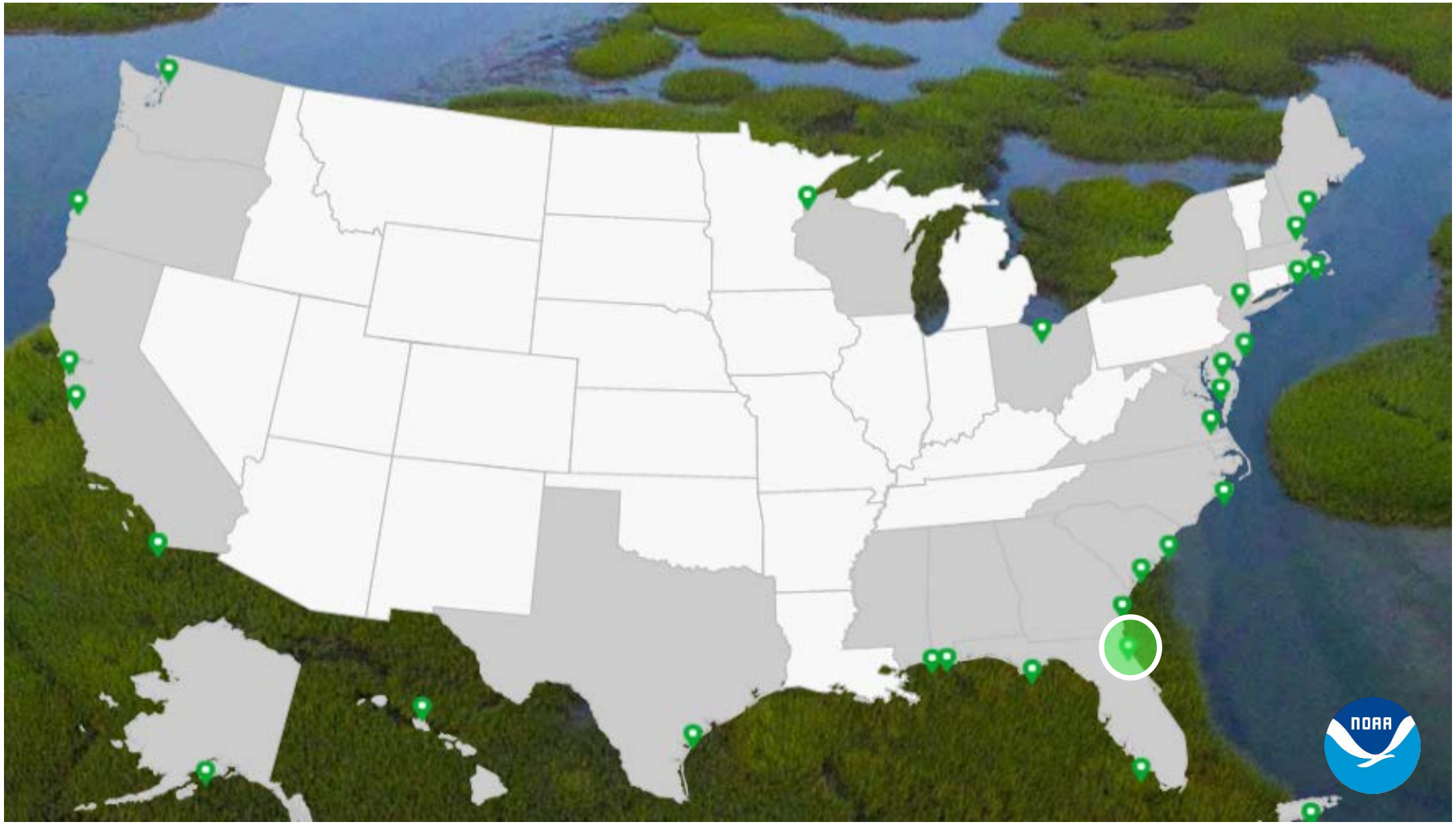
Long-term Monitoring of Coastal Wetlands in the Guana Tolomato Matanzas National Estuarine Research Reserve

Nikki Dix, Pam Marcum, Shannon Dunnigan and Silas Tanner
GTM National Estuarine Research Reserve

About the GTM Research Reserve



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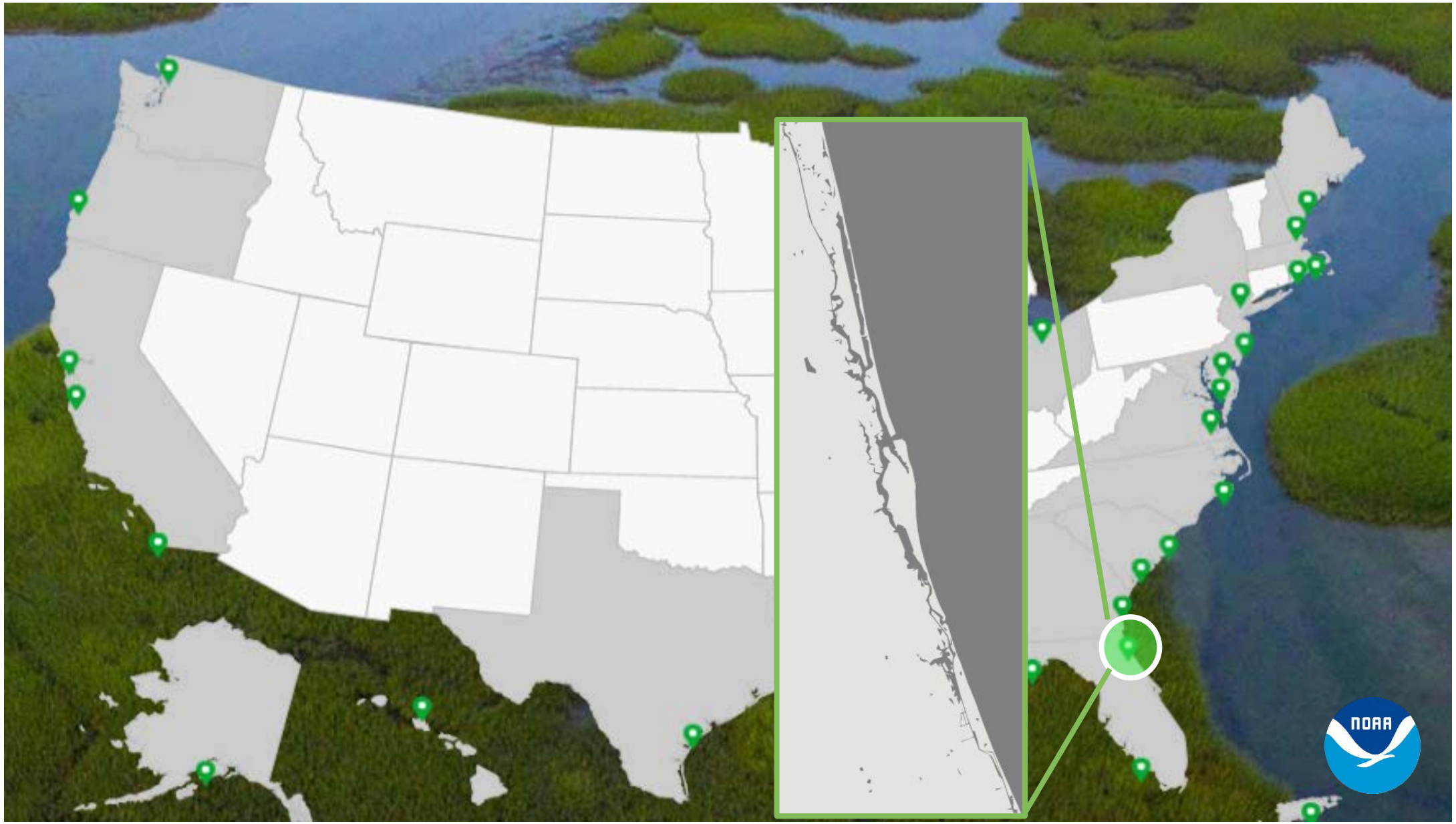

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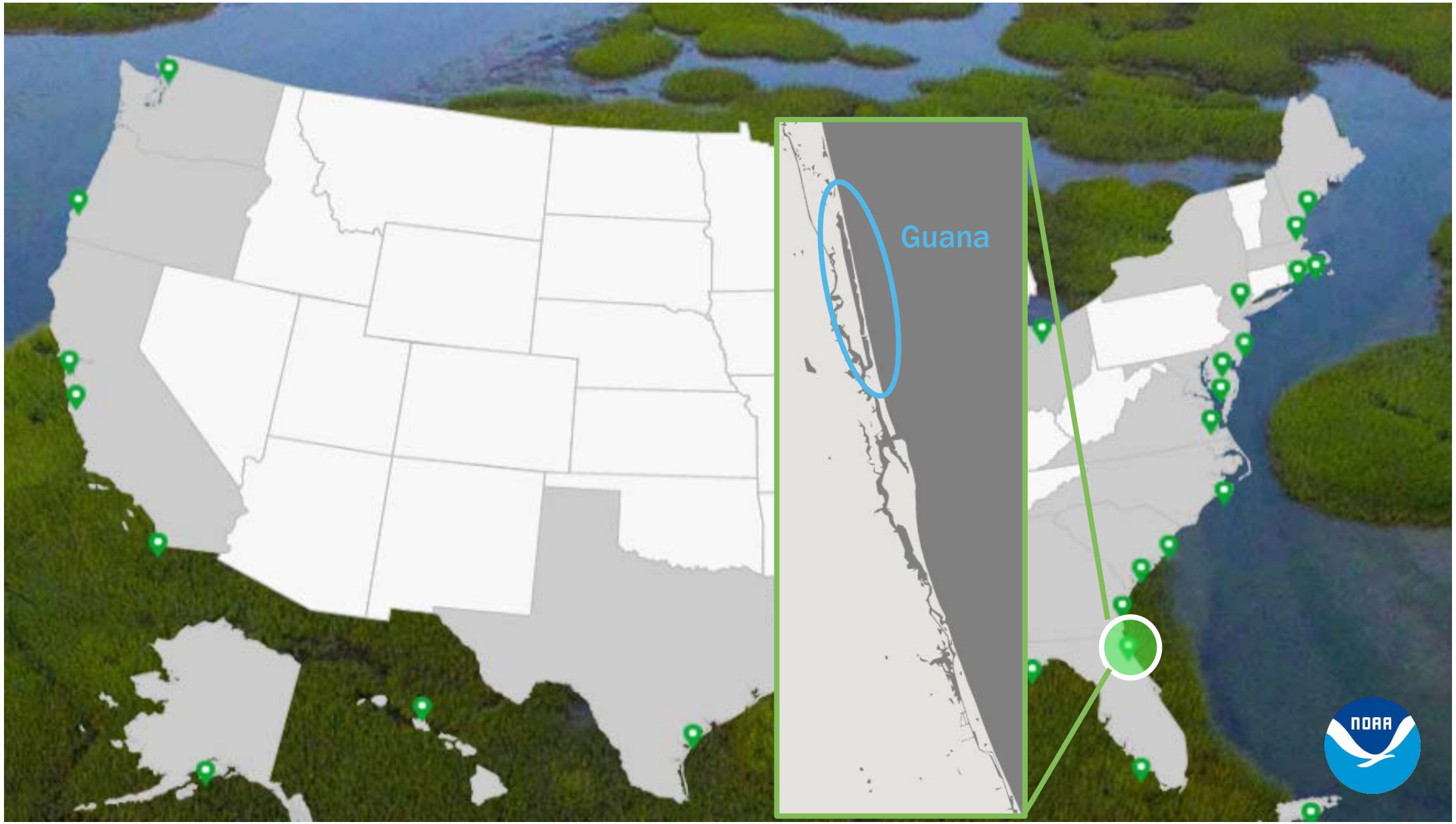

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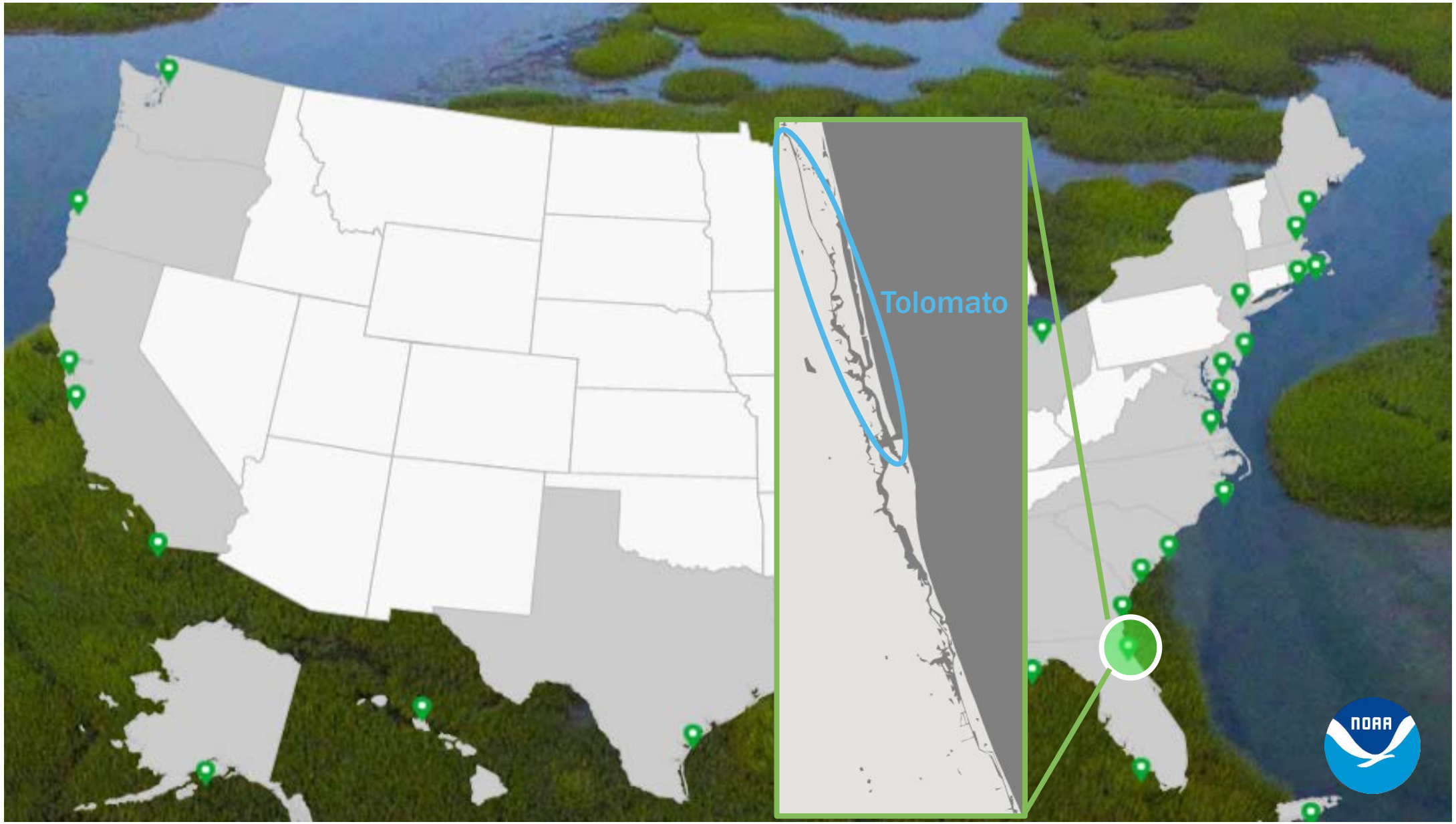

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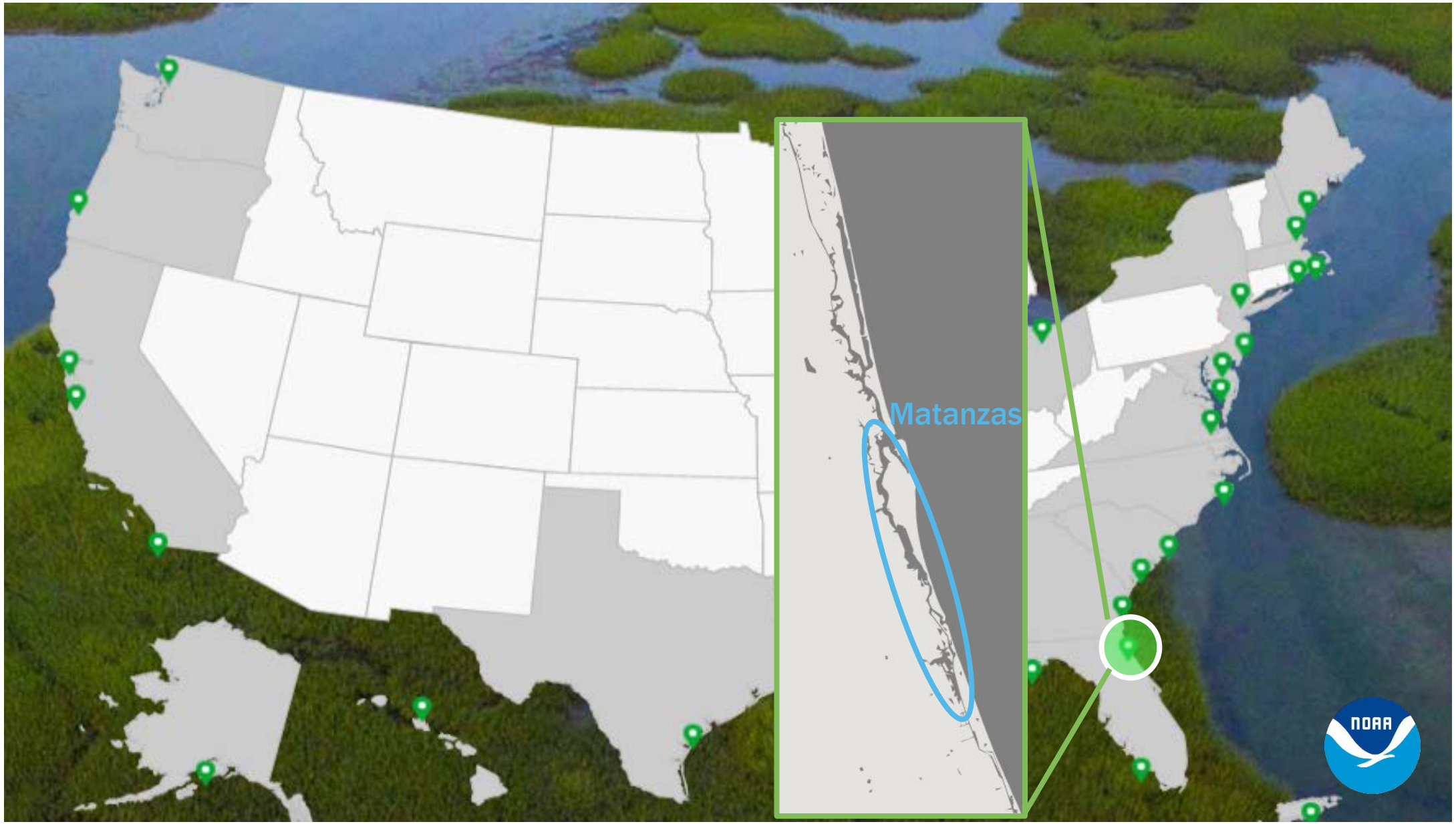
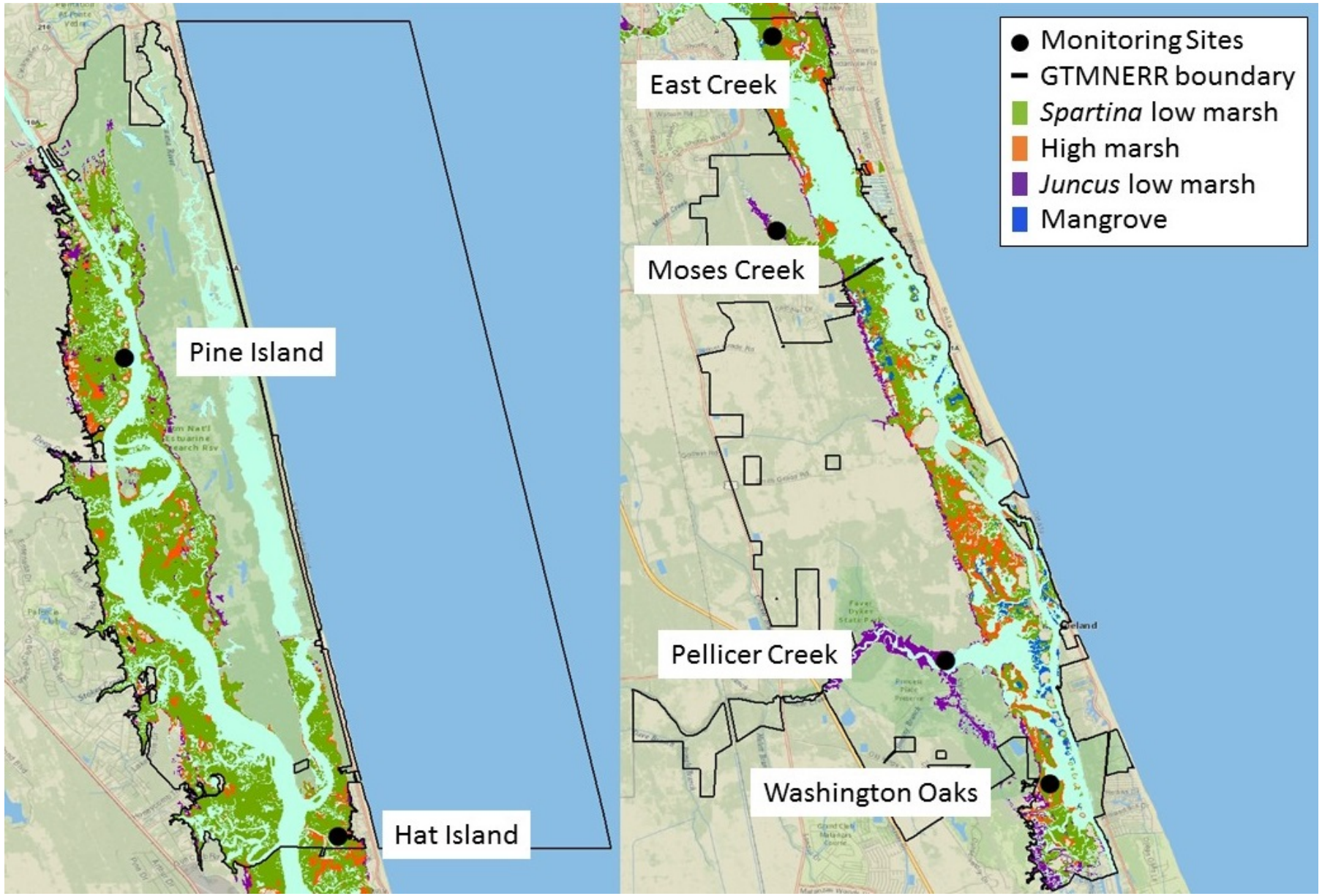


Coastal Wetland Monitoring Objectives

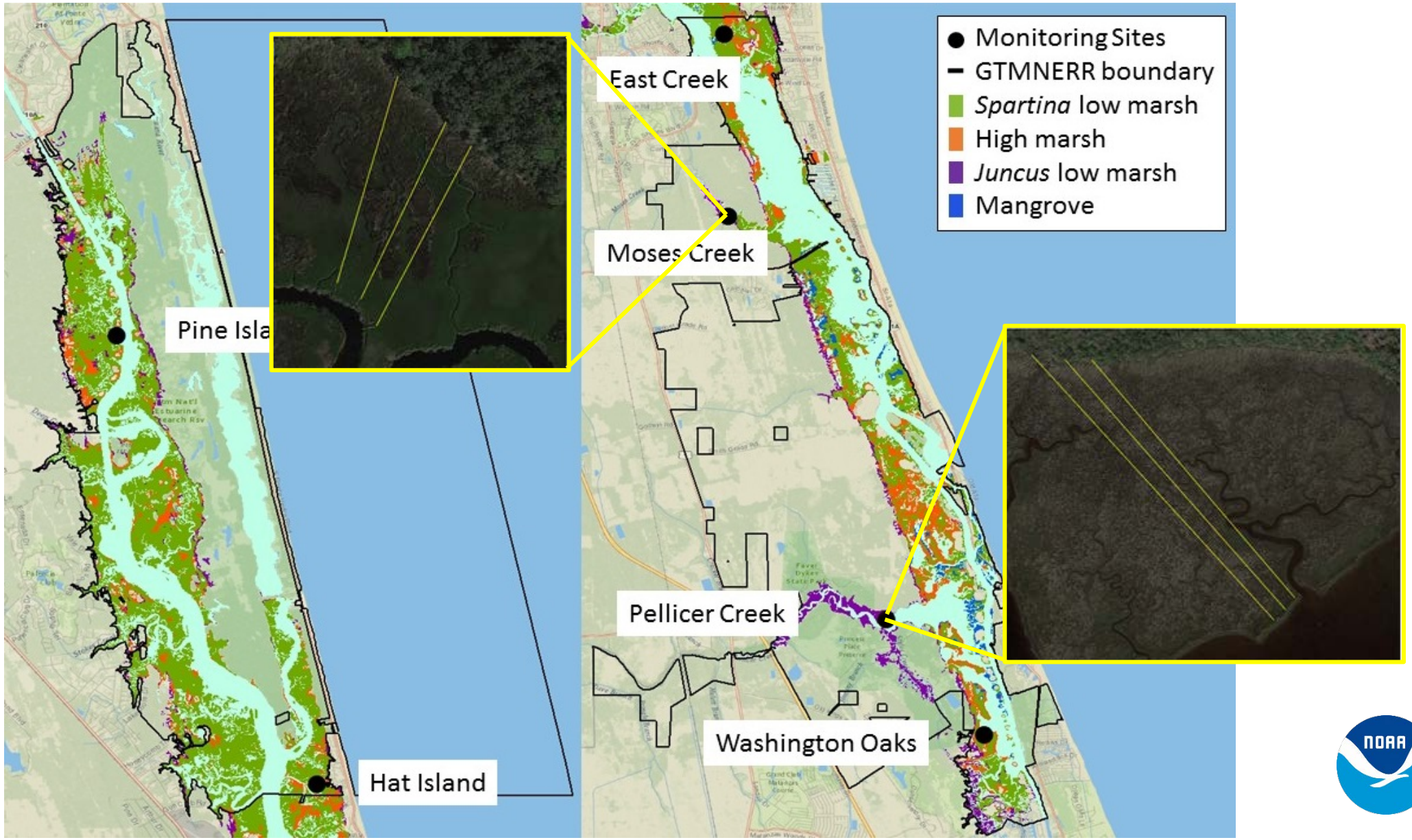
- Estuary-scale conditions over time
- Effects of warming and shifts in foundational vegetation
- Effects of sea level rise

Estuary-scale Conditions Over Time

2012 – Present



2012 – Present



Standard Protocols

nerrsdata.org

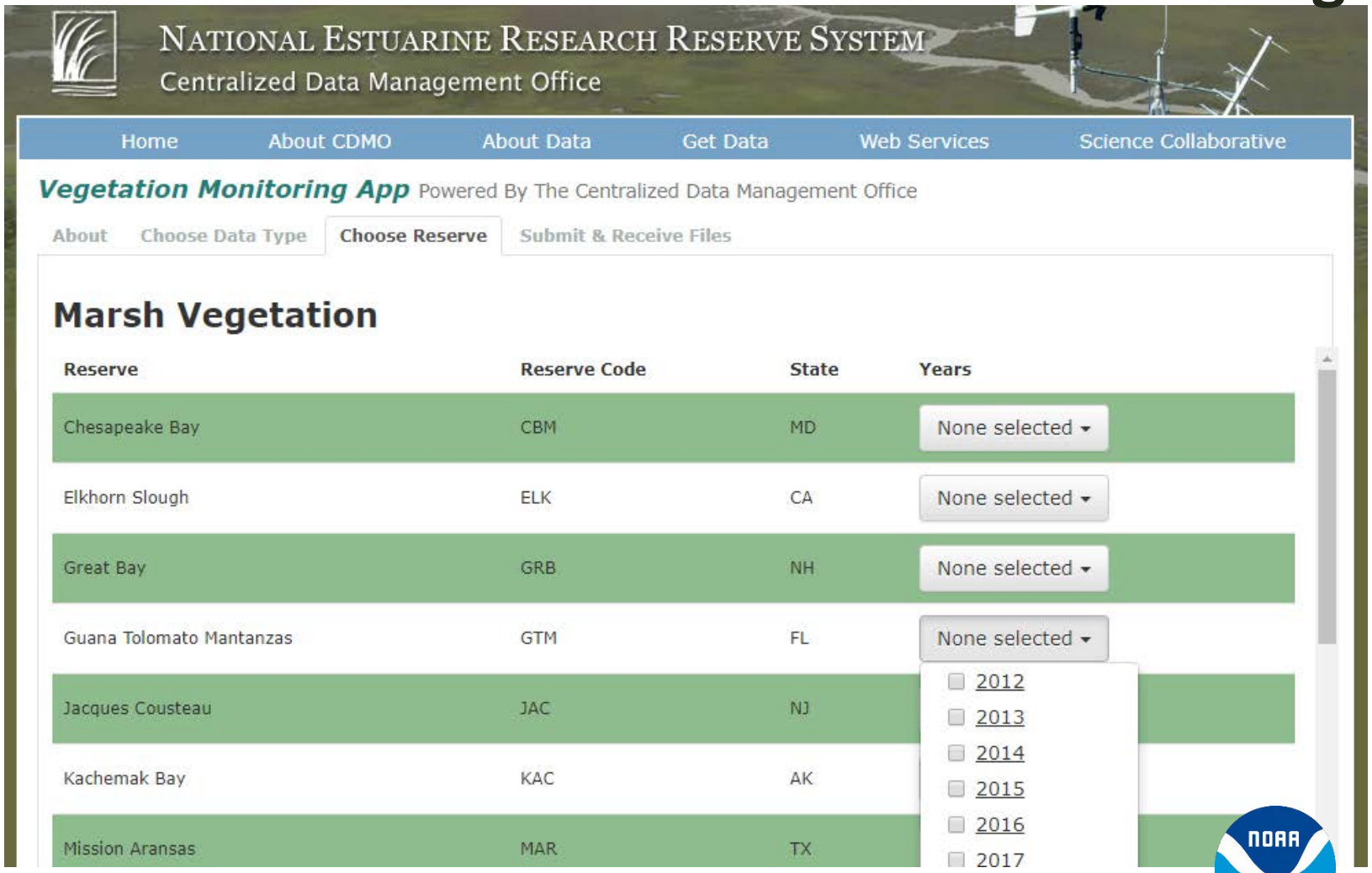
NERRS SWMP Vegetation Monitoring Protocol

Long-term Monitoring of Estuarine Vegetation Communities

National Estuarine Research Reserve System
Technical Report

Vegetation Monitoring Workgroup
Chair, Dr. Kenneth Moore, Research Coordinator
Chesapeake Bay National Estuarine Research Reserve System in Virginia
Gloucester Point, VA 23062

9/6/2013



Standard Protocols

Southeast Coast Network

National Park Service
Inventory & Monitoring Program

Standard Operating Procedure (SOP) #1.3.9

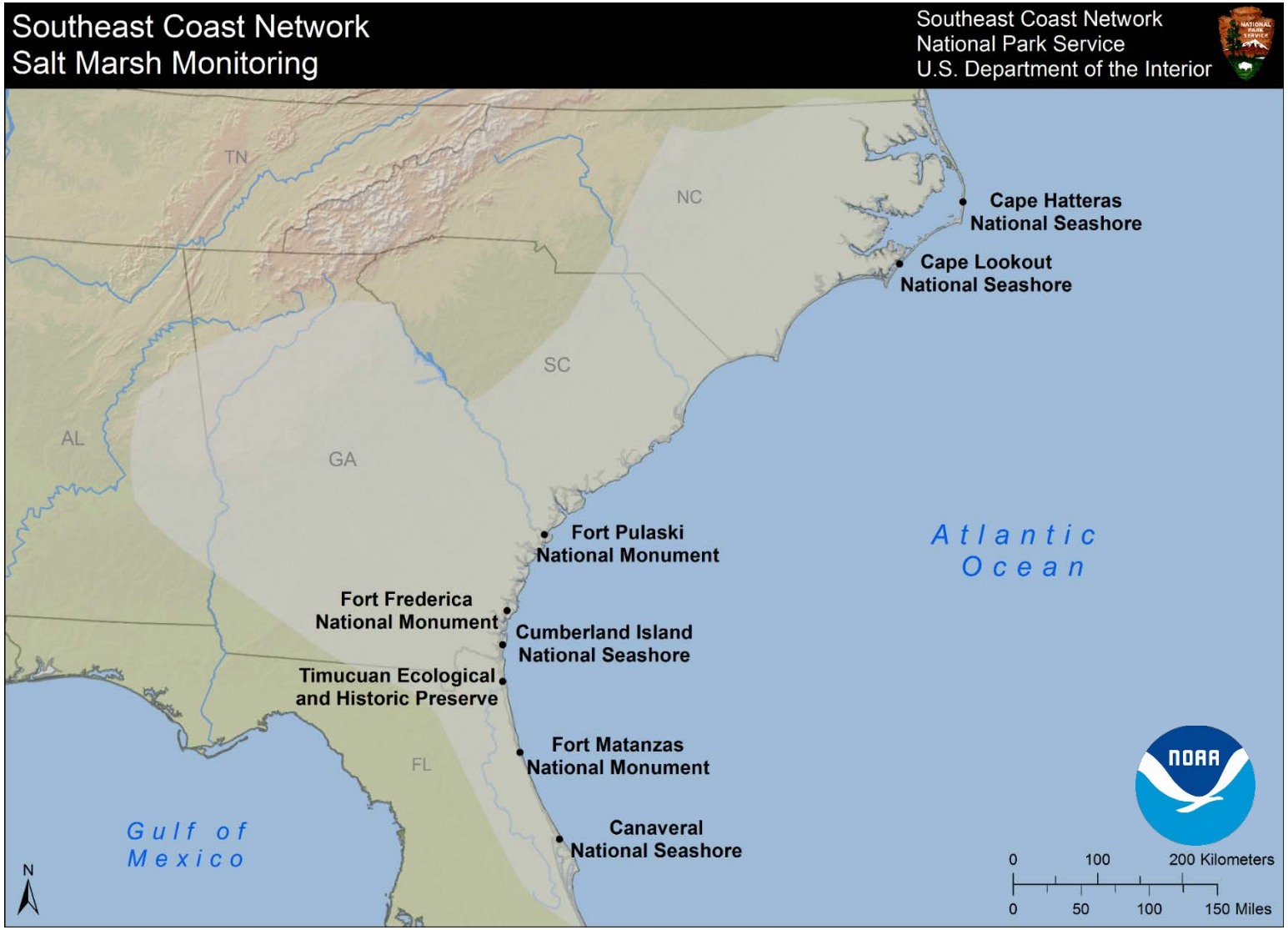
Photoplot-based Monitoring of Salt Marsh Vegetation

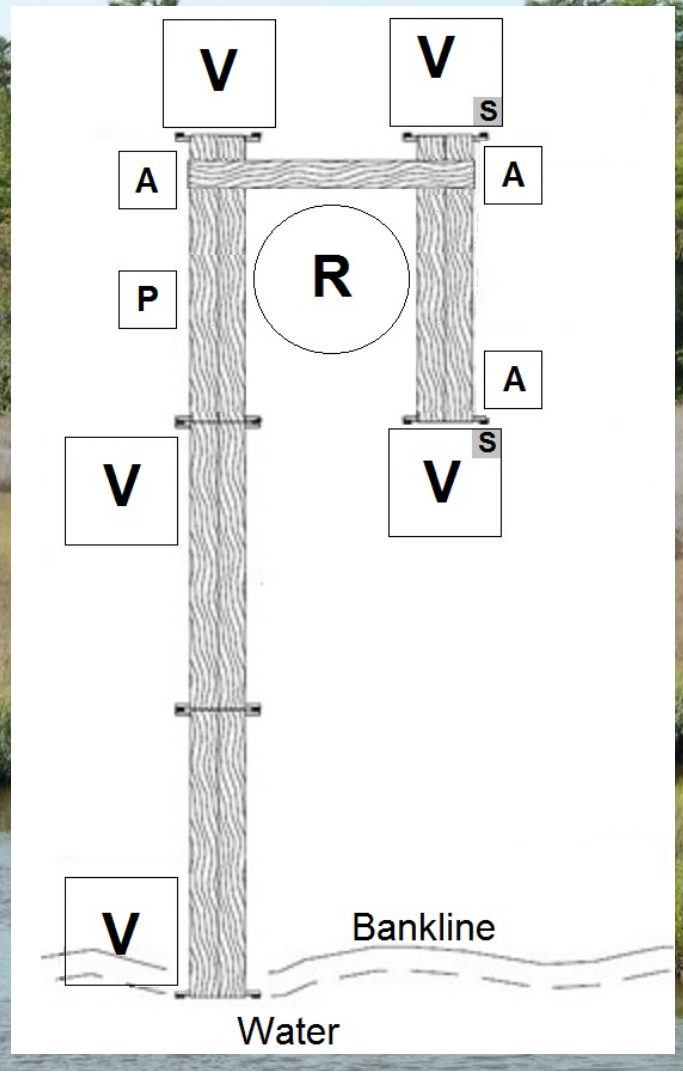
Please cite this as:

Curtis, A.C., J. Asper, S. Eastman, and L. C. Baron. 2013. Photoplot-based monitoring of salt marsh vegetation. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP-1.3.9

Summary

The following Standard Operating Procedure (SOP) is for assessing salt marsh vegetation composition and abundance on an annual basis using the total vegetation cover and average height of the dominant plant species. The following procedures for salt marsh vegetation monitoring are adapted from a number of sources, including: NERRS SWMP Bio-Monitoring Protocol, Long-term Monitoring of Estuarine Submersed and Emergent Vegetation Communities (Moore 2009); Louisiana Department of Natural Resources Coastal Resource Division protocol (Folse and West 2004); and, Monitoring Salt Marsh Vegetation, A Protocol for the Long-term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore (Roman et al. 2001).

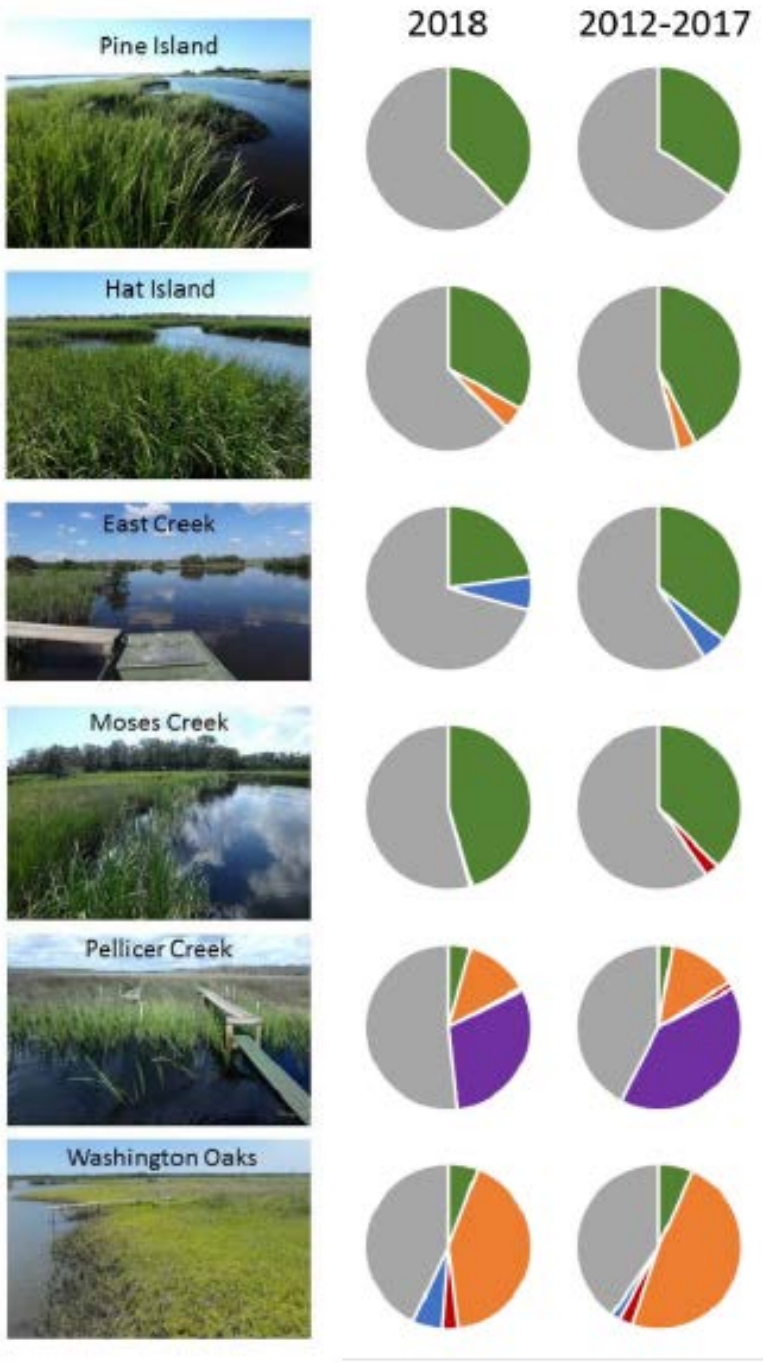




Vegetation (V), stem density (S), porewater (P), accretion (A), and RSET (R) plots.

Challenges

Results



Spartina alterniflora

Bare ground

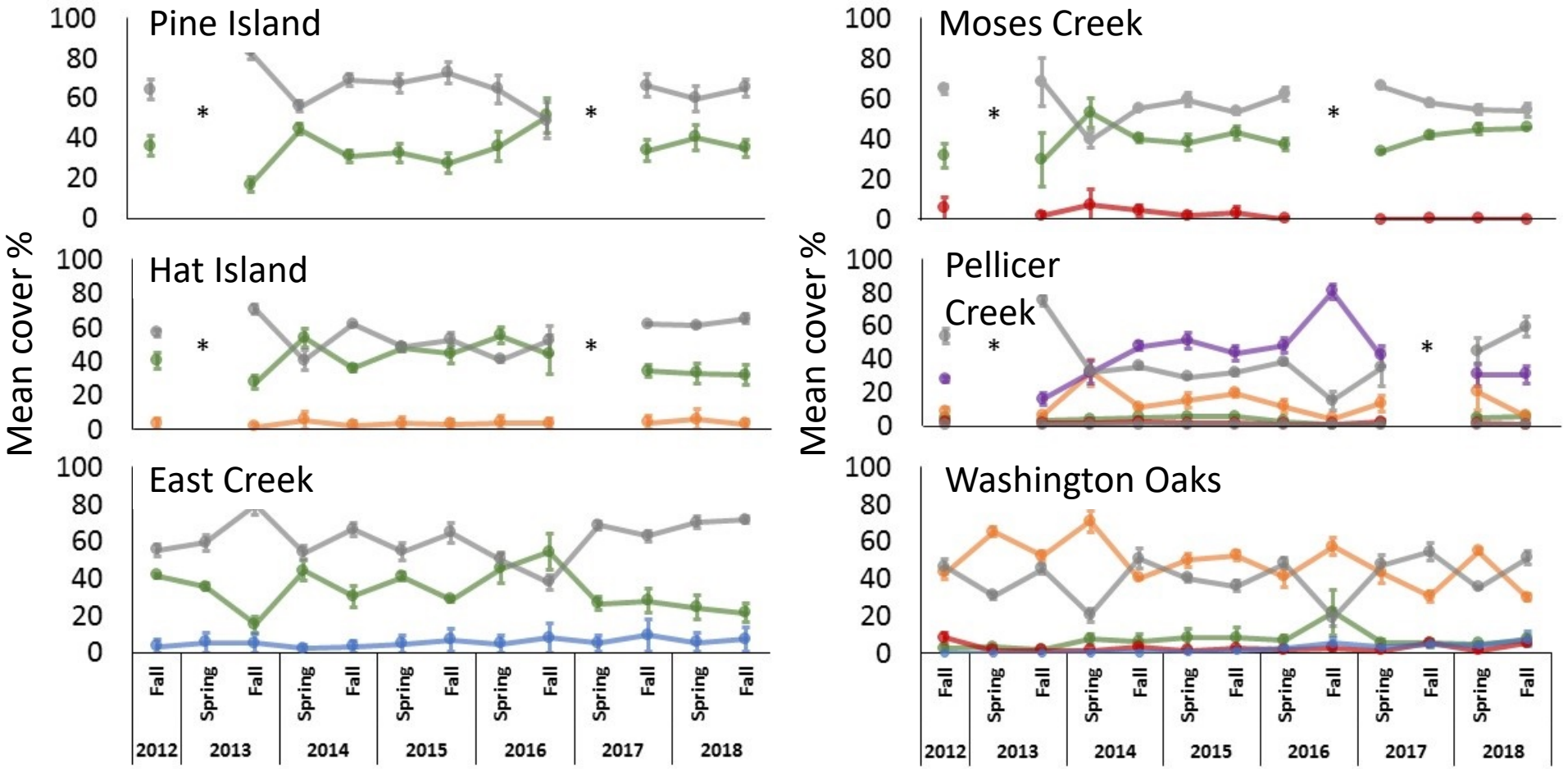
Avicennia germinans

Juncus roemerianus

Batis maritima

Sarcocornia perennis

Results



Bare ground

Spartina alterniflora

Juncus roemerianus

Batis maritima

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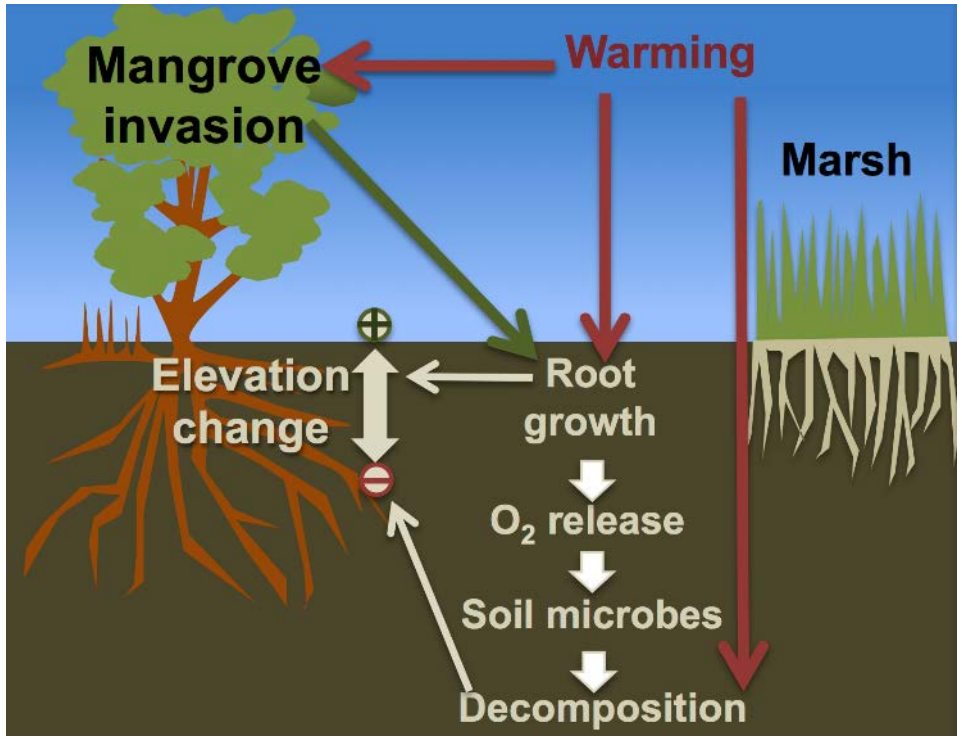
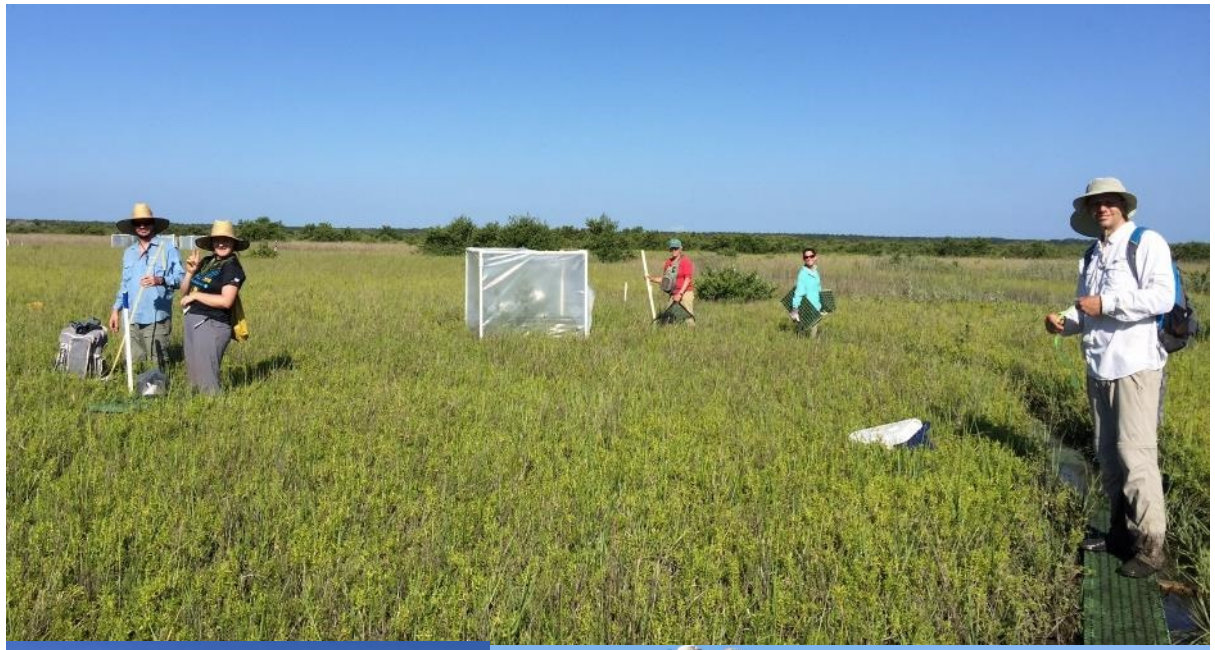
Effects of Warming and Shifts in Foundational Vegetation

WETFEET


Mangrove invasion
Warming
Marsh
Elevation change
Root growth
O_2 release
Soil microbes
Decomposition



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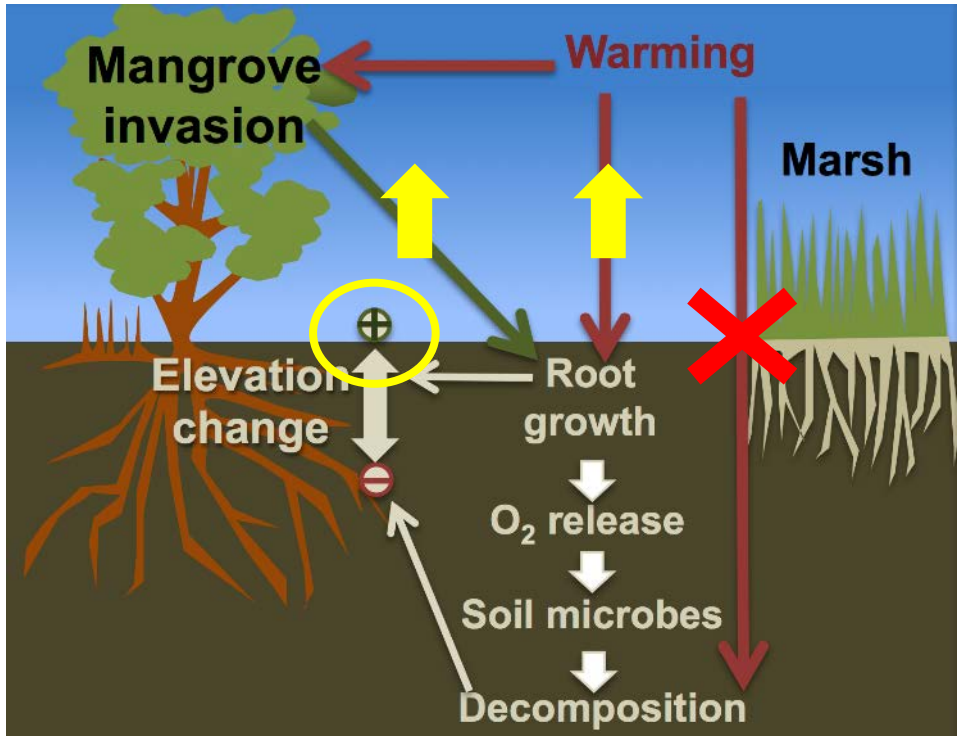
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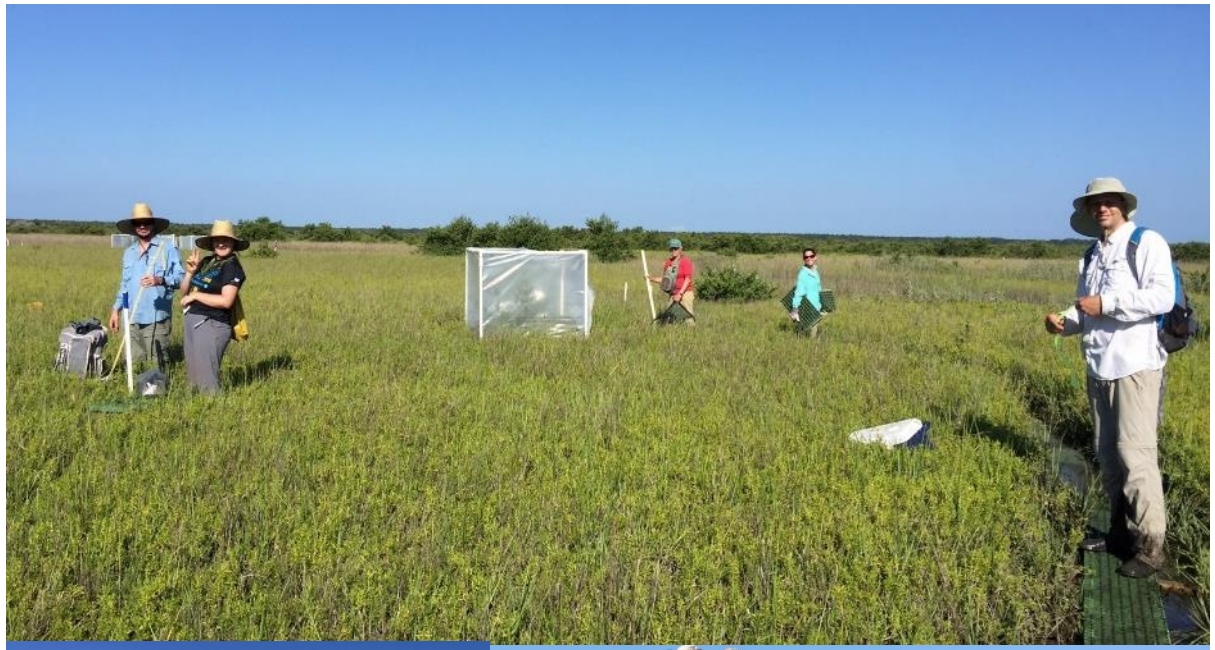
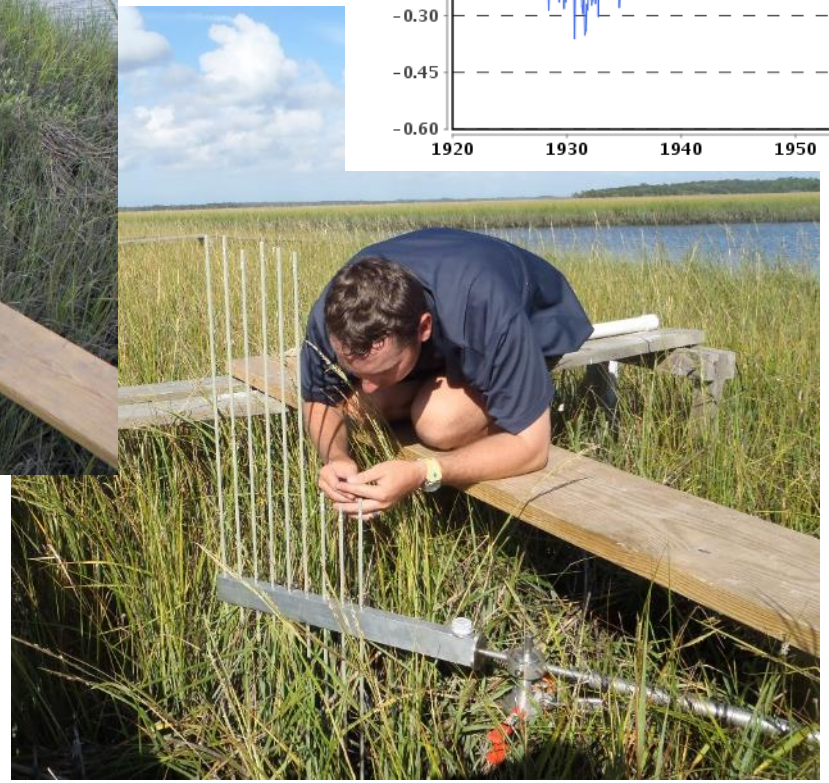
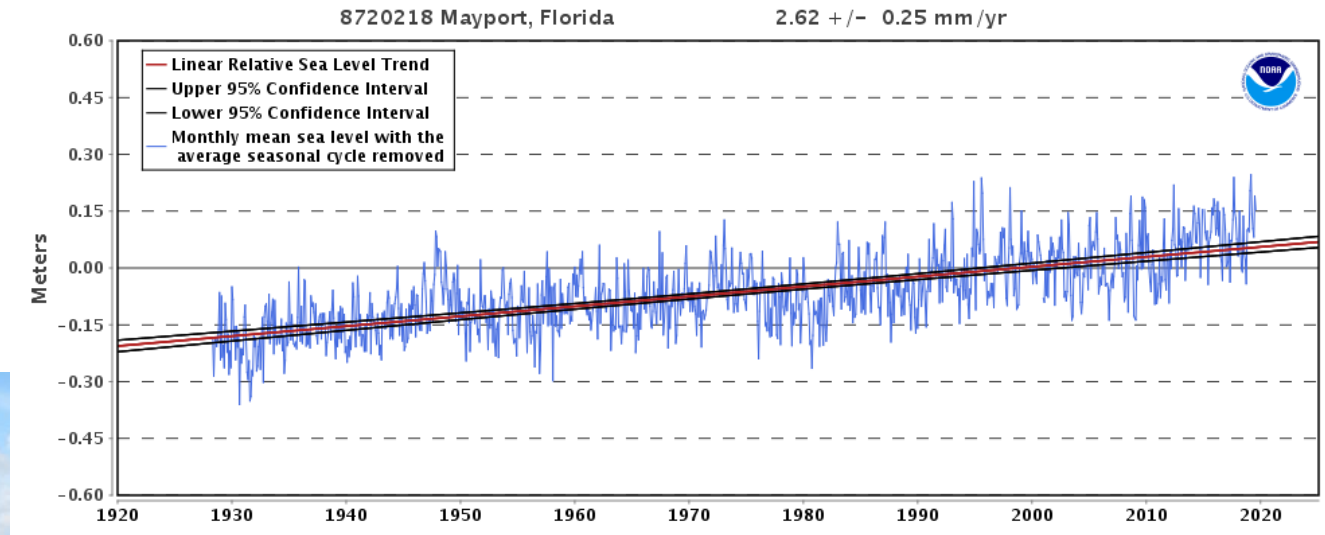


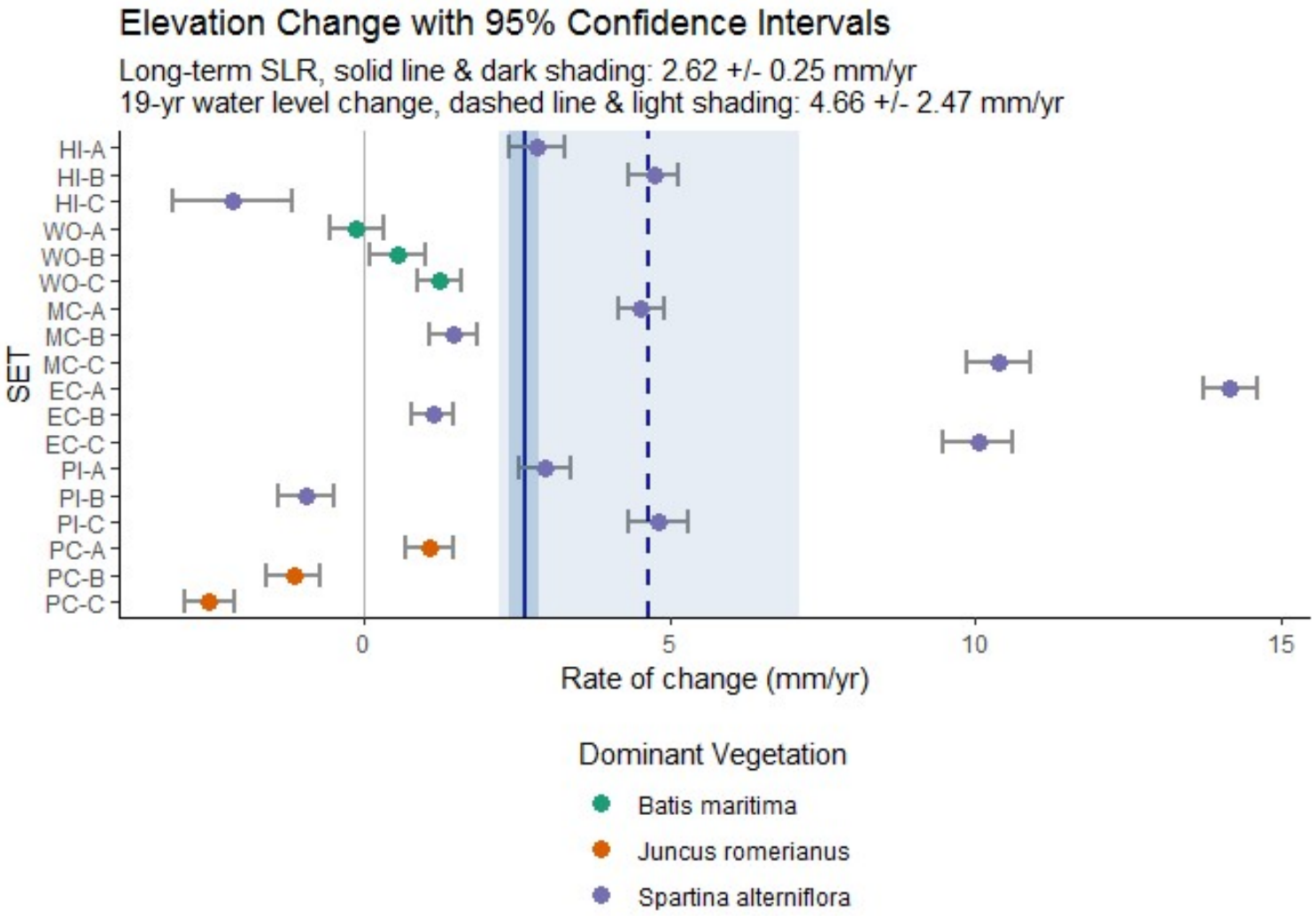
Effects of Sea Level Rise

Surface Elevation Tables





Surface Elevation Tables (2013-2019)



NERRs Index: Marsh Resilience to SLR (MARS)

Metric thresholds	Percent of marsh below MHW	> 80%	> 60%	> 40%	> 20%	≤ 20%
	Percent of marsh in lowest third of plant distribution	> 80%	> 60%	> 40%	> 20%	≤ 20%
	Skewness	> 1.5	> 0.5	0.5 to -0.5	< -0.5	< -1.5
	Elevation change rate (mm yr^{-1})	≤ 2	> 2	> 3	> 4	> 5
	Short-term accretion rate (mm yr^{-1})	≤ 2	> 2	> 3	> 4	> 5
	Long-term accretion rate (mm yr^{-1})	≤ 2	> 2	> 3	> 4	> 5
	Turbidity (NTU) / Total suspended solids (mg l^{-1})	≤ 10	> 10	> 20	> 30	> 40
	Tidal range (m)	≤ 0.6	> 0.6	> 1.2	> 1.8	> 2.4
	Long-term rate of SLR (mm yr^{-1})	> 3.4	> 2.6	> 1.8	> 1	≤ 1
	Short-term inter-annual variability in water levels (mm)	> 25	> 15	> 5	5 to -5	< -5
Scoring	All metrics	1	2	3	4	5
	All categories	< 2	< 3	< 4	< 5	5
	MARS - risk	0-1	2	3	4	5
	MARS - average	1	> 1	> 2	> 3	> 4
	MARS - ratio	< -0.5	> -0.5	> 1.5	> 2.5	> 3.5

Raposa et al. 2016

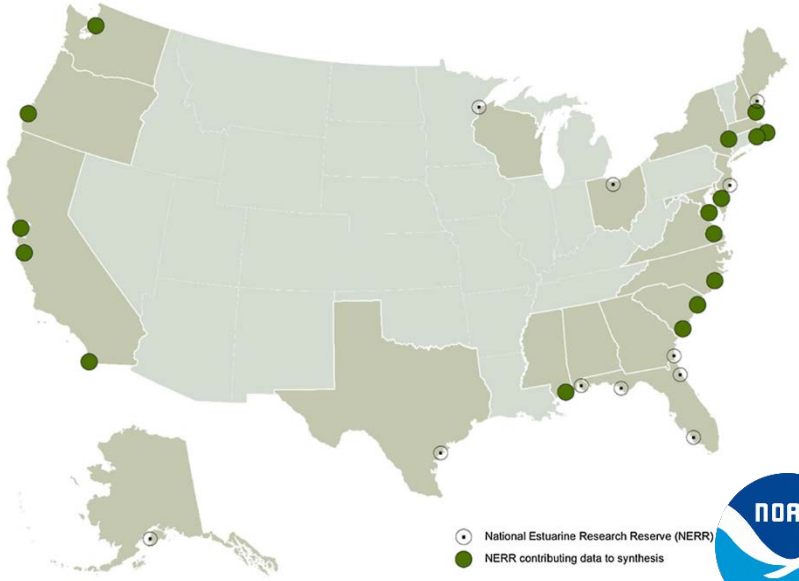
Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/bioc

Assessing tidal marsh resilience to sea-level rise at broad geographic scales with multi-metric indices

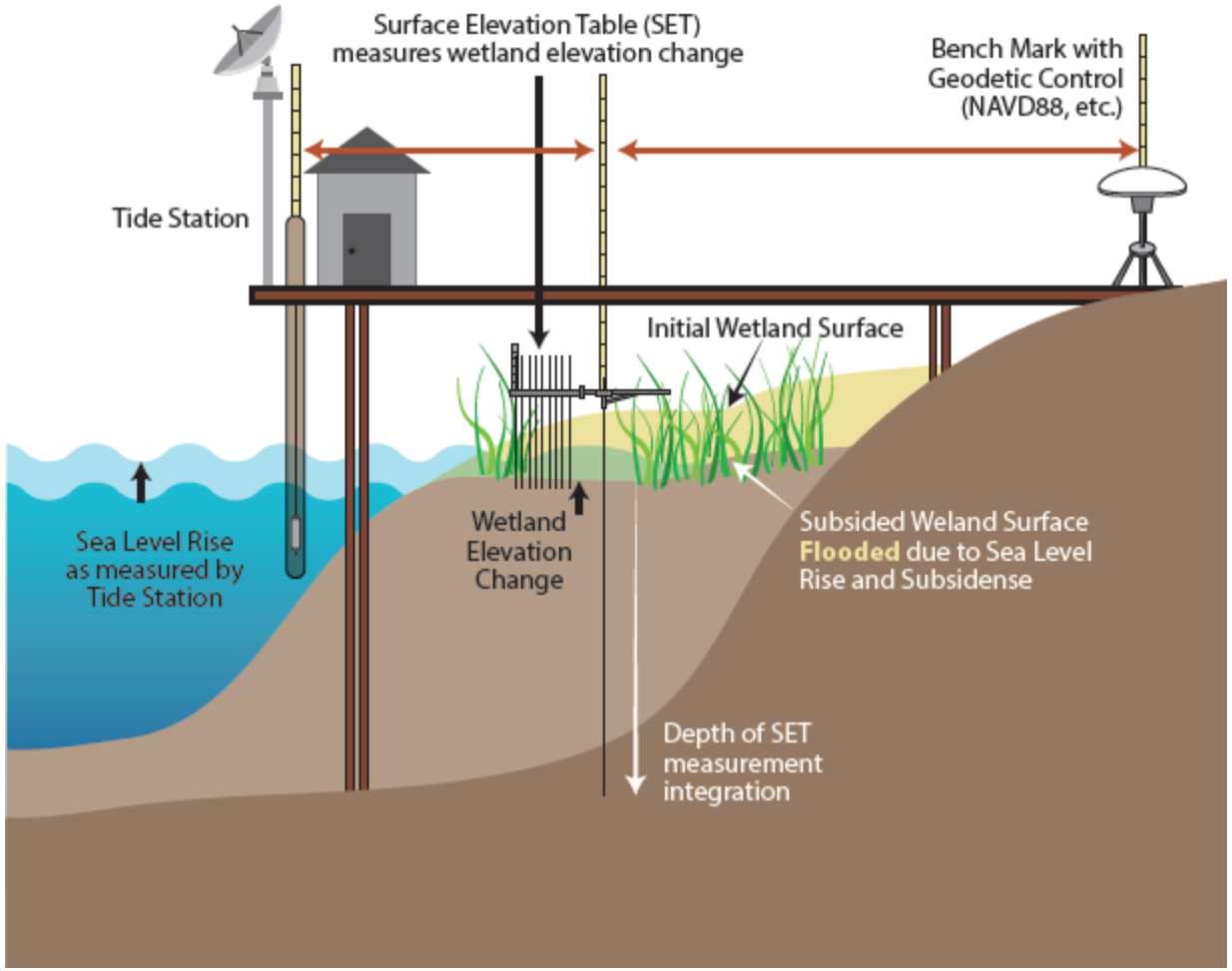
Kenneth B. Raposa [a,*], Kerstin Wasson [b], Erik Smith [c], Jeffrey A. Crooks [d], Patricia Delgado [e], Sarah H. Fernald [f], Matthew C. Ferner [g], Alicia Helms [h], Lyndie A. Hice [i], Jordan W. Mora [j], Brandon Puckett [k], Denise Sanger [l], Suzanne Shull [m], Lindsay Spurrier [n], Rachel Stevens [o], Scott Lerberg [p]



NERRs Index: Marsh Resilience to SLR (MARS)

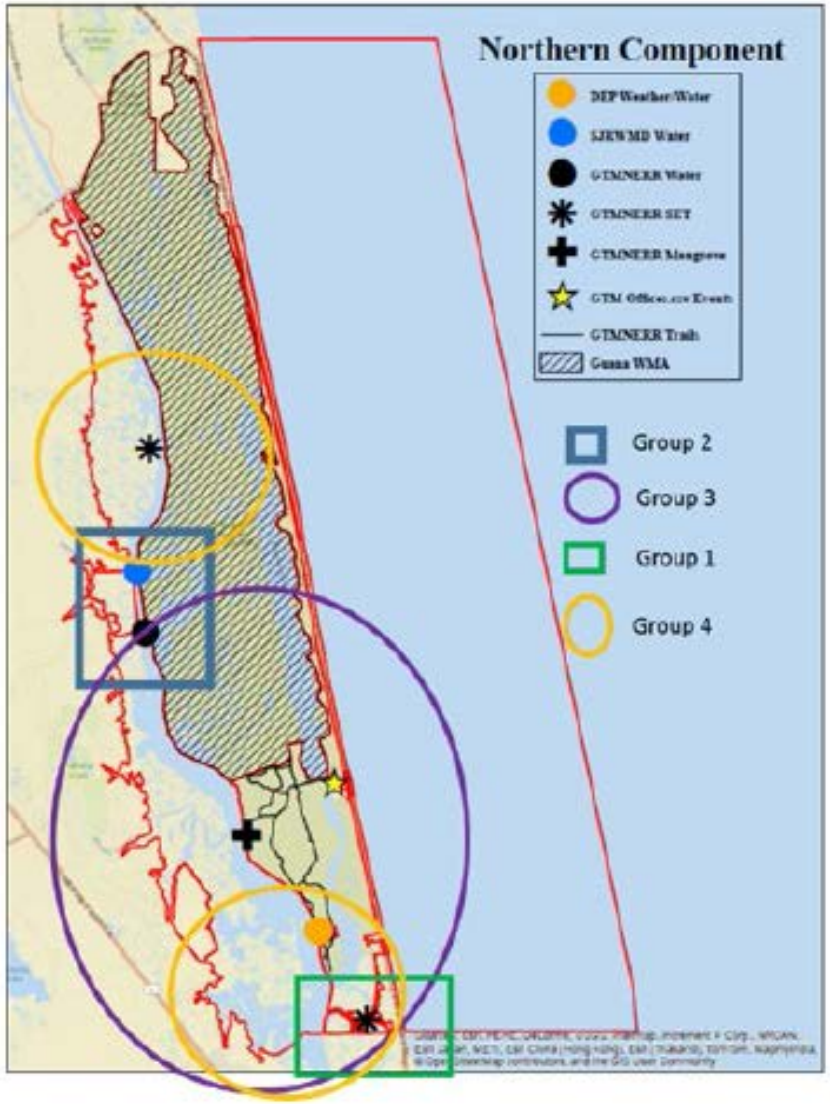
		Pine Island	Pellicer Creek	Hat Island	Jason's Creek	Moses Creek	Washington Oaks
Metrics	Percent of marsh below MHW	98	37	87	87.5	37.5	89
	Percent of marsh in lowest third of plant distribution	42	26	25	47	37.5	56
	Skewness	0.5	0.5	0.5	0.5	2	-0.6
	Elevation change rate (mm yr-1)	1.61	2.93	2.64	10.66	2.3	0.75
	Short-term accretion rate (mm yr-1)	12.65	12.6	No data	No data	1.3	2.3
	Long-term accretion rate (mm yr-1)	No data	No data	No data	No data	No data	No data
	Turbidity (NTU) or Total Suspended Solids (mg l-1)	61.22	11.88	61.22	19.5	20.52	20.52
	Tide range (m)	1.7	0.52	1.7	1.5	1.19	1.9
	Long-term rate of SLR (mm yr-1)	2.62	2.62	2.62	2.62	2.62	2.62
	Short-term inter-annual variability in water levels (mm)	1.63	1.63	1.63	1.63	1.63	1.63
Categories	Marsh Elevation Distributions	2.3	3.7	2.7	2.3	3	2.7
	Marsh elevation change	1.0	2.0	2.0	5.0	2	1
	Sediment/accretion	5	3.5	3	1.5	2	2.5
	Tide Range	3	1	3	3	2	4
	Sea Level Rise	3	3	3	3	3	3
Indices	MARS Risk	3	3	3	3	2	2
	MARS Average	2.87	2.63	2.73	2.97	2.40	2.63
	MARS Ratio	.61	1.12	1.01	4.07	0.88	.29

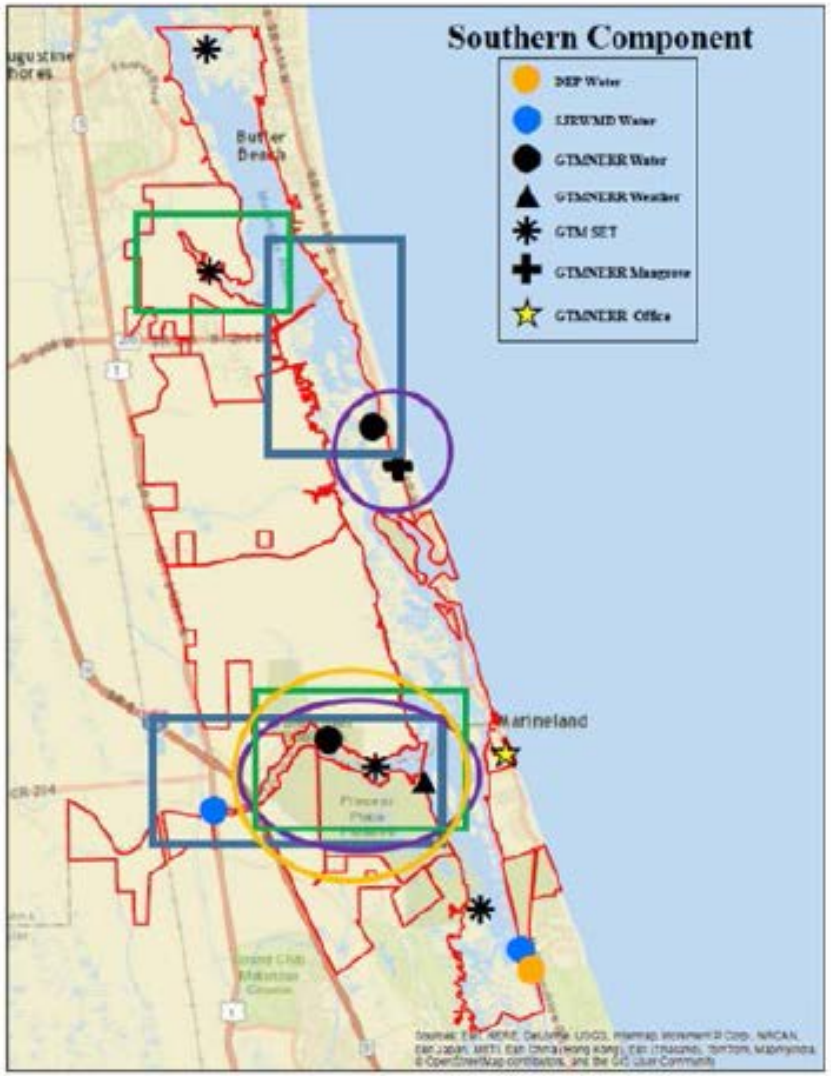
Sentinel Site



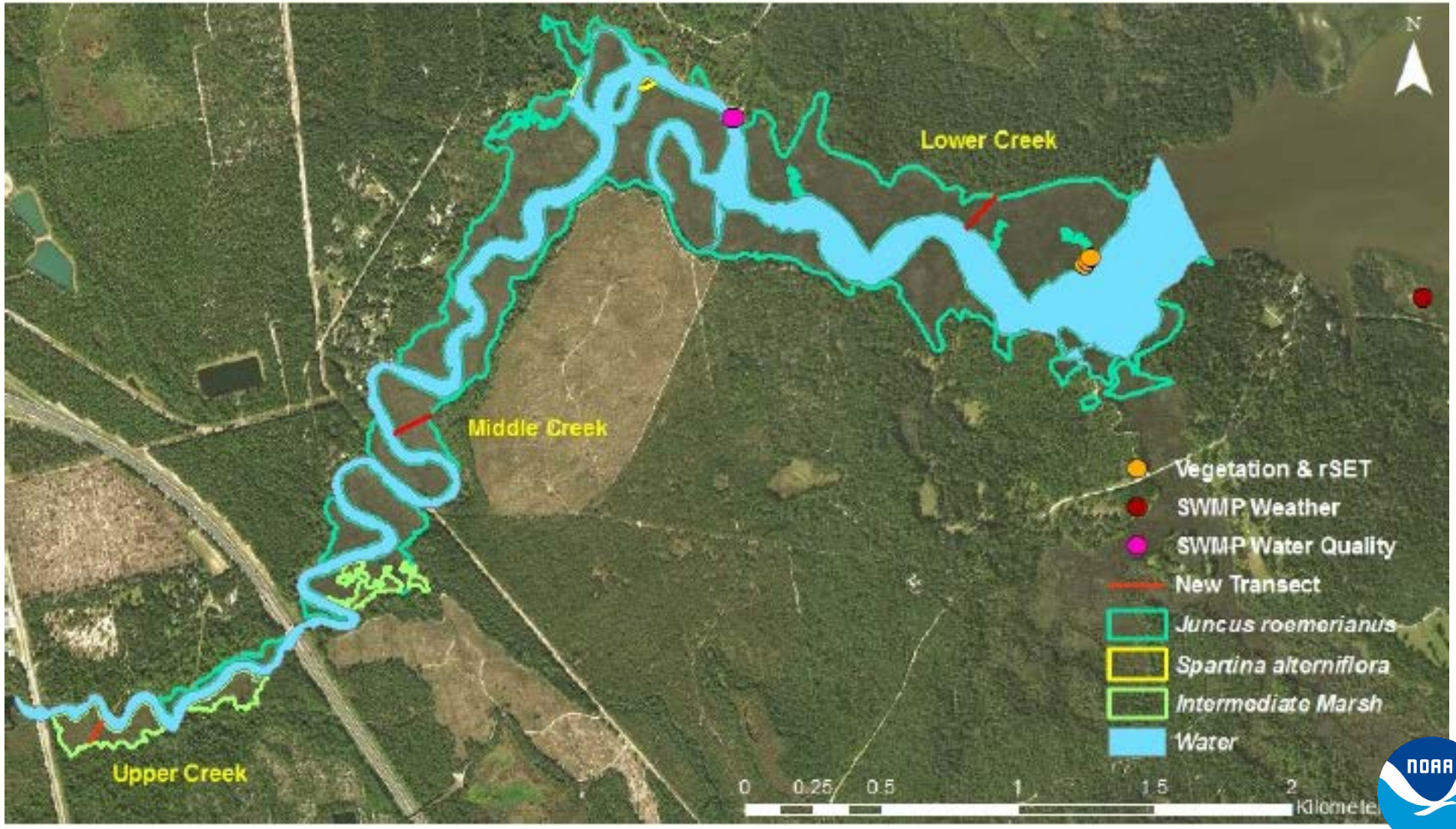
NERRS. 2016. Coastal Habitat Response to Changing Water Levels: NERR Sentinel Site Application Module 1

Site Selection





Pellicer Creek Build-out



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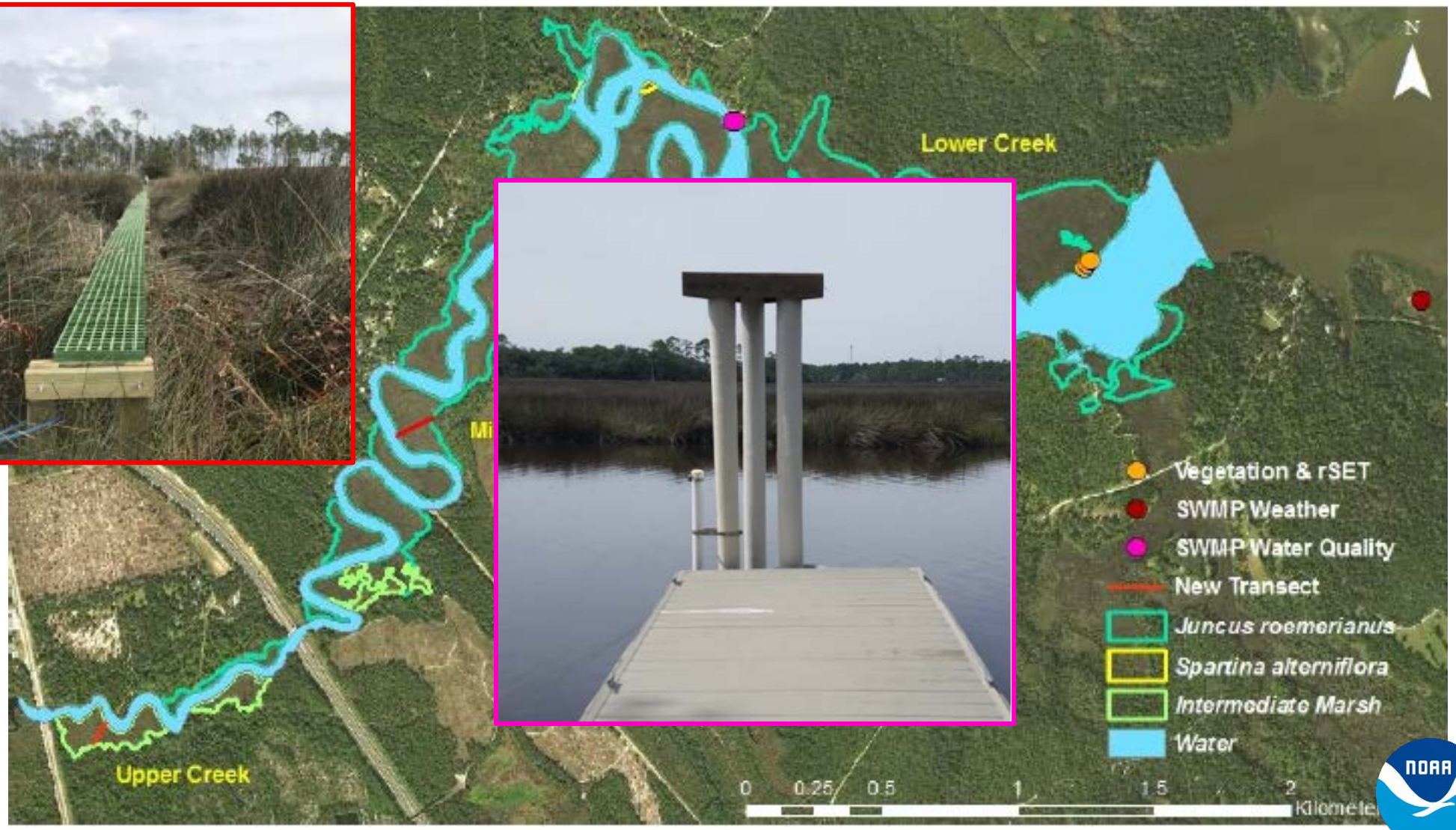

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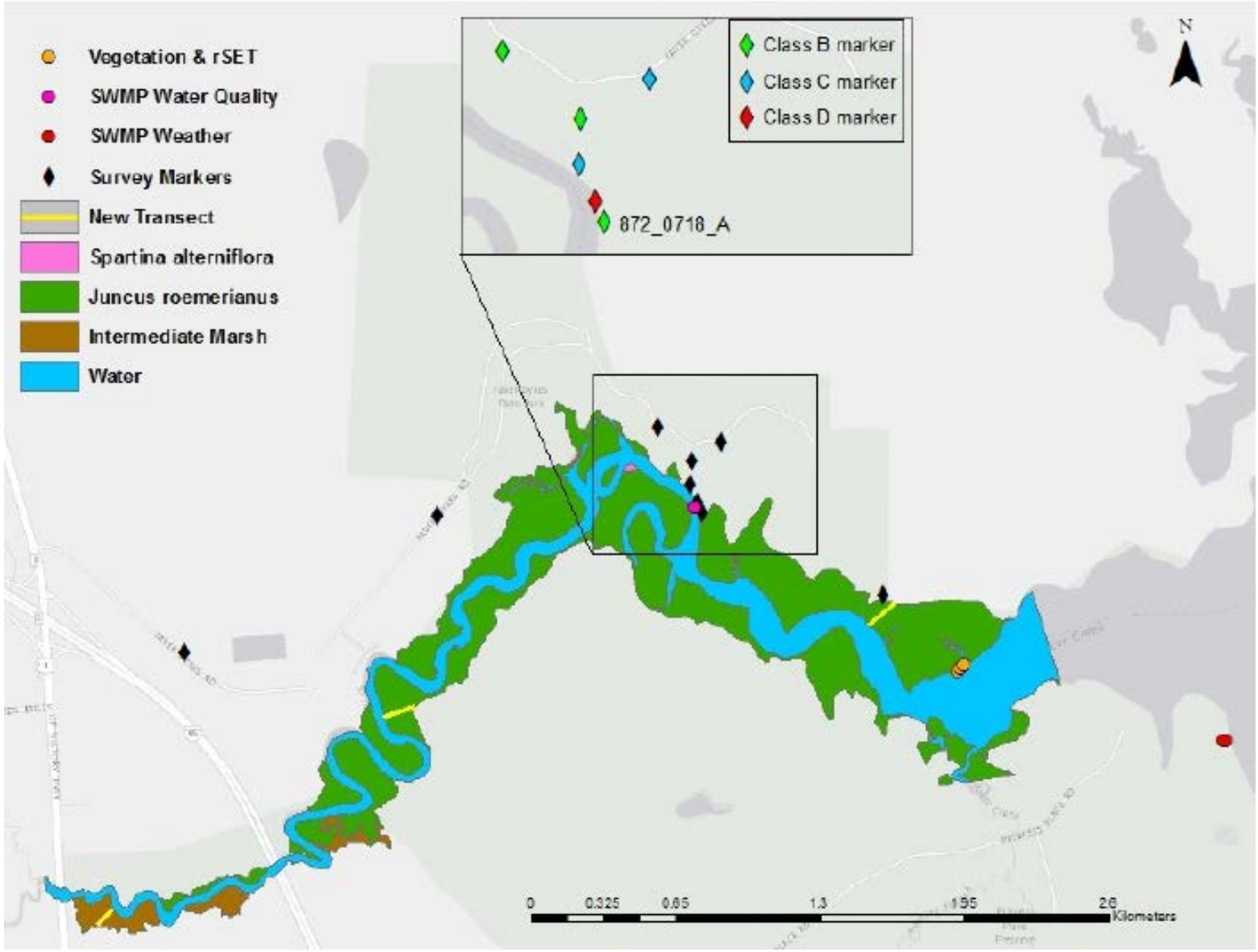
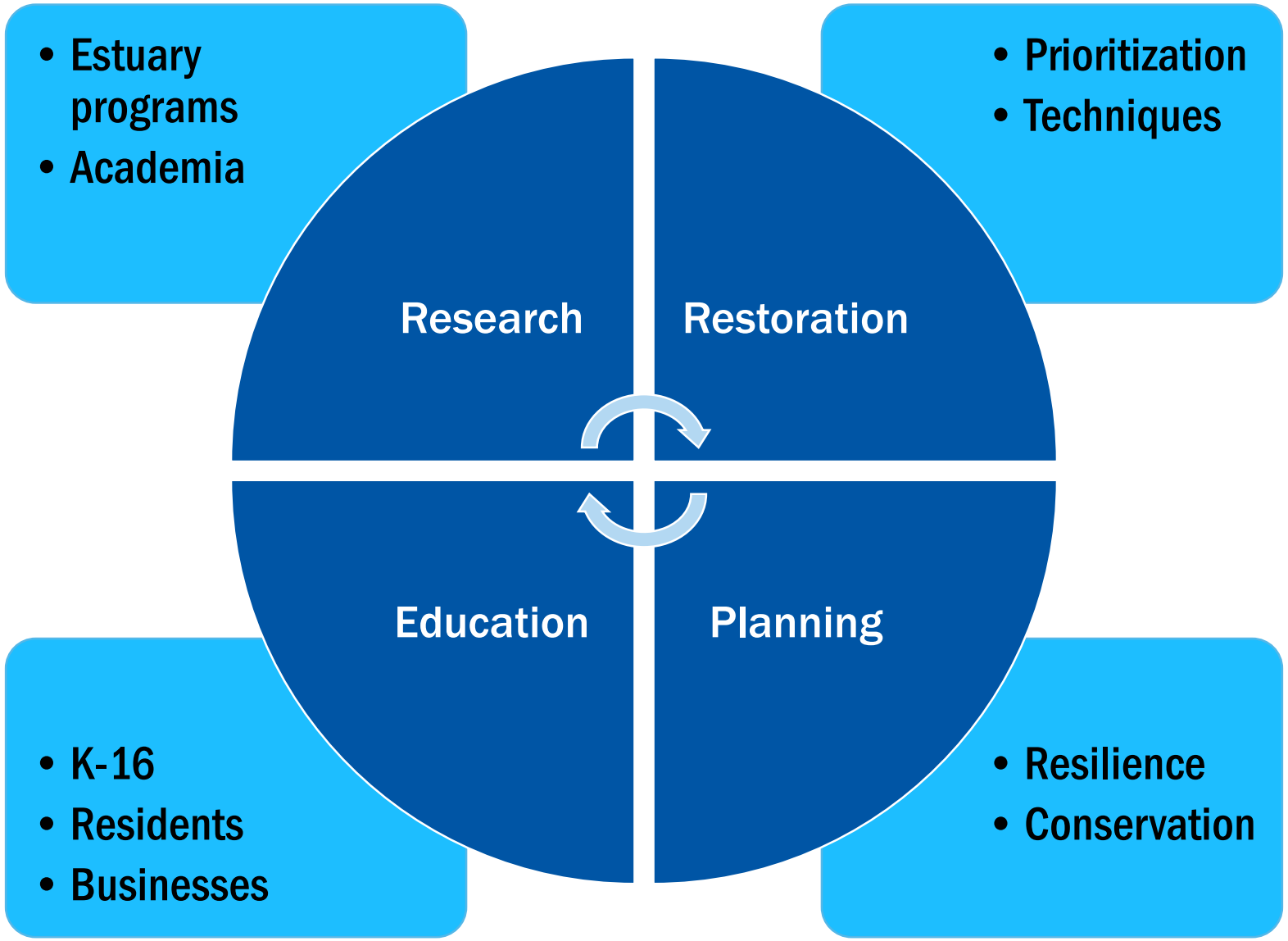


Stakeholder Engagement



Thank you!

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