

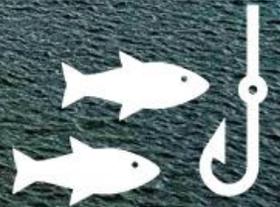
Mapping the effects of sea level rise on North Carolina's coastal habitats and blue carbon

NC Beach, Inlet, and Waterway Association 24th Annual Conference
November 4, 2021

Katie Warnell and Lydia Olander (Duke University)
Carolyn Currin (NOAA)



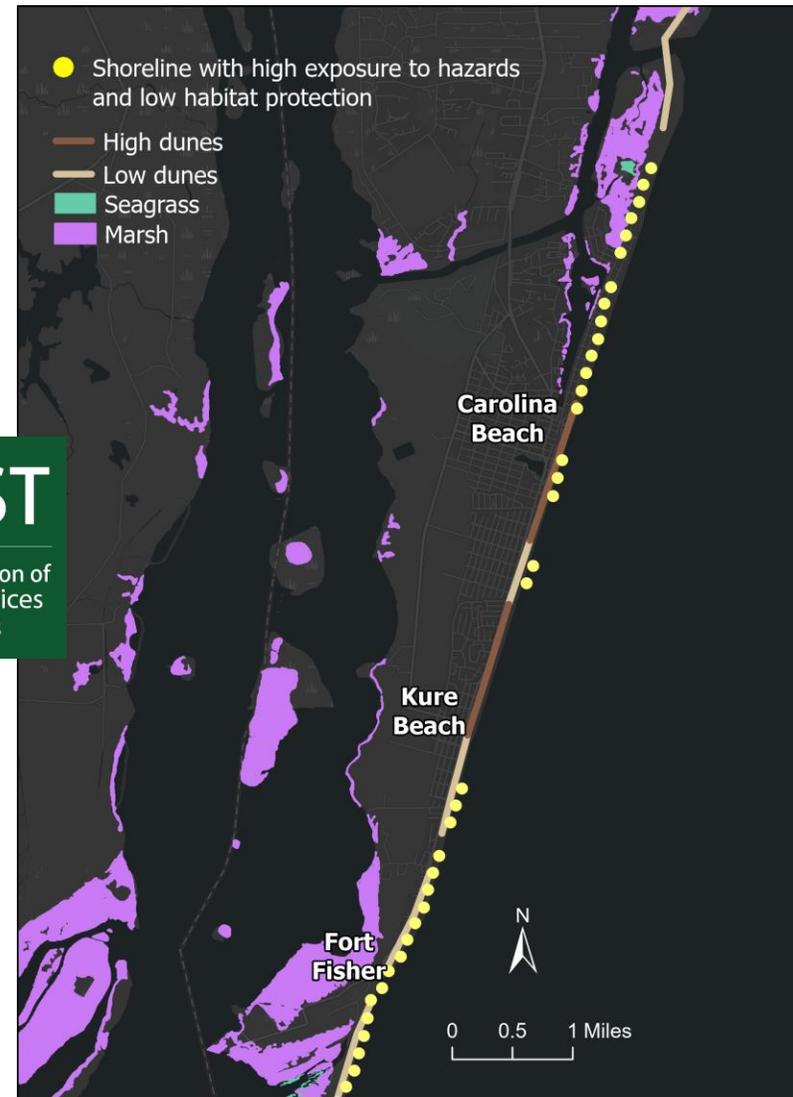
North Carolina's salt marshes & seagrass beds create significant value for our coastal communities.



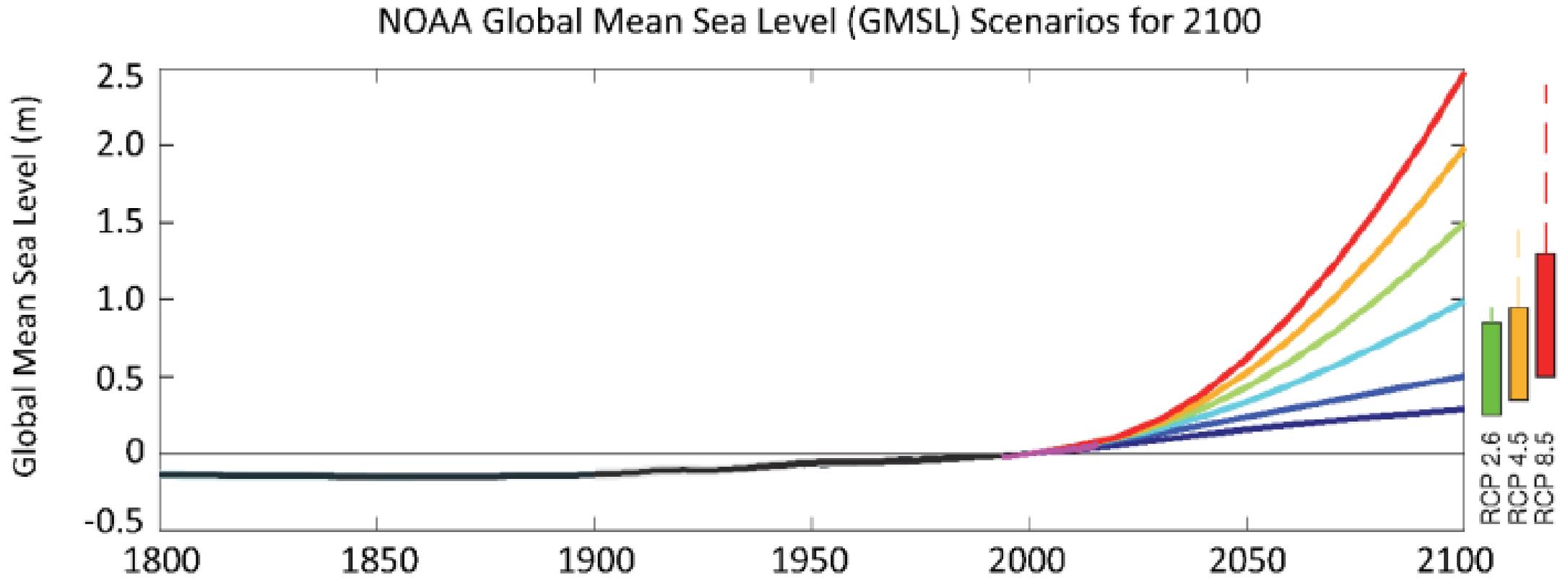
Some NC shorelines are strongly protected by coastal habitats, while others have weaker protection.



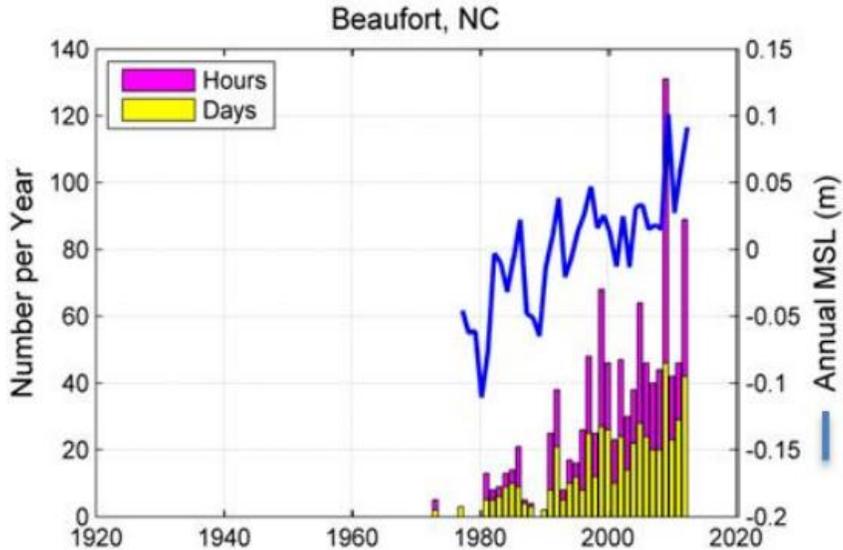
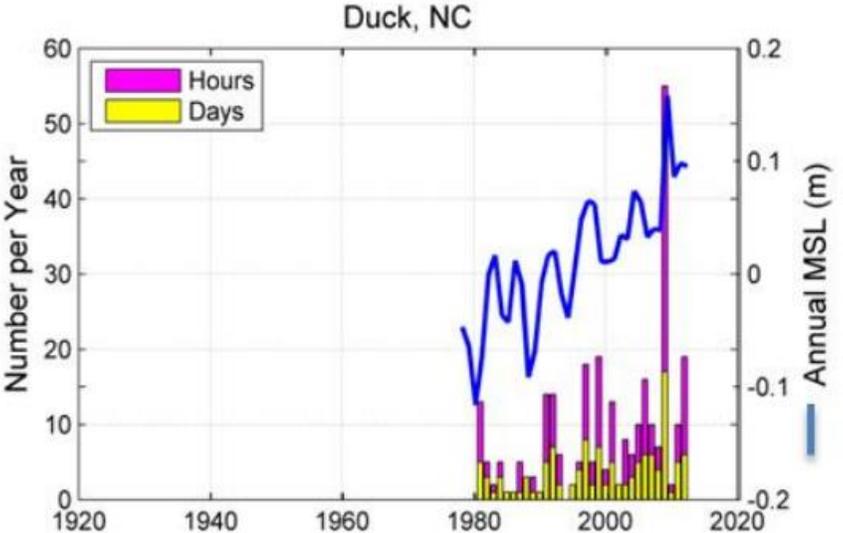
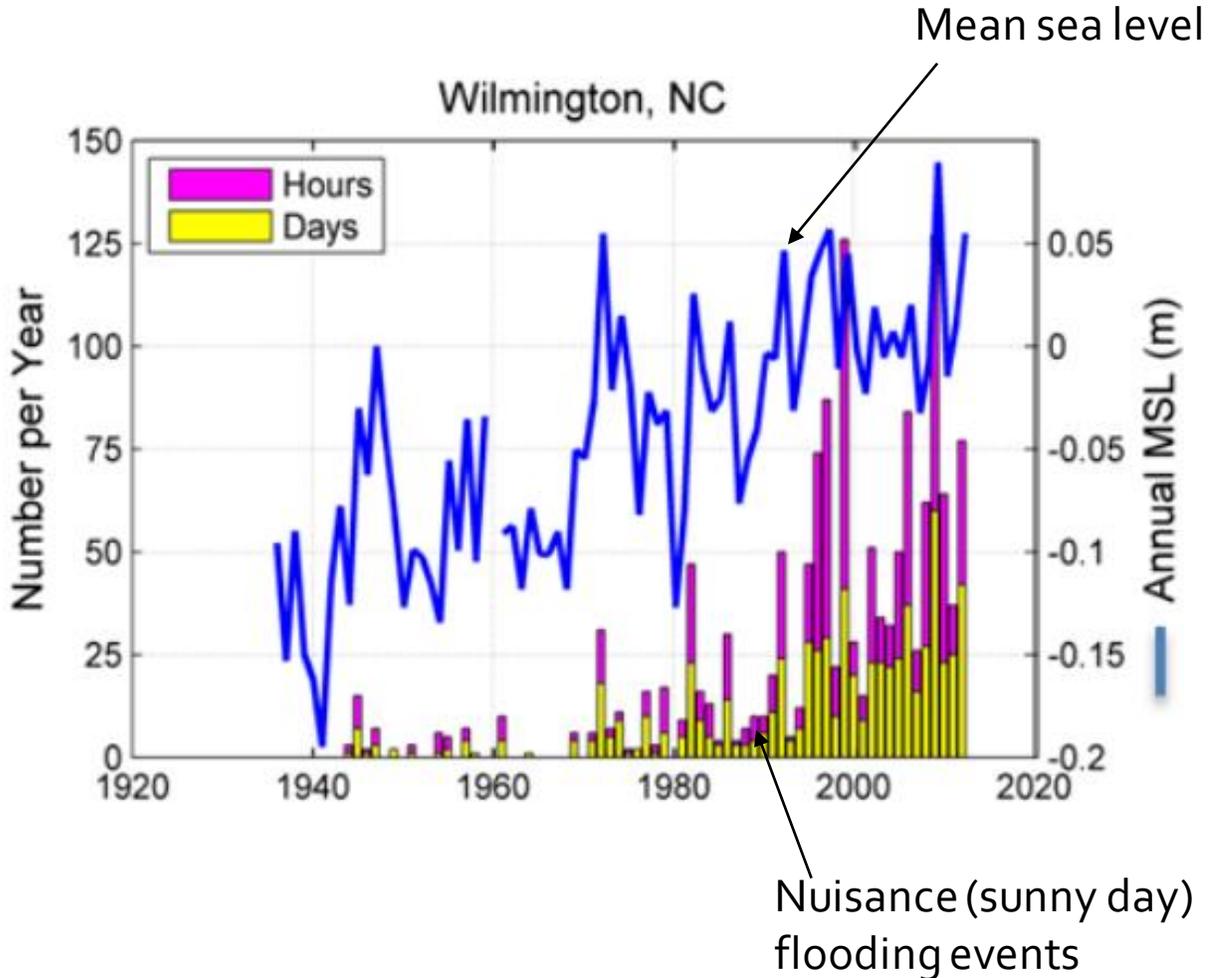
InVEST
integrated valuation of
ecosystem services
and tradeoffs



Sea level is rising globally



Sea level is rising globally and in North Carolina



Sea level rise impacts coastal communities and habitats



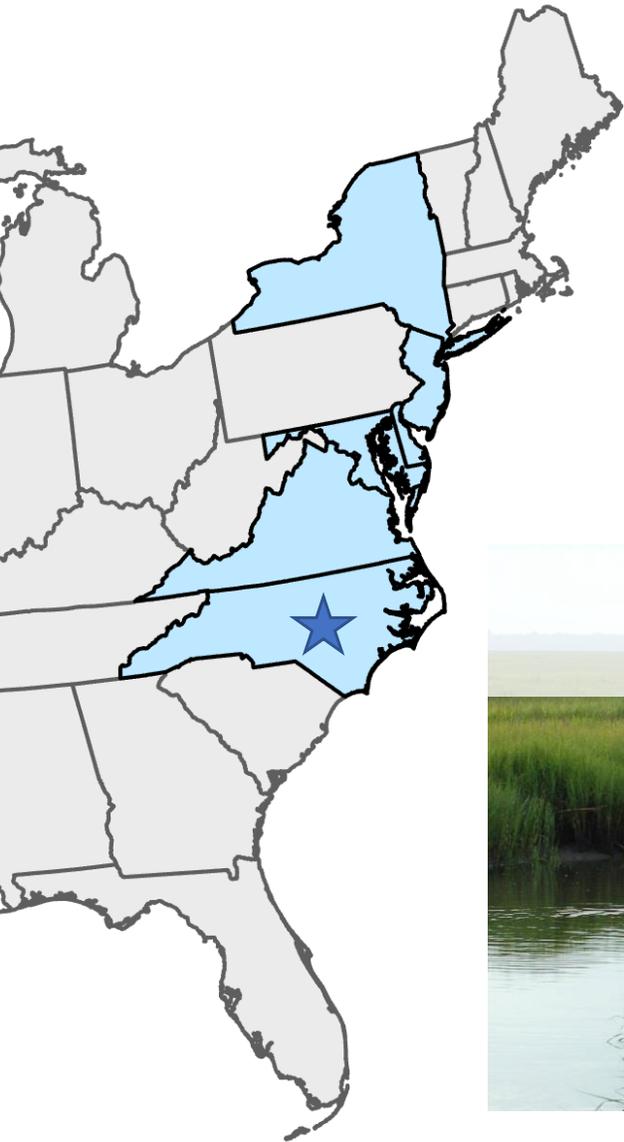
Camilla Cerea, Audubon



Kat Cerny-Chipman



UNC Sunny Day Flooding Project



Our research question: How will coastal habitats and blue carbon change due to sea level rise?

Current NC coastal habitats

Coastal marsh
217,000 acres

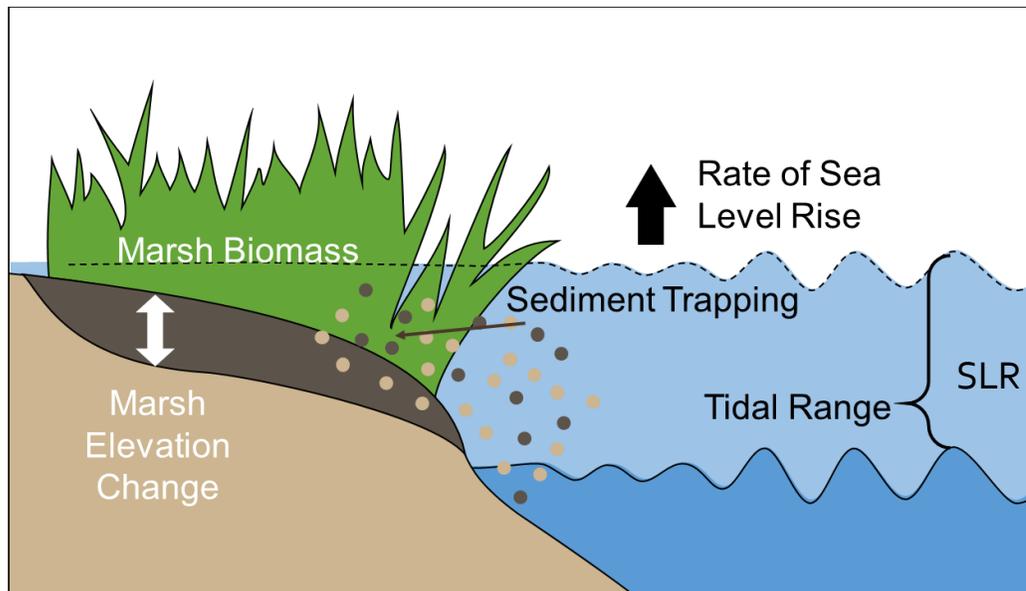


Seagrass
190,000 acres

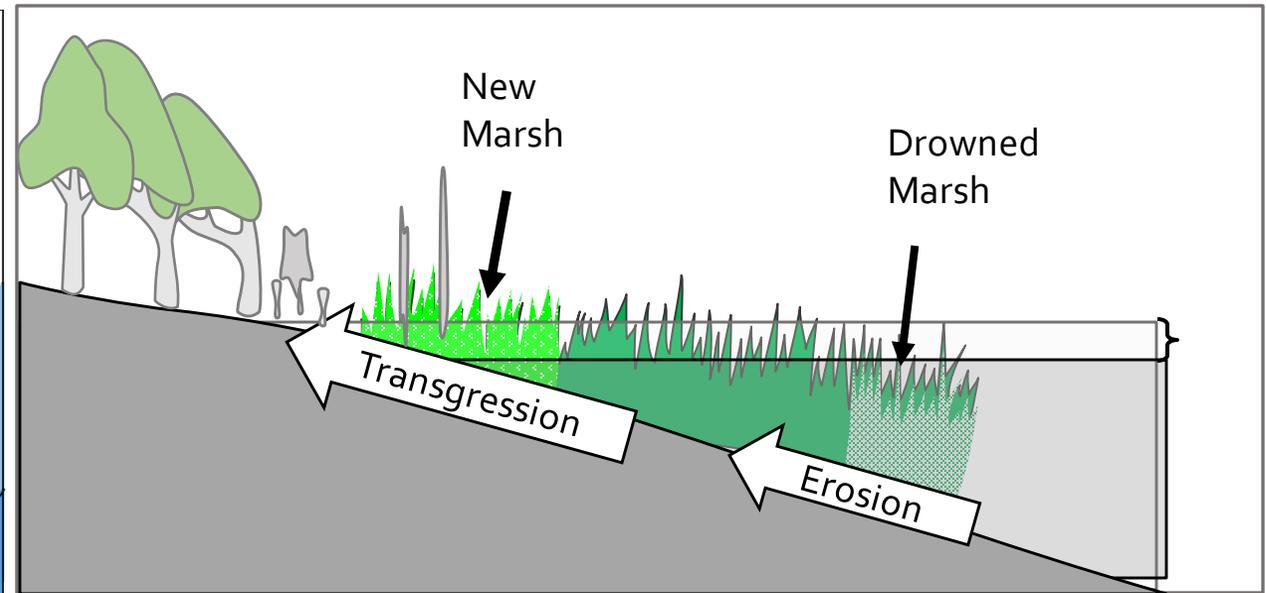


Coastal marsh responses to SLR

Keep Up (accretion)



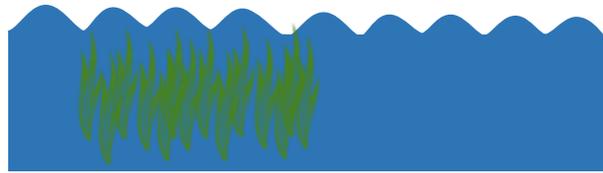
Move Up (migration)



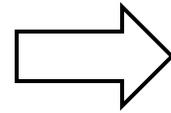
...marshes that can't keep up or move up will likely drown as they are inundated by SLR

Seagrass response to SLR

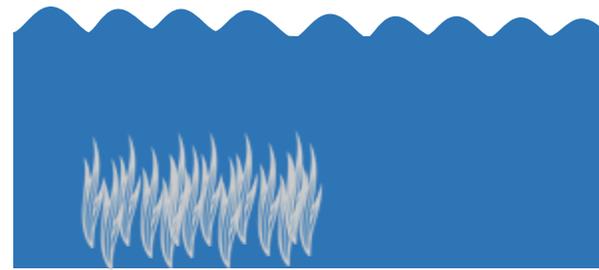
No SLR



Seagrass grows in shallow water,
where it gets sufficient light



SLR

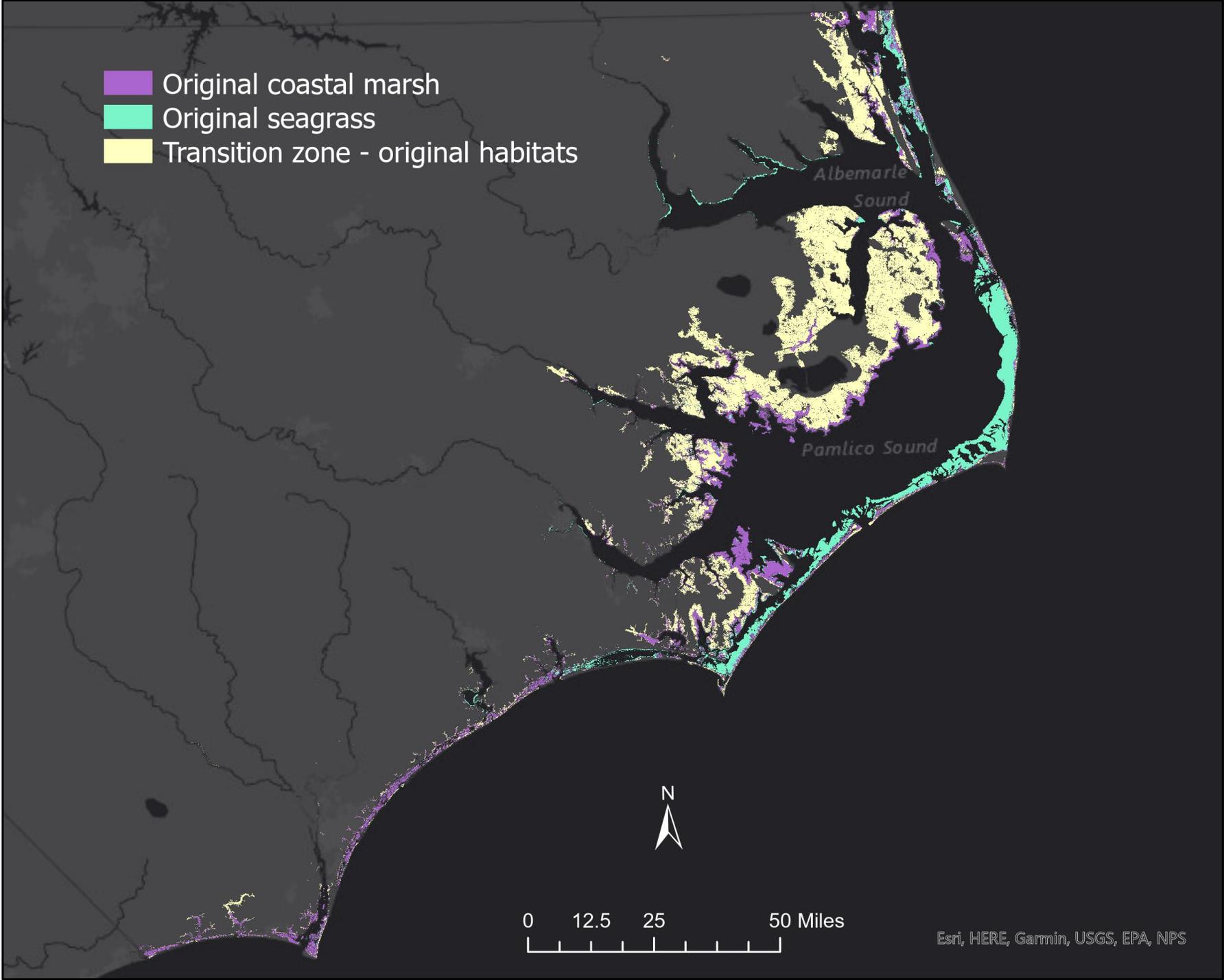


Deeper water due to SLR – not
enough light for seagrass to persist

Seagrass is unlikely to be able to migrate landward with SLR due to water quality issues.

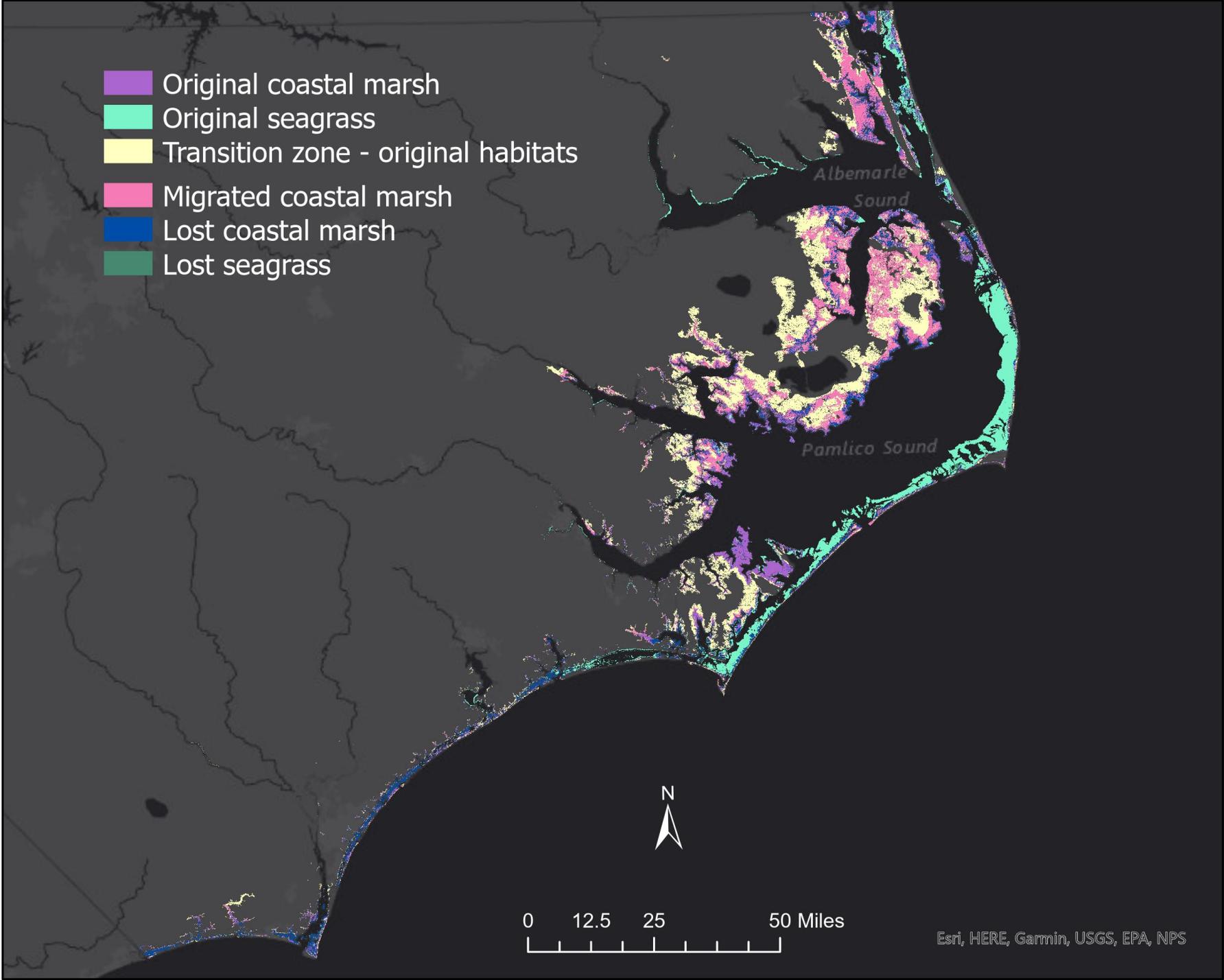
Modeled coastal habitat change

2010 baseline – no SLR



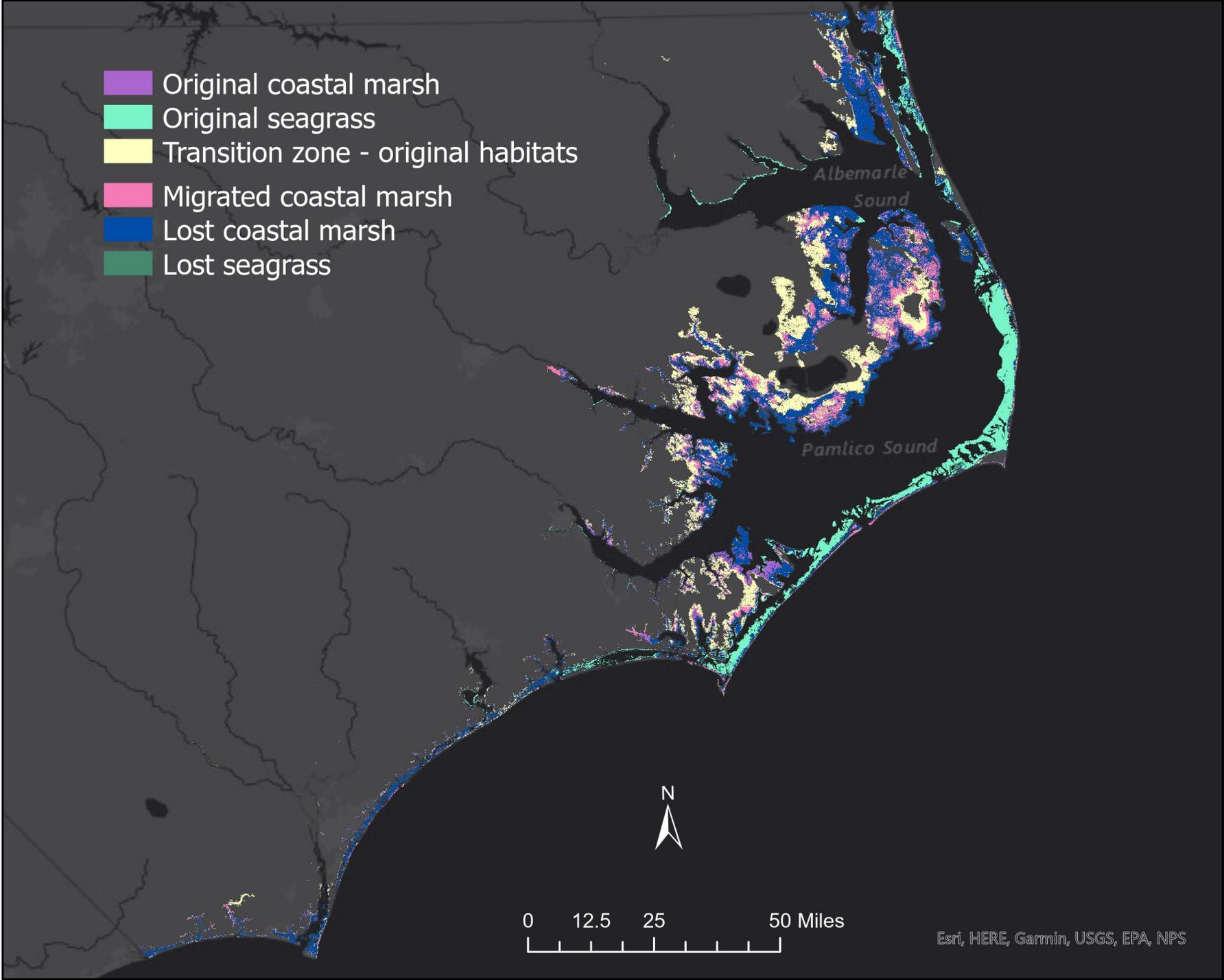
Modeled coastal habitat change

2042 – 1 foot SLR



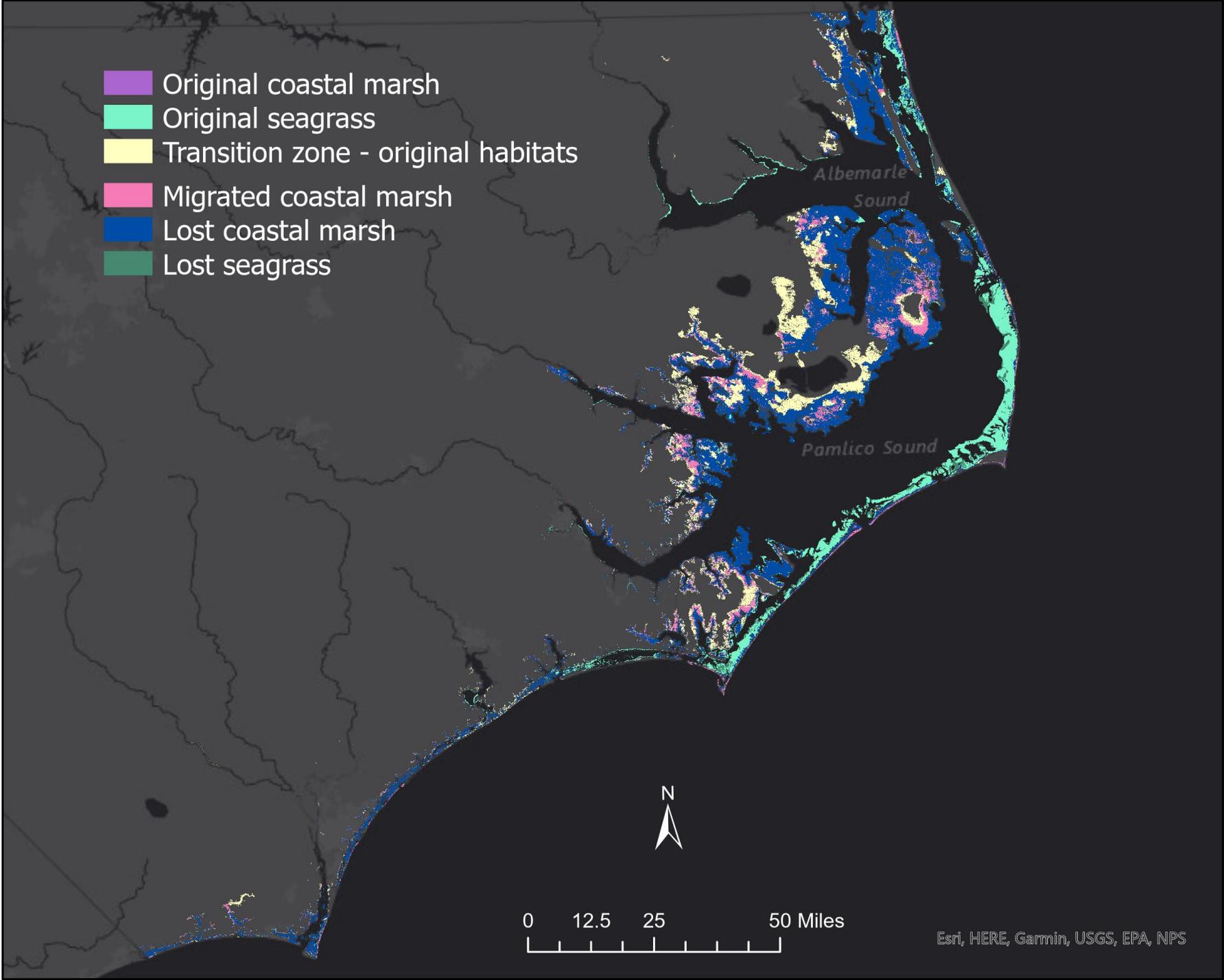
Modeled coastal habitat change

2063 – 2 feet SLR



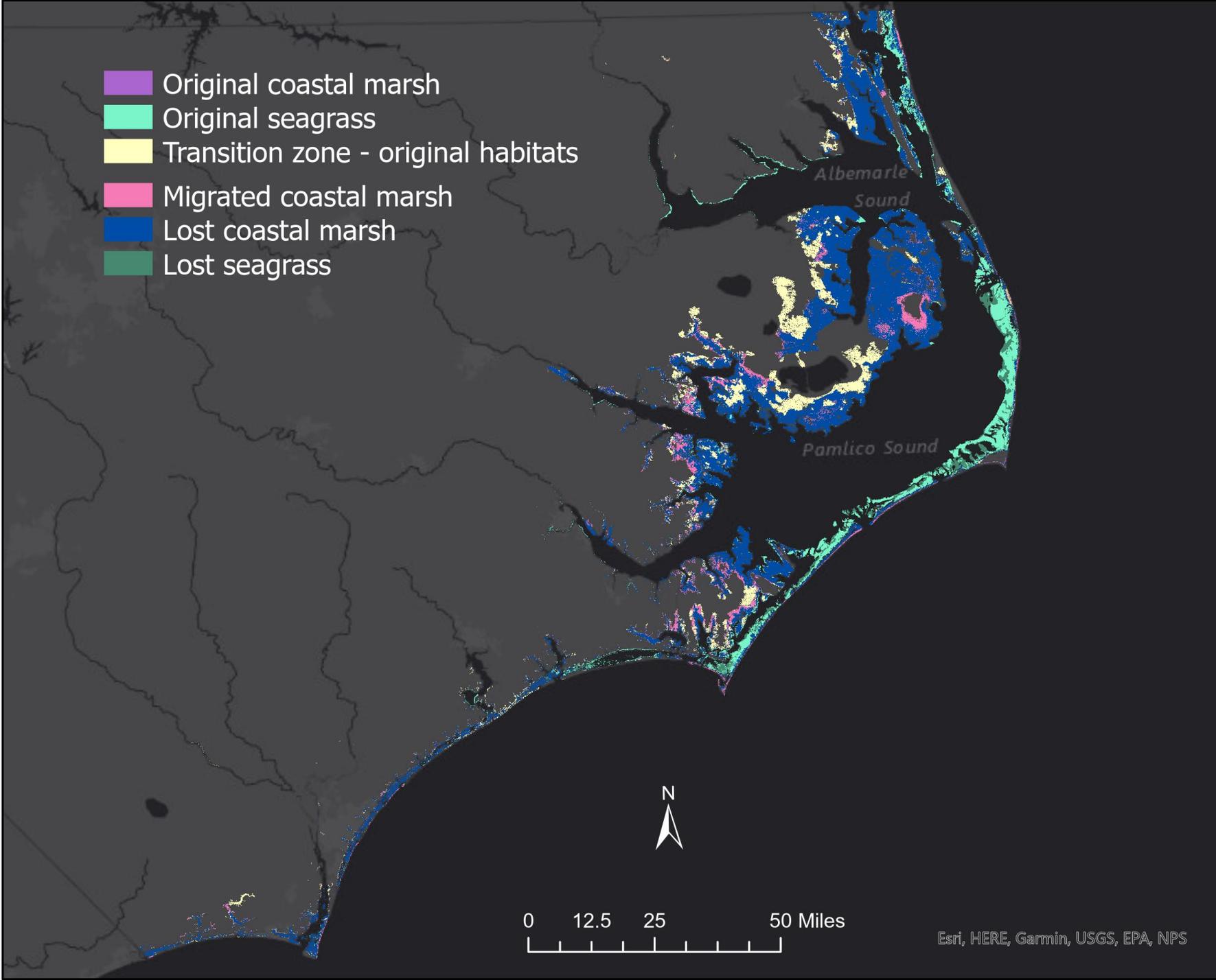
Modeled coastal habitat change

2082 – 3 feet SLR



Modeled coastal habitat change

2103 – 4 feet SLR



Habitat changes cause carbon changes

Habitat change	Carbon change	
Loss of coastal marsh or seagrass	increased carbon emissions (decomposition and sediment loss)	
Conversion of terrestrial habitats to coastal marsh	increased carbon emissions (biomass mortality) increased carbon sequestration (new marsh)	 
Conversion of freshwater wetlands to coastal marsh	decreased carbon emissions (lower methane emissions)	



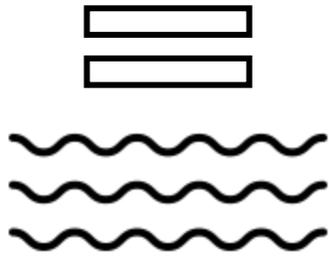
Carbon emissions



Carbon sequestration

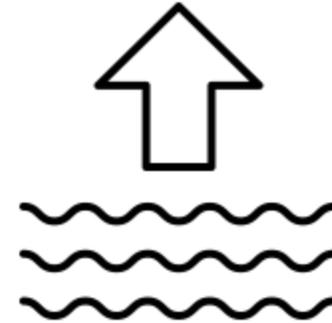
Sea level rise causes the coastal zone to switch from a carbon sink to a carbon source.

No sea level rise



97.7 MMT CO₂-e
sequestered

4 feet sea level rise



53.6 MMT CO₂-e
emitted

totals for North Carolina, 2010-2124

Managing coastal habitats & blue carbon under SLR



NC National Guard



Felton Davis

- Enhance resilience of existing marsh (beneficial use of sediment, living shorelines, oyster reefs)
- Consider SLR in coastal planning – allow space for marsh migration, reduce development in high-risk areas
- Reconnect impounded freshwater wetlands to reduce methane emissions
- (Maybe) opportunities to reduce C emissions during habitat conversion

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UNITED STATES
CLIMATE ALLIANCE

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Thank you!

nicholasinstitute.duke.edu/coastal-ecosystem-services-mid-atlantic-states

