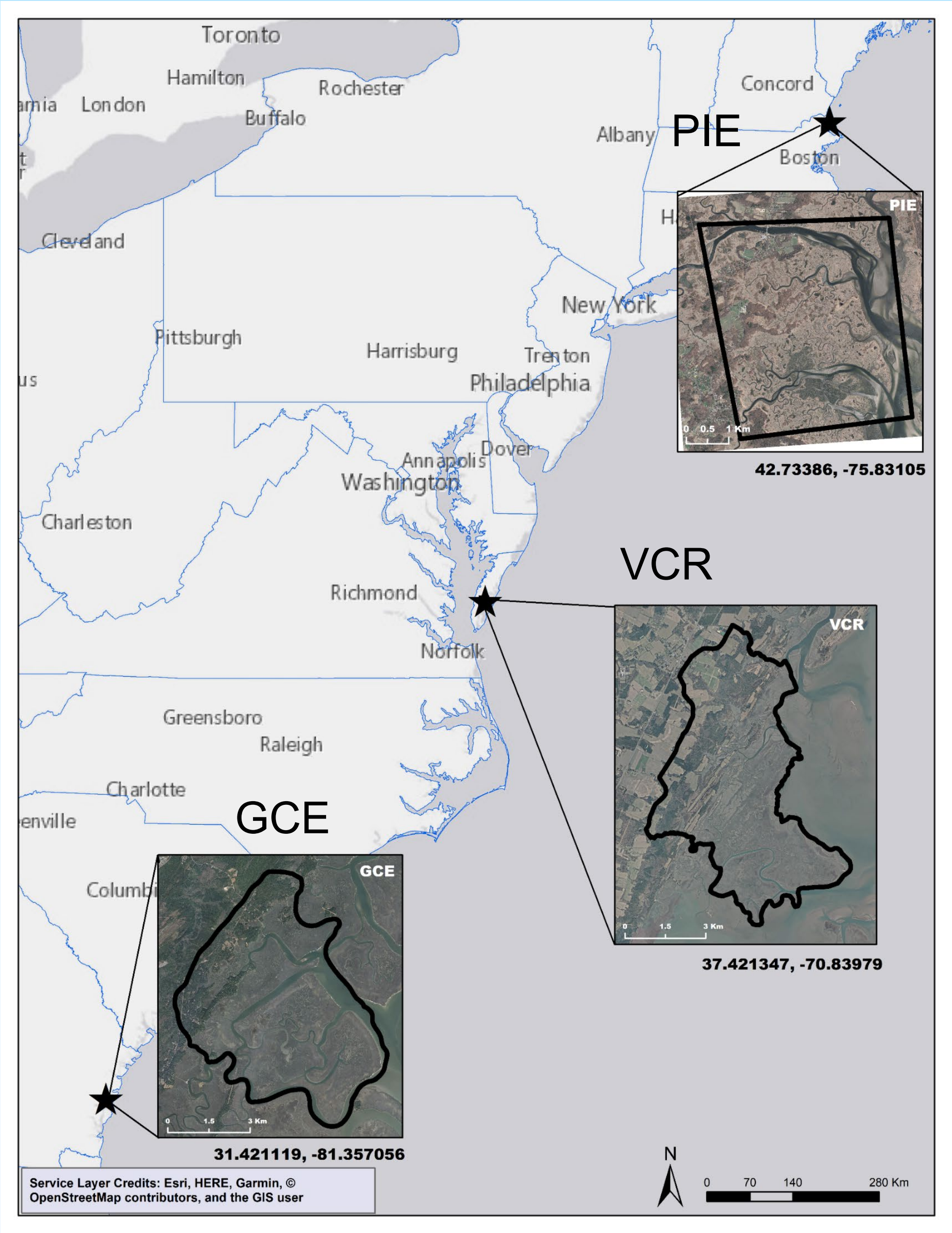


General Marsh Area Loss, Except near Major Rivers



- Large gross change ($\leq 200\ m^2\ m^{-1}\ y^{-1}$) but smaller net change (-50 to $50\ m^2\ m^{-1}\ y^{-1}$) over decades
- 1850s-1930s: Net marsh loss in most areas, except Savannah Estuary
- 1930s-2010s: Net loss in Savannah, but gain in Altamaha River, and St. Simons and St. Andrew Sounds

Mariotti, Alexander and Spivak, in review



Hindcasting and Forecasting Marsh Extent

Journal of Coastal Research	37	2	291–301	Coconut Creek, Florida	March 2021

Assessing Long-Term Trends in Lateral Salt-Marsh Shoreline Change along a U.S. East Coast Latitudinal Gradient

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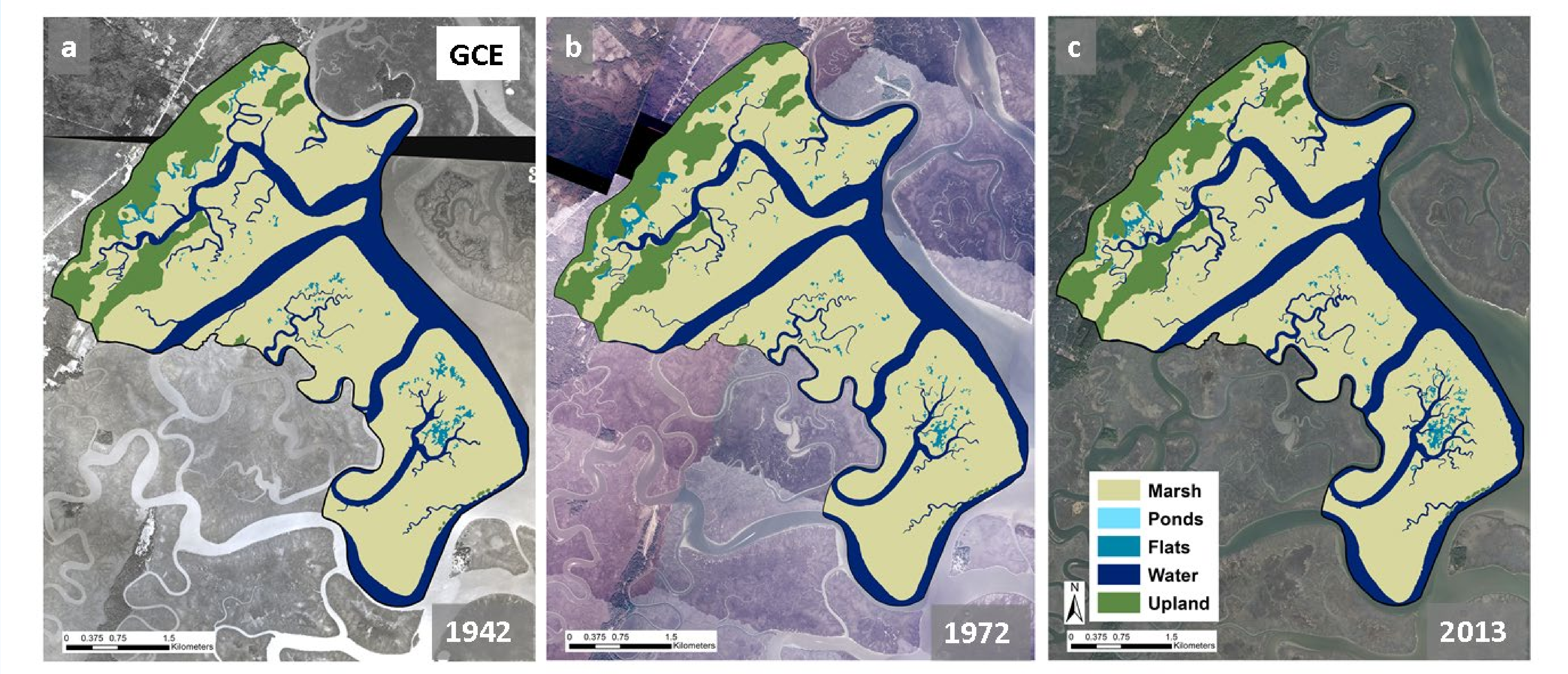
Historical Changes in the Vegetated Area of Salt Marshes

Christine J. Burns[1,2] · Merryl Alber[1] · Clark R. Alexander[1,2]

Shoreline Change Results

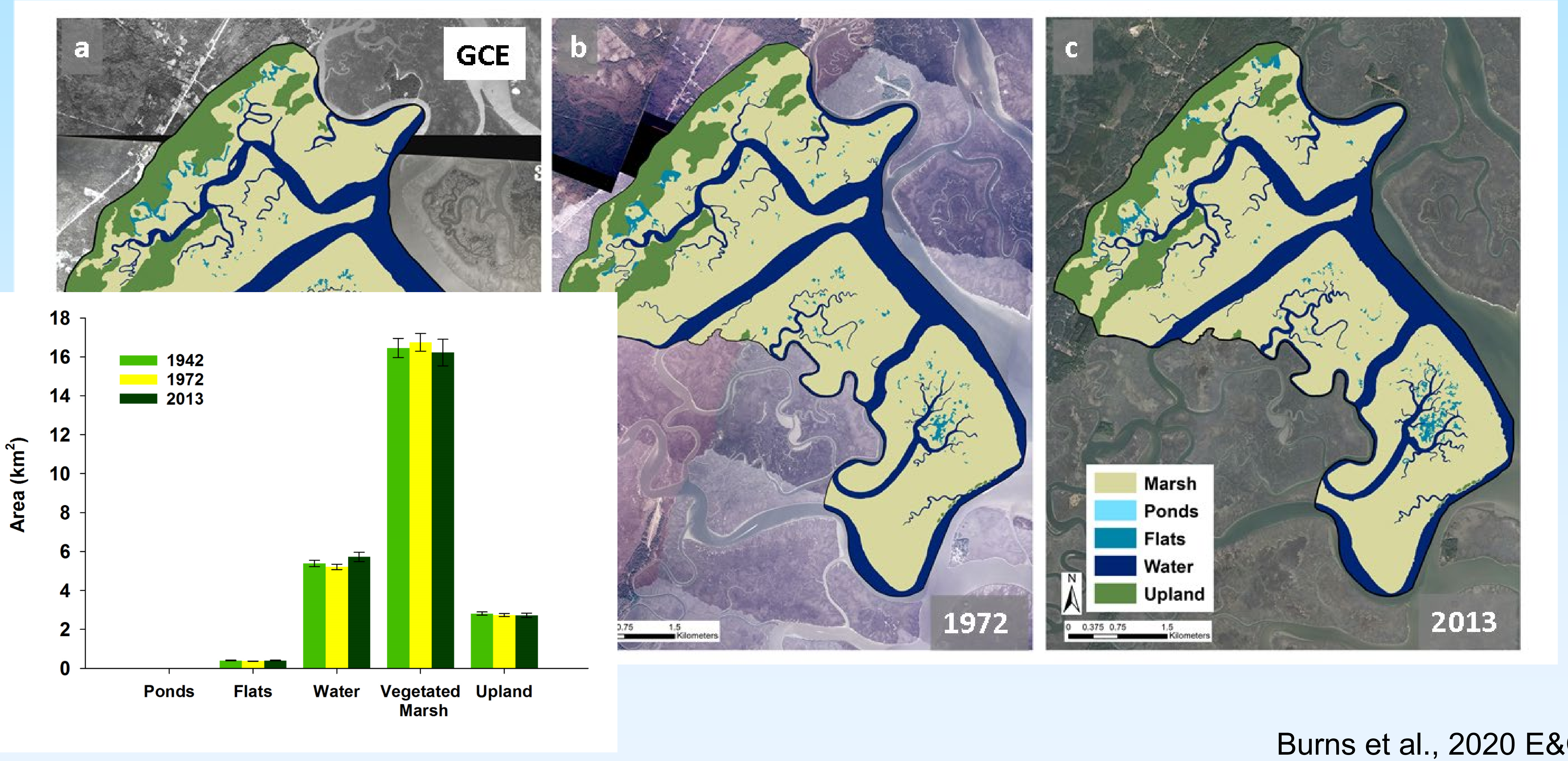
	Number of transects	Percent Erosional	Percent Accretional	Max Erosion Rate (m yr $^{-1}$)	Max Accretion Rate (m yr $^{-1}$)	Mean Rate of Change (EPR) (m yr $^{-1}$)	Error (m yr $^{-1}$)
GCE	2,017	50	50	-1.07	+3.08	+0.03	±0.08
VCR	1,585	48	52	-2.21	+3.62	+0.04	±0.06
PIE	1,397	74	26	-1.25	+1.81	-0.07	±0.06

Salt marsh features



Burns et al., 2020 E&C

Salt marsh features



Burns et al., 2020 E&C

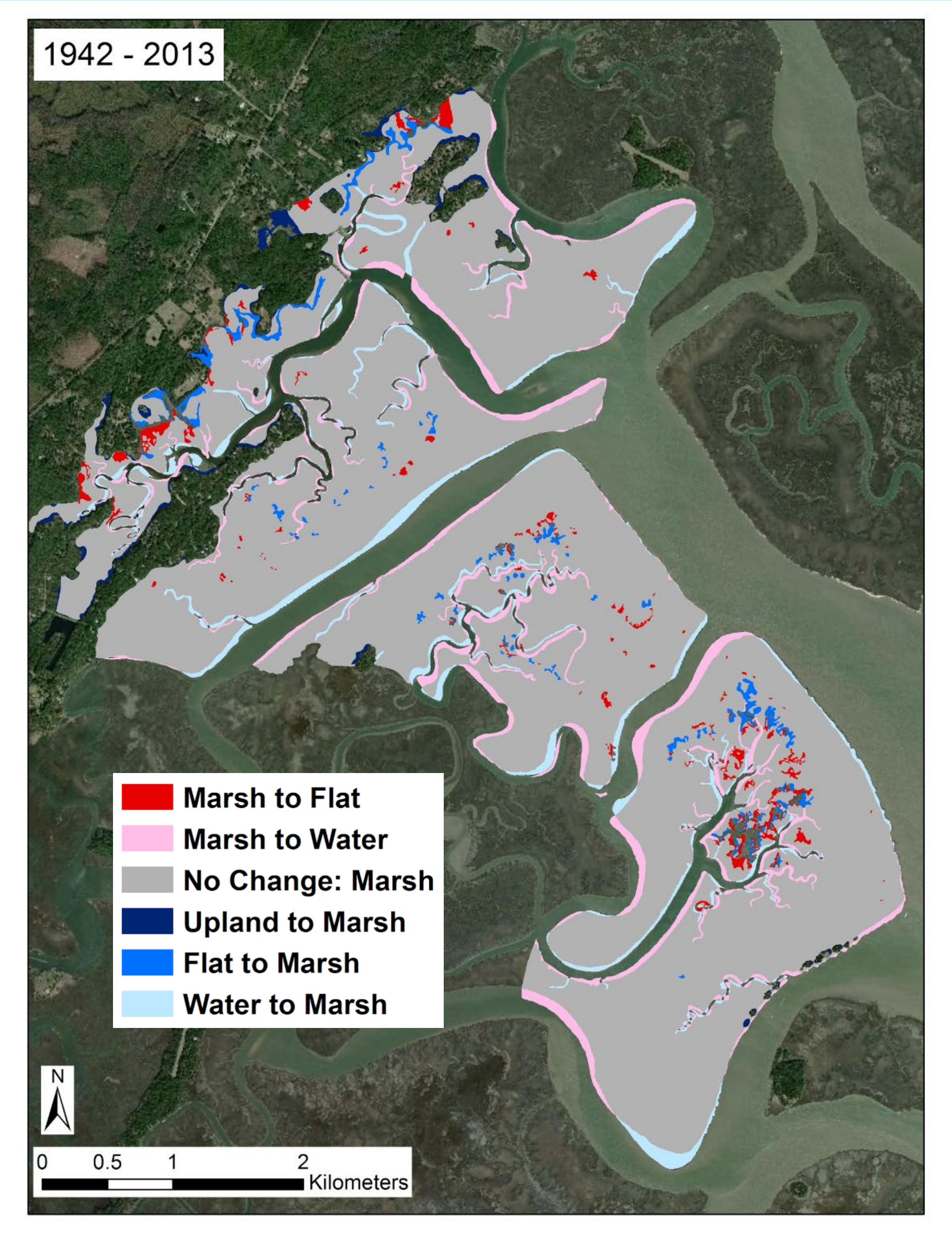
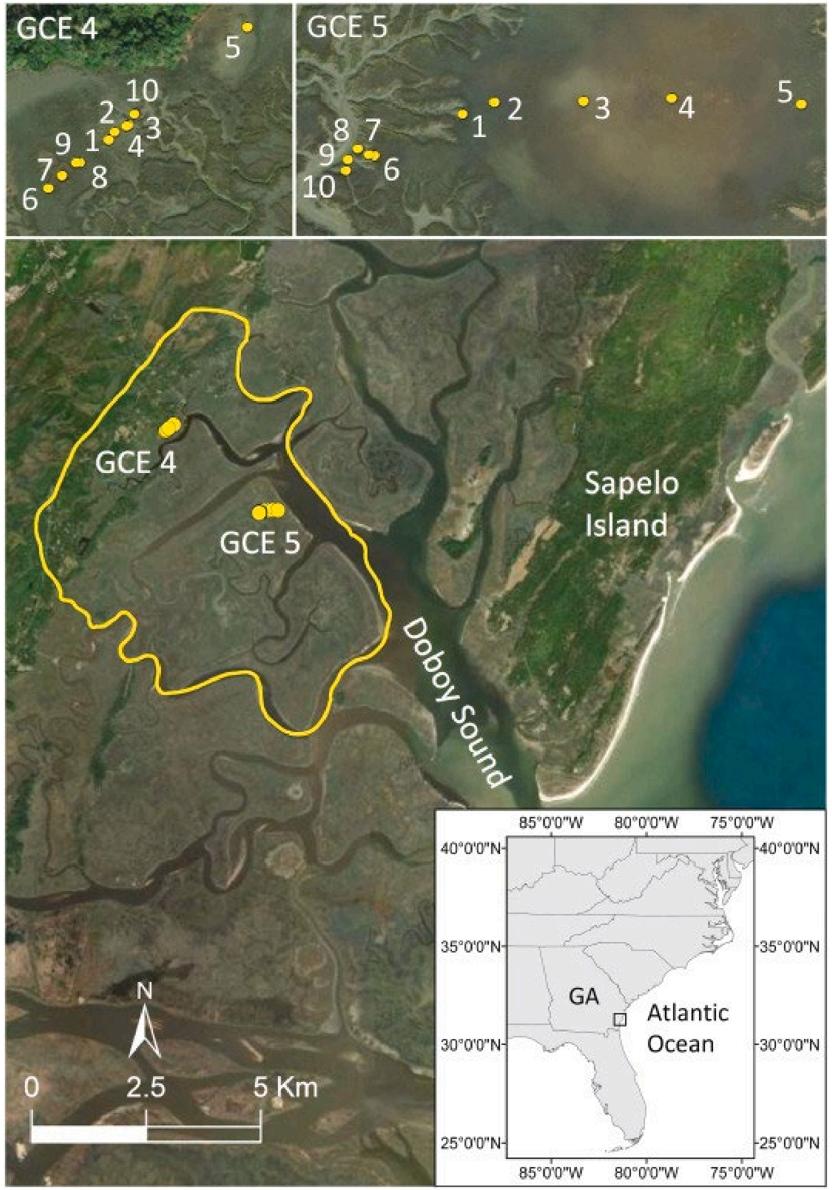


Image subtraction (GCE)

Change		1942 - 2013
Vegetated marsh losses	Conversion to flats	-0.25 km^2
	Channel widening and extension	-1.15 km^2
	Open fetch marsh loss	-0.03 km^2
Vegetated marsh gains	Migration onto upland	+0.17 km^2
	Colonization of flats	+0.28 km^2
	Colonization of channel edge	+0.83 km^2
	Colonization of open fetch marsh	+0.04 km^2
Net change in vegetated marsh		**-0.23 km^2**

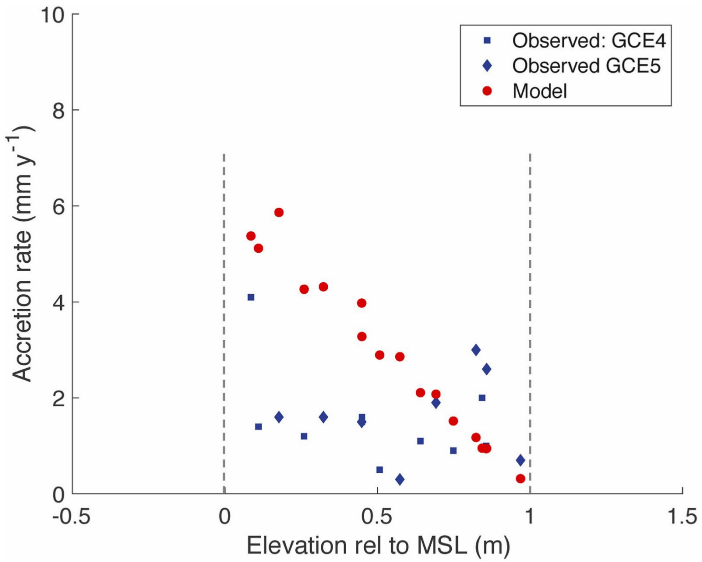


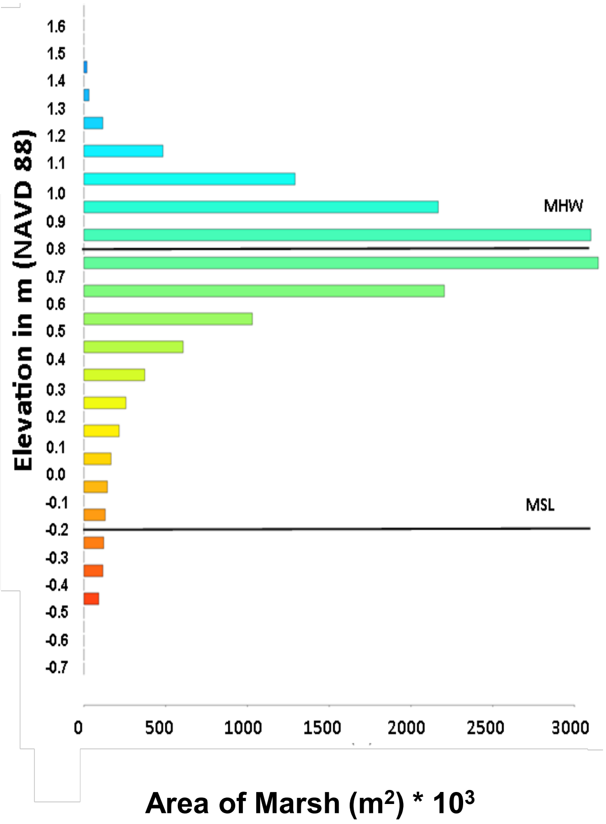
Estuarine, Coastal and Shelf Science
Available online 17 November 2020, 107093
In Press, Corrected Proof

Beyond 2100: Elevation capital disguises salt marsh vulnerability to sea-level rise in Georgia, USA

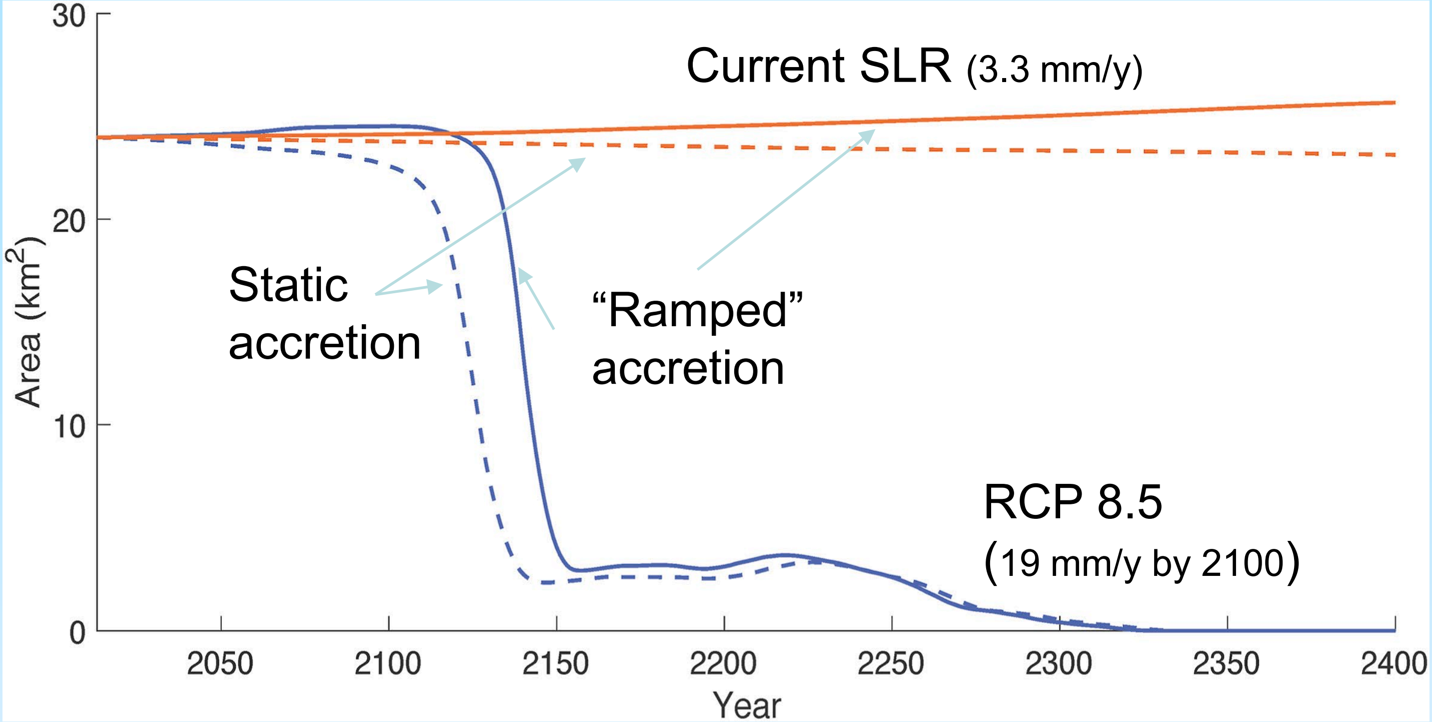
Amy K. Langston [a], Clark R. Alexander [b, c], Merryl Alber [c], Matthew L. Kirwan [a]

- Sediment-rich salt marsh with room to migrate is still vulnerable to drowning.
- Marsh appears stable through 2100 because it relies on elevation capital.
- Elevation capital does not remove long-term threat of marsh drowning beyond 2100.
- Studies should look beyond 2100 to capture long-term marsh vulnerability to SLR.

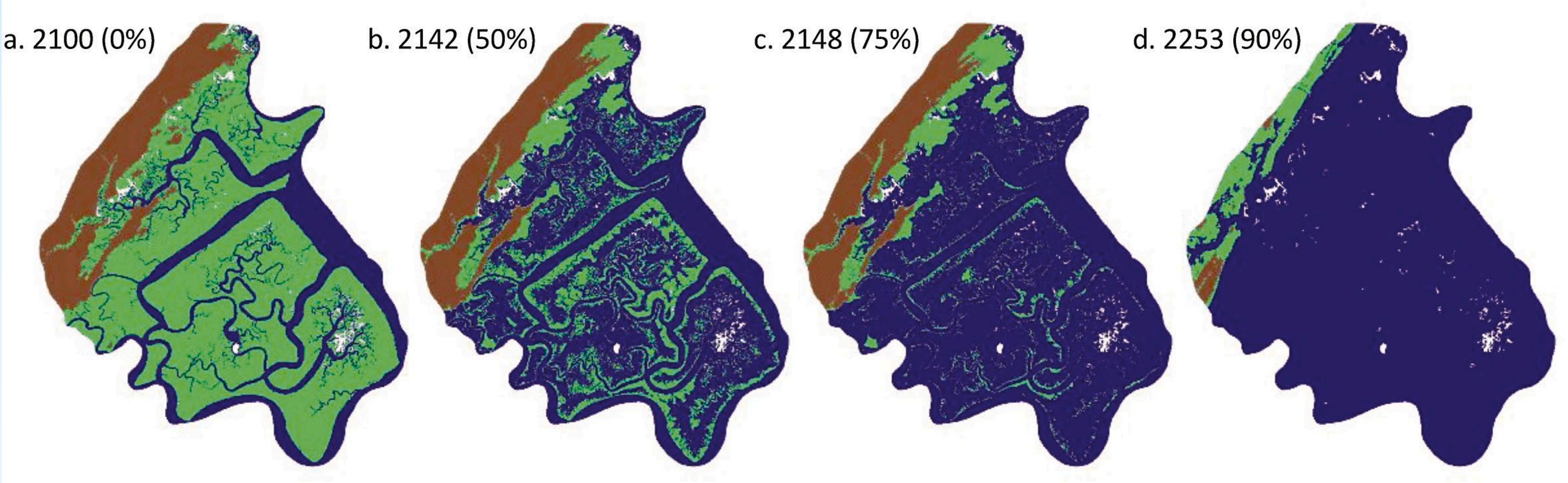


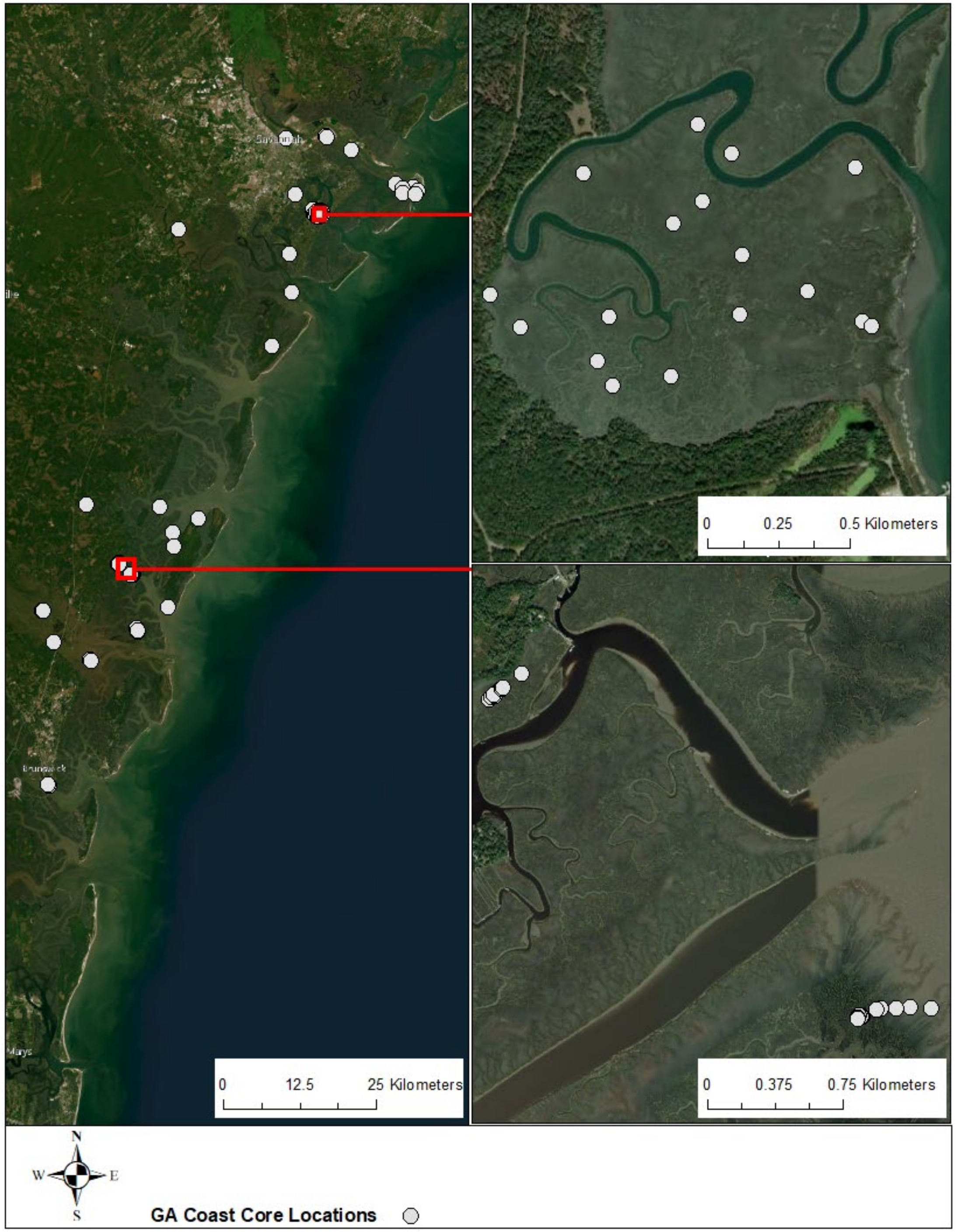


Forecast Model Results



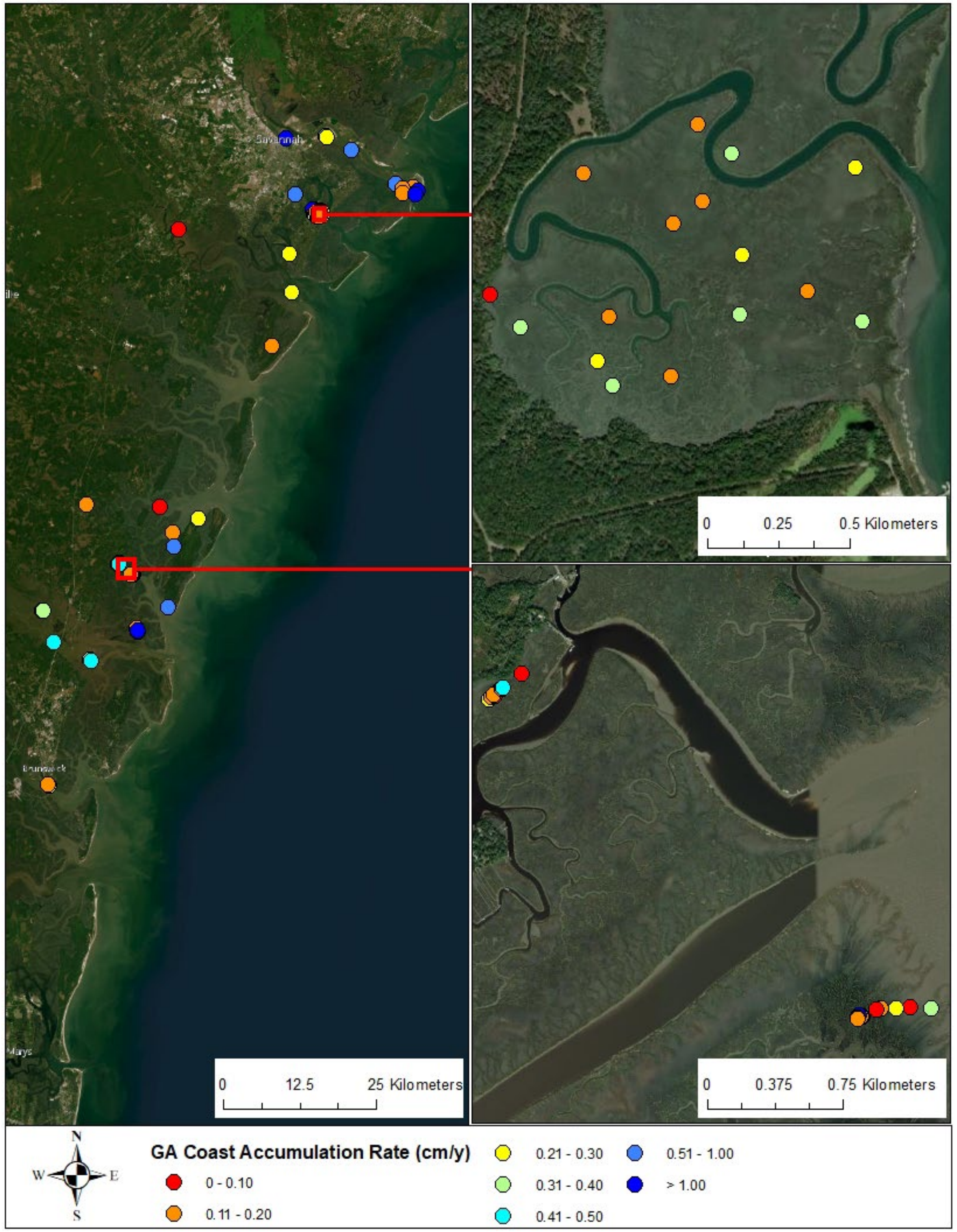
Marsh loss under RCP 8.5 and ramped accretion



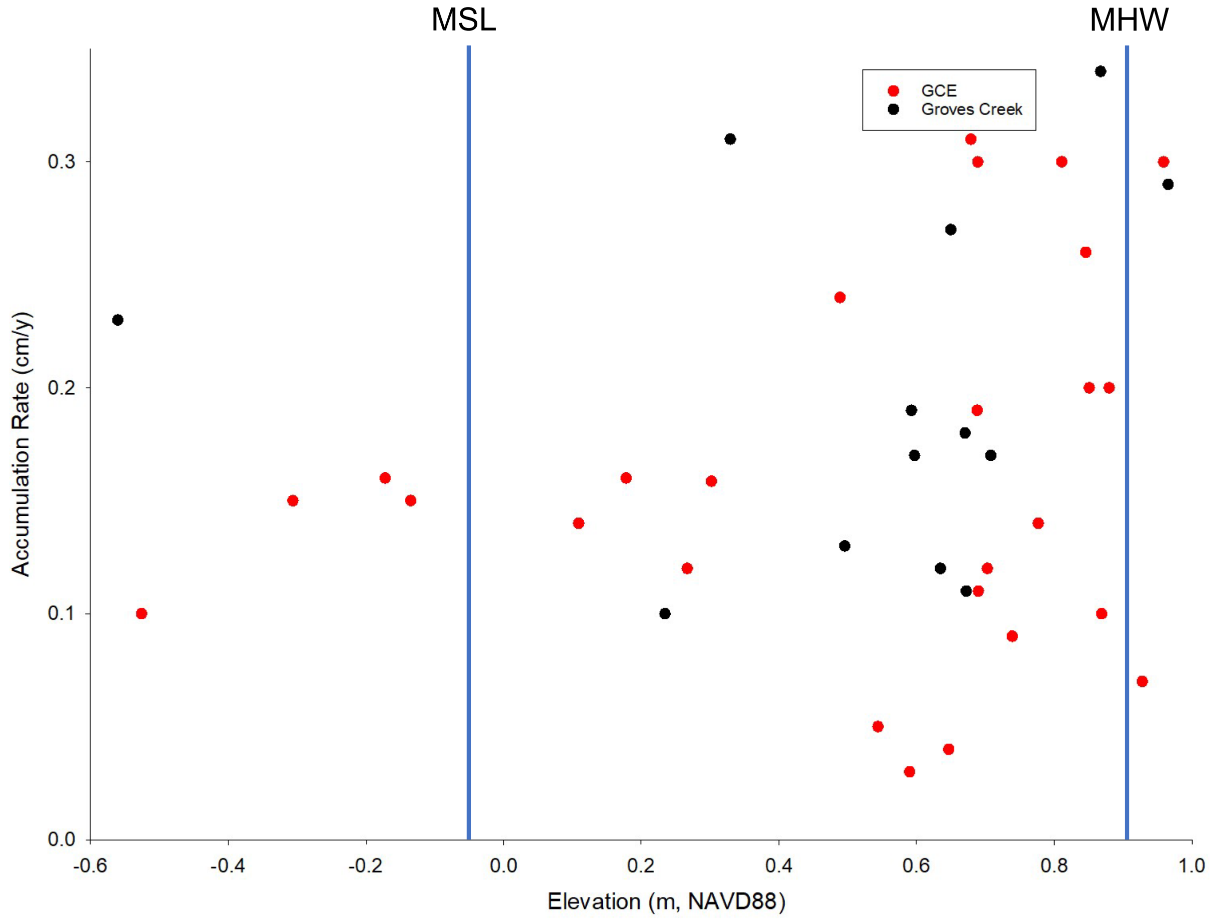


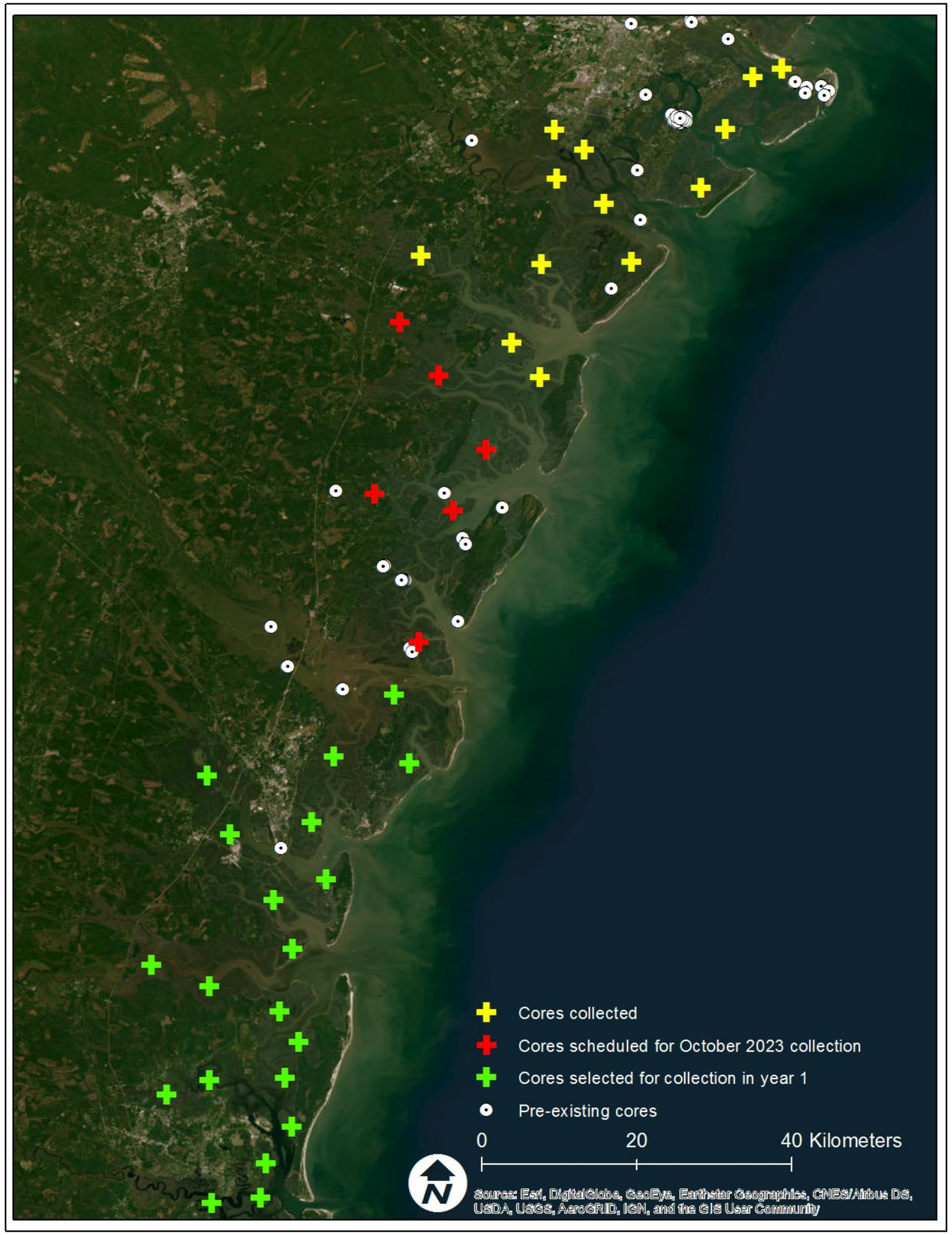
Georgia marsh sediment accumulation rates

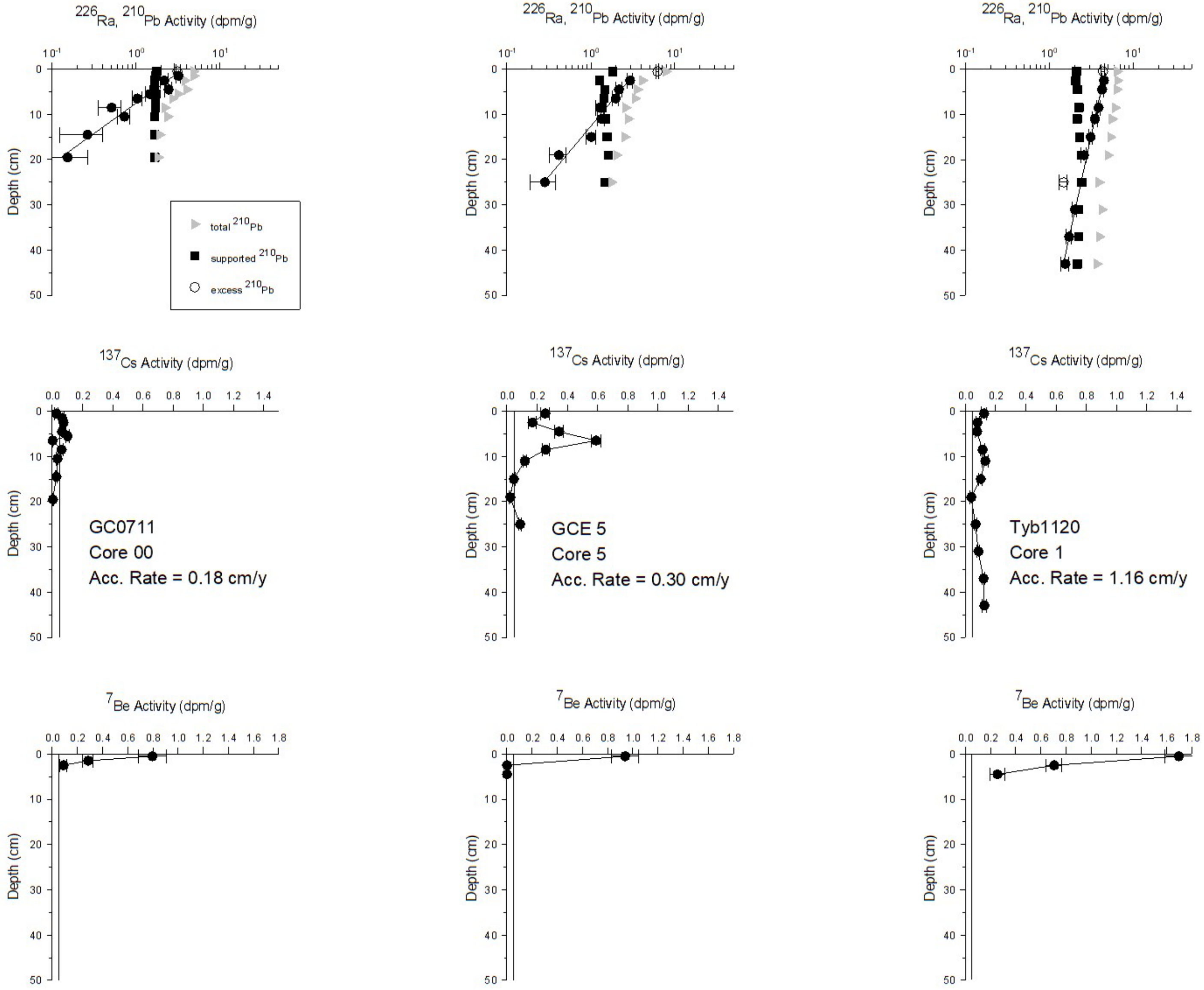
- multiple methods to collect data
  - filters
  - marker layers
  - sediment plates
  - SETs
  - Pb-210/Cs-137/Be-7
- accumulation on 100-y timescales; deposition on annual timescales
- range of rates in GA from 0.1 cm/y to 20 cm/y (n=67)
- Understanding site location within the depositional frame and site history is critical
- No significant loss of marsh area in 80 years (Burns et al., 2021)
- SE US existing data summary 2.1+/- 0.3 mm/y (Crotty et al., 2020)



Elevation vs Accumulation Rates (n = 34)

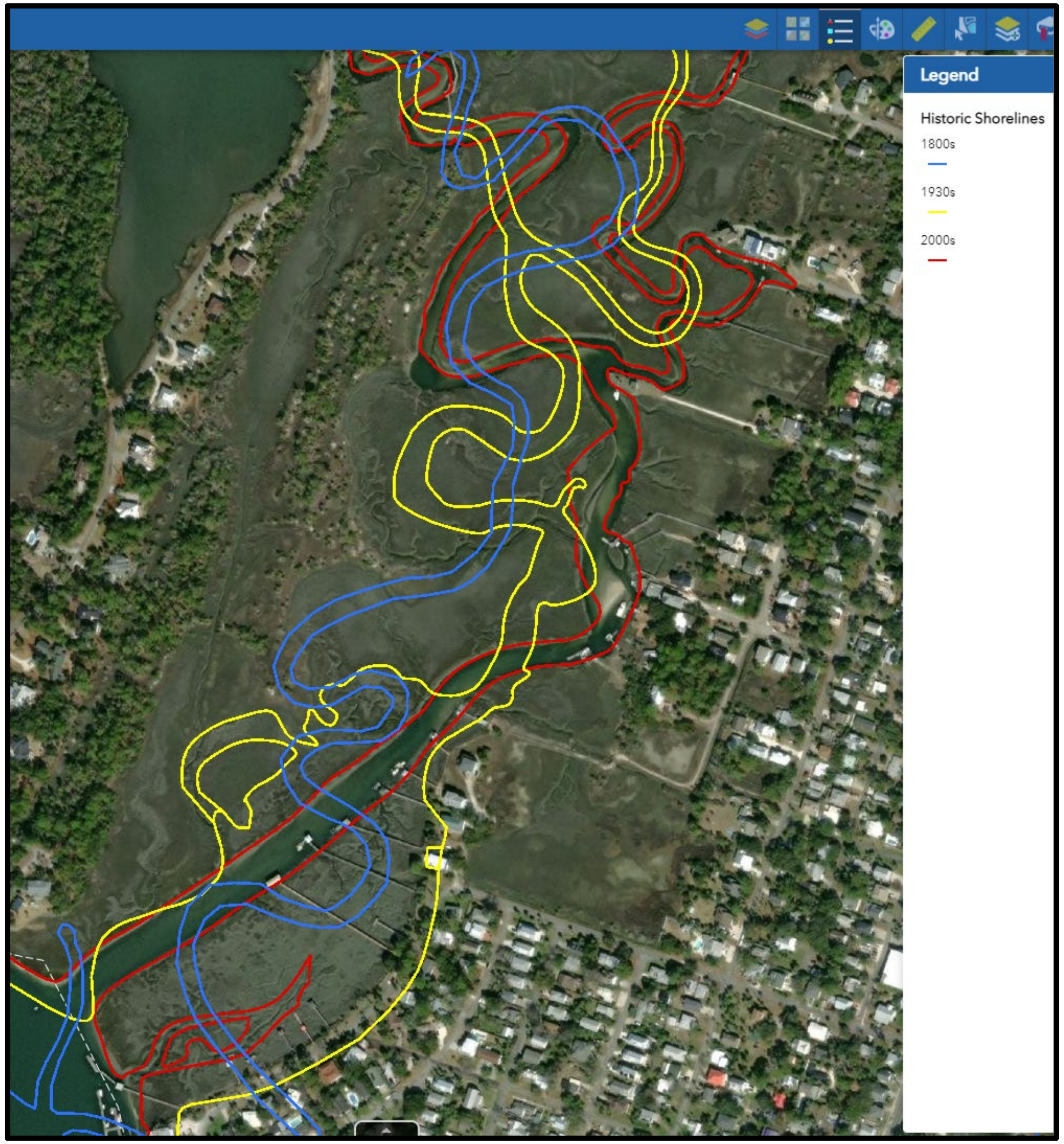


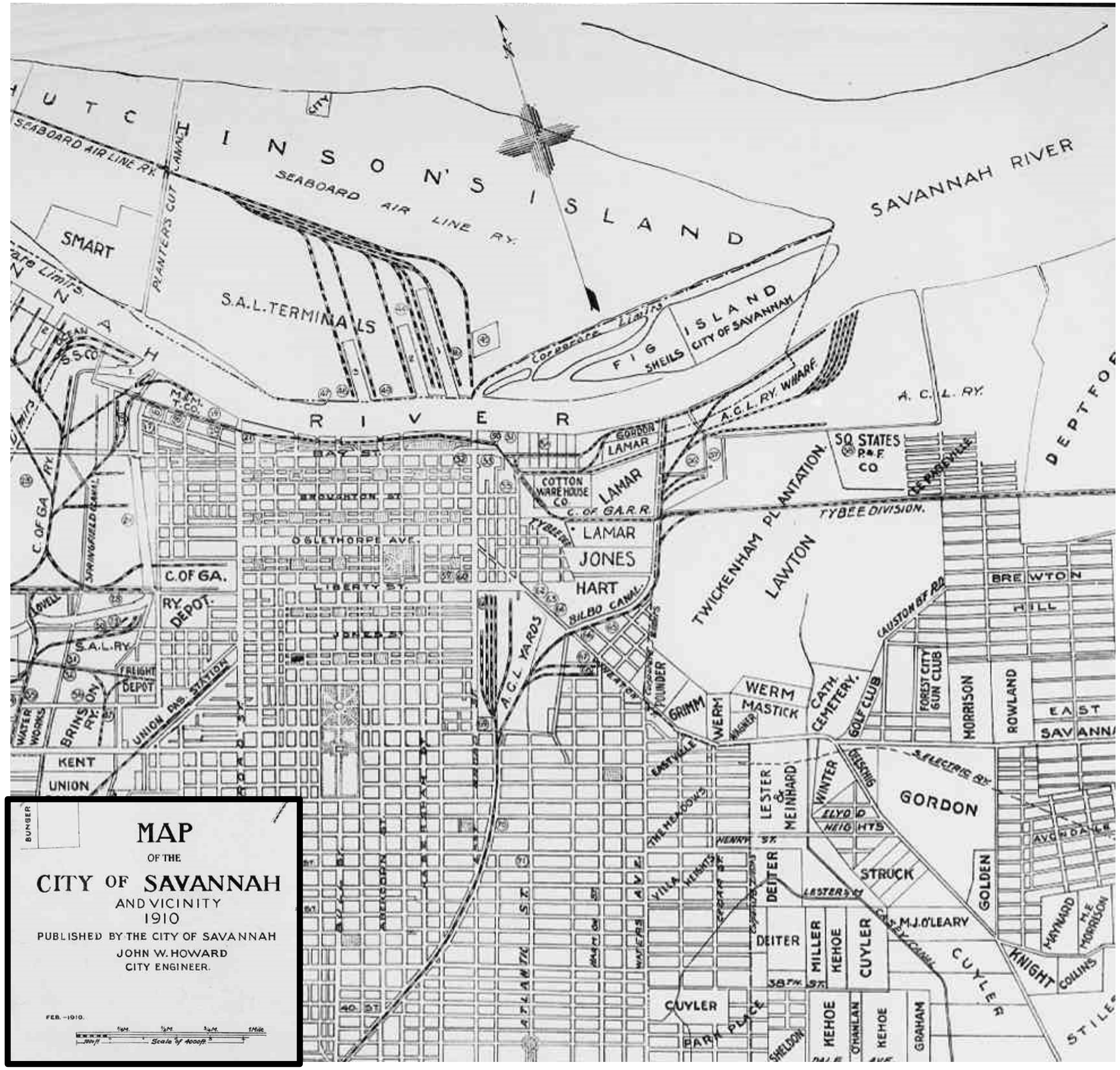




Range of Rates currently: 0.5 – 200 mm/y

Impact of Natural and Anthropogenic Processes on Accumulation





Engineering With Nature – Nature and Nature-Based Features – Living Shorelines