North Carolina Coastal Federation
Working Together for a Healthy Coast

Natrx
ADAPTIVE INFRASTRUCTURE

NC COASTAL FEDERATION × NATRX · CPRG

NC Coastal Wetland Erosion and Restoration Planning

A statewide screen, a decade of shoreline change, carbon, and cost, brought together to build a pipeline of projects

Mason Harris · Natrx · Oct. 22, 2026

THE BACKSTORY

Federal funding for North Carolina’s coast

FUNDER

US EPA

Climate Pollution Reduction Grant, July 2024

GRANT RECIPIENT

Atlantic Conservation Coalition

NC, SC, VA, MD and The Nature Conservancy; NC DNCR leads

PARTNER

NC Coastal Federation

Leads NC projects to protect and restore coastal habitat

ANALYSIS

Natrx

Phased effort to support restoration planning. Began April 2025

Sources: NC Governor’s Office and NC DNCR (July 2024); Coastal Review (July 22, 2024)

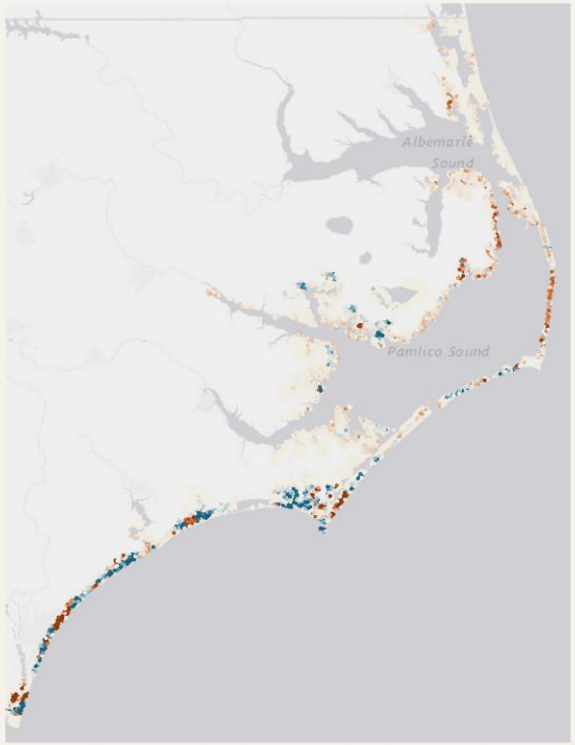
Identify and prioritize areas for protection and restoration

Lots of data and analysis. Today's focus is on three main topics:

1. **Coastal wetland change and erosion**
2. **Carbon and mitigation opportunities**
3. **Preliminary design and cost estimates**

1 · WHERE IS IT ERODING?

First: Statewide screen of coastal wetlands



235,000
acres of coastal wetland

1 m
classification

2016 → 2022
change compared

A fast, coast-wide look at where coastal wetland is being lost. The goal was to identify regions for more in-depth shoreline change analysis.

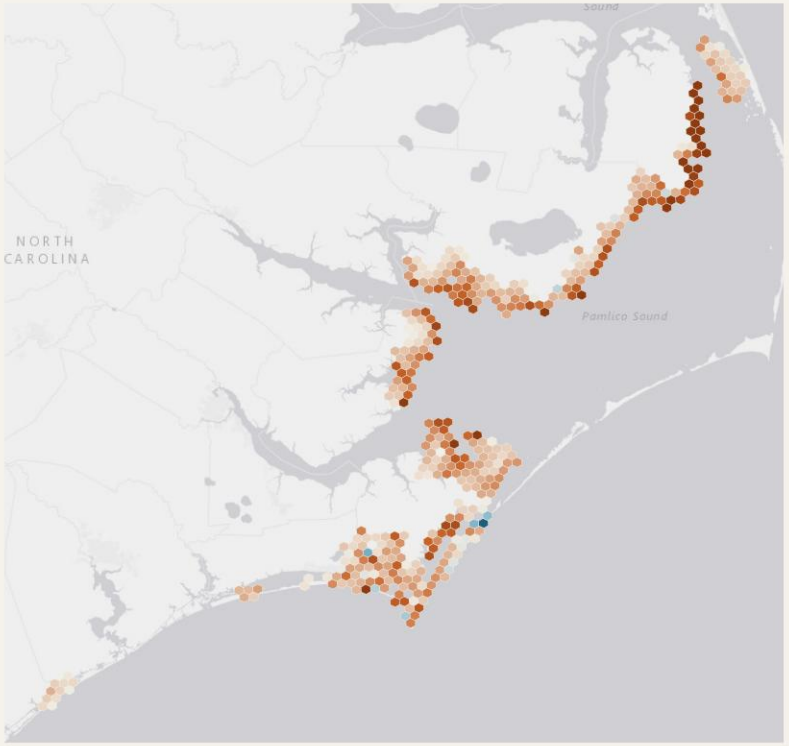
- Hexagons that lost coastal wetland
- Hexagons that gained coastal wetland

Imagery quality and consistency limited the timespan. Poor 2016 imagery in southern areas.

Data: Natrx regional coastal wetland change analysis

1 · WHERE IS IT ERODING?

Next: Decade of measured shoreline change



~2,500 mi
of outer marsh edge

2012–2022
ten-year record

1 m NAIP imagery, with human quality control of every land–water classification before any rate was computed.

darker = faster retreat

Data: Natrx shoreline change analysis (public marsh-edge release), mean rate per hexagon

1 · WHERE IS IT ERODING?

Majority of analyzed marsh edge is retreating

82%

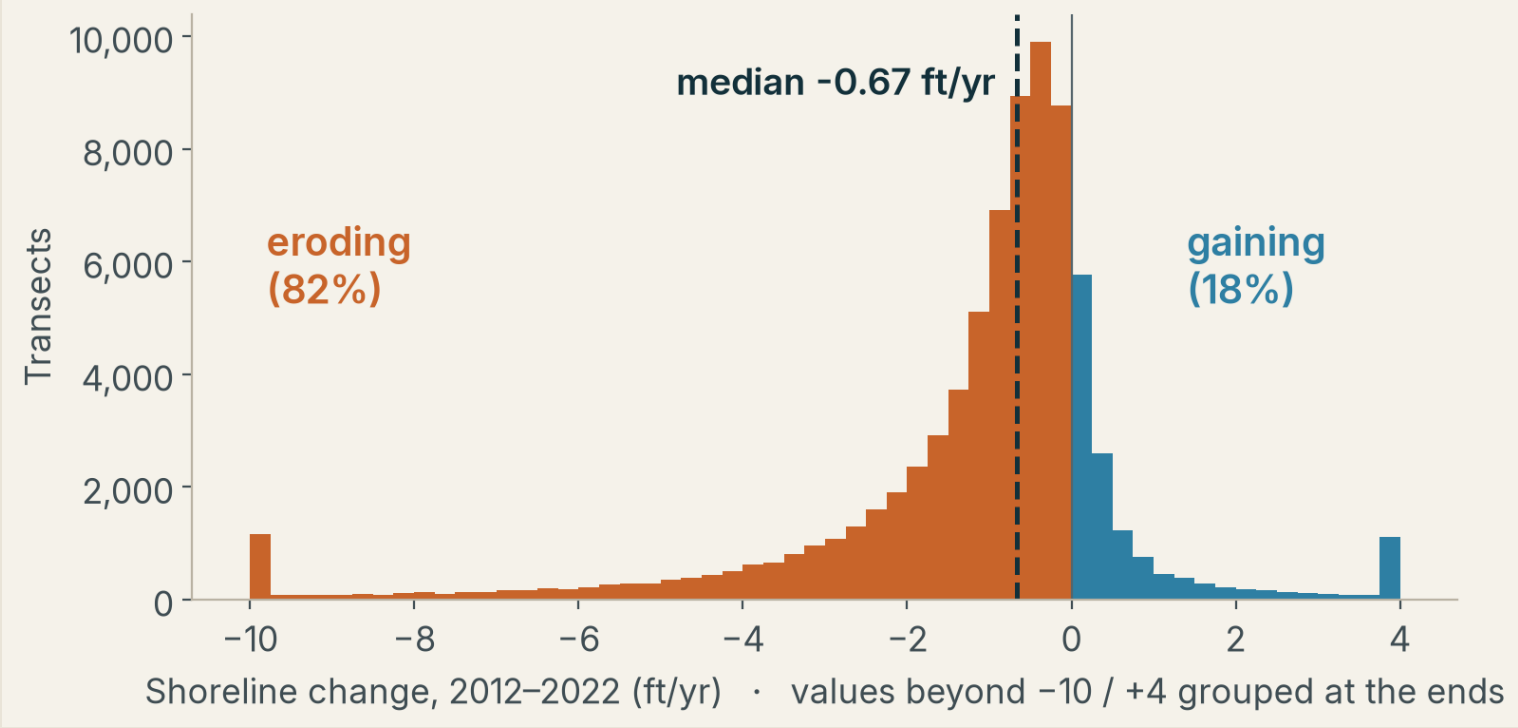
of transects eroding

0.67 ft/yr

median retreat

1.19 ft/yr

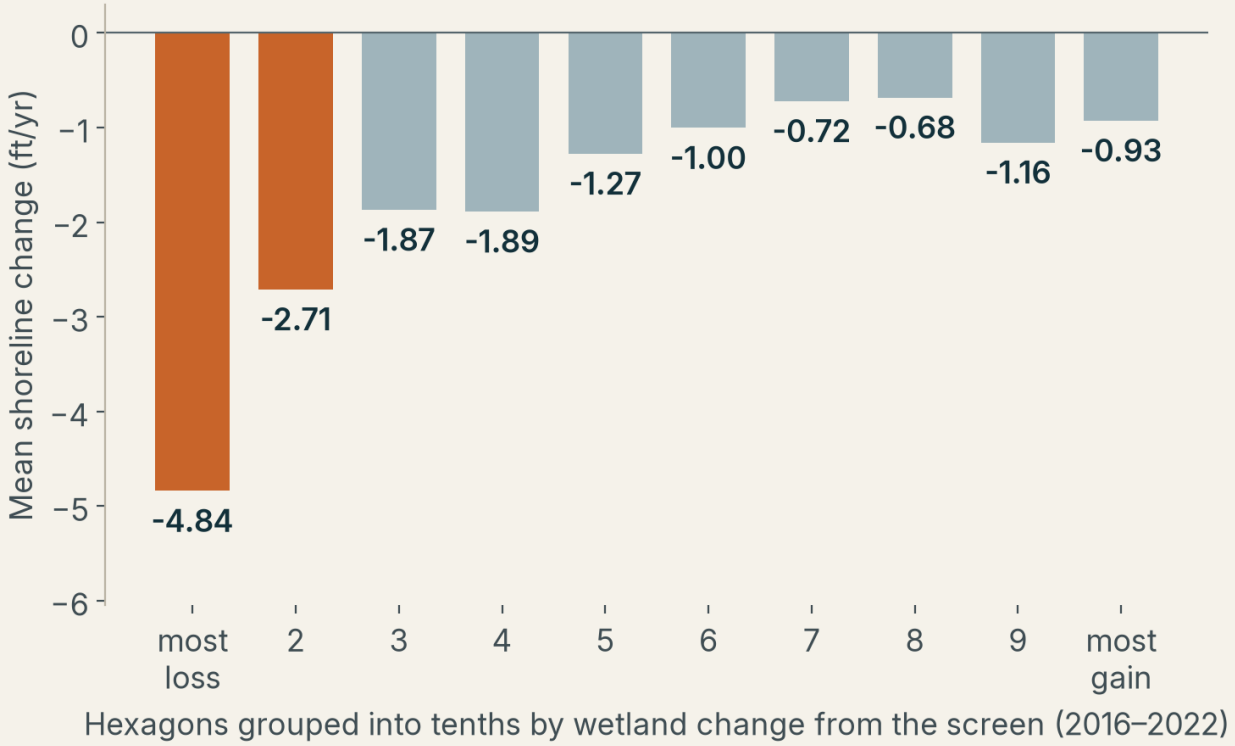
mean retreat, about 12 ft per decade



Data: NAIP aerial imagery 2012–2022. 50-meter shoreline transects for change rates. Fastest observed retreat: 45.9 ft/yr

1 · WHERE IS IT ERODING?

Screen approach validated by shoreline change



Where the screen saw greatest wetland loss, the shoreline retreated about 3-5 ft/yr. Elsewhere, about 1-2 ft/yr.

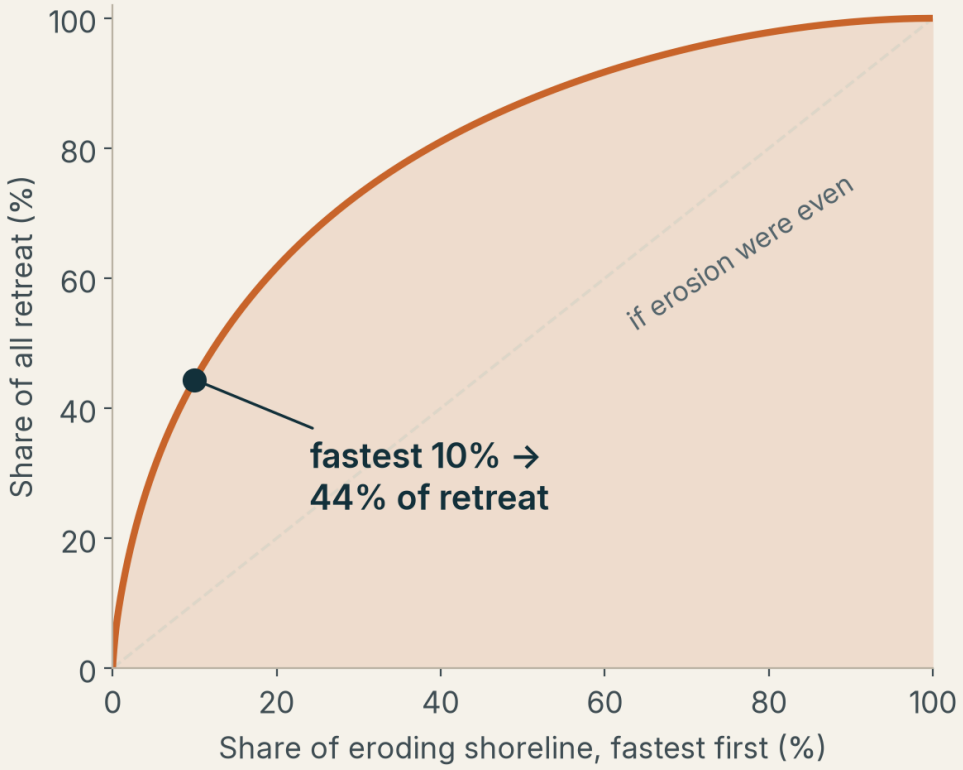
Loss is a strong warning sign. Apparent stability is not an all-clear: even “stable” areas still erode.

68% of survey transects landed in Pamlico Sound, the region the screen flagged.

Data: Wetland change on x-axis. Shoreline change rates on the y-axis.

1 · WHERE IS IT ERODING?

The most severe erosion is concentrated



10% → 44%

The fastest-eroding 10% of shoreline accounts for 44% of all land lost.

Protection aimed at a small share of the coast addresses a disproportionate share of the loss. That is the case for a screen-and-prioritize approach.

Data: Eroding transects ranked by rate, 2012–2022

2 · HOW MUCH CARBON IS THERE?

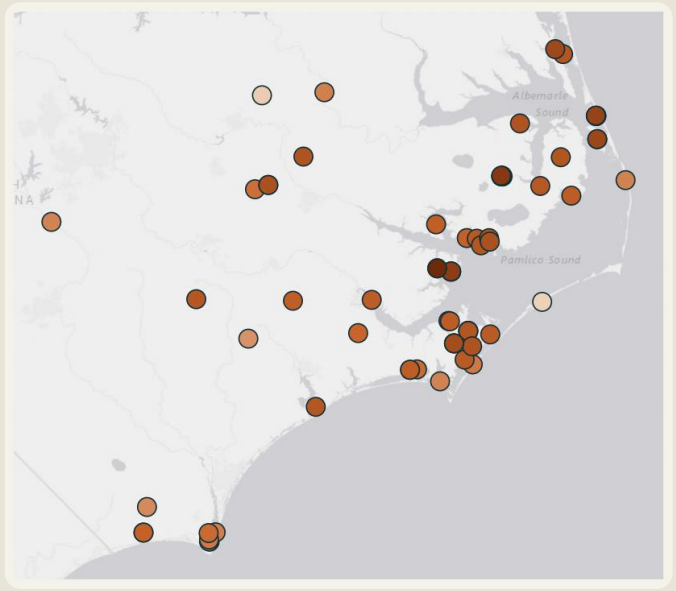
Carbon ranges in North Carolina soil cores

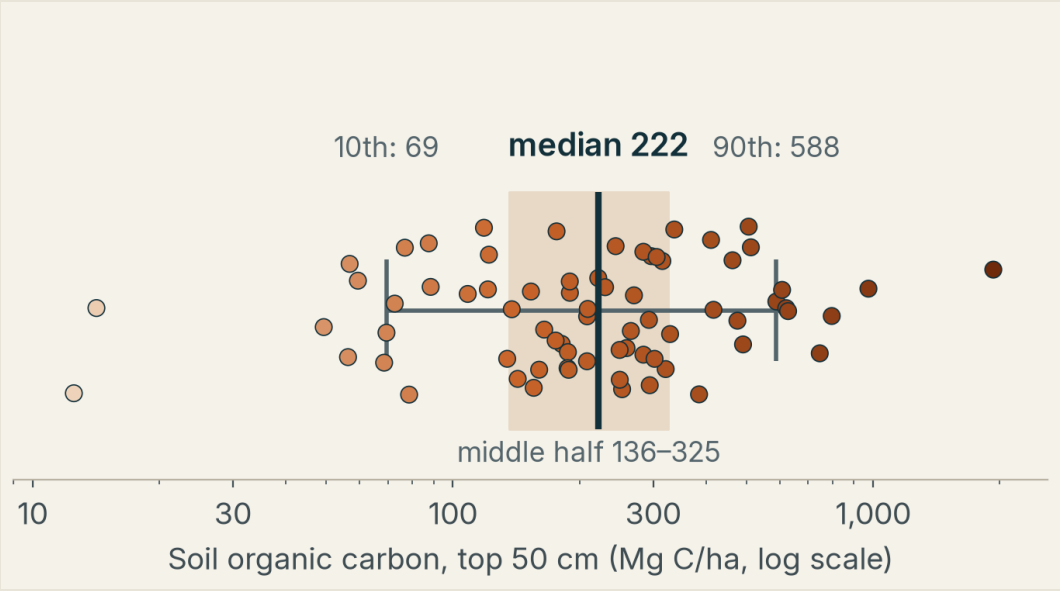
71
cores, top 50 cm

222
Mg C/ha, median core

136–325
Mg C/ha, middle half

~330 t
CO_2e per acre, median core





Data: 71 cores with complete 0–50 cm profiles (of 197 found) · Coastal Carbon Network (25), EPA National Wetland Condition Assessment 2011 (25) and 2016 (21) · Appendix D

3 · WHAT WOULD IT COST?

Desktop analysis at 20 priority sites



20
sites and segments

~17 mi
~91,700 linear feet

20
cross-sections

LiDAR profiles
Wave and fetch climate
Tidal datums
SAV and habitat
Sill, revetment or reef

Cost estimates produced using low-profile rock breakwaters.
Generally laid out according to NC living-shoreline general-permit conditions.

3 · WHAT WOULD IT COST?

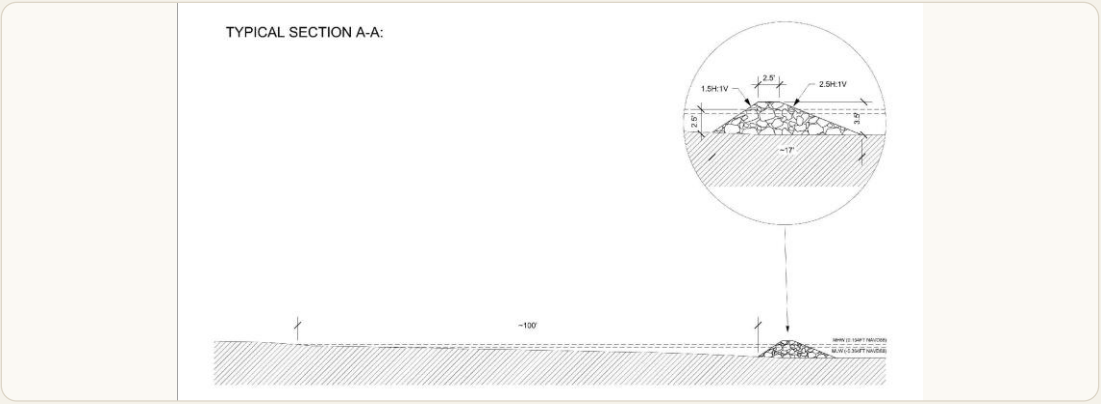
Preliminary design site example



Measured. −5.9 ft/yr, every transect eroding



Planned. ~3,755 LF on two exposed limbs



Sized. Typical section A-A: low offshore sill, crest ~+1 ft NAVD88

LANDOWNERS

Public and agricultural land along the reach

NC COASTAL FEDERATION

Project lead, reach selection, coordination

NATRX

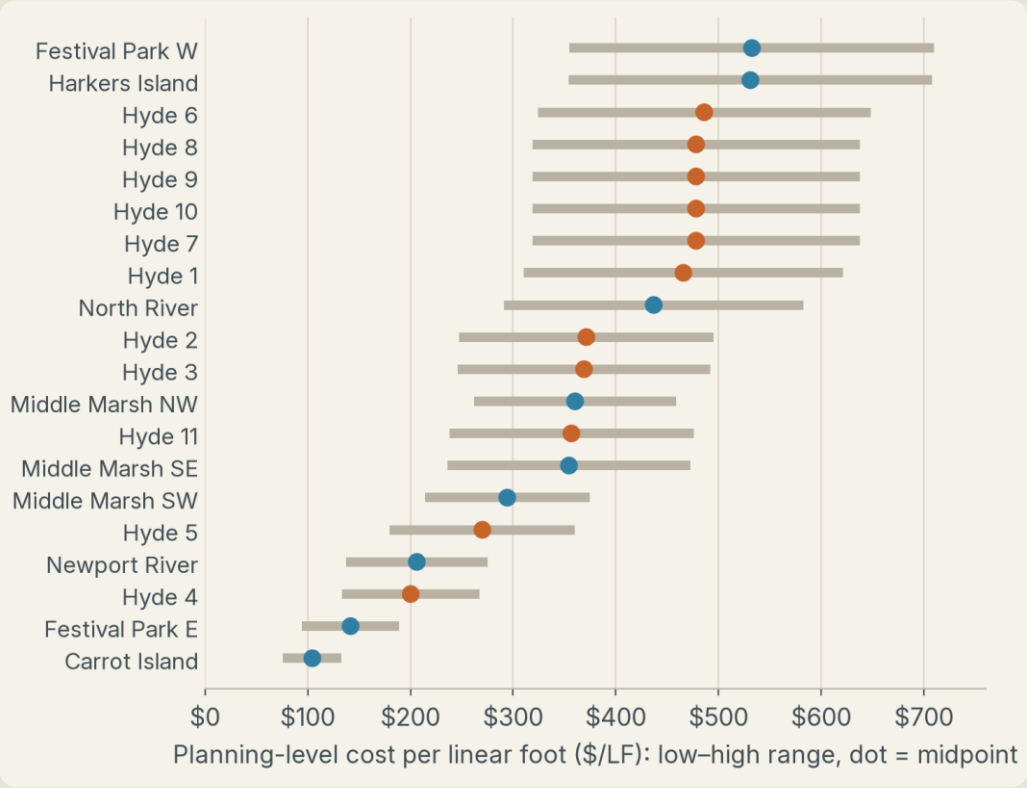
Erosion, wave climate and pre-design

PERMITTING

Future effort, state and federal agency review

3 · WHAT WOULD IT COST?

(ROM) Cost per foot compared across sites



~5×

spread in cost per foot between sites

Every site was sized and roughly estimated with the same method. Differences due to site conditions: water depth, wave exposure and the size of structure needed.

Hyde County Beaufort / Core Sound, Festival Park

BRINGING IT TOGETHER

From geospatial data to a pipeline of projects

SCREEN
Statewide wetland change shows where to look

→

MEASURE
Shoreline change finds the hotspots

→

PRE-DESIGN
Treatment, length and cost for each site

→

DEVELOP
Project list ready for restoration and future funding pursuits

This framework can be applied to other areas. Efficient and cost-effective approach for coastal protection and restoration planning.

Questions

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