



IHA and OEA Long-Term Average Annual Erosion Rates & Setback Factors Update & Rule Amendments

Ken Richardson - NC Division of Coastal Management NNovember 20, 2025

Erosion Rates: What They Are & What They Are Not

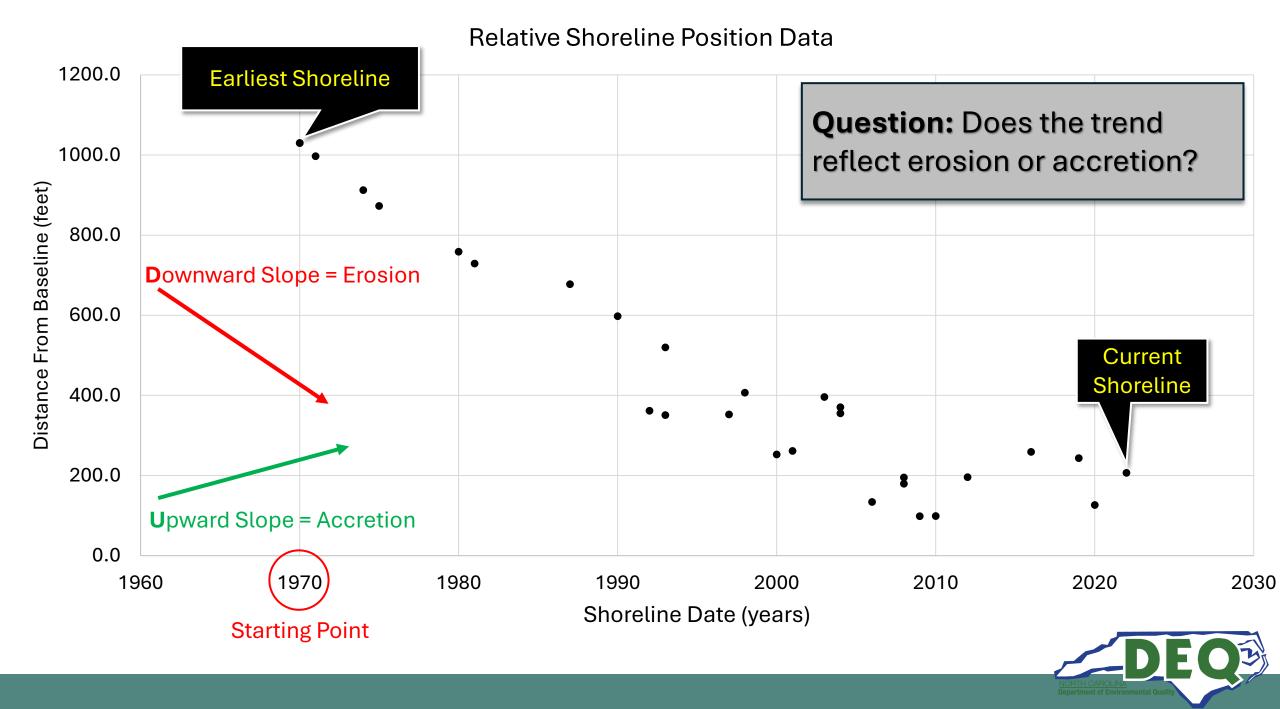
What they are:

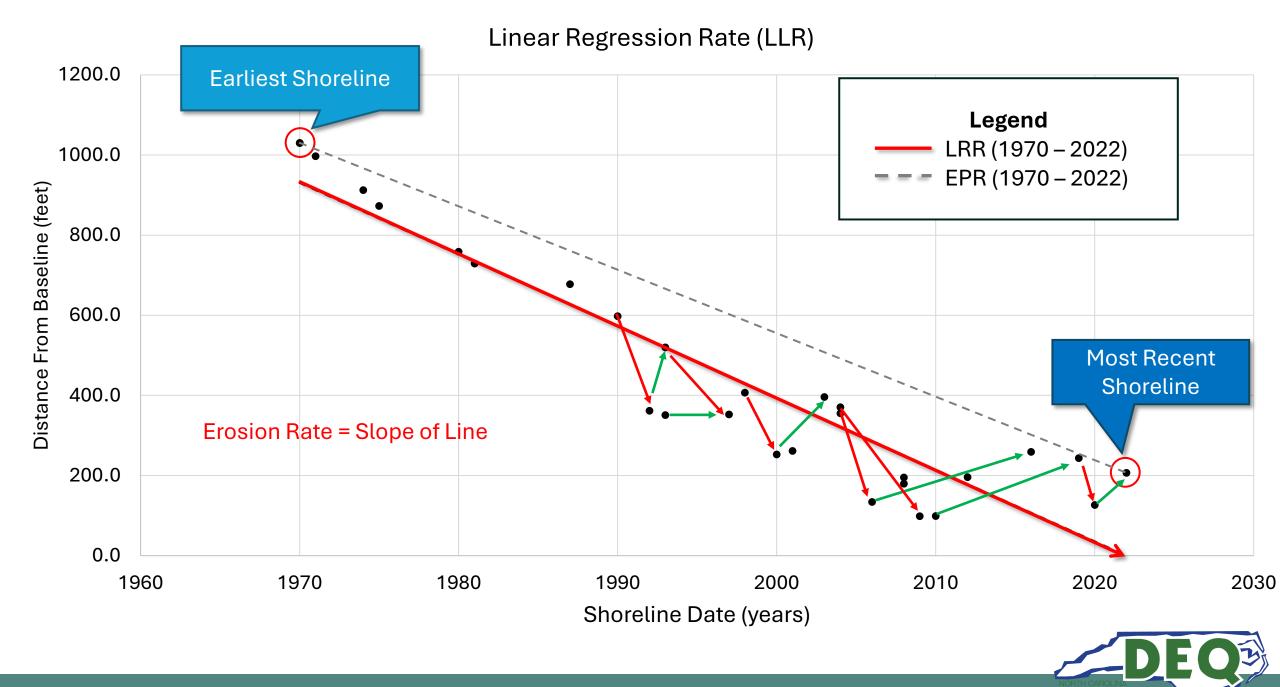
Calculated long-term trends (50 years or more) based on relative position of historic shorelines.

What they are not:

- Predictions (modeled, calculated, or estimated)
- Always reflective of short-term trends (less than 20 years)







Why Calculate Erosion Rates

- Update Ocean Hazard Area Erosion Rates & Setback Factors (SBF)
 - 2 Update Ocean Erodible Area (OEA)

- FEMA National Flood Insurance Program (NFIP)
 - Community Rating System (CRS) Credits (50 points)
- New: Update Inlet Hazard Areas Boundaries & Inlet Erosion Setbacks

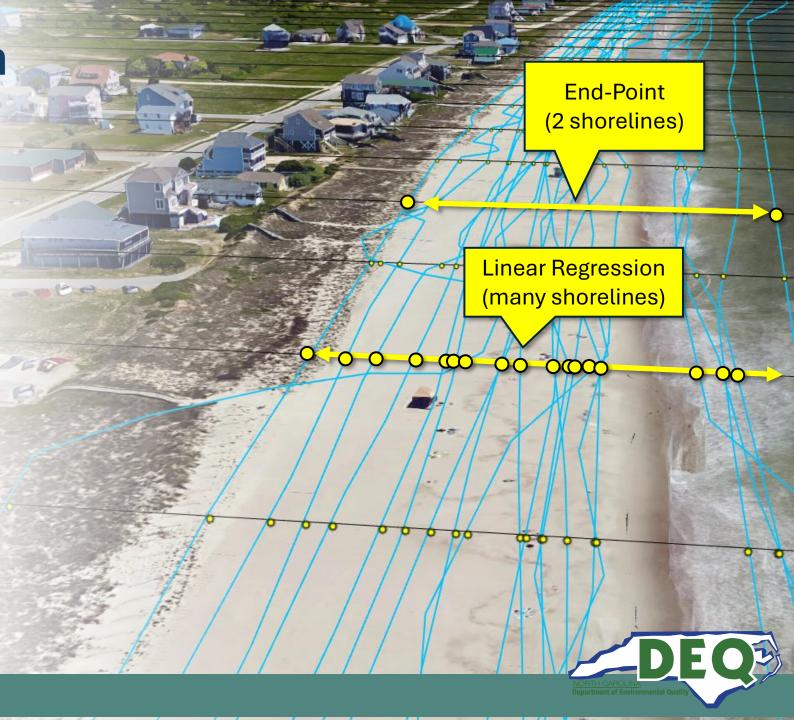


Calculating Erosion Rates: Methods Comparison

- End-Point
 - 2 Shorelines (early& recent)
 - Rate = Distance/Time
 - Used since 1979 study
- Least Squares Regression (Linear Regression)
 - Multiple Shorelines

Mapping & Analysis Tools:

- Geographic Information System (GIS)
- US Geologic Survey's Digital Shoreline Analysis System (DSAS)





Erosion Rates to Setback Factors

Data Processing:

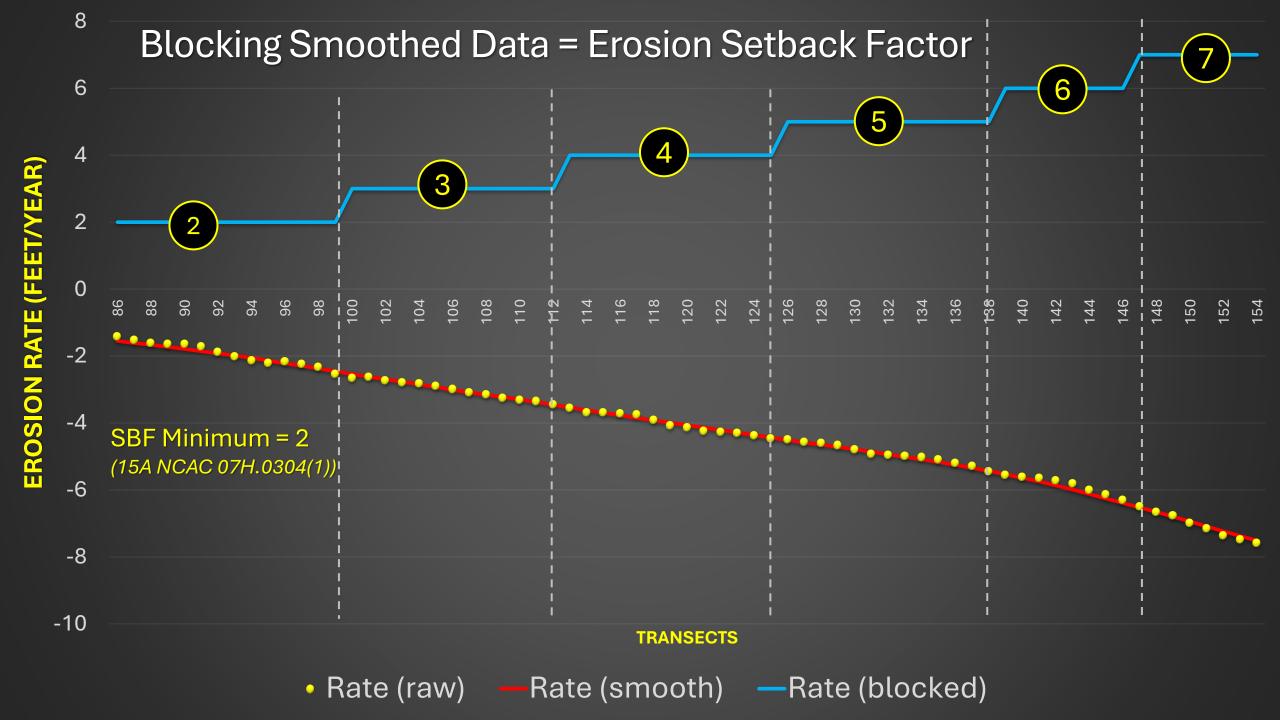
- Raw data statistical smoothed
 - 17-Point Running Average
- Block smoothed data
- Where parcels are split, shift boundary in favor of lower value



Why Smooth Raw Data?

Statistical smoothing helps filter out the influence of beach cusps, smaller sand waves, and landwardmigrating segments of offshore bar systems

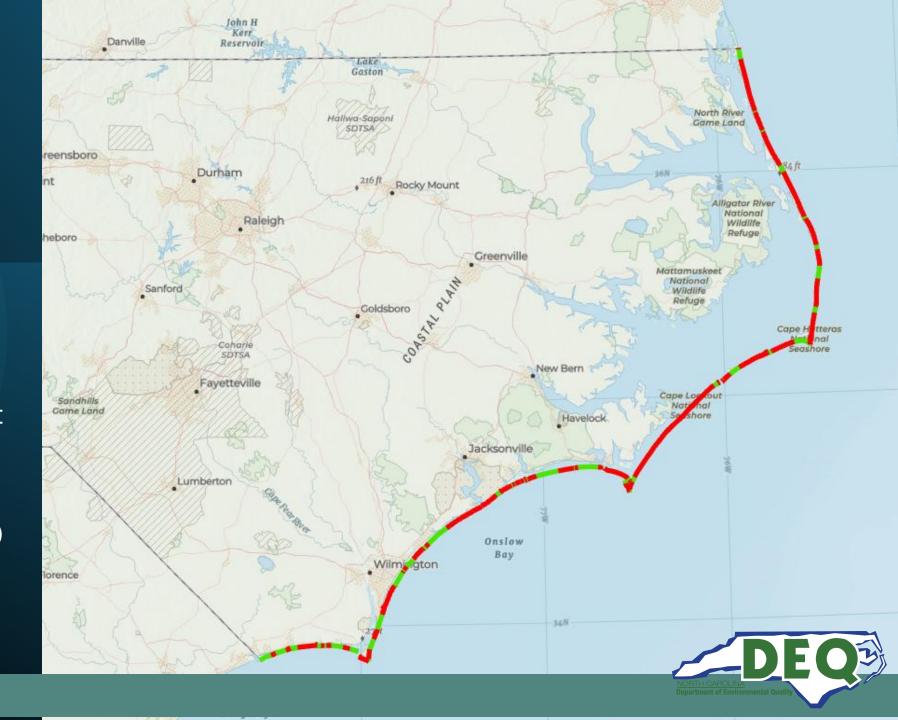




Results Summary

Ocean Erodible Area (OEA)

- ~ 318 Miles of Oceanfront Shoreline Mapped and Analyzed
- 10,232 Transects (50-Meter)



Method Comparison:

End-Point

VS.

Least Squares Regression

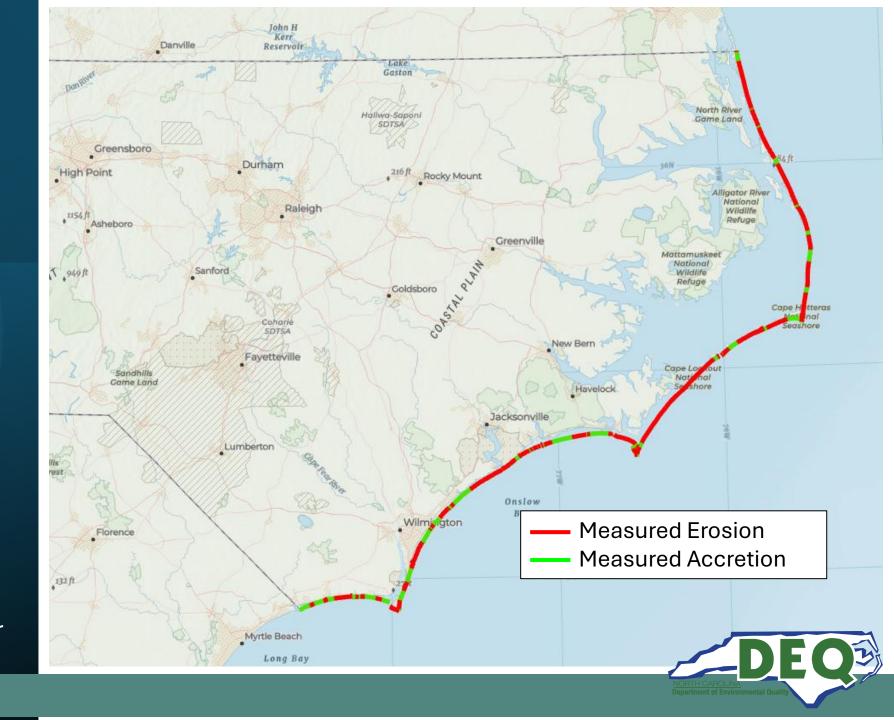
	Length of Shoreline per Parameter			
Parameter	End-Point Method Miles of Shoreline (%)	Least Squares Regression Method Miles of Shoreline (%)		
Miles of Shoreline Mapped & Analyzed	317.8	317.8		
Measured Accretion	109 (34.3%)	99.2 (31.2%)		
Measured Erosion	208.5 (65.6%)	218 (68.6%)		
No Change or No Output (no data)	0.3 (<1%)	0.6 (<1%)		
SBF = 2.0	196.8 (61.9%)	193.7 (61%)		
SBF = 2.5 to 5.0	63.8 (20.1%)	66.5 (20.9%)		
SBF = 5.5 to 8.0	34.1 (10.7%)	33.7 (10.6%)		
SBF > 8.0	23.1 (7.2%)	23.8 (7.5%)		

Least Squares
Regression Results
Compared to
Previous Studies

Statewide Summary	2025 Miles %	2020 Miles %	2013 Miles %	2004 Miles %	1997 Miles %	1986 Miles %	1980 Miles
Miles of Shoreline Mapped/Analyzed	317.8	304.5	307.4	312	300	237*	245*
SBF = 2	193.7	174.6 57.3%	190.2 61.9%	193 62%	165 55%	144 61%	149 61%
SBF = 2.5 to 5.0	66.5 20.9%	67.1 22.1%	62.1 20.2%	64 21%	54 18%	43 18%	52 21%
SBF = 5.5 to 8.0	33.7 10.6%	38.7 12.7%	31.5 10.2%	28 9%	30 10%	20 8%	22 9%
SBF > 8.0	23.8 7.5%	22.7 7.4%	20.8 6.8%	27 8%	32 10.7%	22 9%	22 9%
No Data	0.0	1.4 <0.5%	2.8 <1%	0	19 6%	8 4%	0

Statewide Erosion Rate Results Summary:

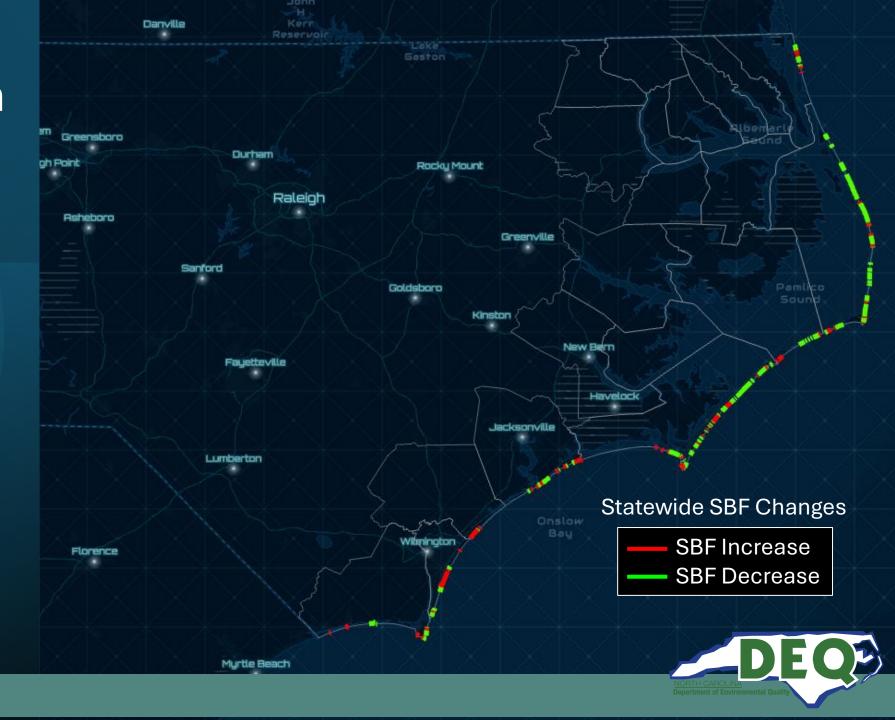
- Erosion = 218 miles
 - Avg = -4.2 ft/yr
 - Range = -1 to -234 ft/yr
- Accretion = 99 miles
 - Avg. = 3.1 ft/yr
 - Range = +1 to +69 ft/yr
- Statewide Average = -1.9 ft/yr



Ocean Erodible Area (OEA) Erosion Setback Factors (SBF)

Developed Shoreline Only:

- 144.6 Miles (~46% of total)
 - 124.9 miles (86%) = No Change
 - 17.7 miles *(12%)* = Decreased SBF
 - Range = 0.5 to 3.5
 - 2.0 miles (2%) = Increased SBF
 - Range = 0.5 to 3.5

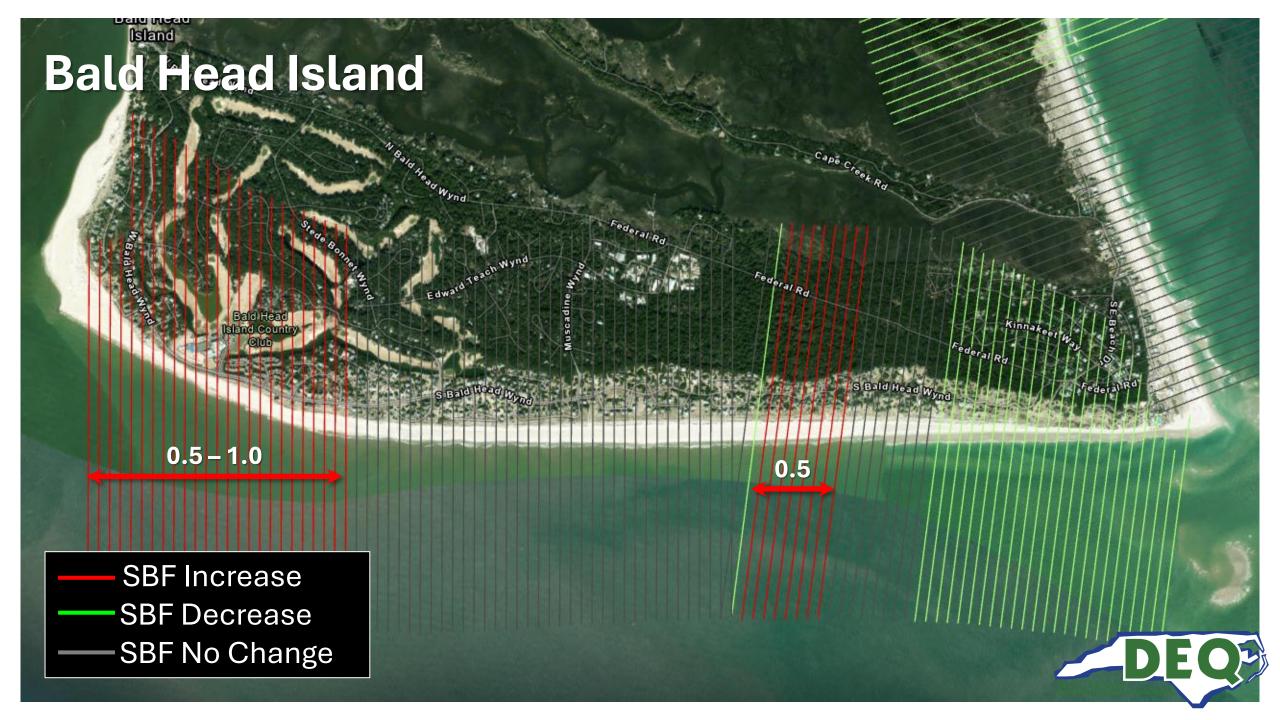


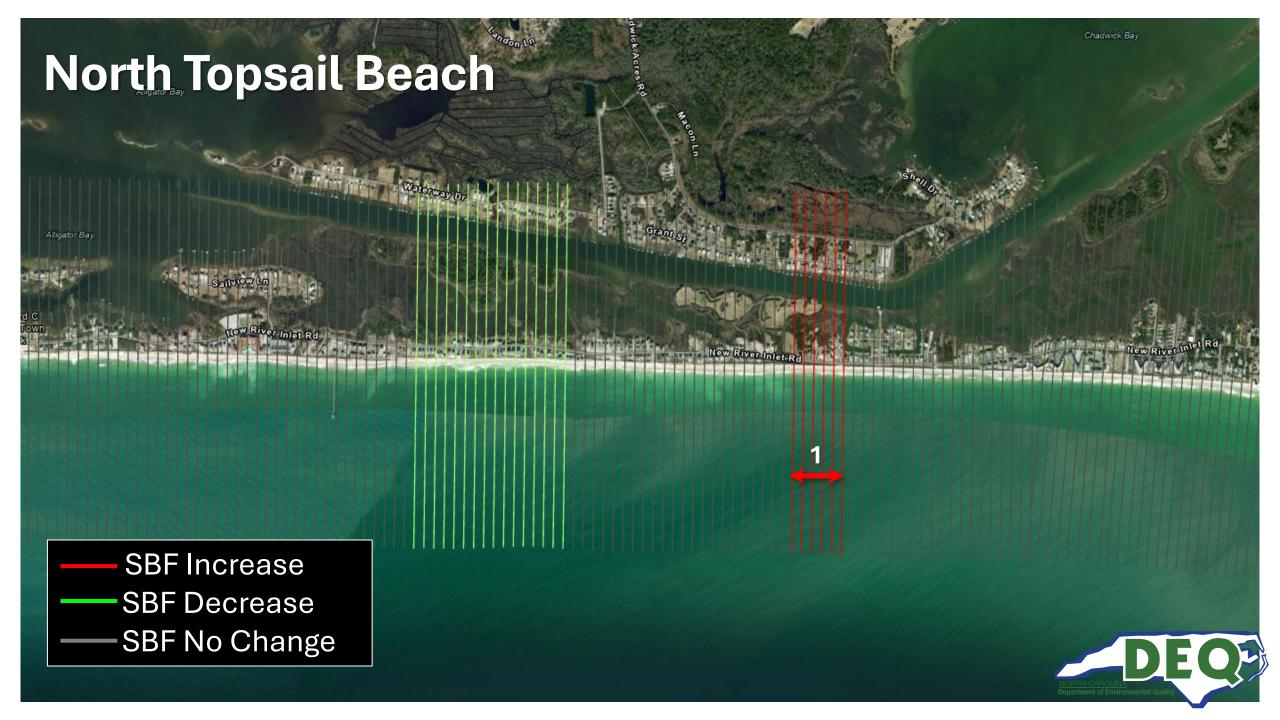
Erosion Rate Setback Factors: Increases

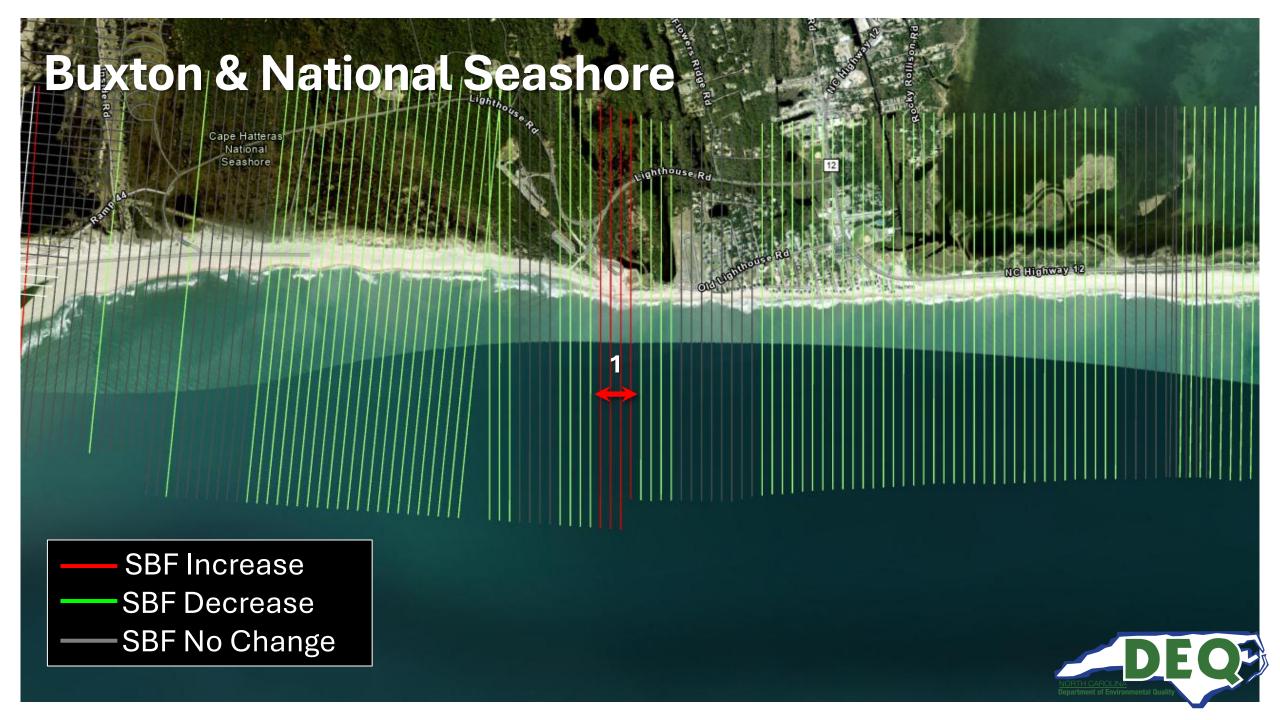
Developed Shoreline Areas

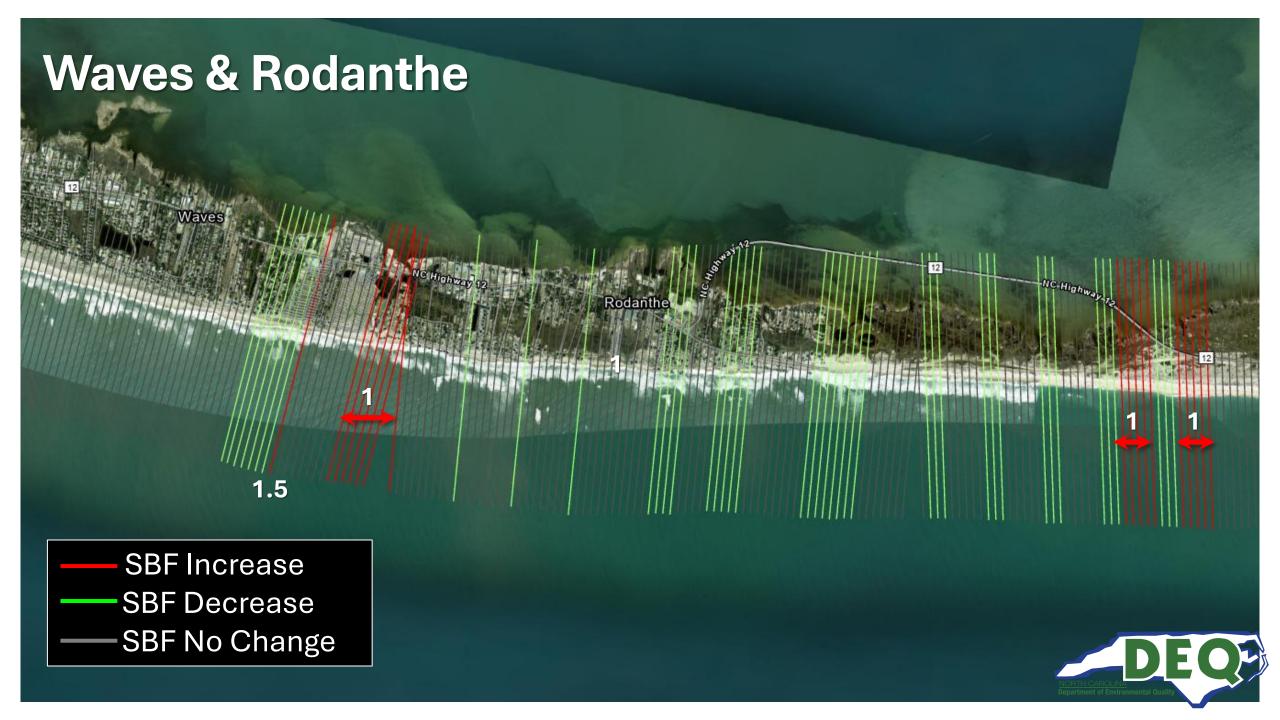
Location	Range of Setback Factor Increase			
Bald Head Island (south-beach)	0.5 to 1.0			
North Topsail Beach	1			
Buxton	0.5			
Waves-Rodanthe	1 to 1.5			
Corolla	1			
Currituck County (N. of Corolla)	1			

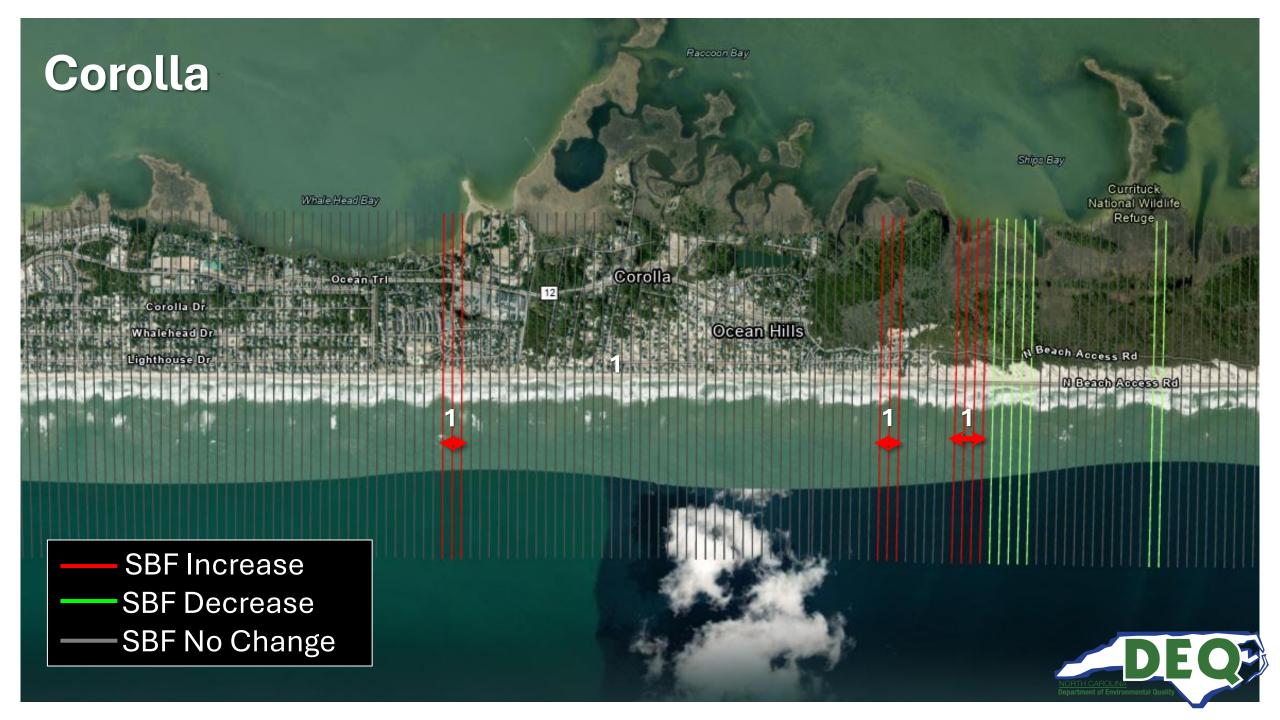


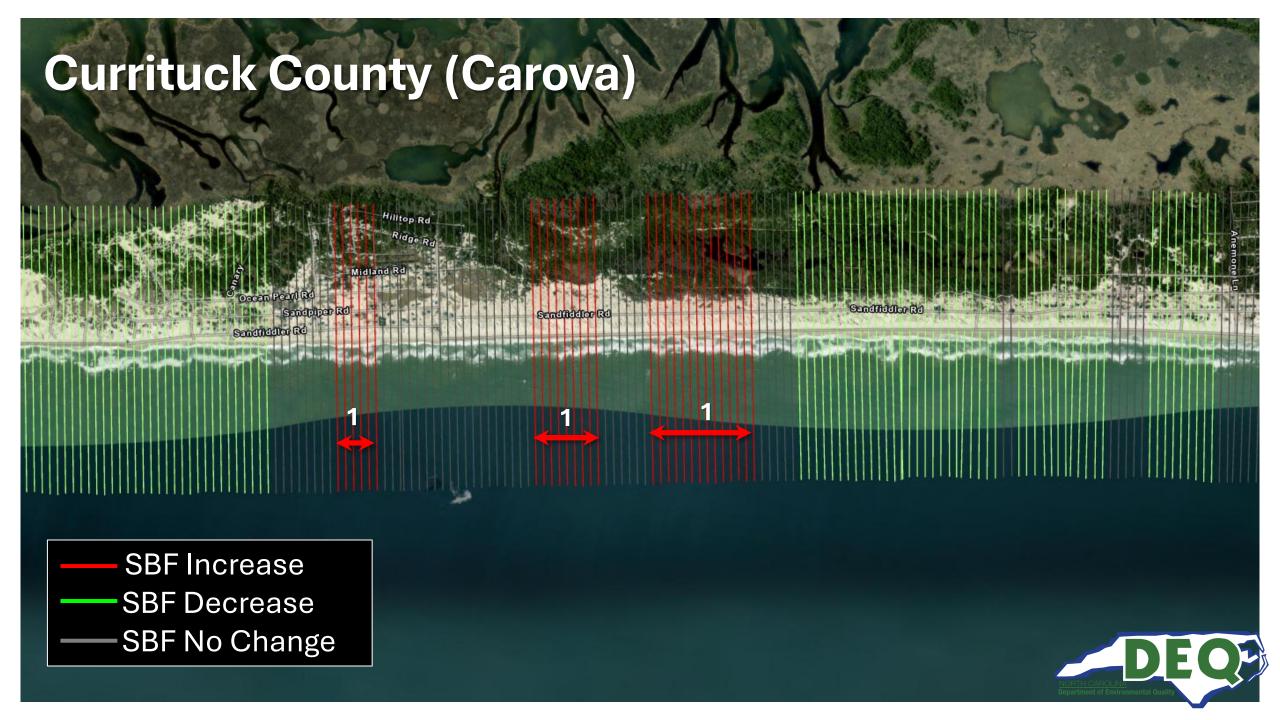






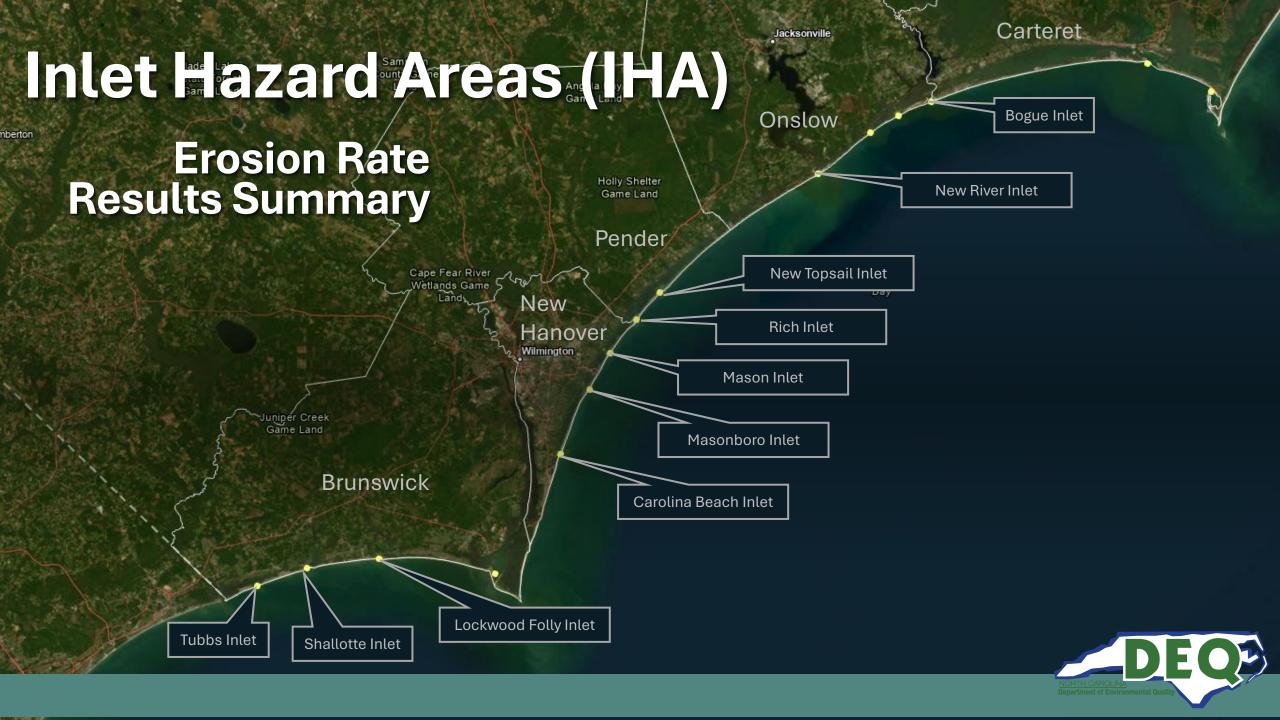


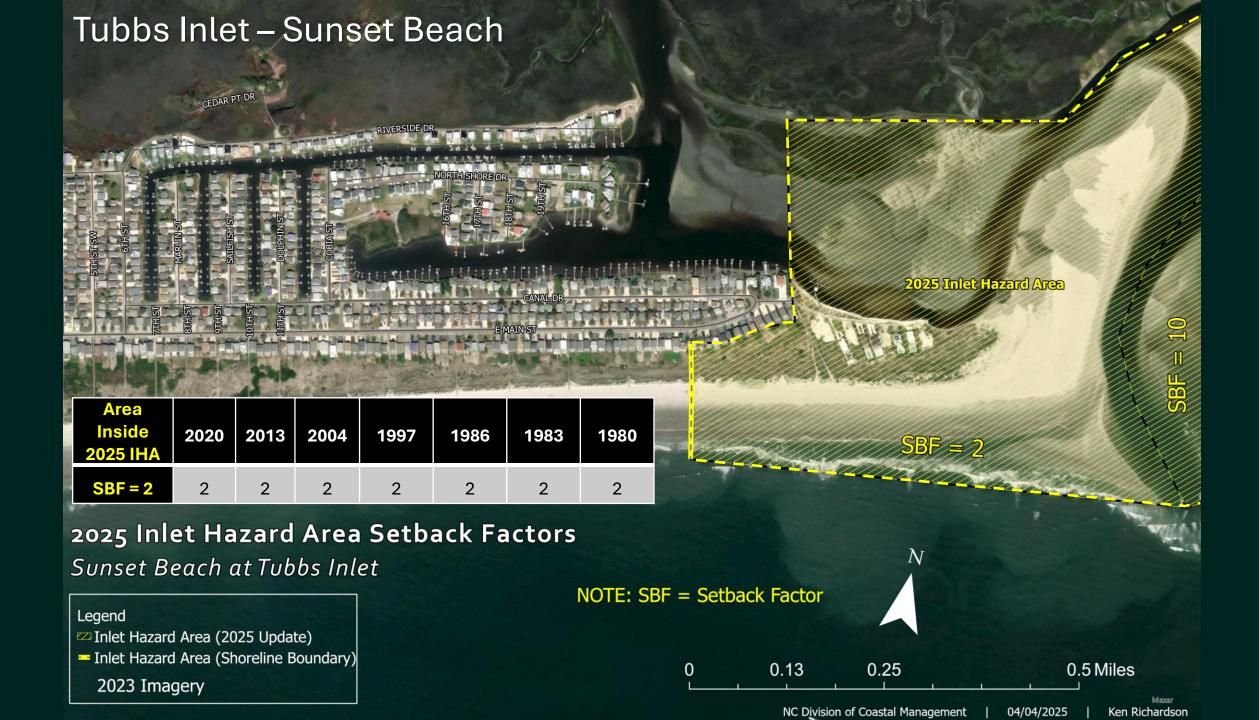


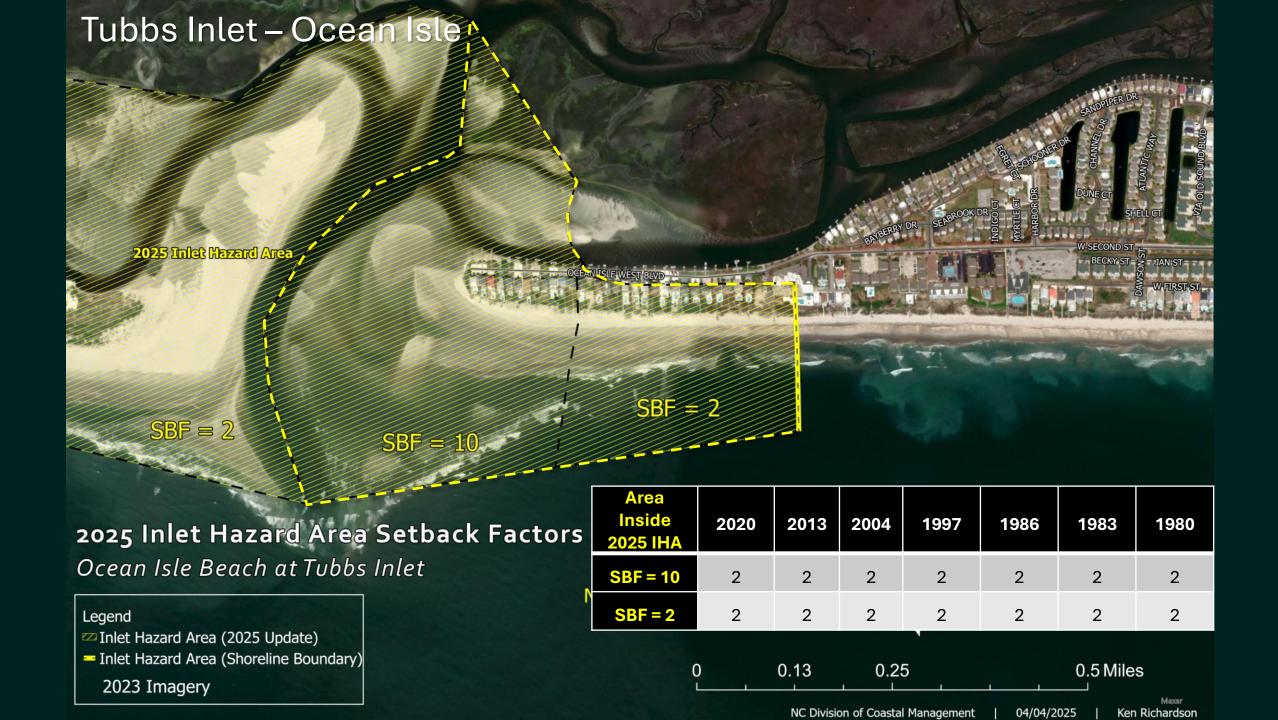


Transitioning from one study to the next: How they compare

Transition to New Setback Factors	No Change miles %	SBF Increase miles	SBF Decrease miles
2020 to 2025	124.9	2	17.7
	86%	1.4%	12%
2013 to 2020	120.5	20.3	3.8
	86%	14%	2.6%
2004 to 2013	118.3	10.3	16
	82%	7%	11%
1997 to 2004	111.6	10.4	22.6
	77%	7%	16%









2025 Inlet Hazard Area Setback Factors

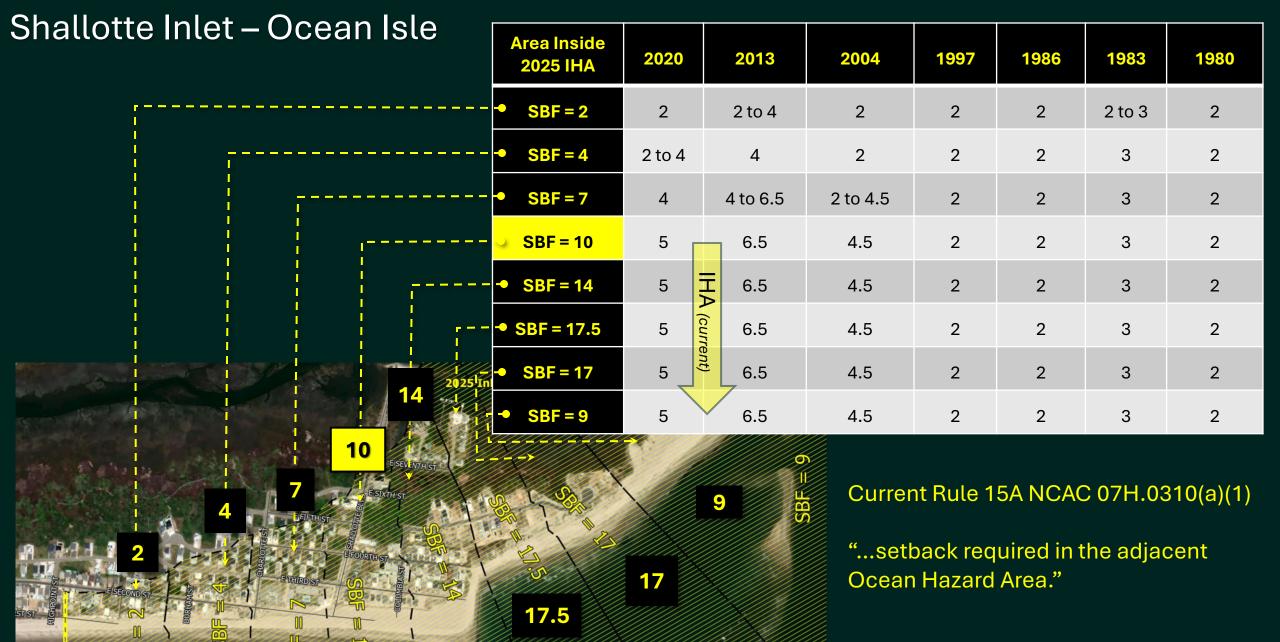
Ocean Isle Beach at Shallotte Inlet

Legend

- ☑ Inlet Hazard Area (2025 Update)
- Inlet Hazard Area (Shoreline Boundary)

2024 Imagery





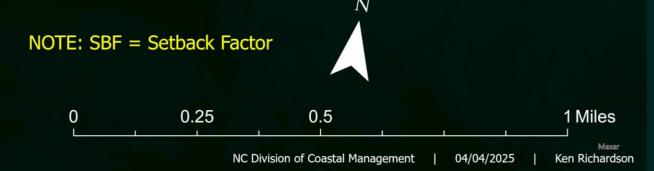


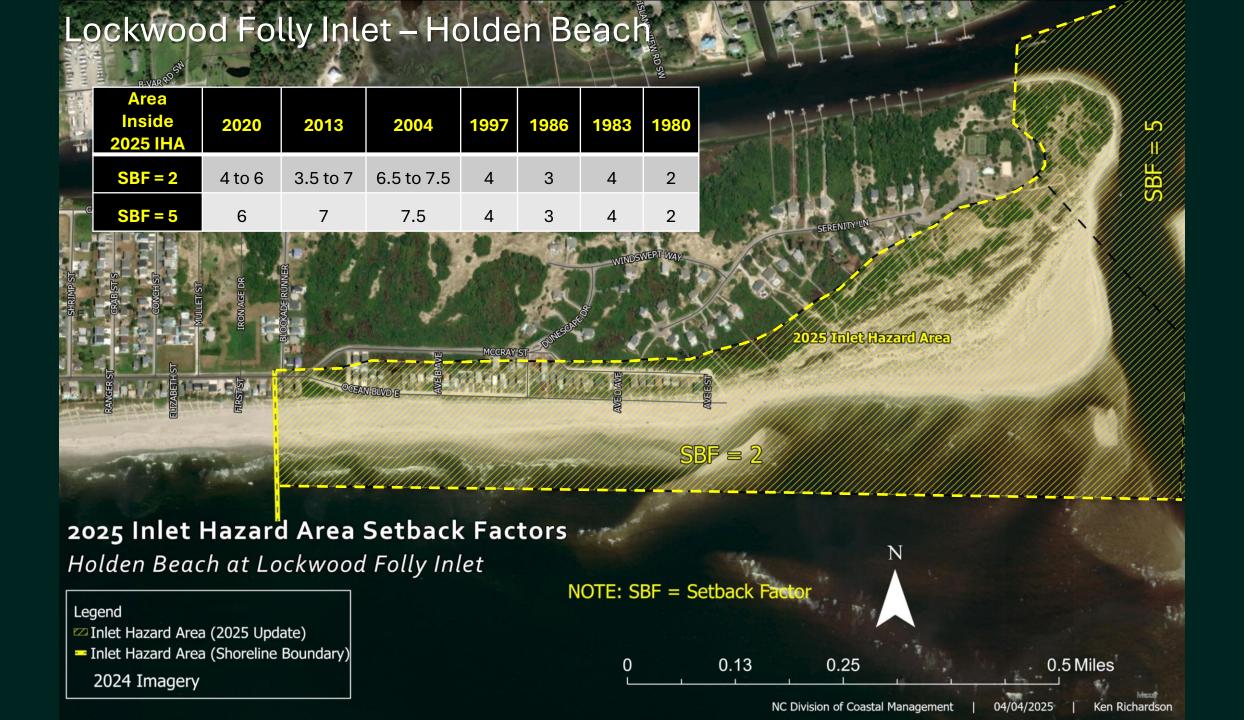
2025 Inlet Hazard Area Setback Factors

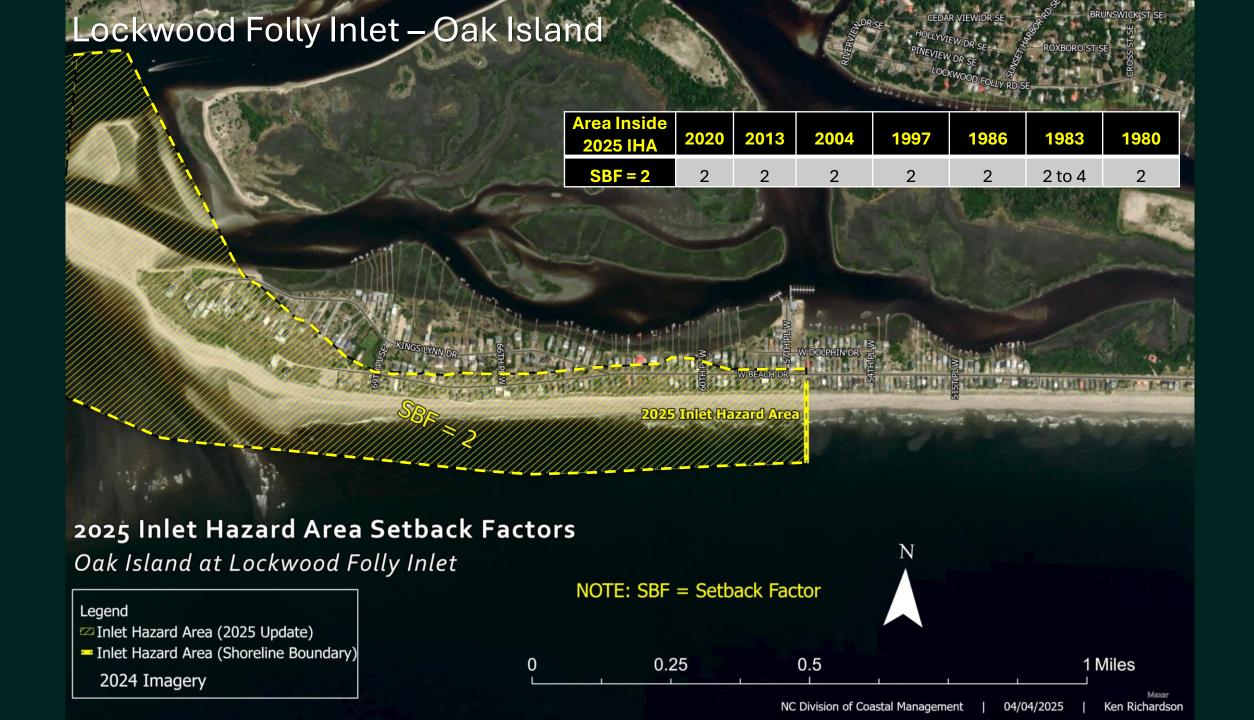
Holden Beach at Shallotte Inlet

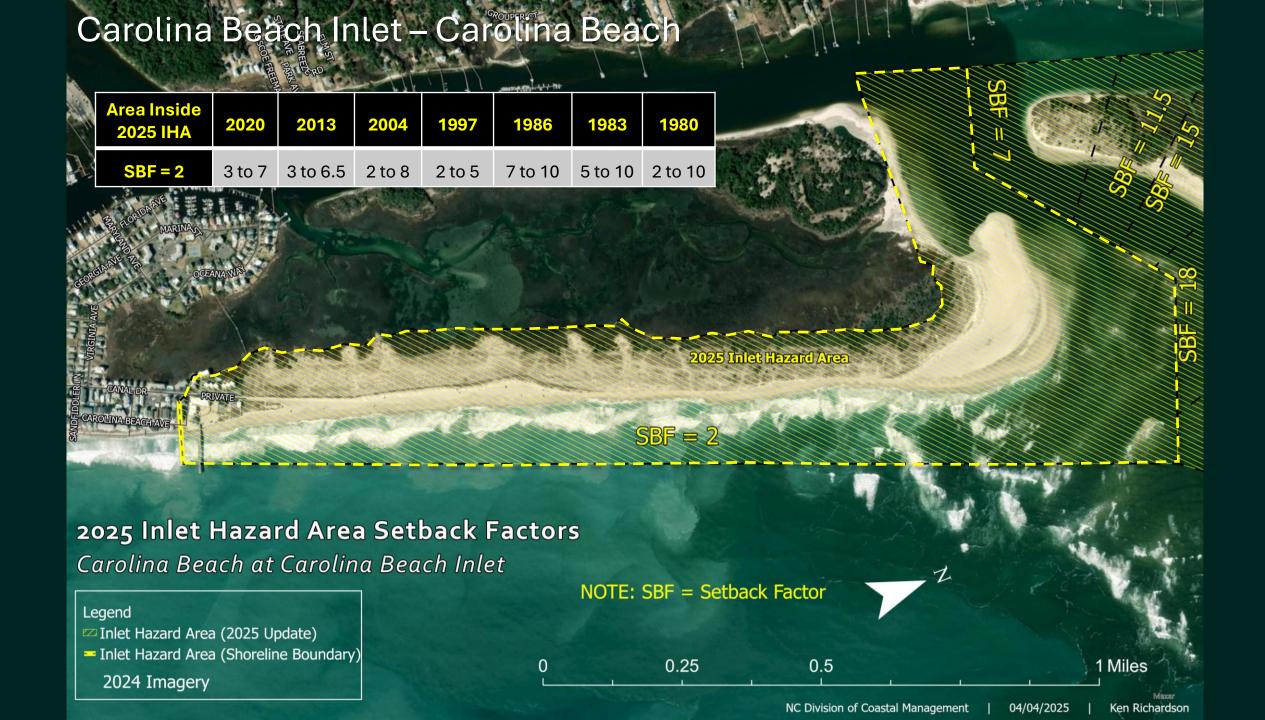
Legend

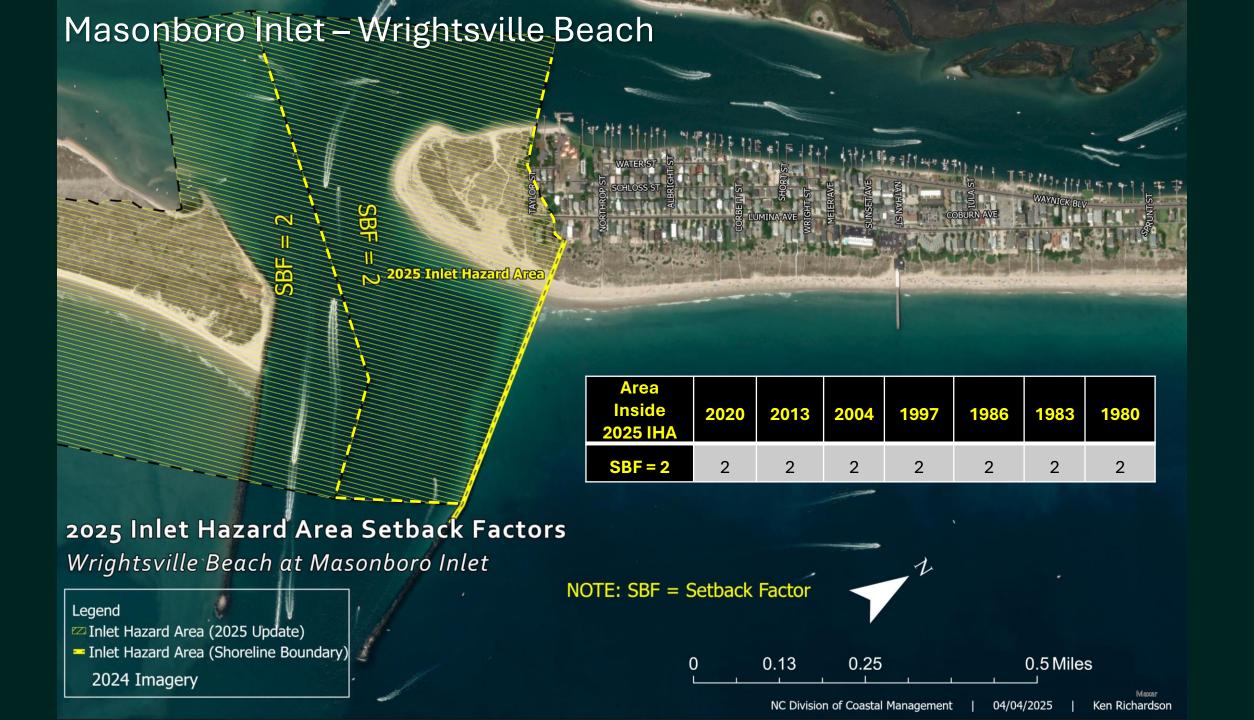
- ☑ Inlet Hazard Area (2025 Update)
- Inlet Hazard Area (Shoreline Boundary)2024 Imagery

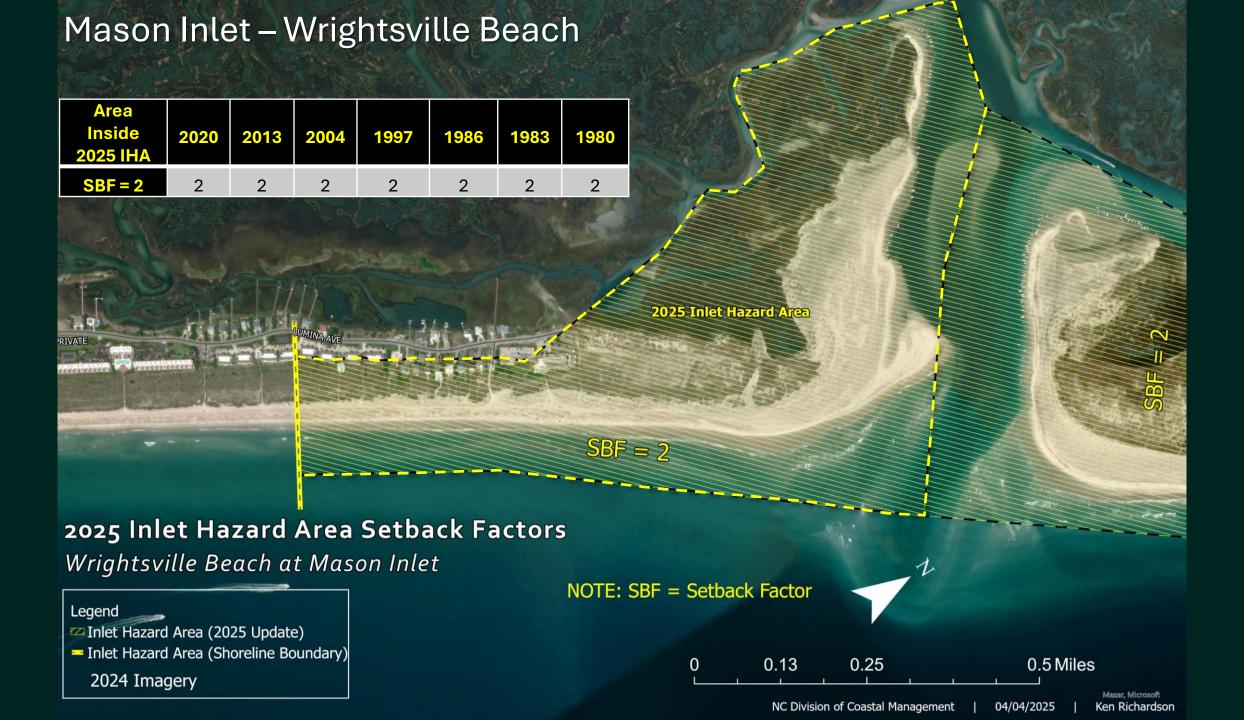


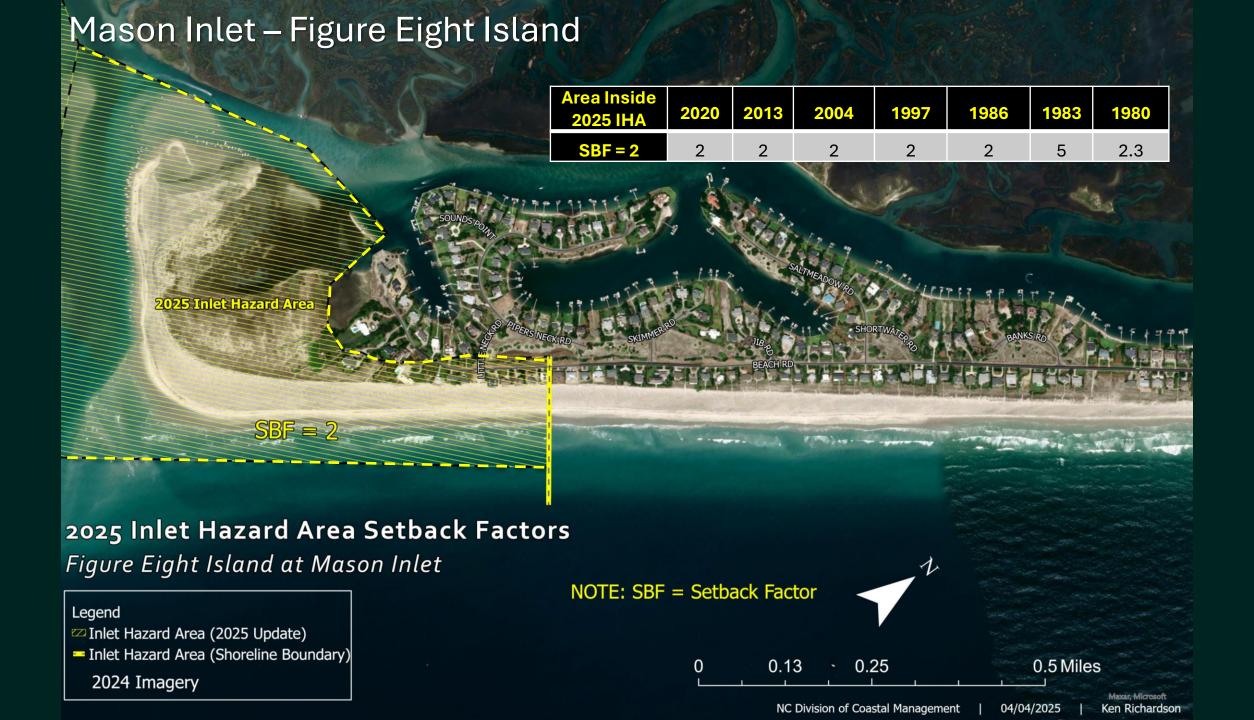












Rich Inlet – Figure Eight Island

Area Inside 2025 IHA	2020	2013	2004	1997	1986	1983	1980
SBF = 2	2	2	2	2	2	2	2.3
SBF = 3.5	2	2	2	2	2	2	2.3
SBF = 5	2	2	2	2	2	2	2.3
SBF = 2	2	2	2	2	2	2	2.3

-2625 Inlet Hazard Area

SBF = 2 / SBF = 5

2025 Inlet Hazard Area Setback Factors

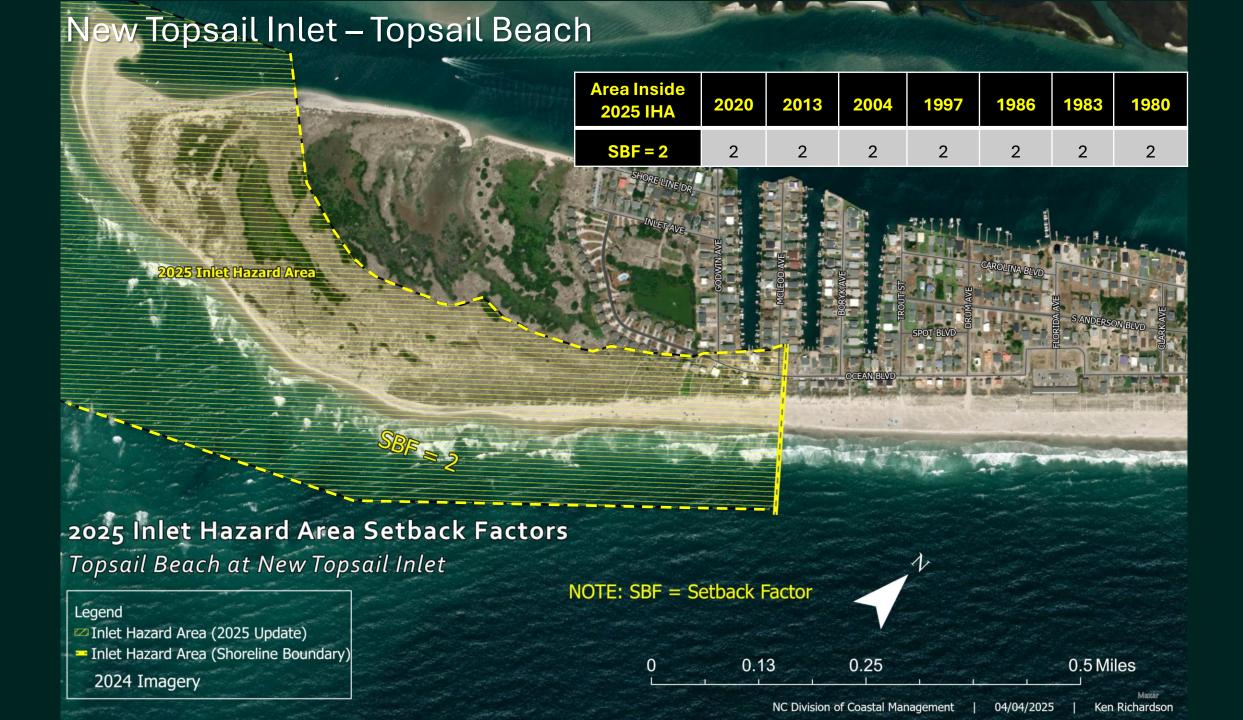
Figure Eight Island at Rich Inlet

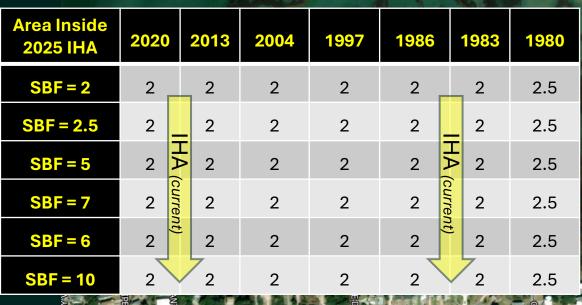
Legend

- ☑ Inlet Hazard Area (2025 Update)
- Inlet Hazard Area (Shoreline Boundary)2024 Imagery

NOTE: SBF = Setback Factor









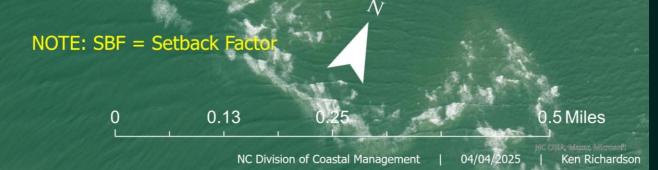
2025 Inlet Hazard Area Setback Factors

North Topsail Beach at New River Inlet

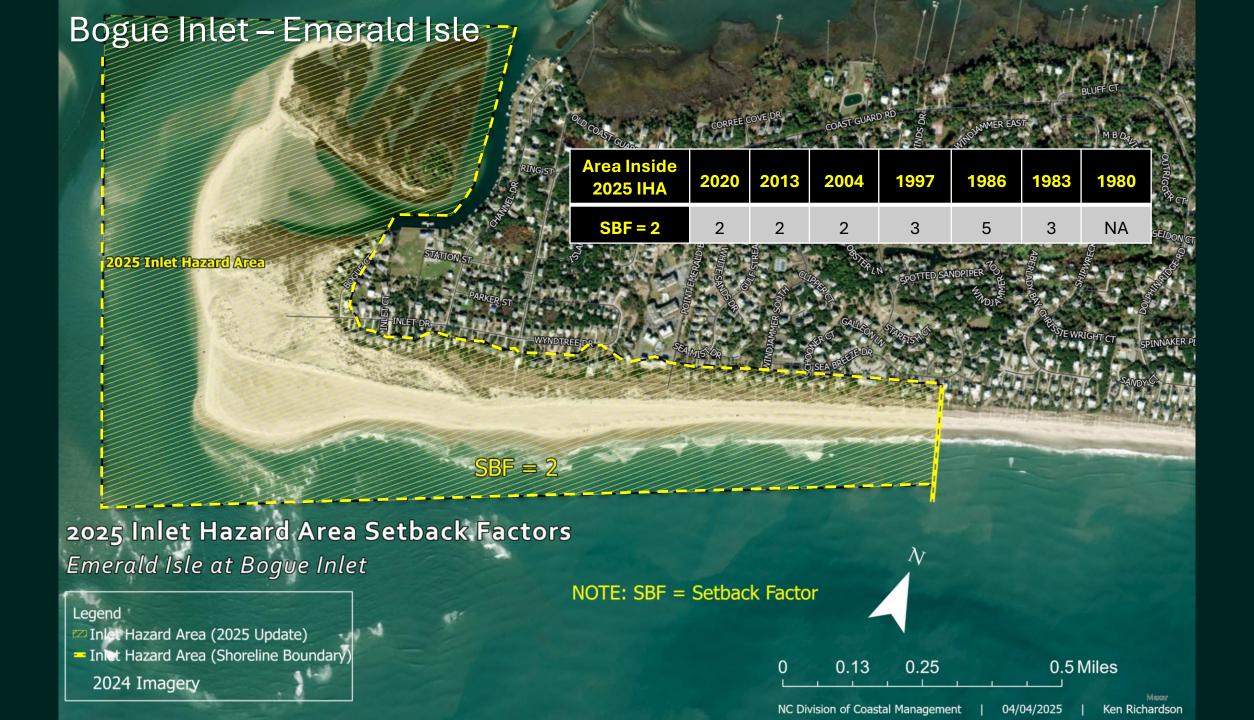
SBF = 2

Legend

- ☑ Inlet Hazard Area (2025 Update)
- Inlet Hazard Area (Shoreline Boundary)2024 Imagery



New River Inlet - North Topsail Beach



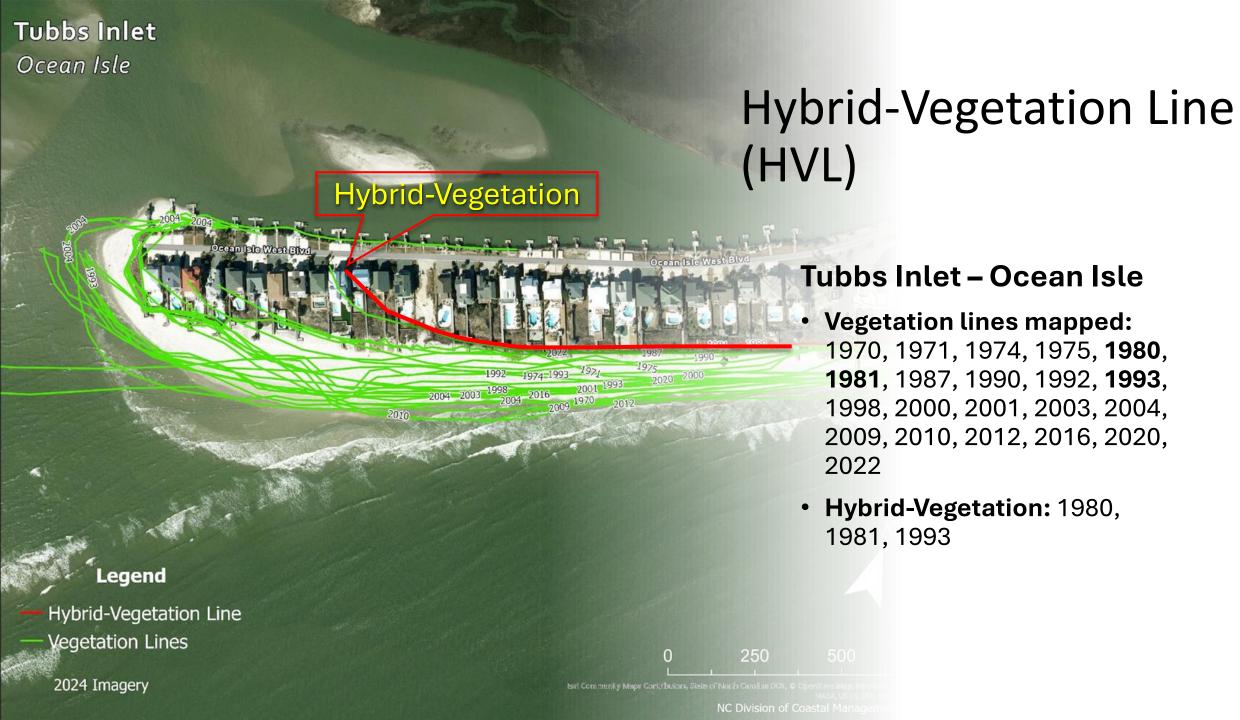
Structures Inside Inlet Hazard Areas (Current vs. Updated)

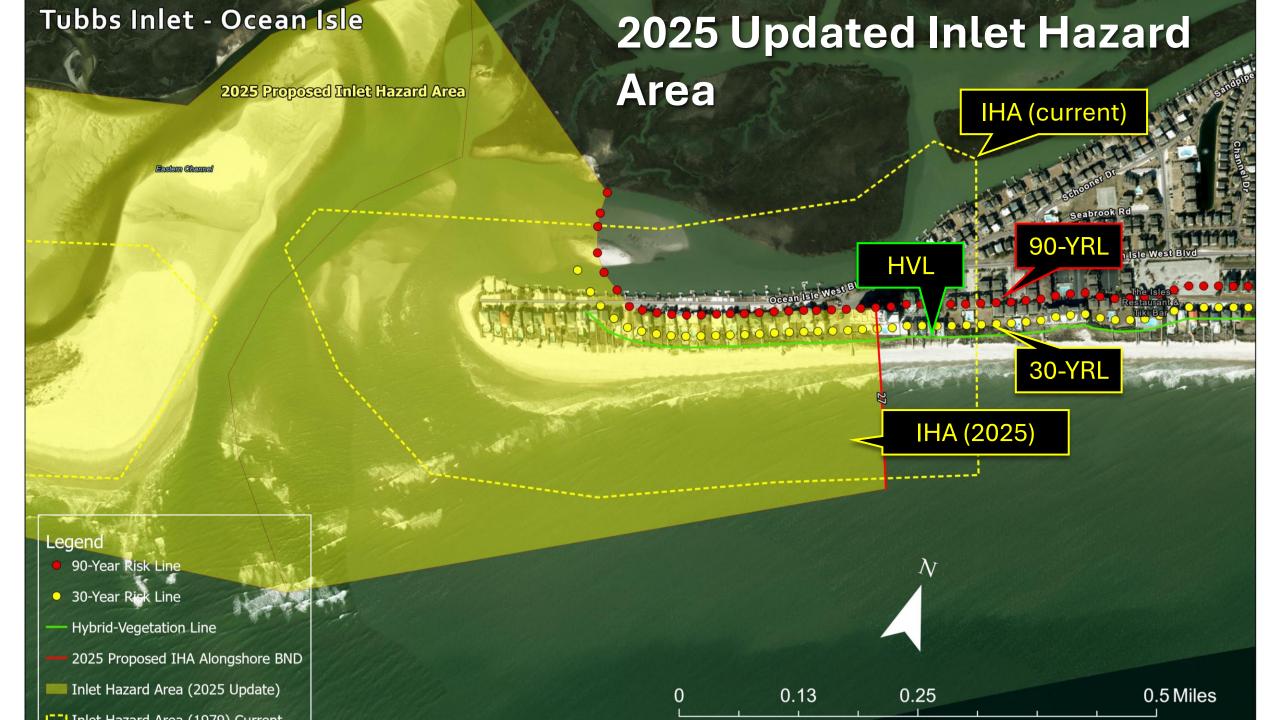
Location	Current IHA (1979)	Updated IHA (2025)	Difference (current to 2025)
Tubbs Inlet – Sunset Beach	206	17	-189
Tubbs Inlet – Ocean Isle	41	30	-11
Shallotte Inlet – Ocean Isle	0	200	200
Shallotte Inlet – Holden Beach	59	144	85
Lockwood Folly Inlet – Holden Beach	4	42	38
Lockwood Folly Inlet – Oak Island	43	105	62
Carolina Beach Inlet – Carolina Beach	0	18	18
Masonboro Inlet – Wrightsville Beach	0	3	3
Mason Inlet – Wrightsville Beach	1	16	15
Mason Inlet – Figure Eight	36	10	-26
Rich Inlet – Figure Eight	36	62	26
New Topsail Inlet – Topsail Beach	177	17	-160
New River Inlet – North Topsail Beach	84	125	41
Bogue Inlet – Emerald Isle	96	77	-19
Total:	783	866	83

Updating OEA and IHA Erosion Rates & IHA Boundaries

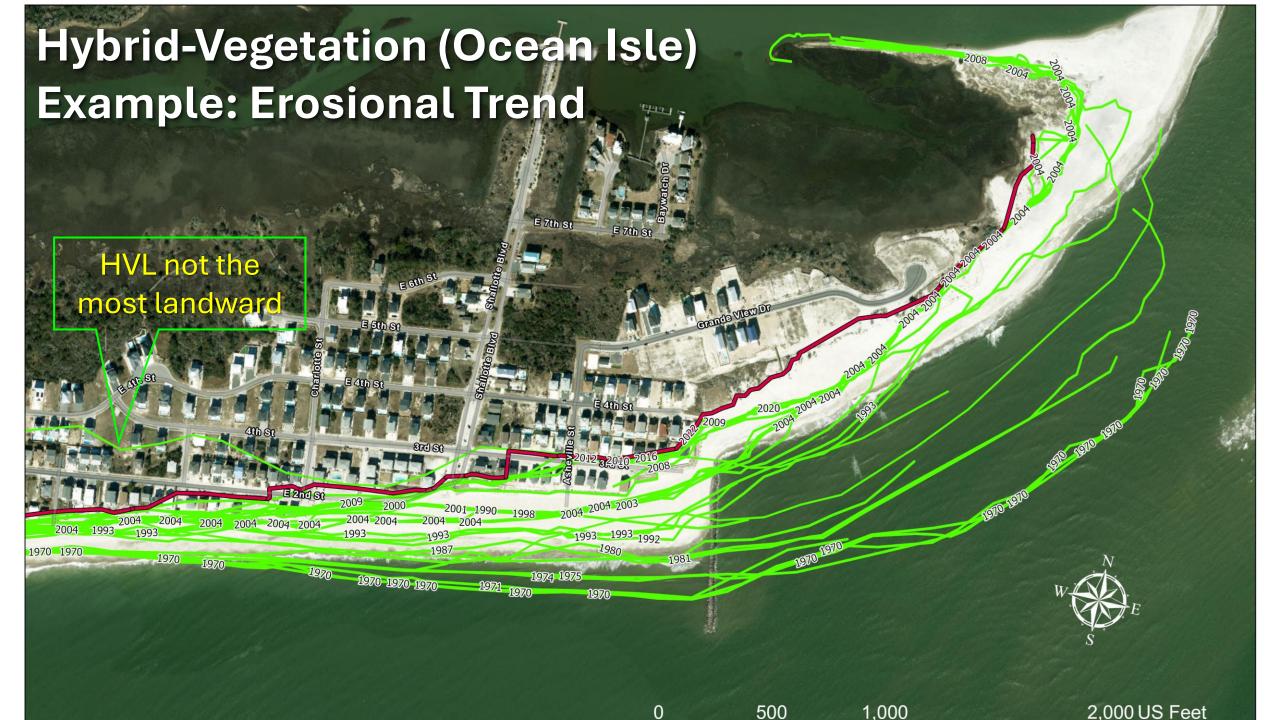
Requires Rule Amendments:

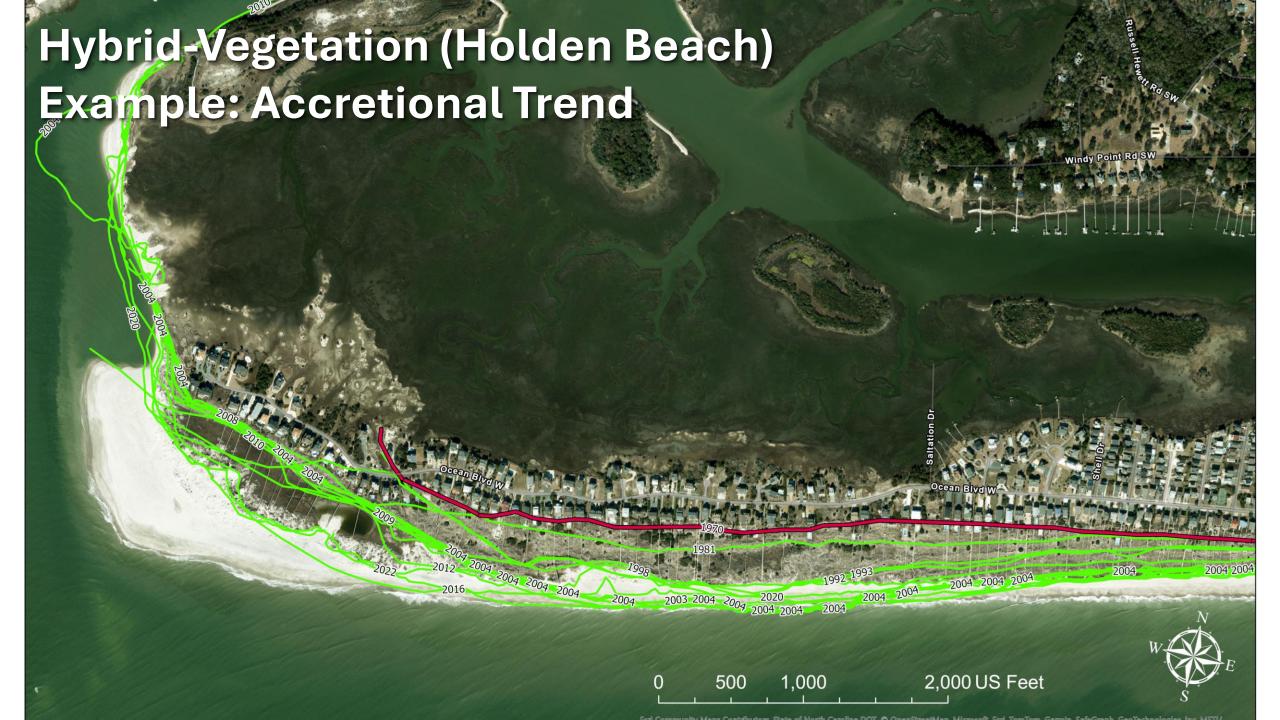
- **1. 07H .0304(1)** definition of Ocean Erodible Area (OEA) to reference erosion rate report & maps
- 2. 07H .0304(2) definition of Inlet Hazard Area (IHA) to reference:
 - IHA erosion rates report & maps
 - Updated IHA boundary report and maps
- 3. 07H .0310(a)(1) reference inlet erosion rate setbacks, not adjacent OEA
 - Include reference to hybrid-vegetation if used to measure setbacks?
- **4. 07H .0310(a)(4)** clarify that existing grandfather rules apply inside IHAs

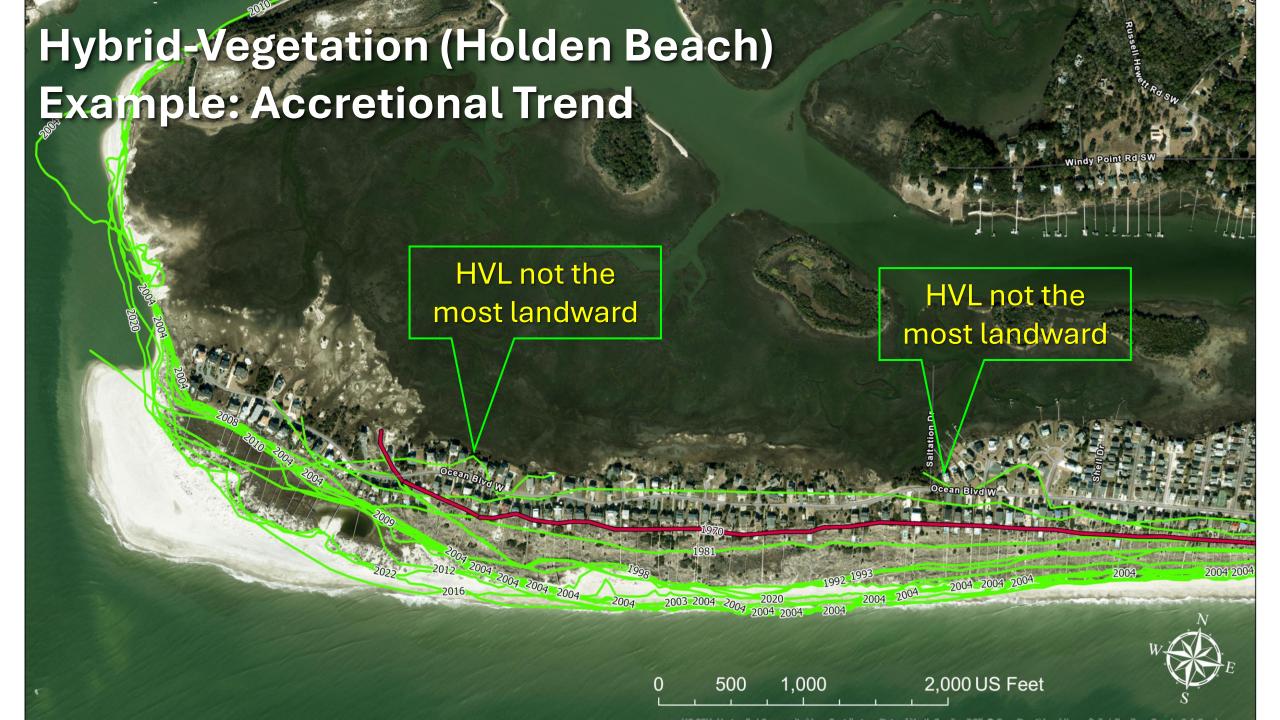














Hybrid-Vegetation (HVL) vs. Pre-Project Vegetation Line (PPVL):

Pre-Project

Vegetation Line

Oceanfront:
Without routine

maintenance = erosion

Inlet Areas:

Accretional trend reverses

= erosion

Post-Project Vegetation

Base Photo: Dare County, NC

Photo Simulation: NC DCM

Existing Structures & Potential Issues with Meeting Setbacks: 3 Scenarios

Location	Total Structures Inside 2025 IHA	(#1) Current Requirements Current Veg. & 2020 Setbacks	(#2) Current Veg. & 2025 Setbacks	(#3) Hybrid-Vegetation Current Veg. & 2025 Setbacks
Sunset Beach - Tubbs Inlet	17	0	0	5
Ocean Isle - Tubbs Inlet	30	1	12	13
Ocean Isle - Shallotte Inlet	200	66	113	122
Holden Beach - Shallotte Inlet	144	0	0	97
Holden Beach - Lockwood Folly Inlet	42	34	2	20
Oak Island - Lockwood Folly Inlet	105	24	24	76
Carolina Beach - CB Inlet	18	2	1	15
Wrightsville Beach - Masonboro Inlet	3	0	0	1
Wrightsville Beach - Mason Inlet	16	0	0	3
Figure Eight - Mason Inlet	10	9	9	10
Figure Eight - Rich Inlet	62	14	22	33
Topsail Beach - New Topsail Inlet	17	2	2	7
N. Topsail Beach - New River Inlet	123	41	58	68
Emerald Isle - Bogue Inlet	77	0	0	36
Total:	866	193	243	506

Updating Erosion Rates & IHA Boundaries

Requires Rule Amendments:

- **1. 07H .0304(1)** definition of Ocean Erodible Area (OEA) to reference erosion rate report & maps
- 2. 07H .0304(2) definition of Inlet Hazard Area (IHA) to reference:
 - IHA erosion rates report & maps
 - Updated IHA boundary report and maps
- 3. 07H .0310(a)(1) reference inlet erosion rate setbacks, not adjacent OEA
 - Include reference to hybrid-vegetation if used to measure setbacks?
- **4. 07H .0310(a)(4)** clarify that existing grandfather rules apply inside IHAs

Proposed Rule Amendments: 07H .0304(1) Definition of Ocean Erodible Area of Environmental Concern

(1)

Clarifications & Re-Organization of the Rule

Change to reference updated report & maps

The ocean hazard AECs contain all of the following areas:

Ocean Erodible Area. This is the area where there exists a substantial possibility of excessive erosion and significant shoreline fluctuation. The oceanward boundary of this area is the mean low water line. The landward extent of this area is the distance landward from the vegetation line as defined in 15A NCAC 07H .0305(a)(5) to the recession line established by multiplying the long term annua erosion rate times 90; provided that, where there has been no long term erosion or the rate is less than two feet per year, this distance shall be set at 180 feet landward from the vegetation line. For the purposes of this Rule, the erosion rates are the long term average based on available historica data. The current long term average erosion rate data for each segment of the North Carolina coas is depicted on maps entitled "North Carolina 2019 Oceanfront Setback Factors & Long Term Average Annual Erosion Rate Update Study" and approved by the Coastal Resources Commission on February 28, 2019 (except as such rates may be varied in individual contested cases or in declaratory or interpretive rulings). In all cases, the rate of shoreline change shall be no less than two feet of erosion per year. The maps are available without cost from any Local Permit Officer or the Division of Coastal Management on the internet at http://www.nccoastalmanagement.net These are oceanfront areas vulnerable to chronic or rapid erosion resulting from the combined effects of wind, ocean waves, current, tides, dredging activities, nearshore bathymetry, and erosion control structures.

- (a) The oceanward boundary of this area is the mean low water line.
- (b) The landward extent of this area is 180 feet or 90 times the erosion rate, whichever is greater, and is measured landward from the first line of stable and natural vegetation as definition as defined in 15A NCAC 07H .0305(5), the pre-project vegetation line as defined in 15A NCAC 07H .0305(9);
- (c) For the purposes of this Rule, erosion rates are long-term averages based on historical shoreline data. The current erosion rate data for each segment of the North Carolina coast is depicted on maps entitled "North Carolina 2025 Oceanfront Setback Factors & Long-Term Average Annual Erosion Rate Update Study" and approved by the Coastal Resources Commission on <<DATE>>:
- d) For the purpose of siting development, the minimum erosion rate shall be two feet per year;
- (e) Data and maps are available from the Division of Coastal Management online at https://www.deq.nc.gov/coastal-management/north-carolina-2025-oceanfront-setback-factorslong-term-average-annual-erosion-rate-update-study/open

Proposed Rule Amendments: 07H .0304(2) Definition of Inlet Hazard Area of Environmental Concern

(2)

Clarifications & Re-Organization of the Rule

Inlet Hazard Area. The inlet hazard areas are natural hazard areas that are especially vulnerable to erosion, flooding, and other adverse effects of sand, wind, and water because of their proximity to dynamic ocean inlets. This area extends landward from the mean low water line a distance encompassing that area within which the inlet migrates, based on statistical analysis, and shall consider such factors as previous inlet territory, structurally weak areas near the inlet, and external influences such as jetties, terminal groins, and channelization. The areas on the maps identified as Inlet Hazard Areas included in the report entitled INLET HAZARD AREAS, The Final Report and Recommendations to the Coastal Resources Commission, 1978, as amended in 1981, by Loie J. Priddy and Rick Carraway are incorporated by reference and are hereby designated as Inlet Hazard Areas, except for:

- a) the location of a former inlet which has been closed for at least 15 years;
- inlets that due to shoreline migration, no longer include the current location of the inlet;
 and
- (c) inlets providing access to a State Port via a channel maintained by the United States Army Corps of Engineers.

In all cases, the Inlet Hazard Area shall be an extension of the adjacent ocean erodible areas and in no case shall the width of the inlet hazard area be less than the width of the adjacent ocean erodible area. This report is available for inspection at the Department of Environmental Quality, Division of Coastal Management, 400 Commerce Avenue, Morehead City, North Carolina or at the website referenced in Item (1) of this Rule. These are areas vulnerable to severe erosion driven by the

Proposed Rule Amendments: 07H .0304(2) Definition of Inlet Hazard Area of Environmental Concern

Clarifications & Re-Organization of the Rule

- (a) Reference IHA Erosion Rate Report & Maps
- (b) Reference IHA Boundary Report & Maps
- (c) Like the OEA, reference the minimum erosion rate

referenced in Item (1) of this Rule. These are areas vulnerable to severe erosion driven by the dynamic nature of ocean inlets where natural processes and can undergo rapid shoreline change as

inlet movement redistributes sand along adjacent beaches through the combined effects of wind, waves, current, dredging activities, nearshore bathymetry, and erosion control structures.

- (a) The Inlet Hazard Area erosion rates are the long-term average erosion rates for each inlet hazard area and depicted in the report entitled "North Carolina 2025 Inlet Hazard Area (IHA) Erosion Rate & Setback Factors: Update Study" and approved by the Coastal Resources Commission on << DATE>>, except for inlets providing access to a State Port via a channel maintained by the United States Army Corps of Engineers.
- (b) For the purposes of this Rule, the areas on the maps identified as inlet hazard areas are included in the report entitled, "Inlet Hazard Area Boundaries, 2025 Update: Science Panel Recommendations to the North Carolina Coastal Resources Commission" which were approved by the Coastal Resources Commission on << DATE>> and are incorporated by reference and hereby designated as Inlet Hazard Areas.
- (c) For the purpose of <u>siting development</u>, the minimum erosion rate shall be two feet per year.
- (d) Data and maps are available from the Division of Coastal Management online at:
 - (i) <u>Inlet hazard area boundaries: https://www.deq.nc.gov/coastal-management/documents/north-carolina-2025-inlet-hazard-area-iha-boundary-update/open
 </u>
 - (ii) Inlet hazard area erosion rates and setback factors: https://www.deq.nc.gov/coastal-management/north-carolina-2025-inlet-hazard-area-iha-erosion-rate-setback-factors-update-study/open

Proposed Rule Amendments: 07H .0304(3) Definition of Unvegetated Beach Area of Environmental Concern

Vegetation is re-established
This temporary AEC designation
is no longer needed at the
following locations:

(c)(i) Surf City & North Topsail Beach

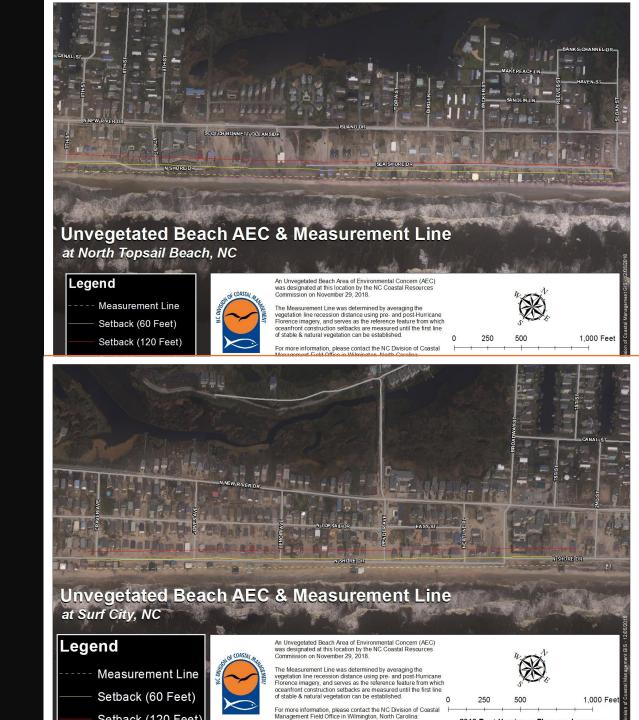
(c)(ii) Oak Island

- (3) Unvegetated Beach Area. Beach areas within the Ocean Hazard Area of Environmental Concern where no stable and natural vegetation is present may be designated as Unvegetated Beach Areas on either a permanent or temporary basis as follows:
 - (a) The areas in this category shall be designated following studies by the Division of Coastal Management to determine if the area is subject to rapid unpredictable landform change due to wind and wave action. Areas in this category shall be designated based on studies conducted by the Division of Coastal Management to determine whether the area is subject to rapid and unpredictable landform change, characterized by significant shoreline or inlet movement occurring over short-time periods and high variability in erosion patterns caused by wind, waves, and tidal processes. These areas shall be designated on maps approved by the Coastal Resources Commission and available without cost from any Local Permit Officer or the Division of Coastal Management on the internet at the website referenced in Item (1) of this Rule.
 - (b) An area that is unvegetated as a result of a hurricane or other major storm event may be designated by the Coastal Resources Commission as an Unvegetated Beach Area for a specific period of time, or until the Division has determined the vegetation has reestablished in accordance with 15A NCAC 07H .0305(a)(5). At the expiration of the time specified or the re-establishment of the vegetation, the area shall return to its pre-storm designation.
 - (c) The Commission designates as temporary unvegetated beach areas those oceanfront areas of:
 - (i) Surf City and North Topsail Beach in which the vegetation line as shown on the United States National Oceanic and Atmospheric Administration imagery dated September 17, 2018 was destroyed as a result of Hurricane Florence in September 2018; and
 - (ii) Oak Island in which the vegetation line as shown on the United States National Oceanic and Atmospheric Administration and Geological Survey imagery dated August 4, 2020 was destroyed as a result of Hurricane Isaias in August 2020.

The designation AEC boundaries can be found on the Division's website a https://files.nc.gov/ncdeq/Coastal%20Management/GIS/unvegetated_beach_aec.pdf and https://files.nc.gov/ncdeq/Coastal%20Management/GIS/unveg_beachAEC_Oak_Island.zip.

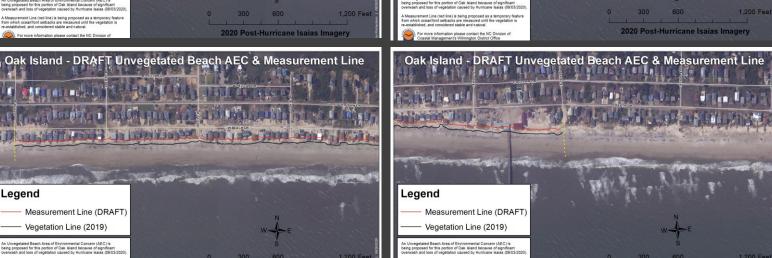
Unvegetated Beach AEC at

- North Topsail Beach
- Surf City



Unvegetated Beach AECs at Oak Island





Legend





Oak Island - DRAFT Unvegetated Beach AEC & Measurement Line

Proposed Rule Amendments: 07H .0310 Use Standards for Inlet Hazard Areas

(a) clarifications

(a)(1) change adjacent OEA rate condition

(a)(1) use Hybrid-Vegetation Line?

(a)(2) remove commercial & residential

(a)(3) clarification

Current (a)(4) not required

(a)(4) to reference grandfathering

15A NCAC 07H .0310 USE STANDARDS FOR INLET HAZARD AREAS

- (a) Inlet Hazard Areas of Environmental Concern as defined by Rule .0304 of this Section are subject to 15A NCAC 07H .0304(2) may experience rapid inlet migration, changes in watercourses, flooding high rates of shoreline erosion, flooding, and strong tides. Due to the hazardous nature of the Inlet Hazard Areas, all development within these areas shall be permitted in accordance with the following standards:
 - (1) All development in the inlet hazard area shall be set back from the vegetation line a distance equal to the setback required in the adjacent ocean hazard area; Development setbacks within Inlet Hazard Areas shall be measured in a landward direction from the first line of stable and natural vegetation, pre-project vegetation line, hybrid-vegetation line, or measurement line as defined in 15A NCAC 07H .0305, whichever is applicable;
 - (2) Permanent structures shall be permitted at a density of no more than one commercial or residential unit per 15,000 square feet of land area on lots subdivided or created after July 23, 1981;
 - (3) Only residential structures of four units or less or non residential structures of with less than 5,000 square feet total floor area shall be allowed within the inlet hazard area, Inlet Hazard Area, except that access roads to those areas and maintenance and replacement of existing bridges shall be allowed;
 - (4) Established common law and statutory public rights of access to the public trust lands and waters in Inlet Hazard Areas shall not be eliminated or restricted. Development shall not encroach upon public accessways nor shall it limit the intended use of the accessways; and
 - (4) Notwithstanding any other setback requirement in Rule 15A NCAC 07H .0306(a)(5), replacement of a structure within the Inlet Hazard Area greater than 5,000 square feet, or more than one unit per 15,000 square feet of land area, shall be allowed provided the structure meets criteria defined in Rule 15A NCAC 07H 0306(a)(3)(L); and
 - (5) All other rules in this Subchapter pertaining to development in the ocean hazard areas Ocean Hazard Areas shall be applied to development within the Inlet Hazard Areas.

Questions?

Reports & Maps are available online:

https://www.deq.nc.gov/about/divisions/division-coastal-management

DCM's Online Map Viewer (AGOL):

- Viewed
- Data downloaded
- Web Data Services

Contact: Ken.Richardson@deq.nc.gov

