Challenges and Opportunities for Sustaining Southeastern US Coastal Wetlands and Reefs

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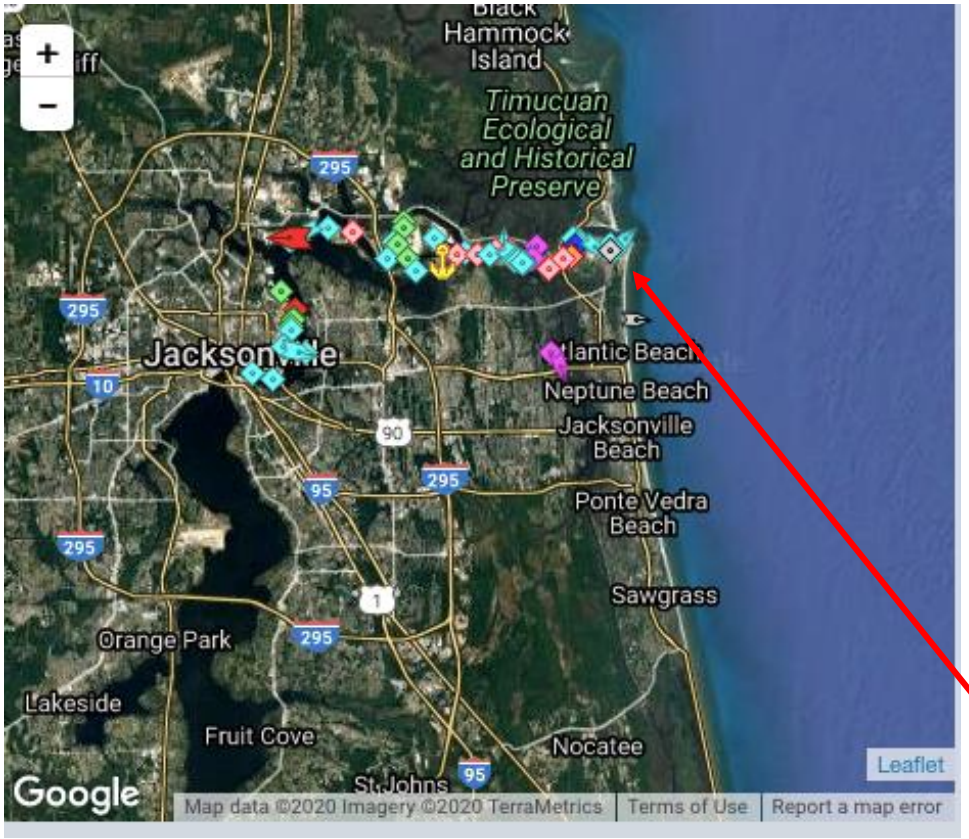
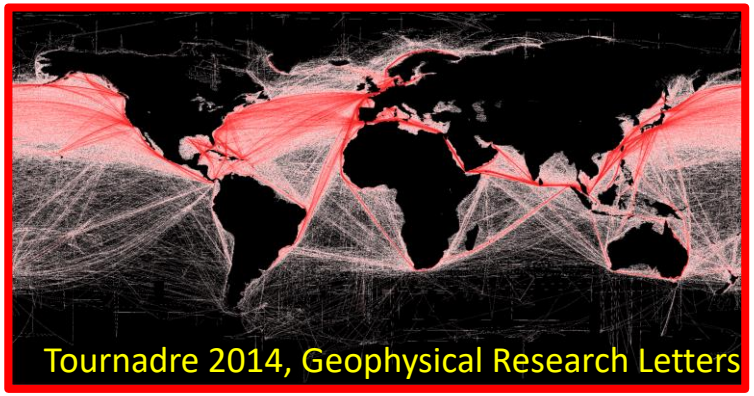
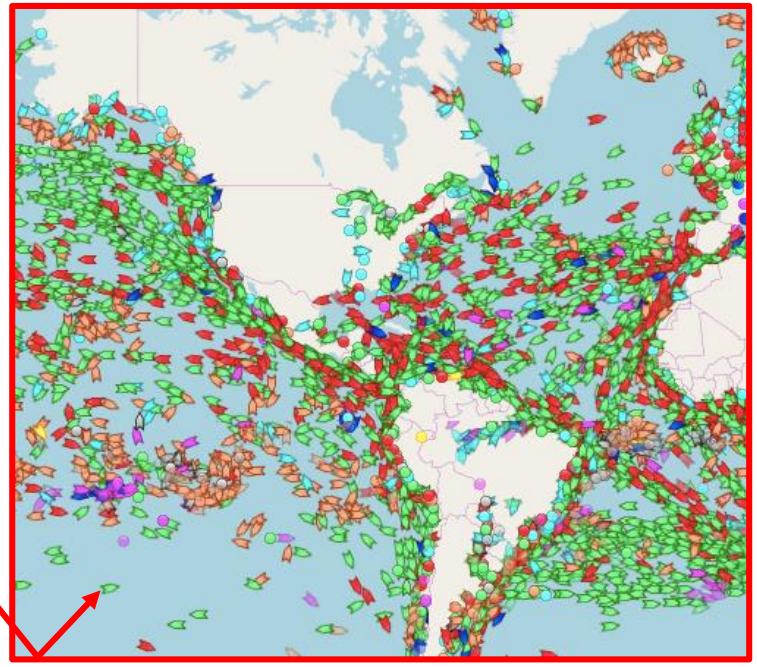
Globally 70% increase in commercial ship traffic since 1990

On-shore, ports & channels are busy!







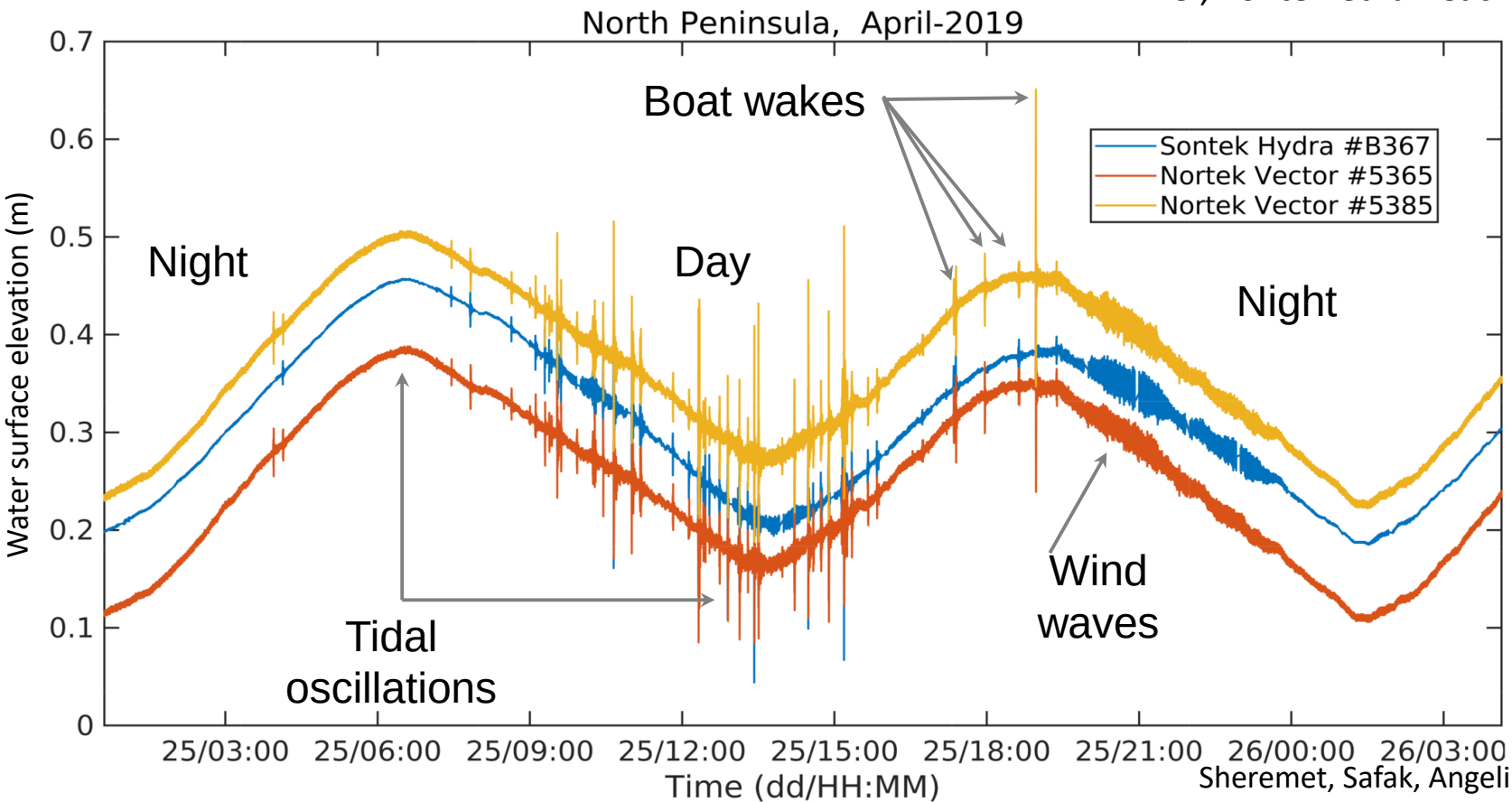
AIS-tracked commercial boats on 2/28/2020

Smaller vessel traffic is also escalating in the coastal zone

Boating is a $12 billion yr^{-1} industry in FL alone

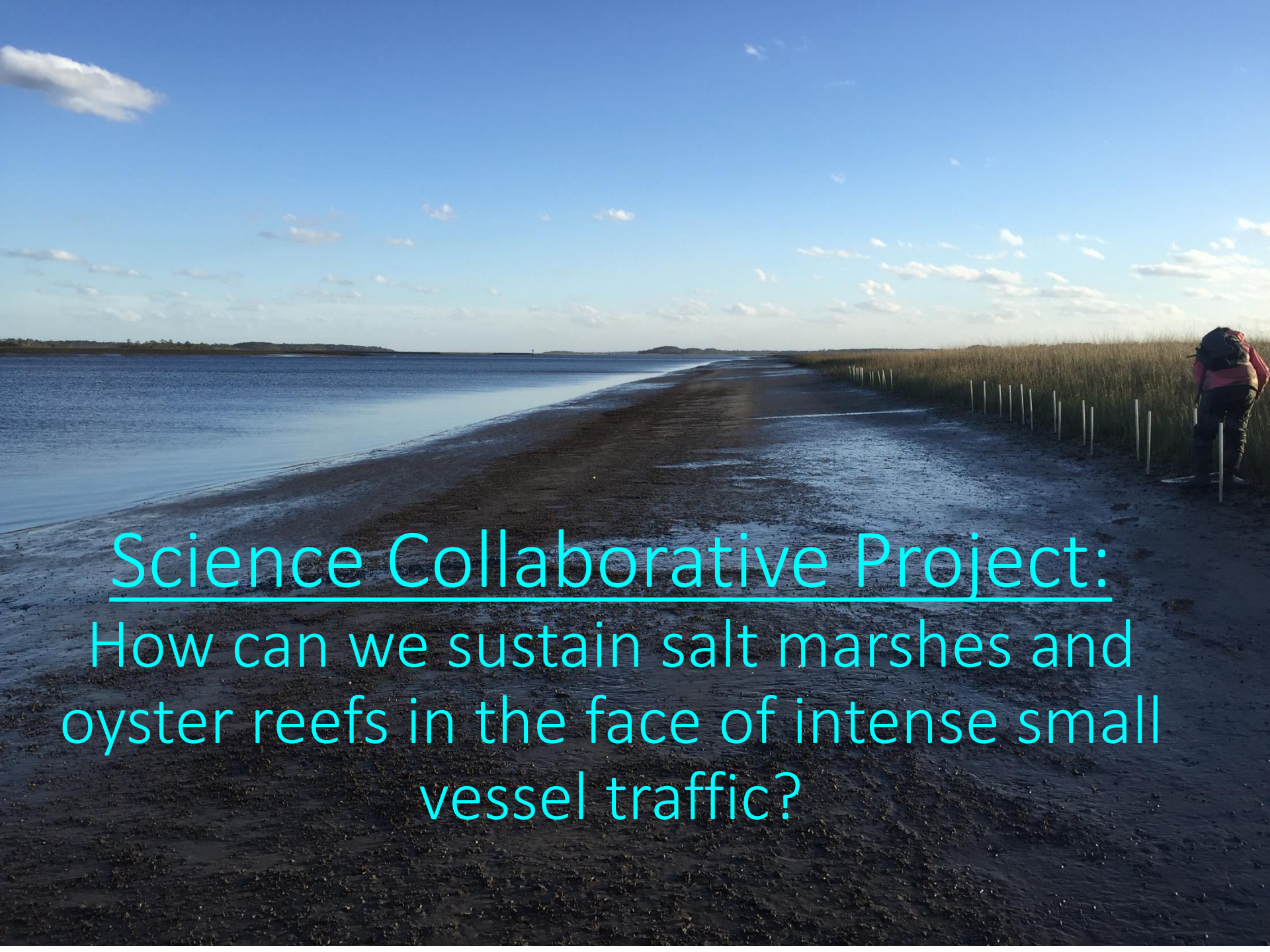
In estuaries, boat wakes transform hydrodynamics

Data from the Tolomato River, Ponte Vedra Beach, FL



Sheremet, Safak, Angelini *in prep*

Intracoastal Waterway (ICW) shoreline

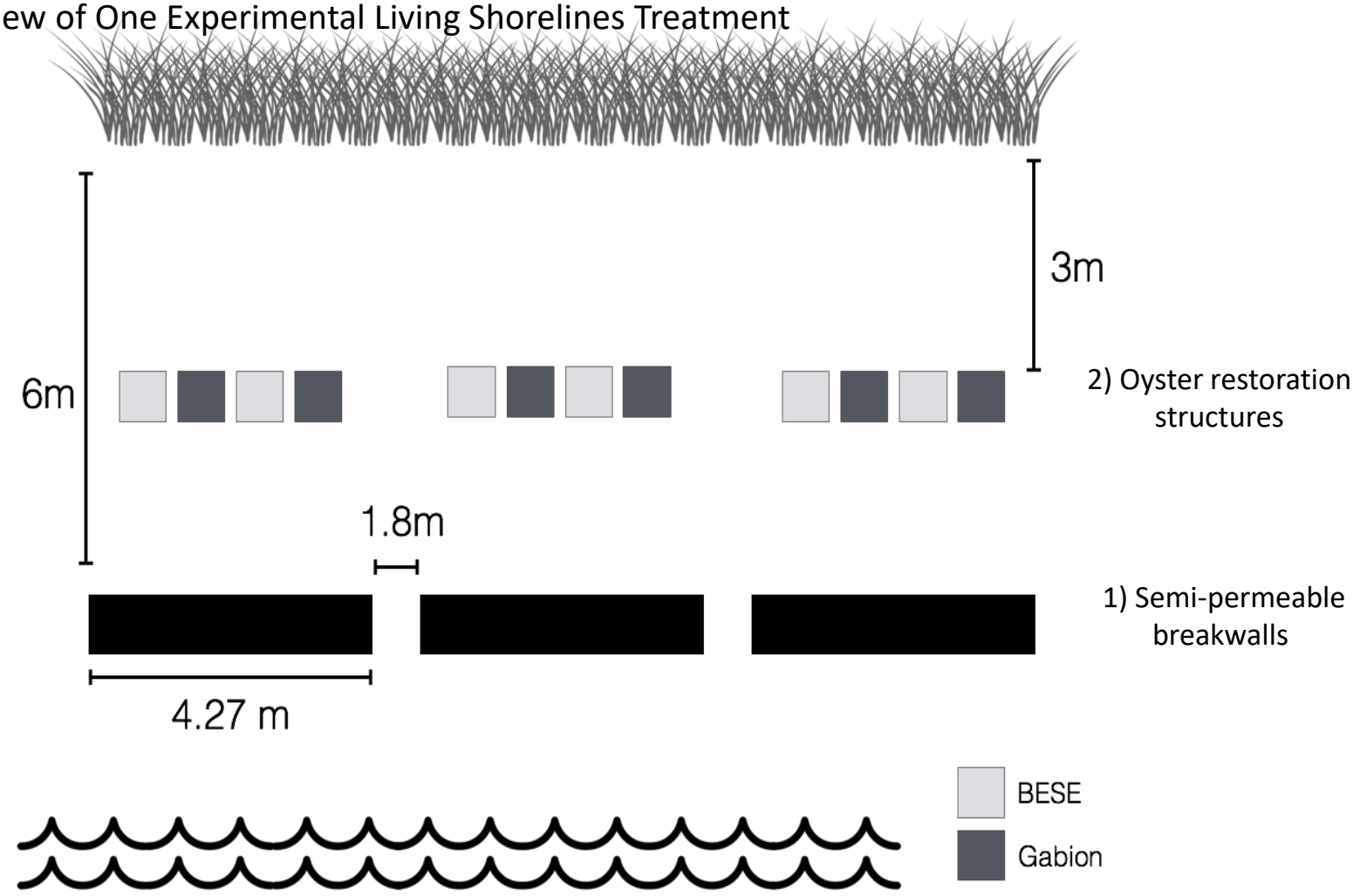


Science Collaborative Project:

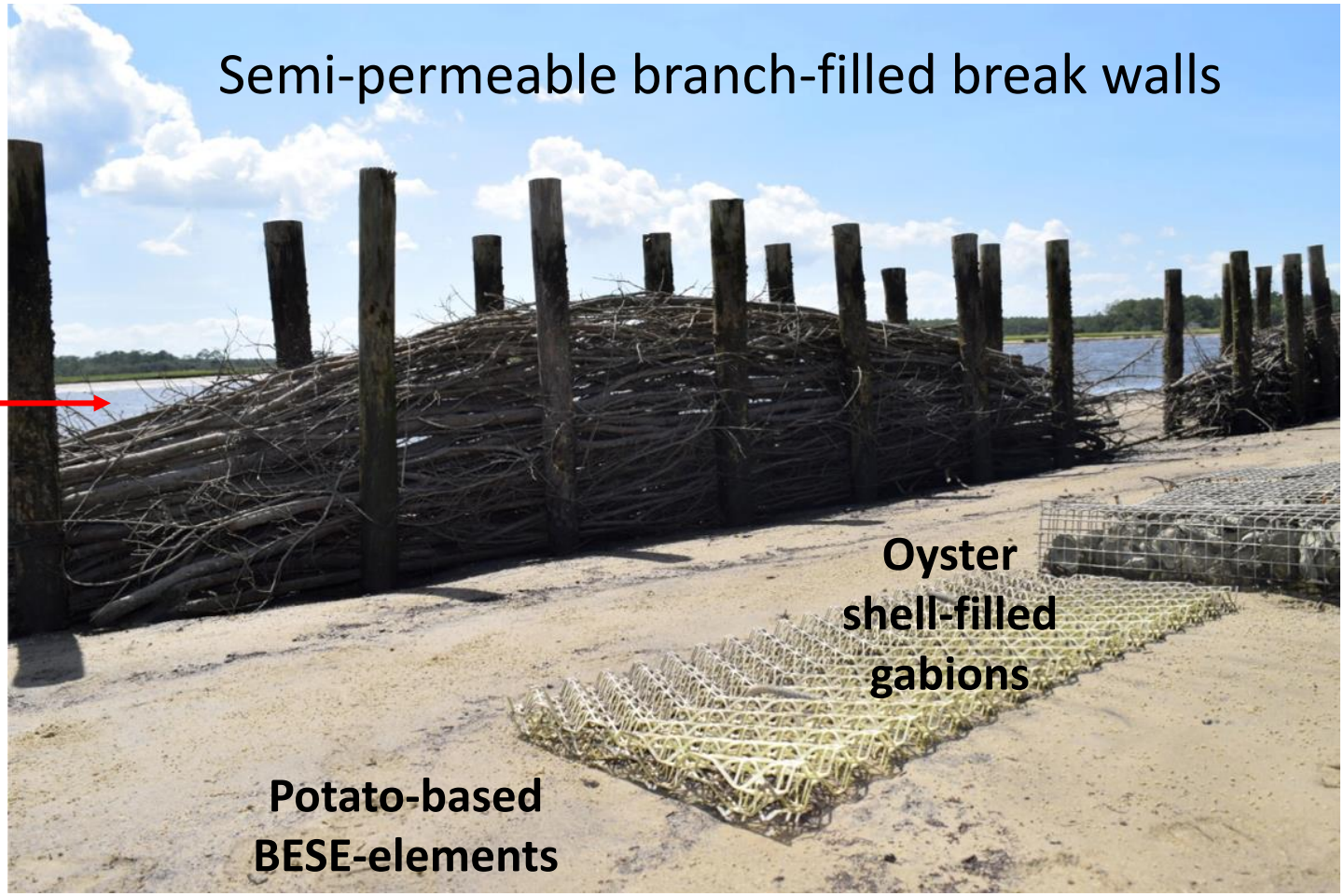
How can we sustain salt marshes and oyster reefs in the face of intense small vessel traffic?

Our approach: ***two*** lines of defense

Bird's Eye View of One Experimental Living Shorelines Treatment



High-Energy Living Shoreline Design



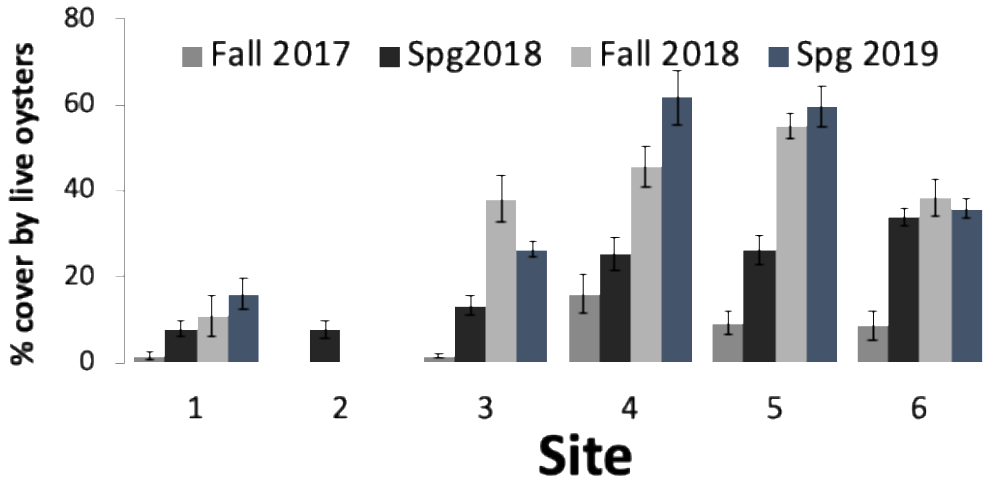
Intracoastal

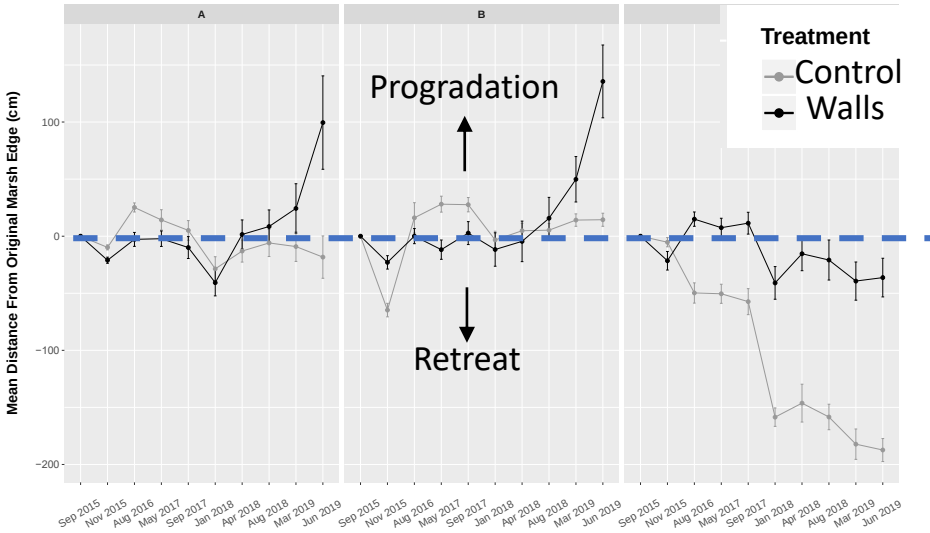
1st Line of Defense: Breakwalls

2nd Line of Defense

Paired living shoreline & unmanipulated controls at 3 sites of varying channel width
1 year pre-treatment + 2 year of post-treatment monitoring

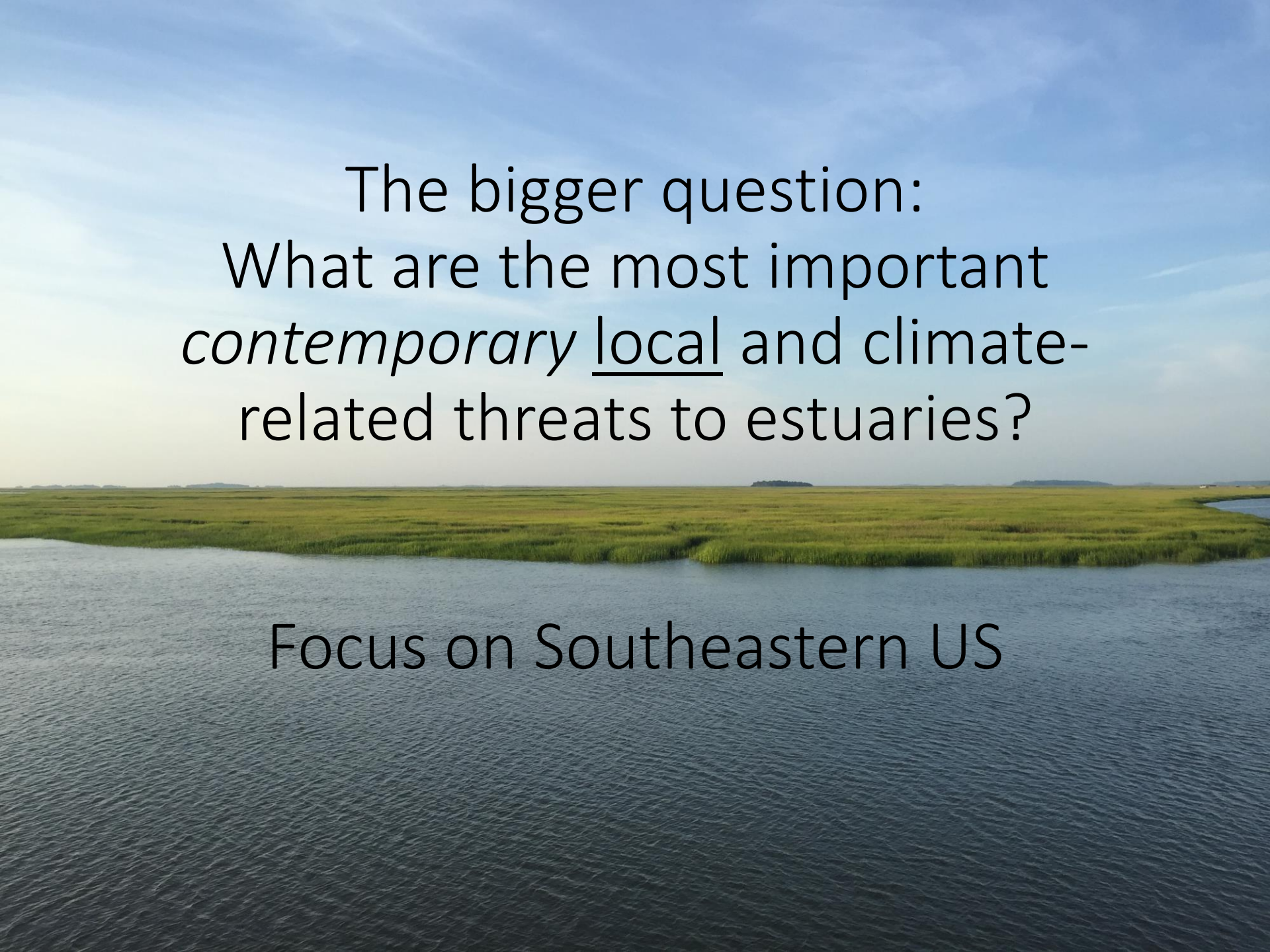
Herbert et al 2018, Safak et al. 2019, Safak et al. *under review*, Angelini et al. *in prep.*





Angelini, Dix, Safak, Norby, Grizzle, Veenstra, Southwell, Brisley et al *in prep.*

So, where else are boats a big deal?

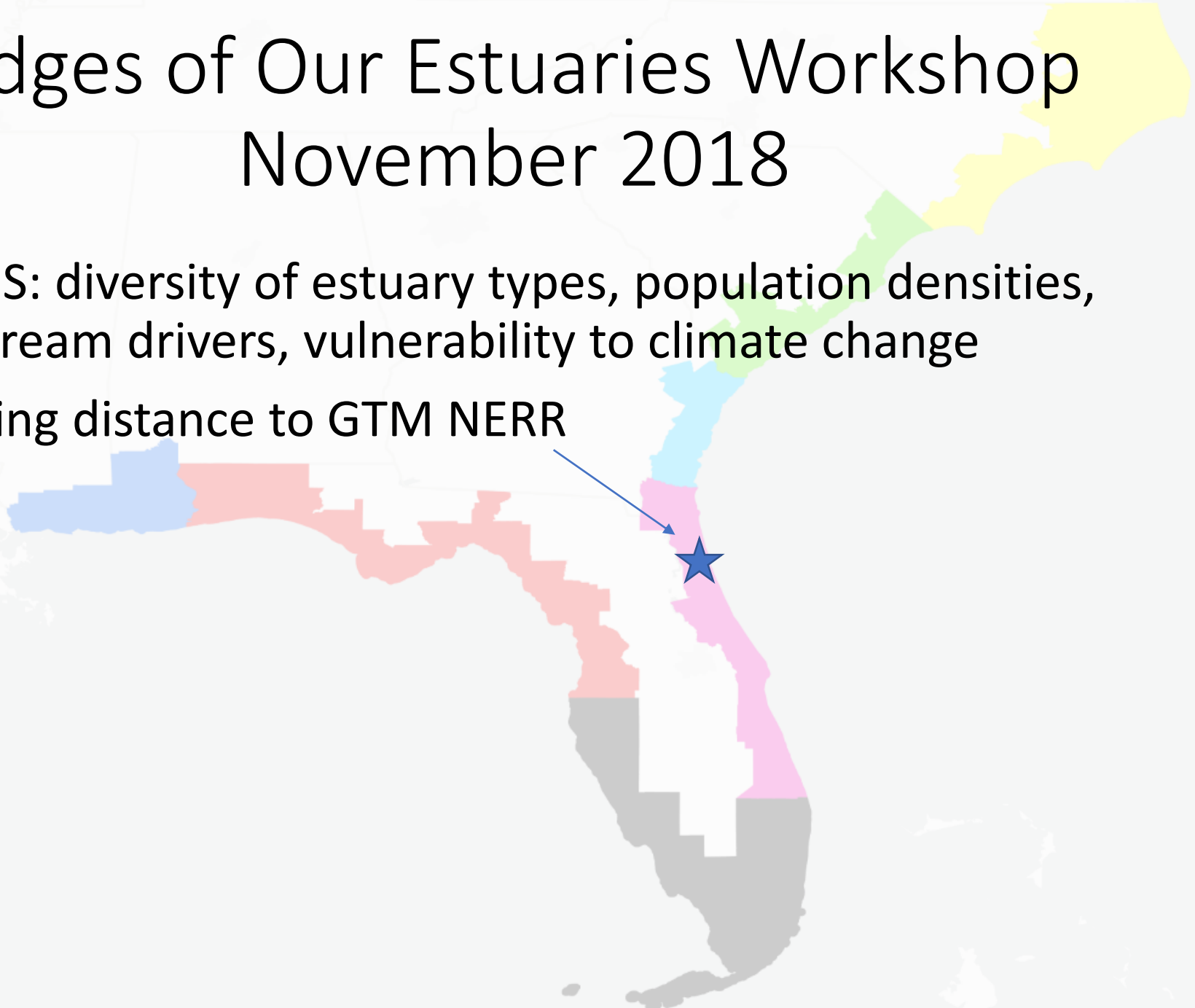


The bigger question:
What are the most important *contemporary* local and climate-related threats to estuaries?

Focus on Southeastern US

Edges of Our Estuaries Workshop November 2018

- SE US: diversity of estuary types, population densities, upstream drivers, vulnerability to climate change
- Driving distance to GTM NERR



Edges of our Estuaries Workshop- 2018

North Carolina

Carter Smith

Rachel Gittman

South Carolina

Benjamin Stone

Gary Sundin

Mississippi/ Alabama

Just Cebrian

Eric Sparks

East Florida

Nicole Dix

John Jaeger

Tricia Kyzar

Ilgar Safak

Alex Sheremet

West Florida

Mark Clark

Savannah Barry

Ilgar Safak

South Florida

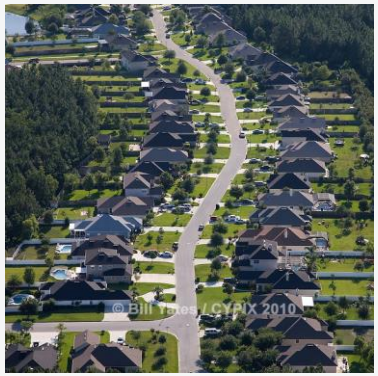
Kara Radabaugh

Annie Roddenberry

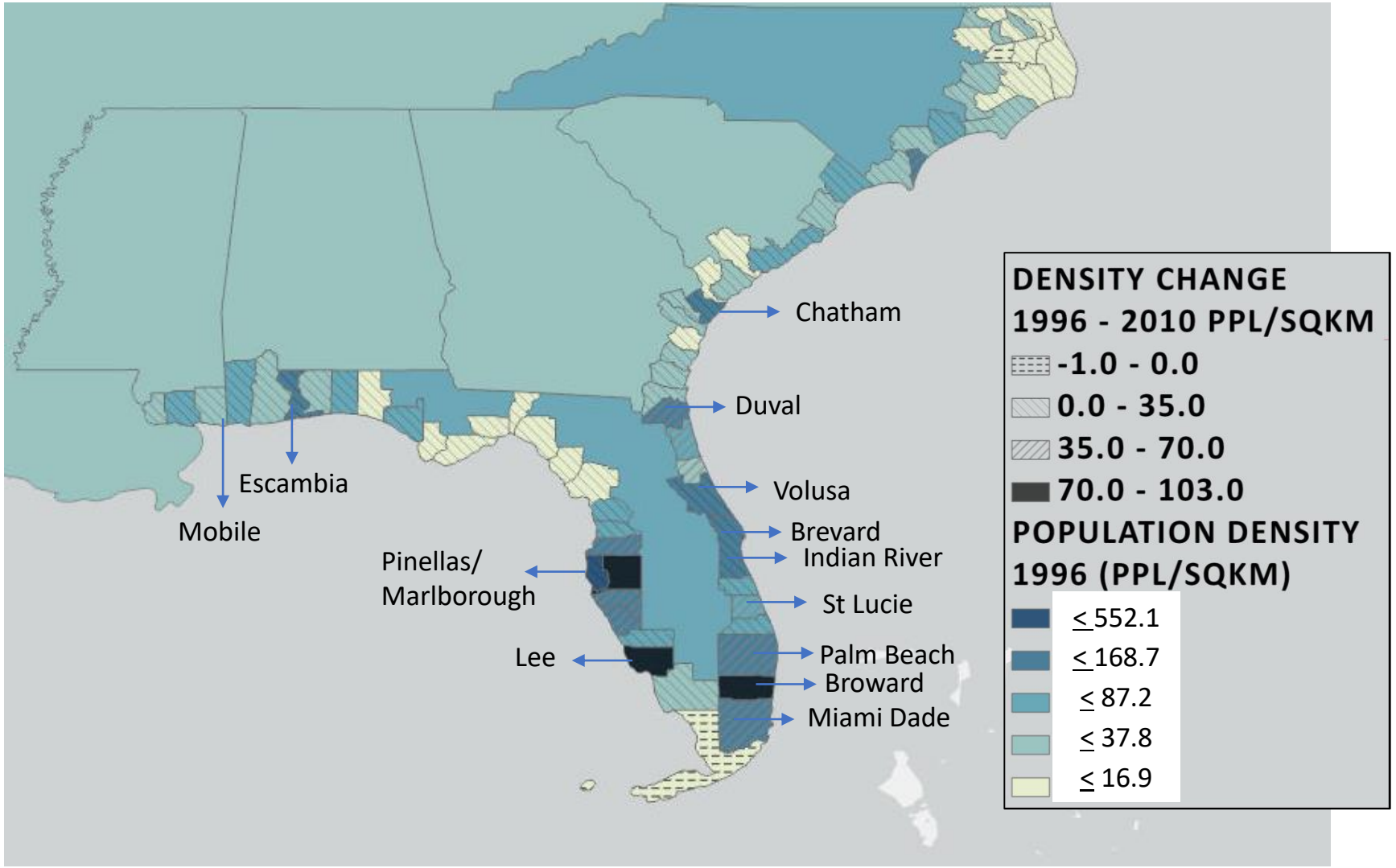
Q1: How are human population densities changing in the region?

Population and Land Cover Analysis (Tricia Kyzar Lead)

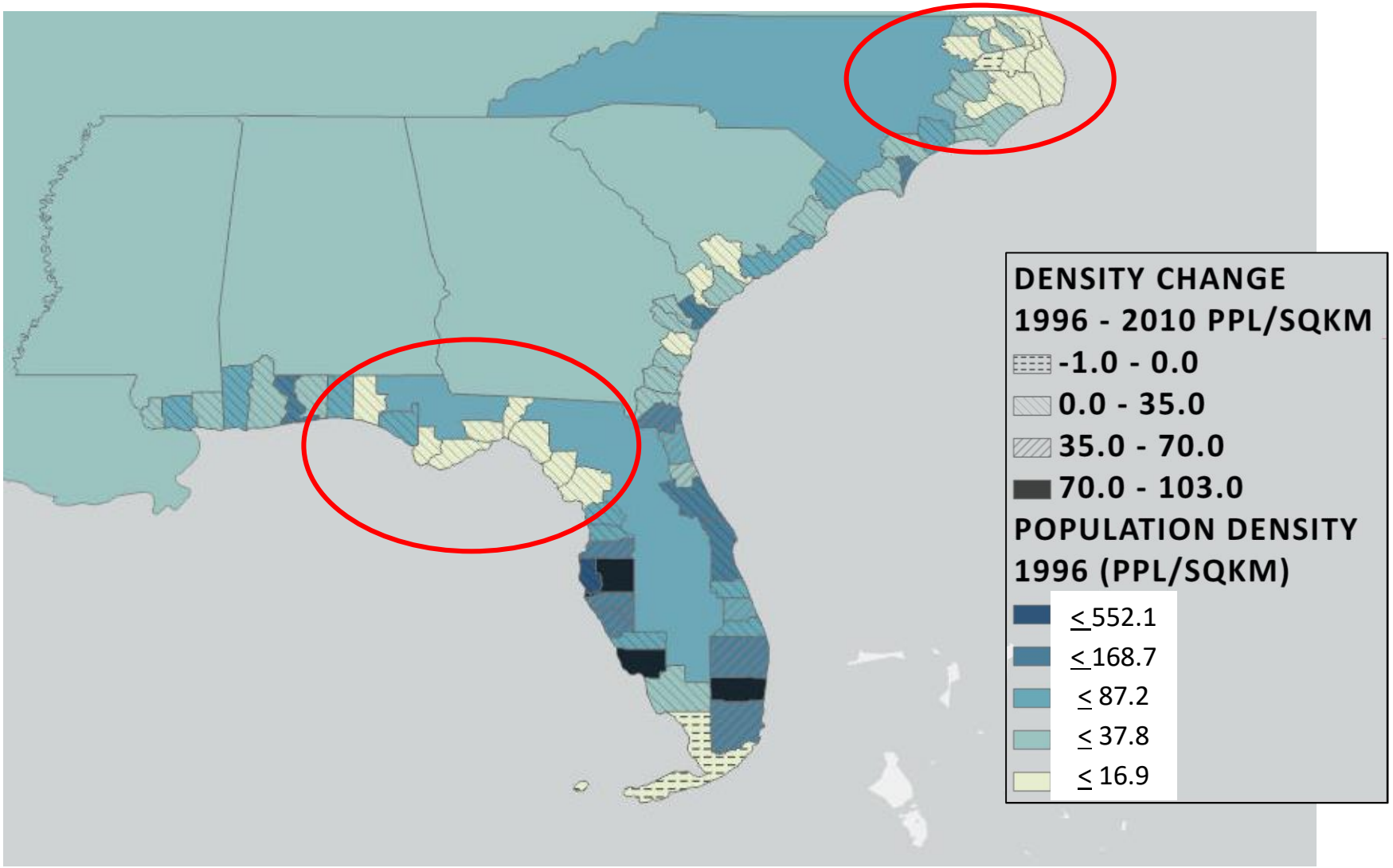
- US Census data (human population density)
- NOAA C-CAP (Coastal Change Analysis Program)
- 1996 through 2010 (will be updated soon to 2016/19)
  - Newer census and land-use data forthcoming…



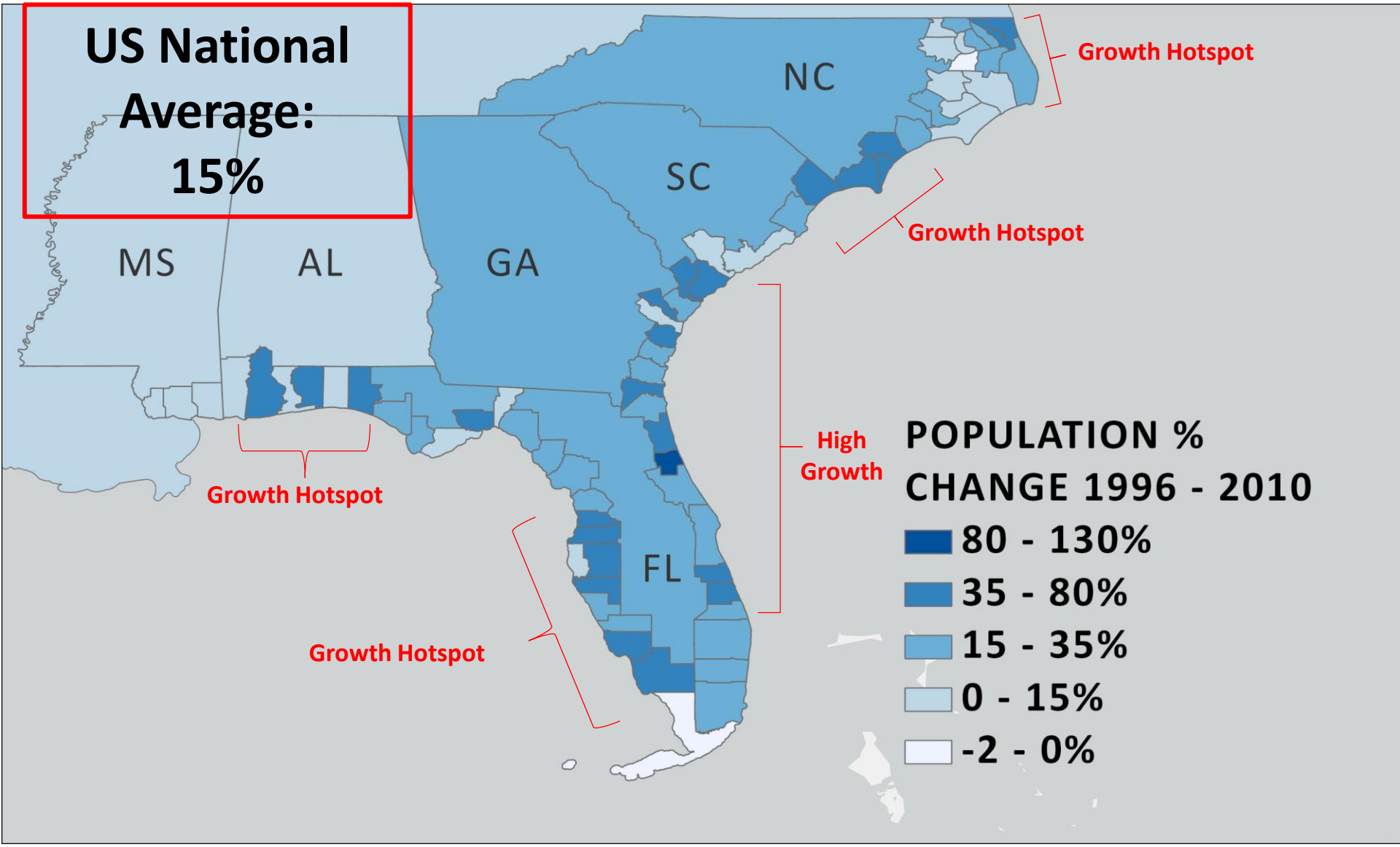
Darker counties:
Already packed with people in 1996
Most in Florida



Still significant sections of coastline with low population densities:
but human impacts may still be high….

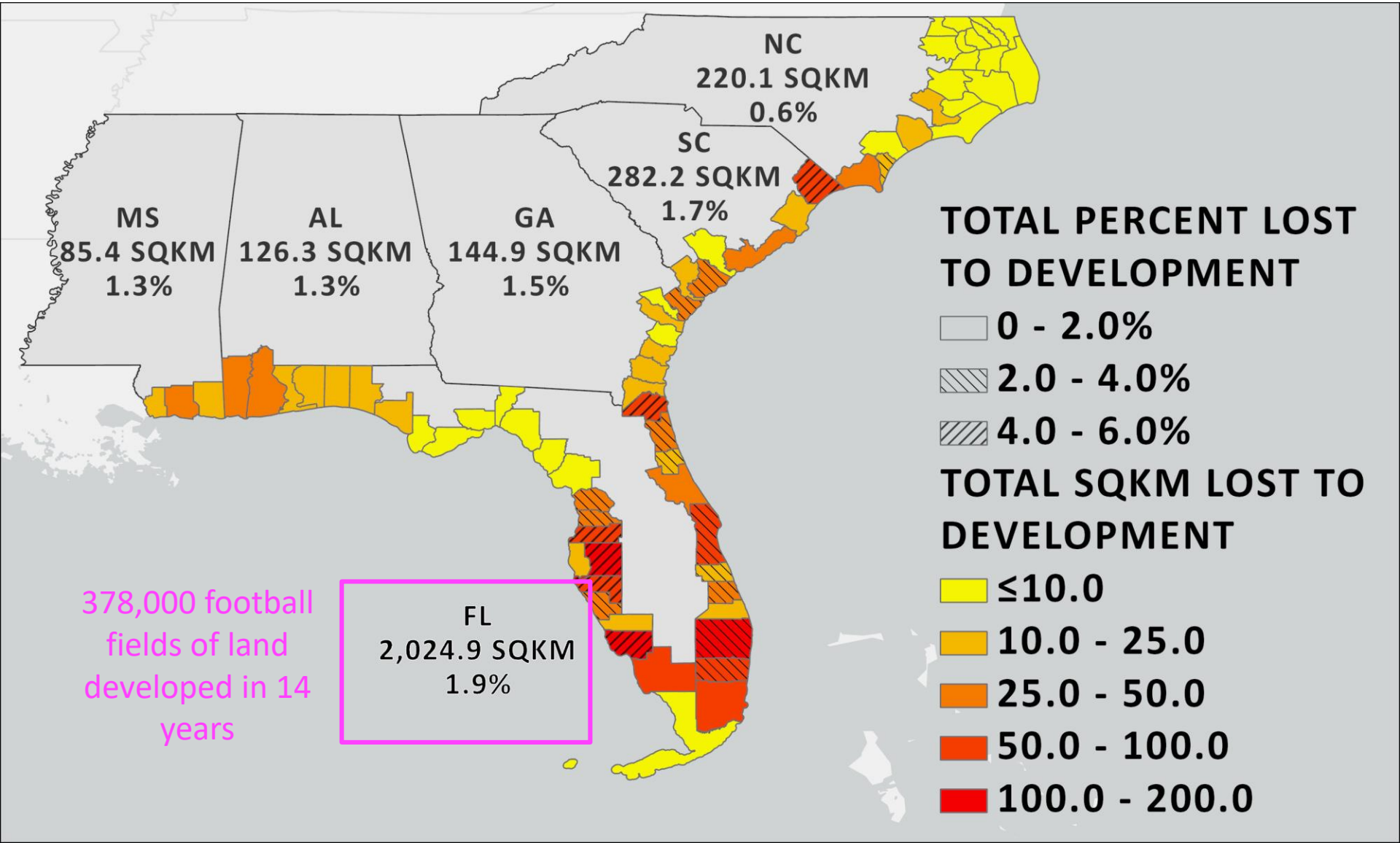


Population is **booming** along FL, SC, GA and AL coasts



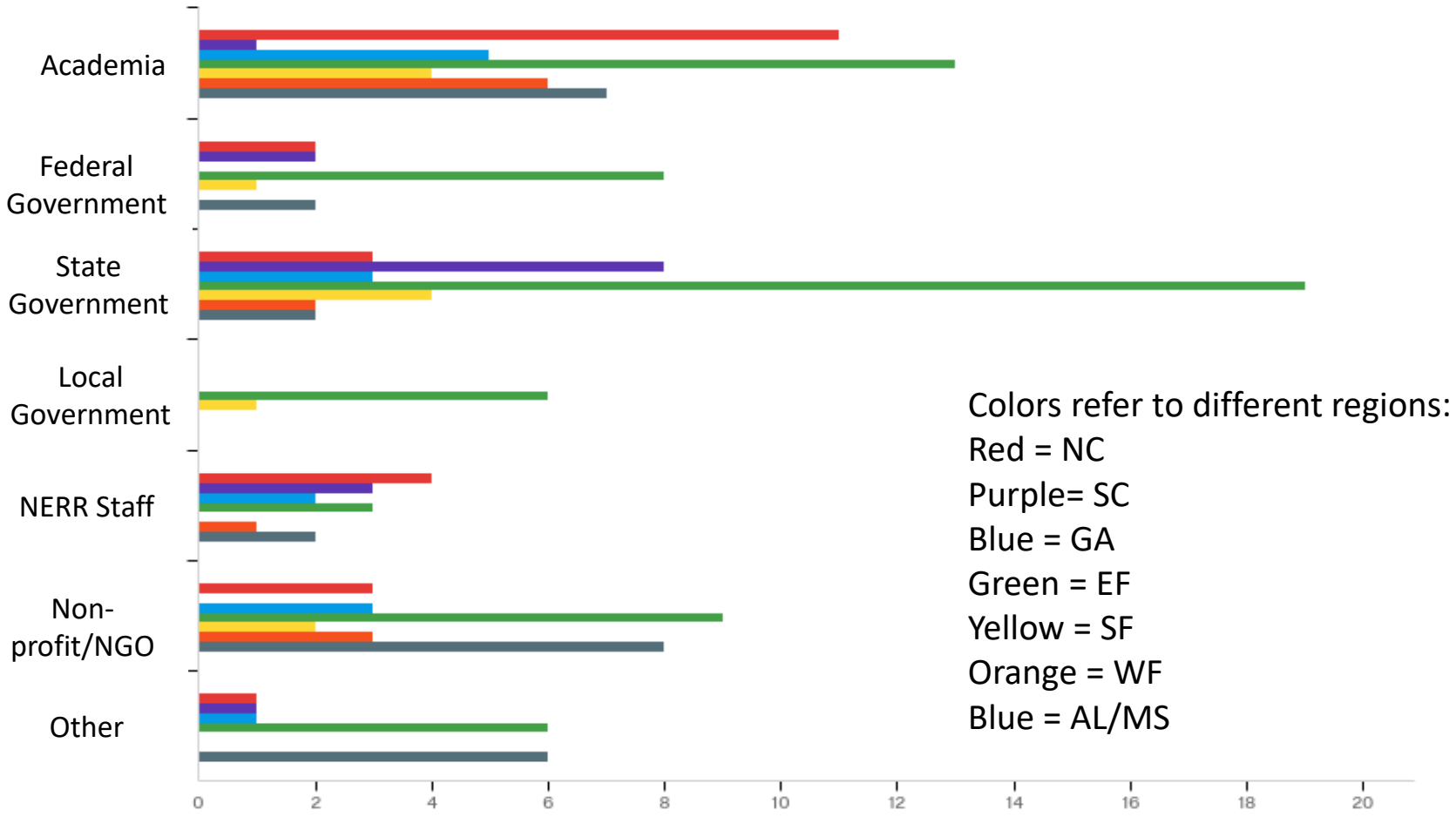
Many of these trends have continued or even escalated since 2010

Coastal Development:
Red & hashed means rapid development

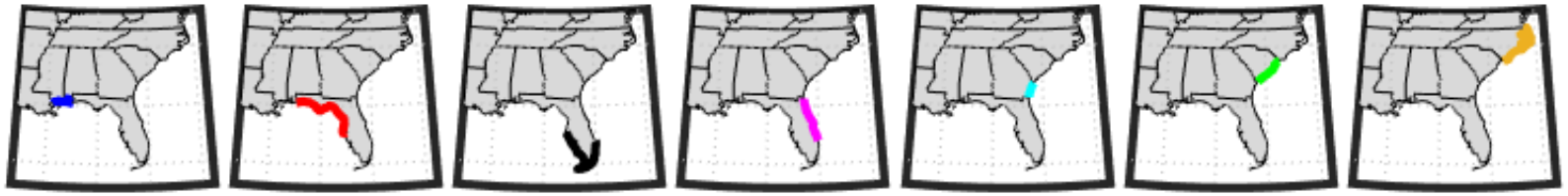


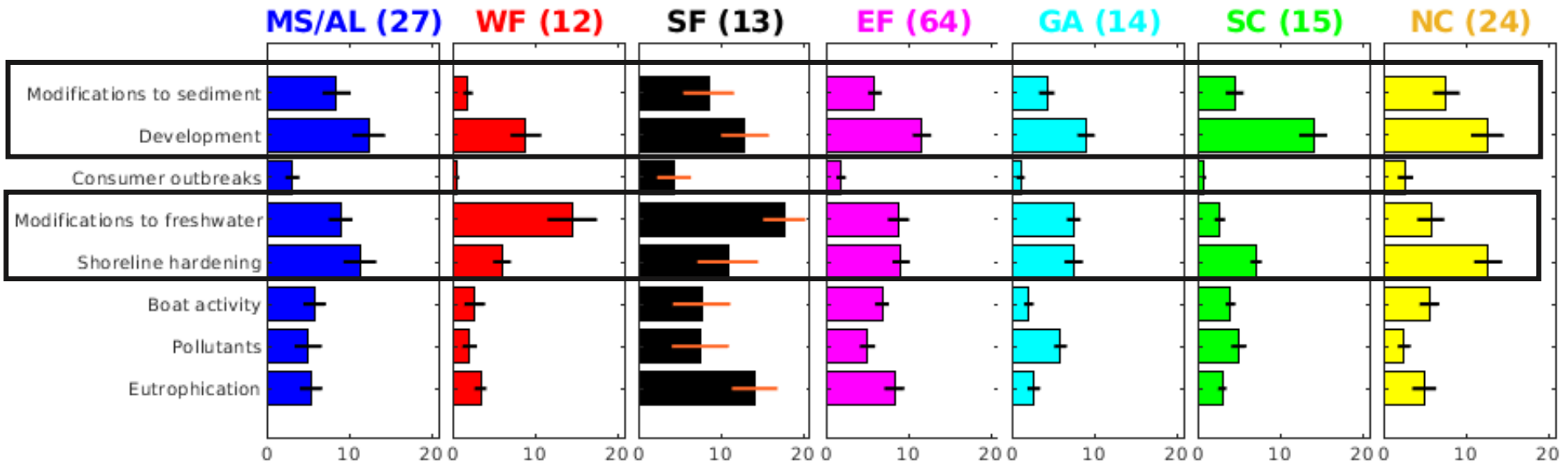
What are the greatest 'local' threats to your coastal wetlands and oyster reefs?

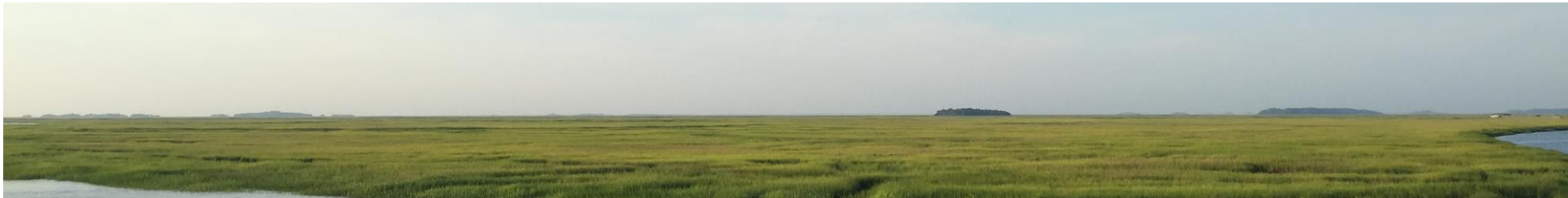
Surveyed via Qualtrics 178 estuary experts



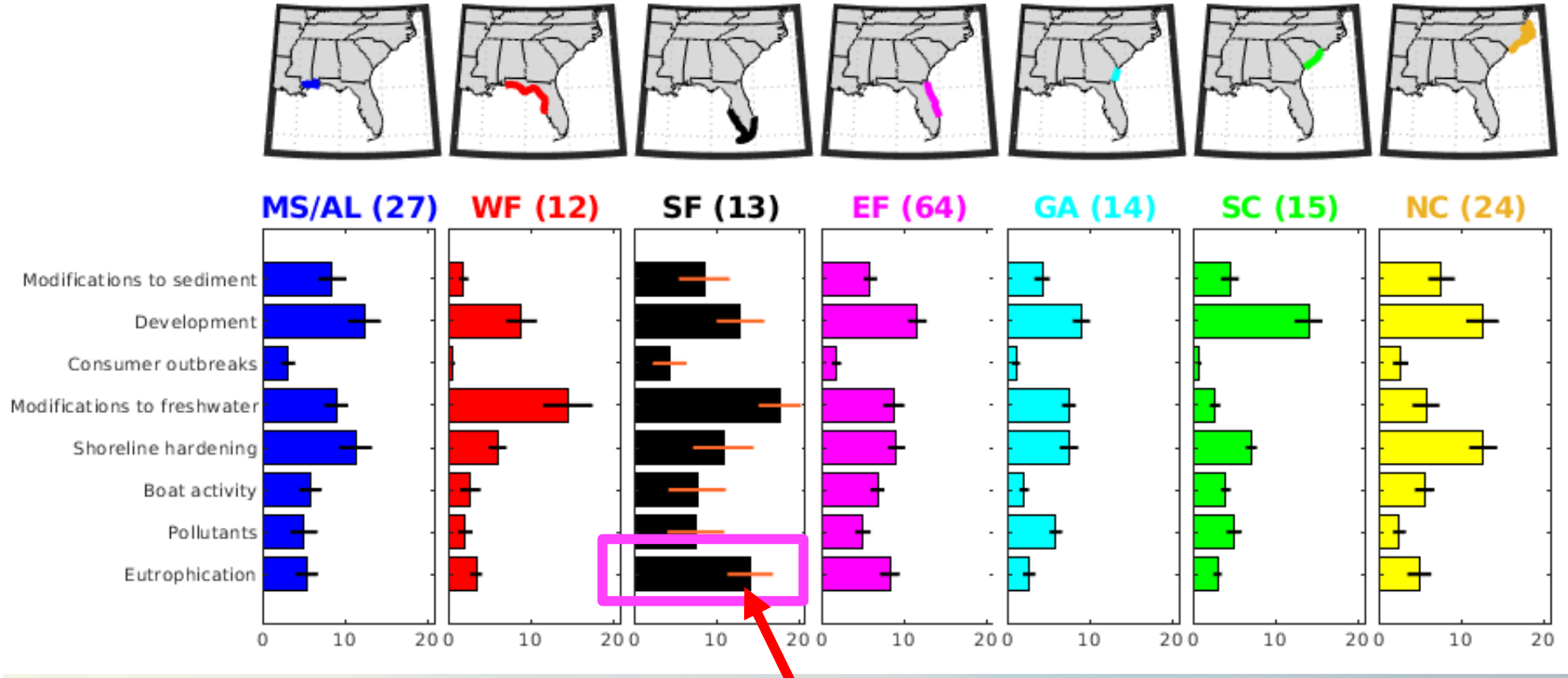
Experts perceive the direct and indirect effect of development to be the most important threats to **coastal wetlands**



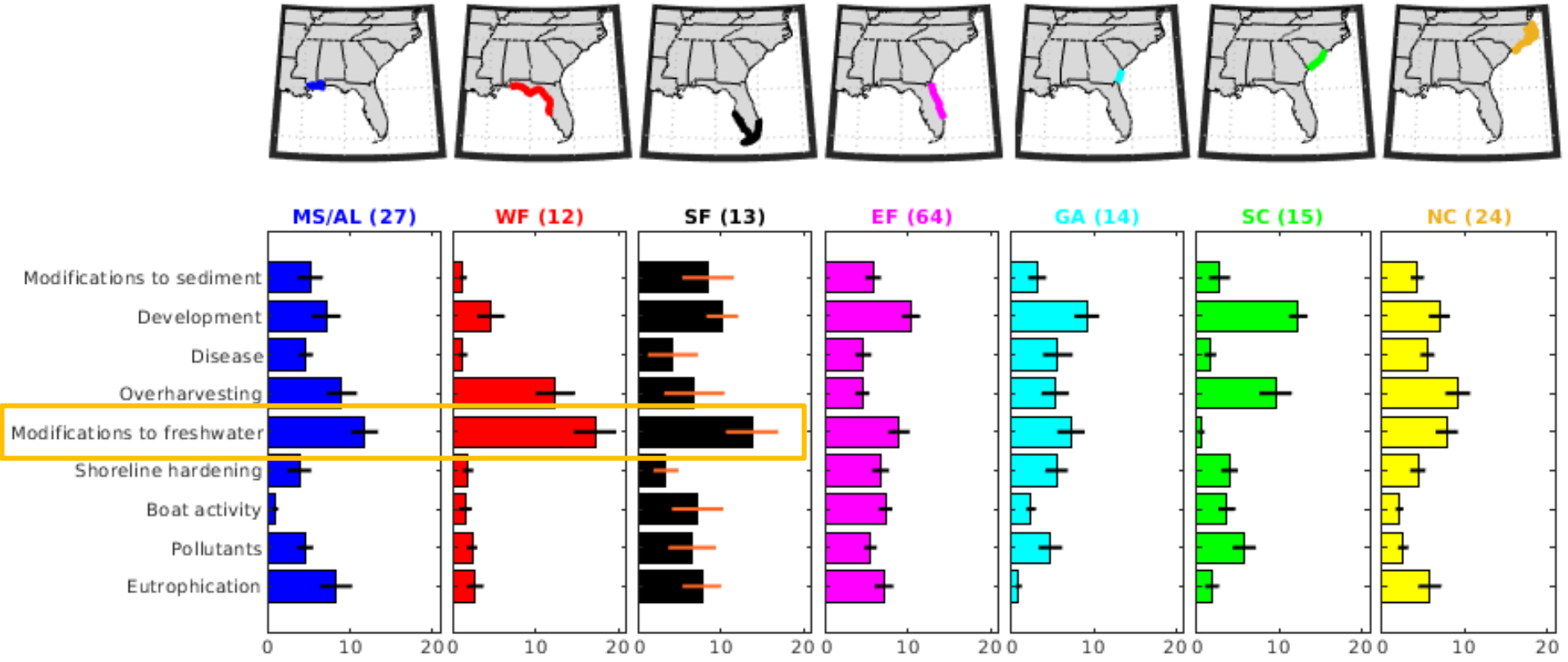




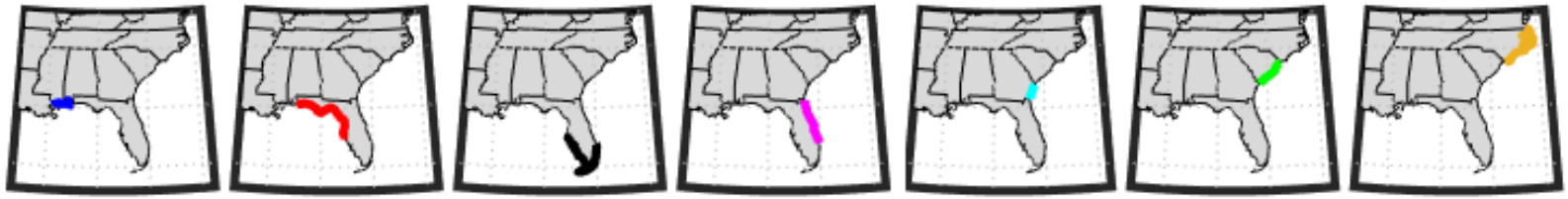
Eutrophication perceived to be particularly important to **coastal wetlands** in S. Florida only

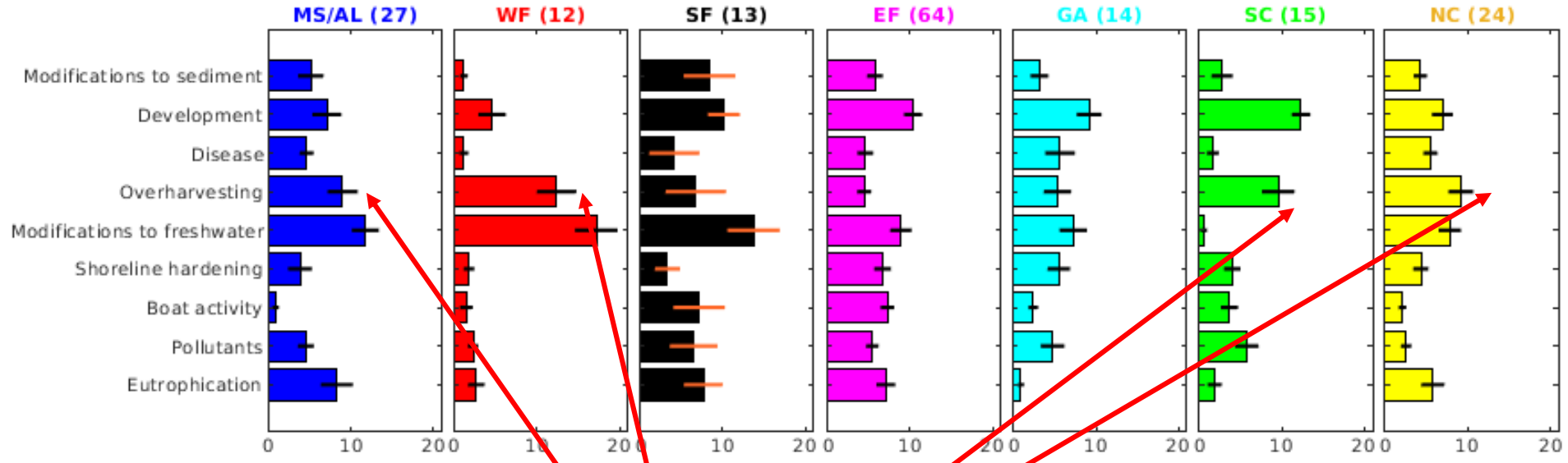


Salinization more important treat to oyster reefs in the Gulf than Atlantic



<u>Overharvesting</u> is a more important threat to oysters in less populated regions (MS/AL, WF, SC and NC)





Conclusions: Boats as a coastal stress

Boats create novel hydrodynamic & sediment transport regime

Many indirect effects of boats: shoreline hardening, dredging, channelization, access to fish and shellfish resources

Conclusions: Coastal urbanization

SE US coast is increasingly packed with people

Development is rapidly transforming coastal land use

Consequences for freshwater, sediment, pollution delivery to coast and recreational intensity in estuaries

Conclusions: What is ahead?

Huge opportunities to transform urbanizing waterways into diverse, ecologically functional and resilient systems

Acknowledgements

- Data synthesis and analysis: **Tricia Kyzar**, Ilgar Safak
- Co-authors: Nikki Dix, Annie Roddenberry, Mark Clark, Rachel Gittman, Carter Smith, Gary Sundin, Benjamin Stone, Kara Radabaugh, Michelle Taubler, Just Cebrian, Erik Sparks, Savanna Barry, John Jaeger
- Workshop Support: Kaitlyn Dietz
- Funding: NOAA NERR Science Collaborative Program

Shoreline hardening perceived as relatively more important in MS/AL and NC:
Maybe because development has been more recent?