

An update on threatened oceanfront structures adjacent to Cape Hatteras National Seashore

November 13, 2024

*North Carolina Coastal Resources Commission Meeting
Ocean Isle Beach, N.C.*

David Hallac

*National Parks of Eastern North Carolina
Cape Hatteras National Seashore*



Virginia Beach

North Carolina

Cape Hatteras National Seashore
75 miles

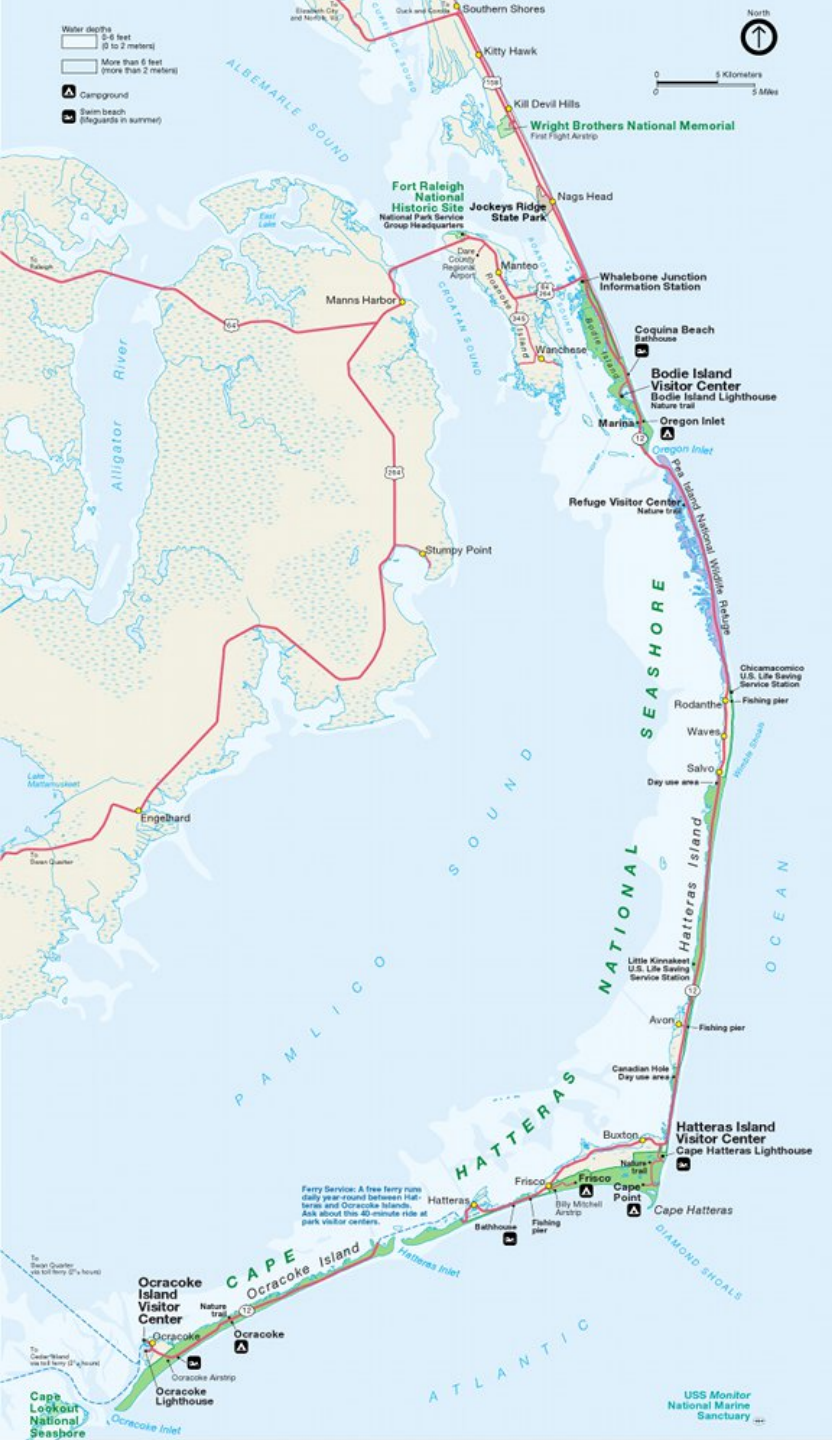
Cape Lookout National Seashore
58 miles

South Carolina

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image Landsat / Copernicus

Google Earth



- 3.2 M visits
- 75 miles of beaches
- 200 miles of marsh shoreline
- 9 Villages
- 4 Beach campgrounds
- 3 Lighthouses
- 2 Fishing piers
- 2 Marinas
- 2 Boat ramps



Ocracoke tops Best Beaches in America list, Buxton comes in at number six

Published 10:05 am Sunday, June 5, 2022

By Staff Reports

4 of 6 < >

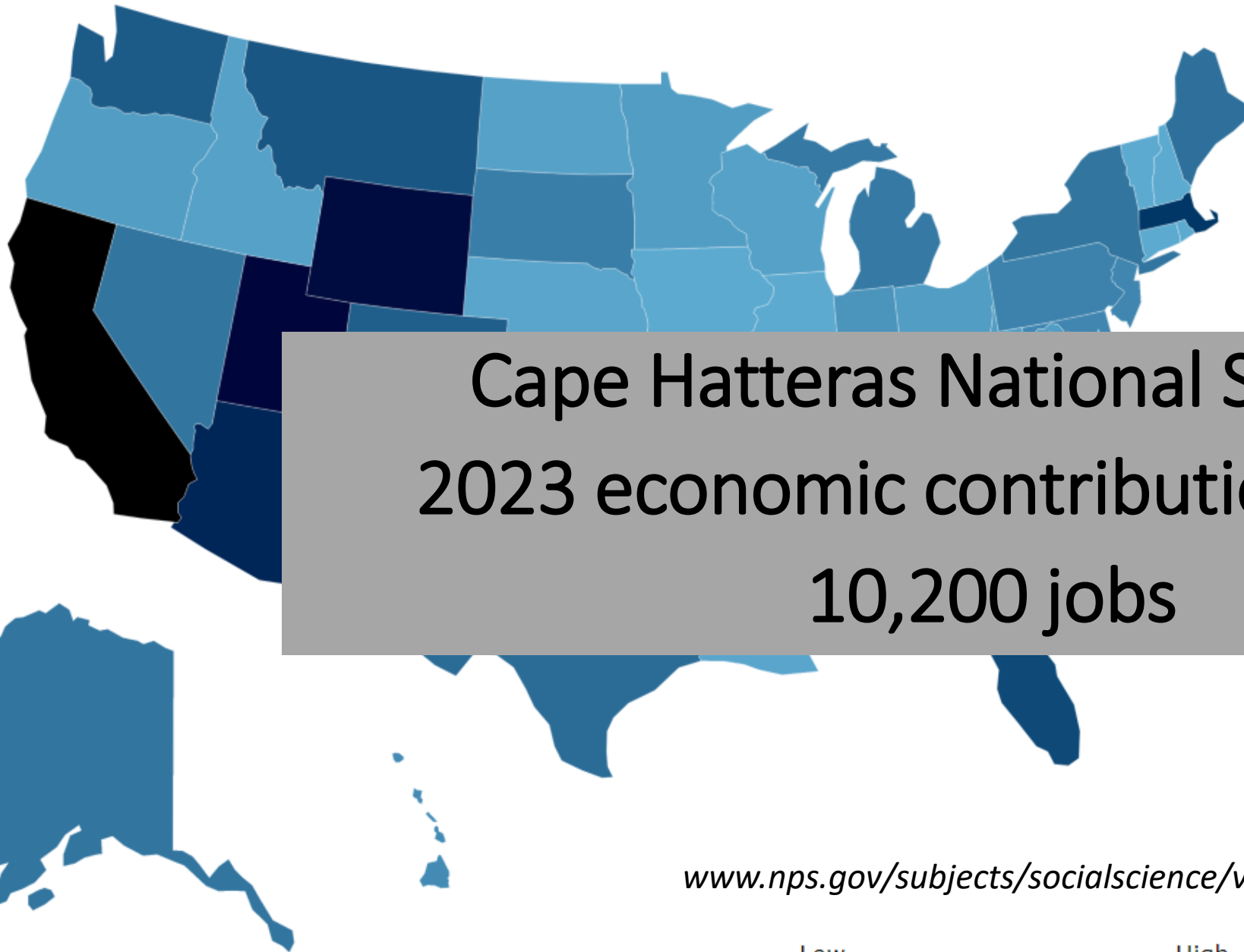


1937 – Act of Congress

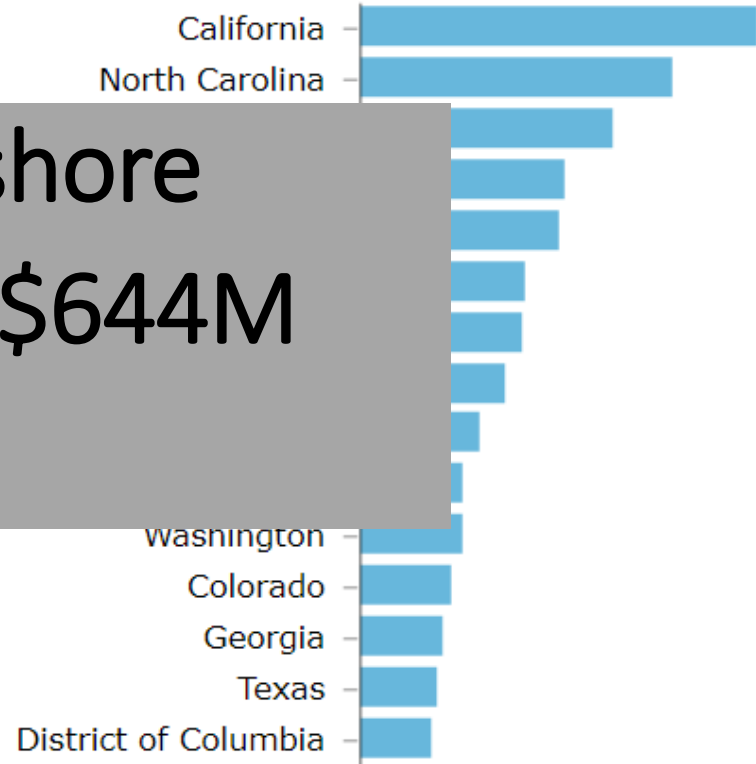
- “except for certain portions of the area, deemed to be especially adaptable for recreational uses, particularly swimming, boating, sailing, fishing, and other recreational activities of similar nature, which shall be developed for such uses as needed, the said area shall be permanently reserved as a primitive wilderness and no development of the project or plan for the convenience of visitors shall be undertaken which would be incompatible with the preservation of the unique flora and fauna or the physiographic conditions now prevailing in this area...”



Top 15 States by Visitor Spending



Cape Hatteras National Seashore
2023 economic contribution: \$644M
10,200 jobs



www.nps.gov/subjects/socialscience/vse.htm



FIGHT THE OCEAN



“The great wall of Carolina”
600 miles of fencing: 1936-1938





1959 Coquina Beach









DOWN BUT NOT OUT



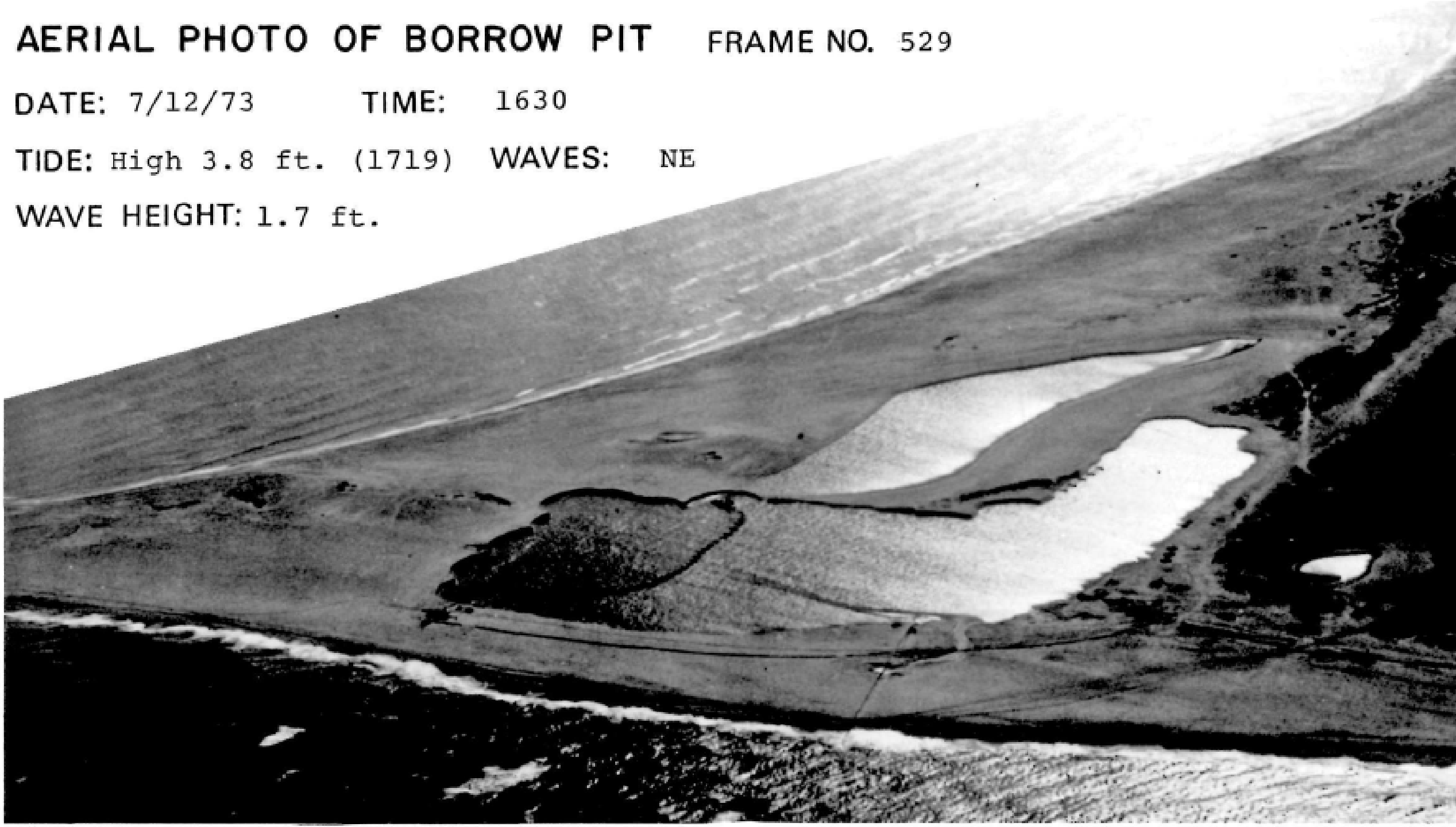


AERIAL PHOTO OF BORROW PIT FRAME NO. 529

DATE: 7/12/73 TIME: 1630

TIDE: High 3.8 ft. (1719) WAVES: NE

WAVE HEIGHT: 1.7 ft.





THE 1958 AND 1973 SHORELINES AT BUXTON



SURRENDER



After 37 years and over \$20 million, “virtually the entire Federal investment in the beach and dunes erosion control program has been lost to erosion.”

NEG. NO: 63-89 DATE: 4-63 PRINT FILE: A/E, s. f.

GENERAL DESCRIPTION, LOCATION, OTHER PERTINENT DATA

Superintendent Myers observing beach erosion at Cape Point Amphitheater.

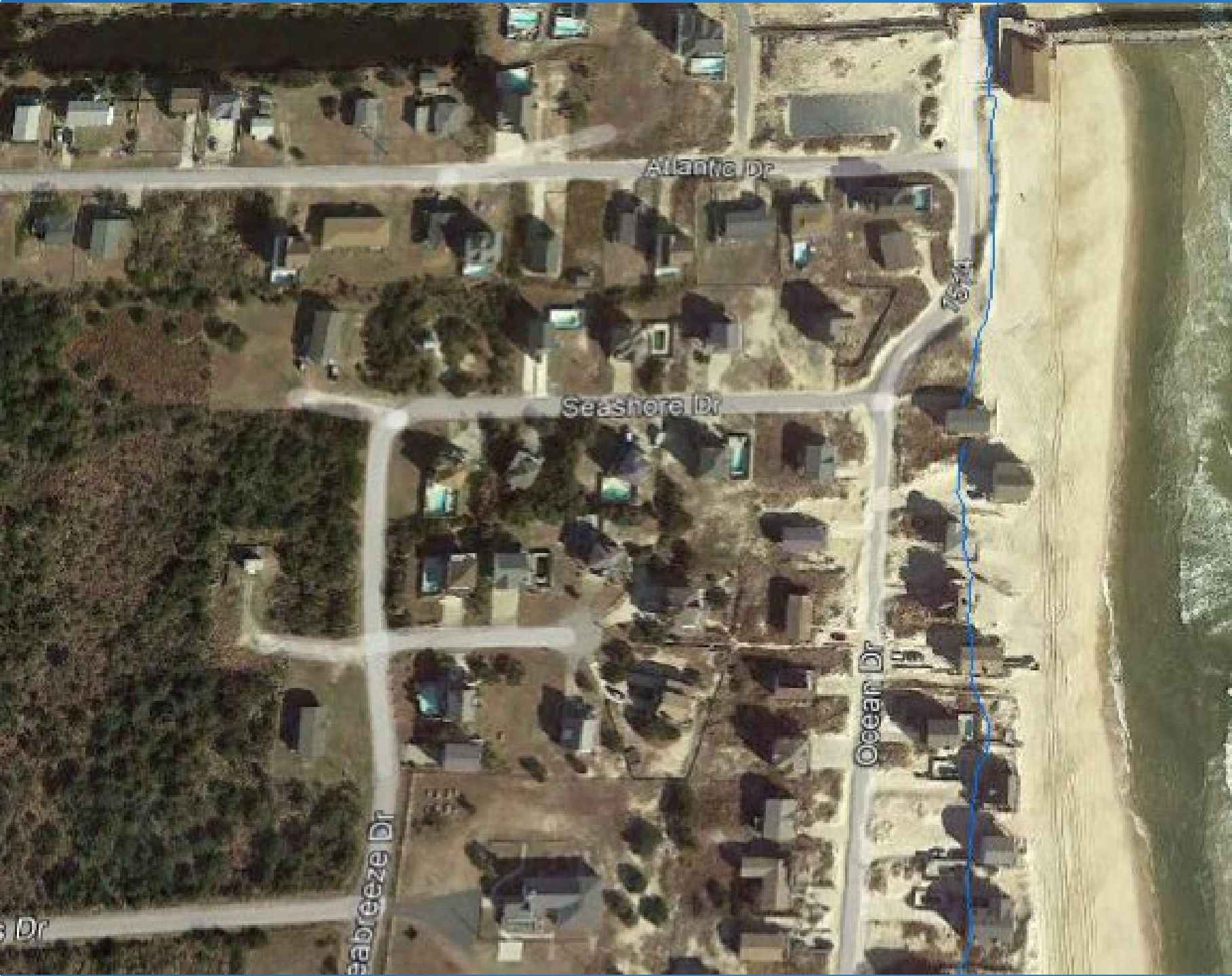
Negative by: Ründell

Photograph: NPS Outer Banks Group Museum Resource Center, Manteo
Scan by John Havel July 12, 2012

1973 NPS Report







#1 May 29, 2020

#2 February 9, 2022

#3 May 10, 2022

#4 May 10, 2022

#5 March 13, 2023

#6 May 28, 2024

#7 August 16, 2024

#8 September 20, 2024

#9 September 20, 2024

#10 September 24, 2024



13News Now Investigates: Beach erosion on the Outer Banks remains an expensive, long-term problem

Three homes were washed out to sea this year and more could be in danger. Now, there's a race to prolong the lifespan of homes and beaches threatened by erosion.

13newsnow.com Facebook: Cape Hatteras National Seashore

FIND OUT MORE

#Perpetual



**'This is our heritage':
Woman saves graves
from rising sea levels**

New Day

CNN chief climate correspondent Bill Weir travels to the Outer Banks of North Carolina where he reports on how the climate change and erosion has led to homes collapsing and graves being swept away by the tide.

Source: CNN

**WALK WITH US
TO DEAL ZERO™**



The Washington Post
Democracy Dies in Darkness

Try four weeks free

Sign in



ROLEX

- Climate & Environment**
- Climate Solutions
- Global warming
- World impacts
- Global emissions
- Extreme heat
- Biden's actions

He bought the house 9 months ago. Then the ocean swept it away.

Buyers, many from out of state, continue to gobble up oceanfront real estate where three homes have collapsed this year along N.C.'s Outer Banks. Scientists and government officials say climate change is likely to continue to exacerbate erosion.





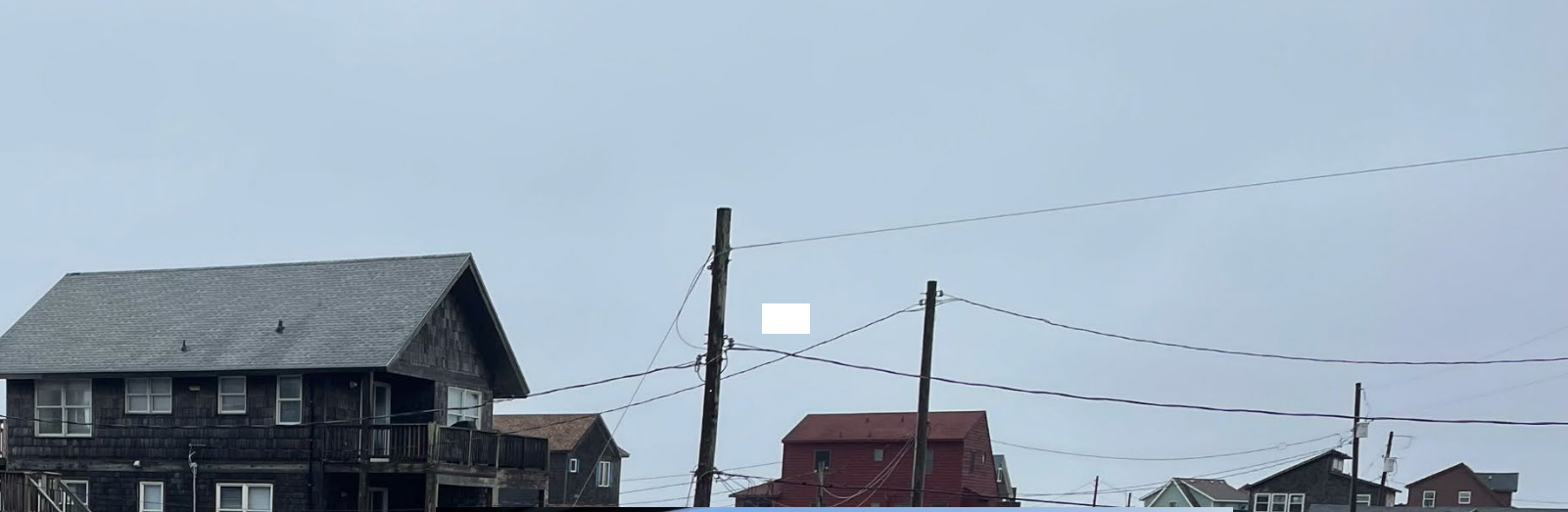


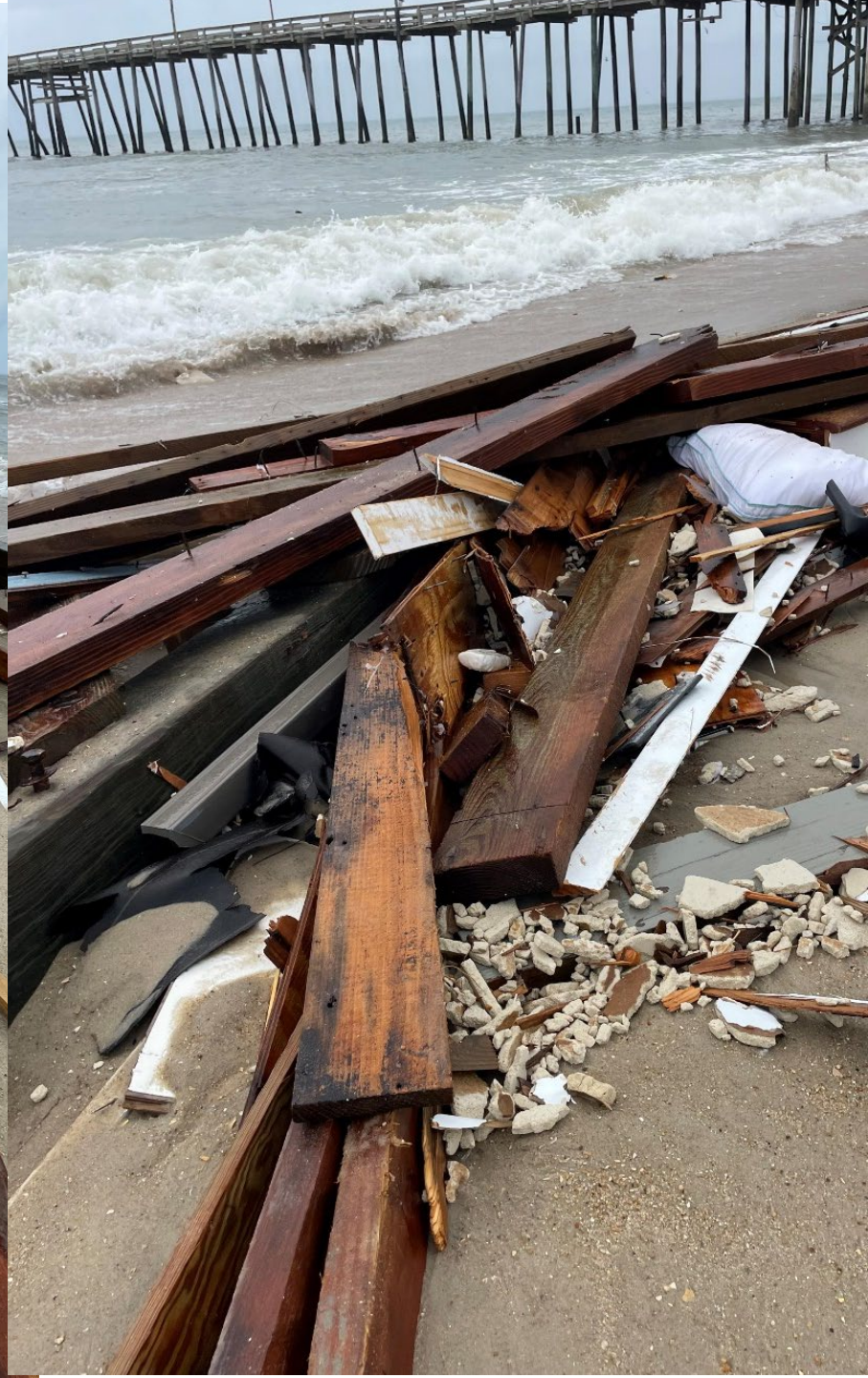
















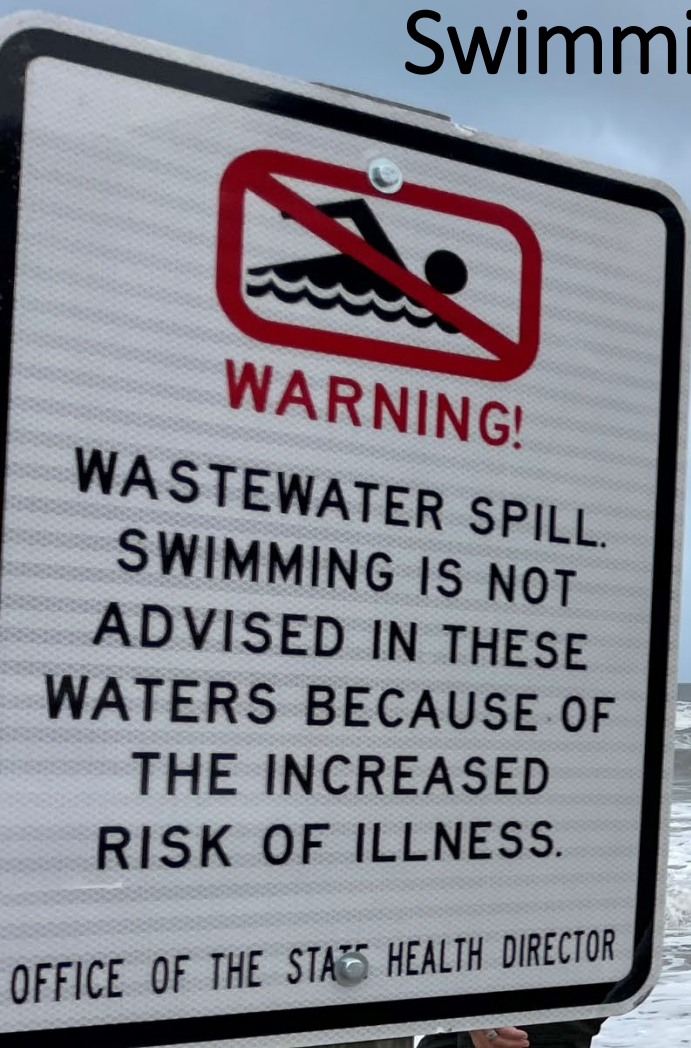


“Hallac stood in front of the place where (Owners) house used to be, wrinkling his nose as the stench from the broken septic system wafted toward him.”

New York Times, May 16, 2022, Beach houses on the Outer Banks are being swallowed by the sea, by Richard Fausset



Swimming advisories due to wastewaters spills



8/12/2024	N	Dare	23047 GA Kohler	23048 GA Kohler	NH/Bux	10	34	80	1/2 FLD	S	NINE	80	0.23
8/14/2024	N	Dare	23214 Corbina Dr	23215 Corbina Dr	NH/Bux	9	34	75	1/2 FLD	S	NE	80	0
8/14/2024	N	Dare	23047 GA Kohler	23048 GA Kohler	NH/Bux	10	34	75	1/2 FLD	S	NE	80	0
8/19/2024	N	Dare	23214 Corbina Dr	23215 Corbina Dr	NH/Bux	9	35	75	1/2 EBB	N	SW	72	0.3
8/19/2024	N	Dare	23047 GA Kohler	23048 GA Kohler	NH/Bux	9	36	75	1/2 EBB	N	SW	72	0.3
8/20/2024	N	Dare	Buxton Village - Cottage Ave	Buxton Village - Cottage Ave	Bux/Ocra	9	38	78	3/4 EBB	S	N	74	0.9
9/5/2024	N	Dare	46001 Cottage Ave	46001 Cottage Ave	Bux/Ocra	20	32	76	3/4 EBB	S	NE	76	0
9/5/2024	N	Dare	46002 Cottage Ave	46003 Cottage Ave	Bux/Ocra	9	32	76	3/4 EBB	S	NE	76	0
9/5/2024	N	Dare	46211 Tower Circle	46212 Tower Circle	Bux/Ocra	10	32	76	3/4 EBB	S	NE	76	0
9/5/2024	N	Dare	23210 Corbina	23211 Corbina	Bux/Ocra	9	32	76	3/4 EBB	S	NE	76	0
9/9/2024	N	Dare	46001 Cottage Ave	46001 Cottage Ave	Bux/Ocra	10	30	75	1/4 FLD	S	NE	68	0
9/9/2024	N	Dare	46002 Cottage Ave	46003 Cottage Ave	Bux/Ocra	9	28	75	1/4 FLD	S	NE	68	0
9/9/2024	N	Dare	46211 Tower Circle	46212 Tower Circle	Bux/Ocra	10	25	75	1/2 FLD	S	NE	68	0
9/9/2024	N	Dare	23210 Corbina	23211 Corbina	Bux/Ocra	9	30	75	3/4 FLD	S	NE	68	0
9/23/2024	N	Dare	46201 Tower	46201 Tower	NH/Bux	10	28	74	1/4 FLD	S	NE	70	0
9/23/2024	N	Dare	46203 Tower	46203 Tower	NH/Bux	9	28	74	1/4 FLD	S	NE	70	0
9/23/2024	N	Dare	46207 Tower	46207 Tower	NH/Bux	10	28	74	1/4 FLD	S	NE	70	0
9/23/2024	N	Dare	46213 Tower	46213 Tower	NH/Bux	10	28	74	1/4 FLD	S	NE	70	0
9/23/2024	N	Dare	46219 Tower	46219 Tower	NH/Bux	9	28	74	1/4 FLD	S	NE	70	0
9/23/2024	N	Dare	46223 Tower	46223 Tower	NH/Bux	10	28	74	1/4 FLD	S	NE	70	0
10/1/2024	N	Dare	23237 Sea Oats Dr	23238 Sea Oats Dr	NH/Bux	9	32	73	1ST FLD	S	E	76	0.29
10/1/2024	N	Dare	20347 GA Kohler Ct	20348 GA Kohler Ct	NH/Bux	9	32	73	1/2 FLD	S	E	76	0.29
10/1/2024	N	Dare	22242 Surf Side Dr	22242 Surf Side Dr	NH/Bux	10	22	72	1ST FLD	S	E	76	0.29





Challenges with erosion are likely to become more significant with SLR



Climatic Change **64**: 41–58, 2004.

GLOBAL WARMING AND COASTAL EROSION

KEQI ZHANG^{1,2}, BRUCE C. DOUGLAS¹ and STEPHEN P. LEATHERMAN¹

¹Laboratory for Coastal Research and International Hurricane Research Center,
Florida International University, Miami, FL 33199, U.S.A.

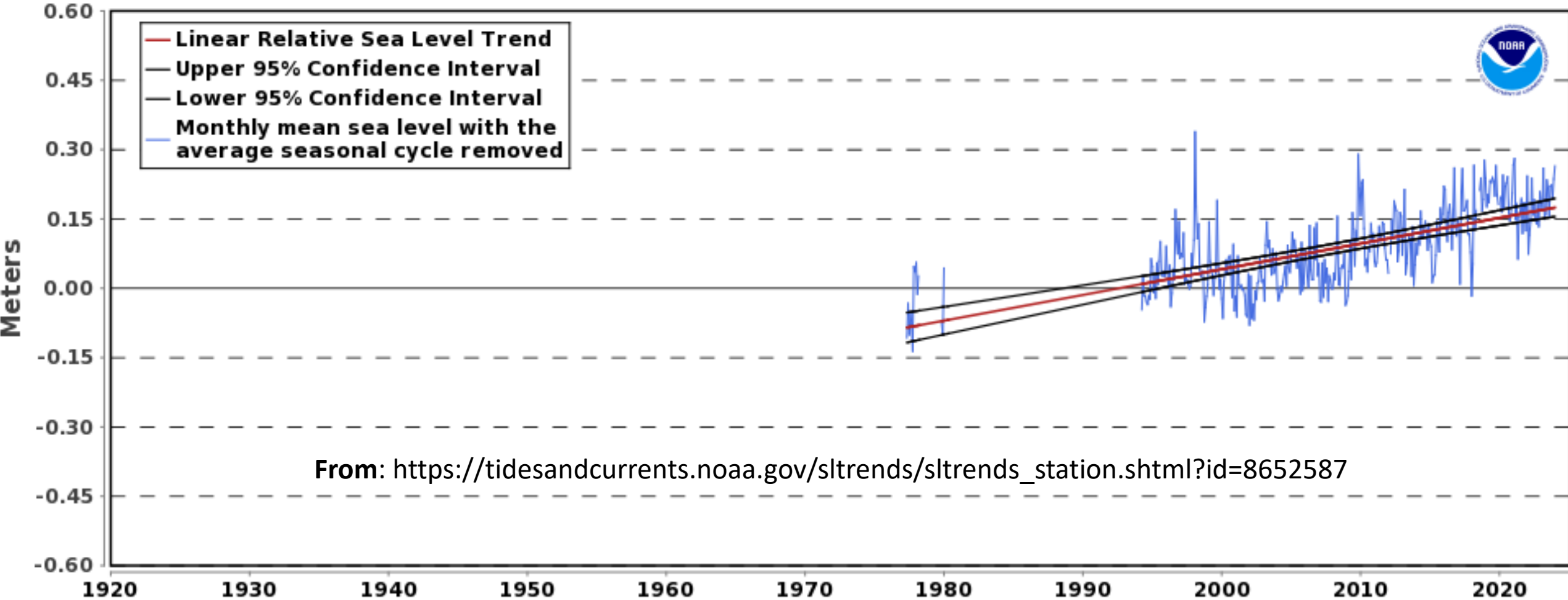
E-mail: zhangk@fiu.edu. bruced7082@aol.com. leatherm@fiu.edu

Relative Sea Level Trend 8652587 Oregon Inlet Marina, North Carolina



8652587 Oregon Inlet Marina, North Carolina

5.56 +/- 0.96 mm/yr

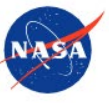


[EXPORT TO TEXT](#) | [EXPORT TO CSV](#) | [SAVE IMAGE](#)

The relative sea level trend is 5.56 millimeters/year with a 95% confidence interval of +/- 0.96 mm/yr based on monthly mean sea level data from 1977 to 2023 which is equivalent to a change of 1.82 feet in 100 years.

2022 Sea Level Rise Technical Report

Updated projections available through 2150 for all U.S. coastal waters.



FEMA



1

The Next 30 Years of Sea Level Rise

Sea level along the U.S. coastline is projected to rise, on average, 10 - 12 inches (0.25 - 0.30 meters) in the next 30 years (2020 - 2050), which will be as much as the rise measured over the last 100 years (1920 - 2020). Sea level rise will vary regionally along U.S. coasts because of changes in both land and ocean height.

[Learn More](#)

2

More Damaging Flooding Projected

Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. By 2050, “moderate” (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors.

[Learn More](#)

2050

- 10-14” of SLR - E. Coast
- Flooding- 10X more often

From: [2022 Sea Level Rise Technical Report \(noaa.gov\)](https://www.noaa.gov/2022-sea-level-rise-technical-report)



A problem that is not going away

**Forecasting oceanfront shoreline position
to evaluate physical vulnerability for recreational and
infrastructure resilience at Cape Hatteras National Seashore**

By

Michael J. Flynn¹ and David E. Hallac²

1) Coastal Resources Management, East Carolina University, East 5th St Greenville, NC 27858; flynnmi13@students.ecu.edu

2) Cape Hatteras National Seashore, National Park Service, 1401 National Park Drive, Manteo, NC 27954

Shore & Beach ■ Vol. 89, No. 2 ■ Spring 2021



Forecasting oceanfront shoreline position to evaluate physical vulnerability for recreational and infrastructure resilience at Cape Hatteras National Seashore

By

Michael J. Flynn¹ and David E. Hallac²

1) Coastal Resources Management, East Carolina University, East 5th St Greenville, NC 27858; flynnmi13@students.ecu.edu

2) Cape Hatteras National Seashore, National Park Service, 1401 National Park Drive, Manteo, NC 27954

Shore & Beach ■ Vol. 89, No. 2 ■ Spring 2021

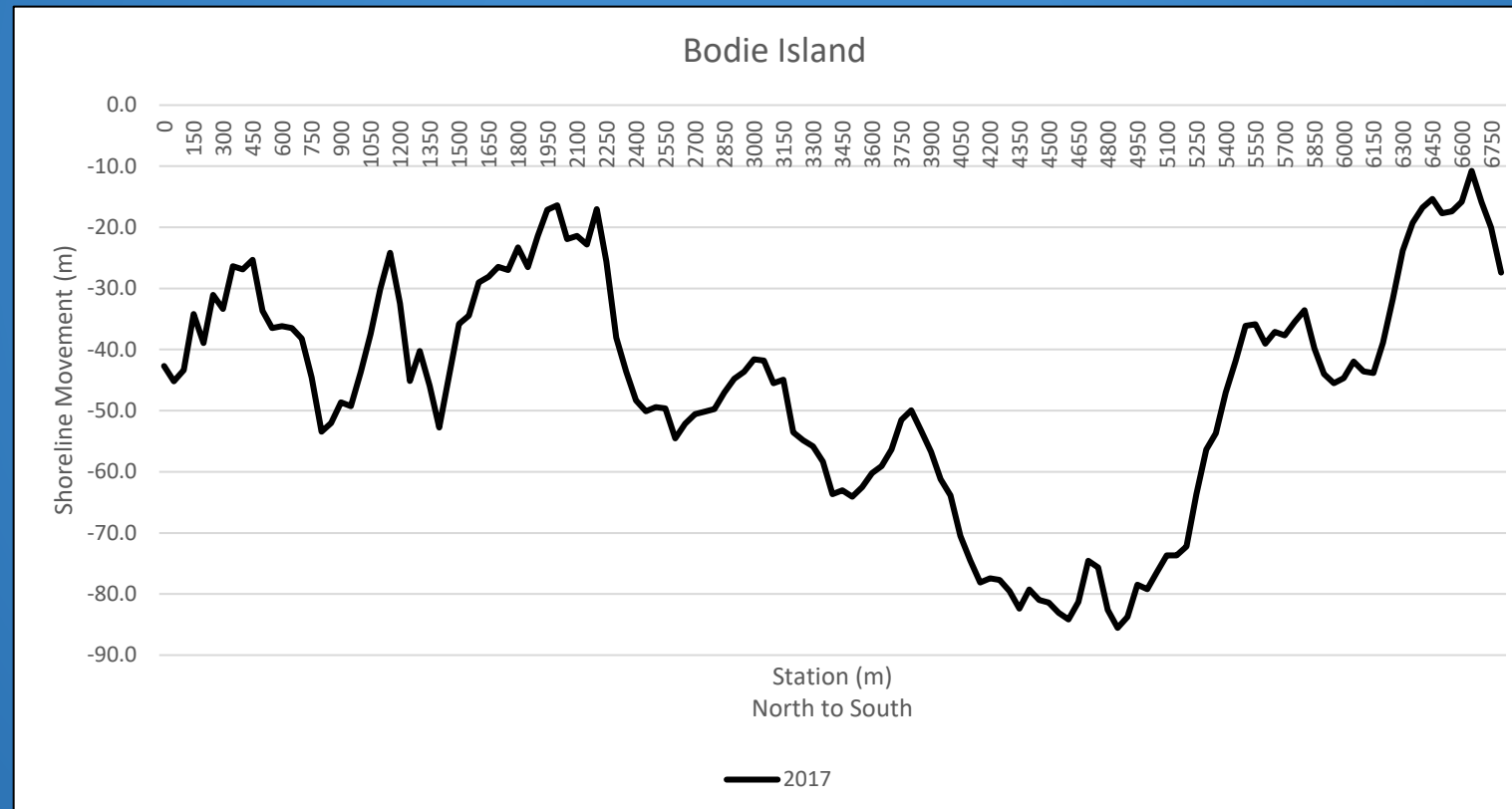
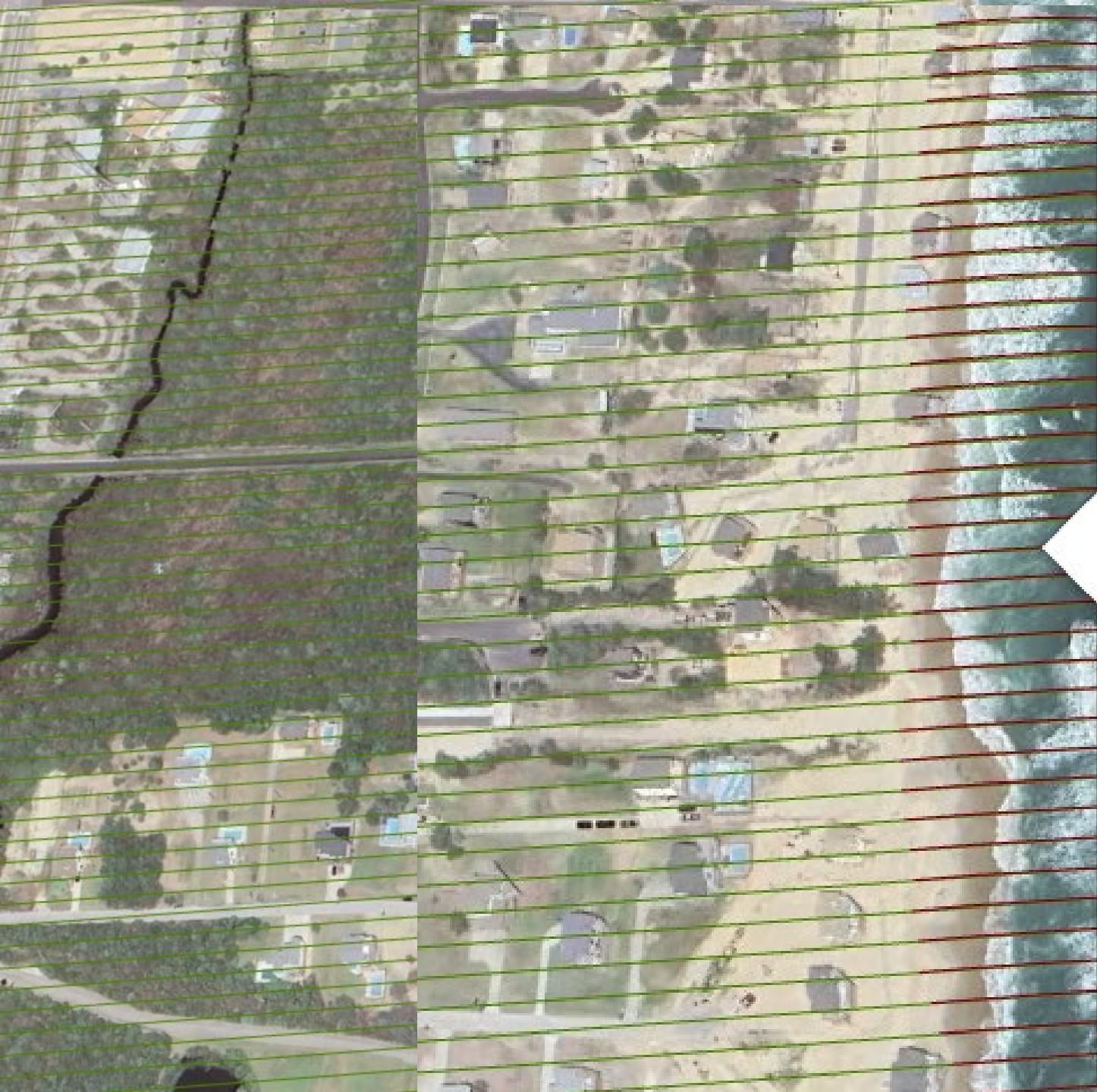




Image © 2024 Airbus

Google Earth



3078

3078	
object identifier	3027
geometry	Polyline
TransectID	3078
BaselineID	1
GroupID	<Null>
TransOrder	3078
Azimuth	266.08
ShrCount	20
TCD	30770
SCE	115.01
NSM	-104.82
EPR	-4.15
EPRunc	0.21
LRR	-3.37
LR2	0.78
LSE	13.89
LCI90	0.73
WLR	-2.32
WR2	0.57
WSE	8.58
WCI90	0.83
SHAPE_Length	115.01182





Image © 2024 Airbus

Google Earth



Image © 2024 Airbus

Google Earth

Oceanfront setbacks – what to do when the setback expires?



Stable vegetation?

The 4-Bs.....

Portfolio Approach to Barrier Island Management

1. **Build Out – Beach Nourishment**
2. **Build Back – Move or Remove Infrastructure**
3. **Build Up– Raise structures and Bridge transportation**
4. **Build Boat (or a plane) – Think differently about Barrier Island transportation**



BUILD OUT - BEACH NOURISHMENT

- Ecological impacts
- Hard to maintain in areas with rapid erosion rates
- High costs may result in “spreading yourself too thin”
- Delays infrastructure management decisions
- May inadvertently cause loss of barrier island area and habitats



The sediment management plan.....

Permit other agencies to conduct, with conditions:

- Beach nourishment, dune rebuilding, habitat restoration, and emergency breach fill
- Up to 6 miles annually
- 13 miles of the Seashore available only for long-term monitoring sites
- Programmatic Section 7, NHPA, 20-year plan with review every 2 years



Cape Hatteras National Seashore
Buxton, Dare County, North Carolina



Environmental Assessment
Beach Restoration to Protect NC Highway 12
Clean Water Act 404 and NPS Special Use Permits
At Buxton, Dare County, North Carolina
September 2015
Volume I

Cottage Ave, Buxton

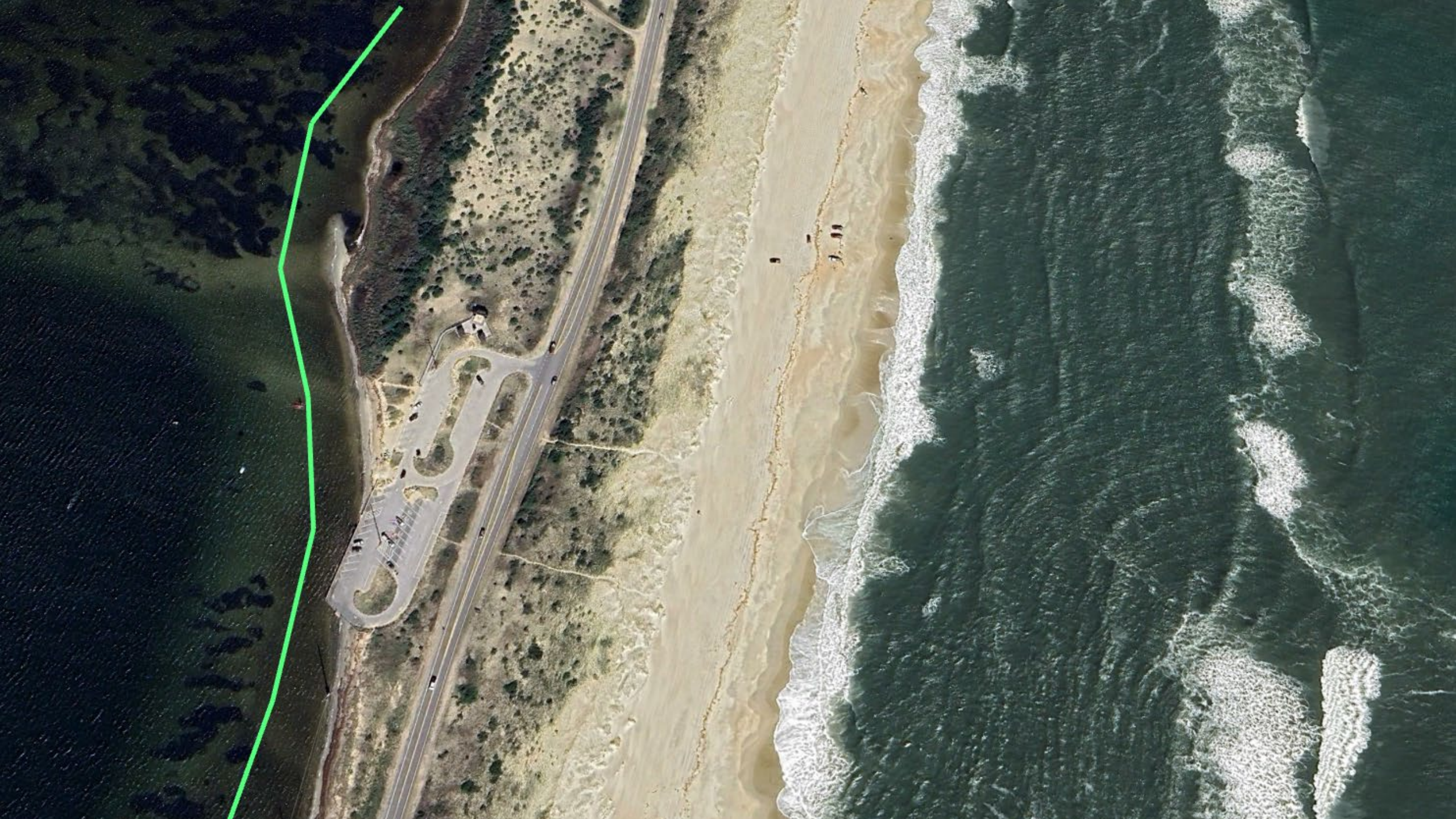


Distant Hurricane Teddy
Sept. 21, 2020
(2.5 years after beach
nourishment)



Distant Hurricane Lee
Sept. 15, 2023
(13 months after beach
nourishment)





BUILD BACK - MOVE OR REMOVE STRUCTURES (managed retreat)

- “giving up” or “abandonment” to some
- Minimizes impacts and restores the beach
- May be more cost effective in the long-term
- Leave to save?



[Home](#) [News](#) [Our Coast](#) [Science](#)

Buying out threatened oceanfront homes is not a crazy idea

05/15/2023 by [Rob Young](#)



Program for the Study of Developed Shorelines
May 2023

The Potential Cost/Benefits of Buyouts in Rodanthe, North Carolina

Identifying and estimating the value of highly exposed, oceanfront properties

[Home](#) » [Report: Buyout Of Rodanthe Homeowners Less Costly Than Beach Nourishment At Cape Hatteras](#)

Report: Buyout Of Rodanthe Homeowners Less Costly Than Beach Nourishment At Cape Hatteras

By [Kurt Repanshek](#) - May 24th, 2023

[Share / Save](#)

Cape Hatteras Fishing Pier Inc

Frisco Pier parking area

© 2020 Google

Google Earth

Hurricane Florence - 2018

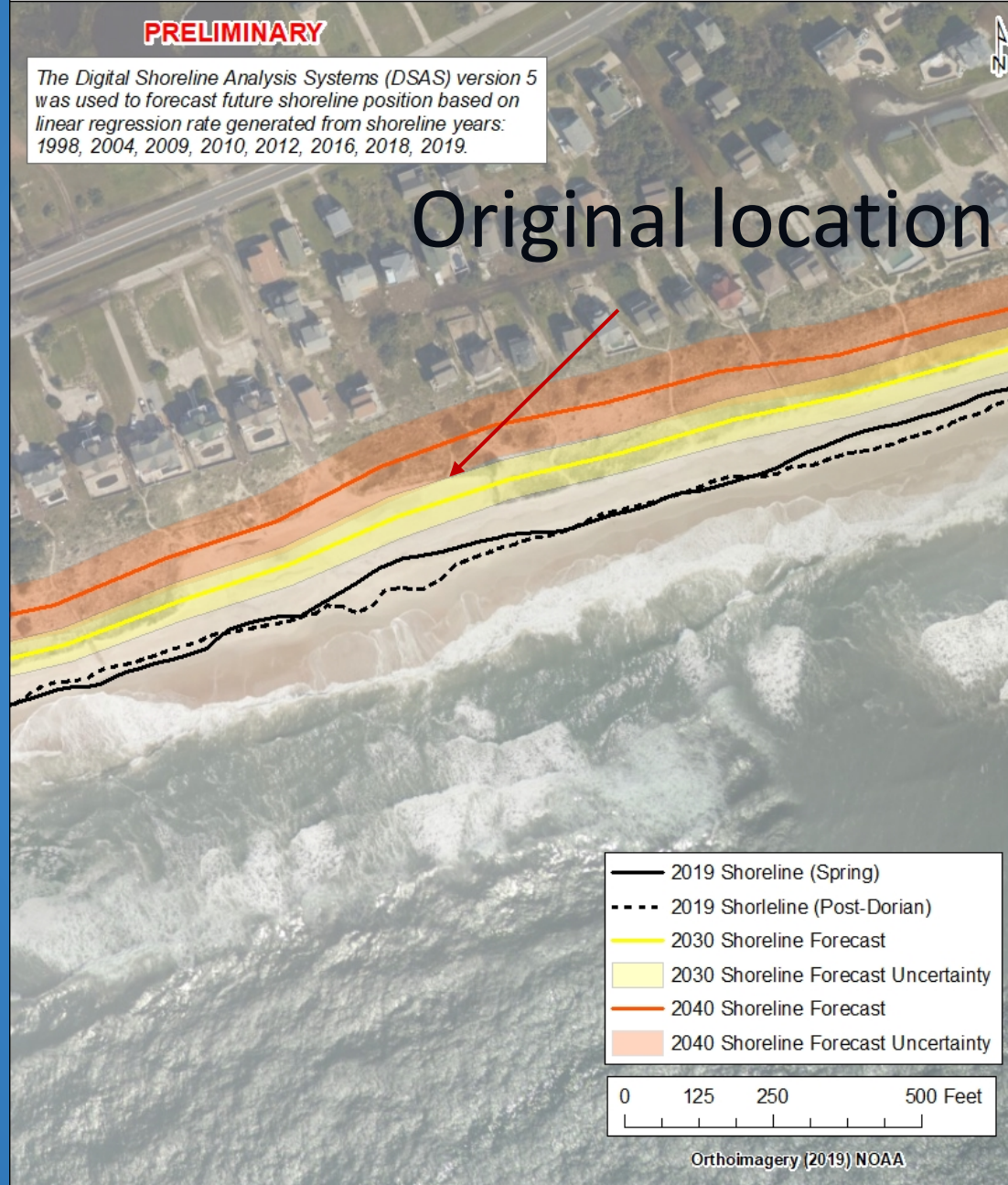


Frisco Pier (2019)

PRELIMINARY

The Digital Shoreline Analysis Systems (DSAS) version 5 was used to forecast future shoreline position based on linear regression rate generated from shoreline years: 1998, 2004, 2009, 2010, 2012, 2016, 2018, 2019.

Original location



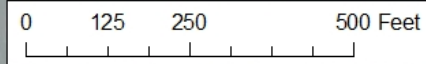
Frisco Day Use Area (2019)

PRELIMINARY

The Digital Shoreline Analysis Systems (DSAS) version 5 was used to forecast future shoreline position based on linear regression rate generated from shoreline years: 1998, 2004, 2009, 2010, 2012, 2016, 2018, 2019.

New location

- 2019 Shoreline (Spring)
- - - 2019 Shoreline (Post-Dorian)
- 2030 Shoreline Forecast
- 2030 Shoreline Forecast Uncertainty
- 2040 Shoreline Forecast
- 2040 Shoreline Forecast Uncertainty



Orthoimagery (2019) NOAA

F

S

CLIMATE Environment Weather Climate Solutions Climate Lab Green Living Business of Climate

These houses are at risk of falling into the sea. The U.S. government bought them.

'It will be a safer beach,' says the National Park Service official who pushed for the buyouts and has seen other homes collapse and scatter debris for miles



By [Brady Dennis](#)

October 16, 2023 at 6:00 a.m. EDT

The Washington Post
Democracy Dies in Darkness





Nov. 15, 2023



Nov. 30, 2023

Managing Threatened Oceanfront Structures: IDEAS FROM AN INTERAGENCY WORK GROUP



Threatened Oceanfront Structures Interagency Work Group Report 2024

- Financial Assistance Opportunities
- The Role of Public and Private Insurance
- Legal and Regulatory Authorities

Work Group Report 2024

Coastal Management

[About Coastal Management](#)

[Coastal Resources
Commission](#)

[Coastal Management Rules &
Regulations](#)

[Coastal Management Permits](#)

[Coastal Management
Enforcement](#)

[Coastal Management GIS Data](#)

[Coastal Management
Recognition Programs](#)

[Coastal Management Hot
Topics](#)

[Coastal Management Land
Use Planning](#)

[Coastal Management Beach &
Waterfront Access Program](#)

[Coastal Management
Oceanfront Shorelines](#)

[Estuarine Shorelines](#)

[Coastal Adaptation and
Resiliency](#)

Highlights of the report include:

- Financial Assistance Opportunities
- Role of Public and Private Insurance
- Legal and Regulatory Authorities

The workgroup concluded that there was value in continuing collaboration to address this issue, which will inevitably continue and worsen considering sea level rise forecasts.

[Managing Threatened Oceanfront Structures: Ideas from an Interagency Work Group](#)

Send comments about the report to DCMcomments@deq.nc.gov. Please list "Threatened Oceanfront Structures Report" in the subject line.

Additional Information and Resources

[Threatened Oceanfront Structures Interagency Work Group Overview](#)

[National Park Services Threatened Oceanfront Structures Information](#)

August 2024





THANK YOU