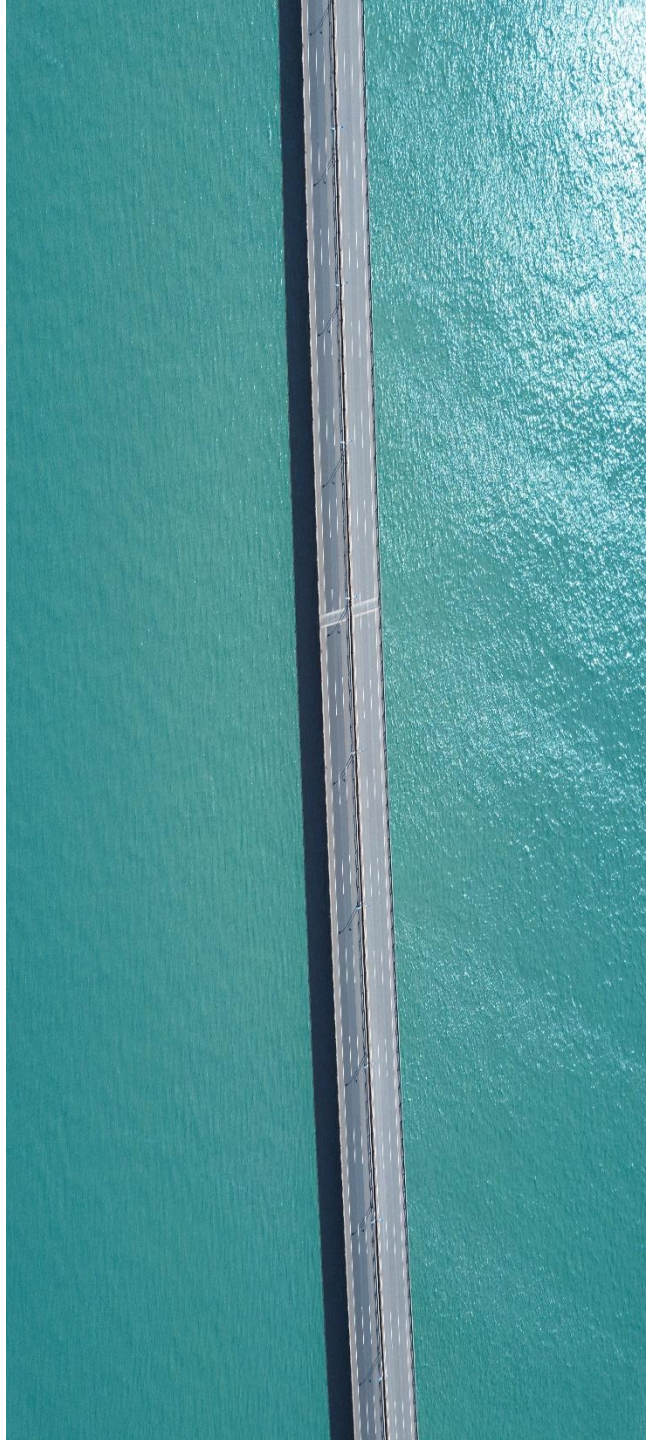
Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee

Meeting 2 – August 28, 2024

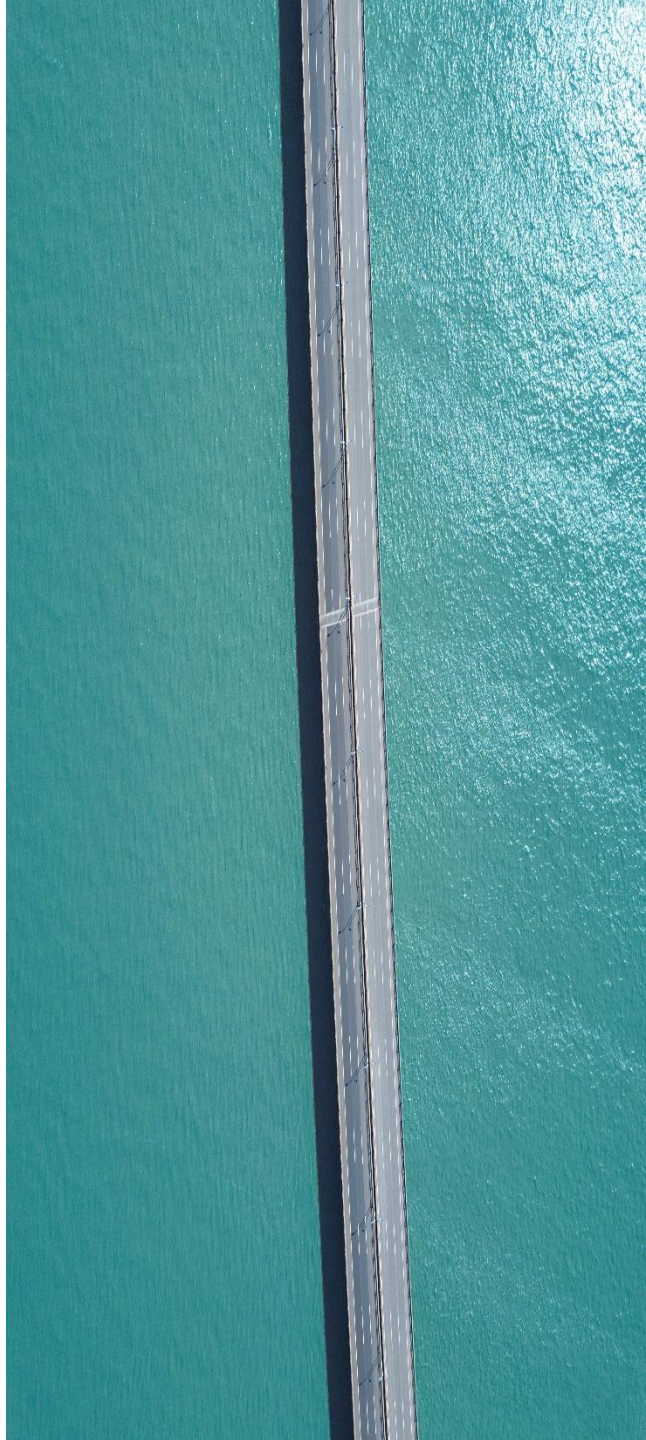
Agenda



Agenda

- Project Overview & Where we are in the planning process
- Hazard Identification
- Asset Inventory
  - iRisk inventory: People, Property, and Critical Facilities
  - Current property estimate
- Hazard Profiles: Risk & Vulnerability
  - Summary of key findings for each hazard
  - Extreme Heat – Andrea Webster, NCORR
- Discussion
- Next Steps

Project Overview



Four-Phase Planning Process

Get Organized

Convene a committee, involve the public, and coordinate

Assess Risks

Identify hazards and evaluate the problems

Develop a Mitigation Strategy

Set goals, review actions, and draft an action plan

Plan Maintenance

Implement, evaluate, and revise the plan

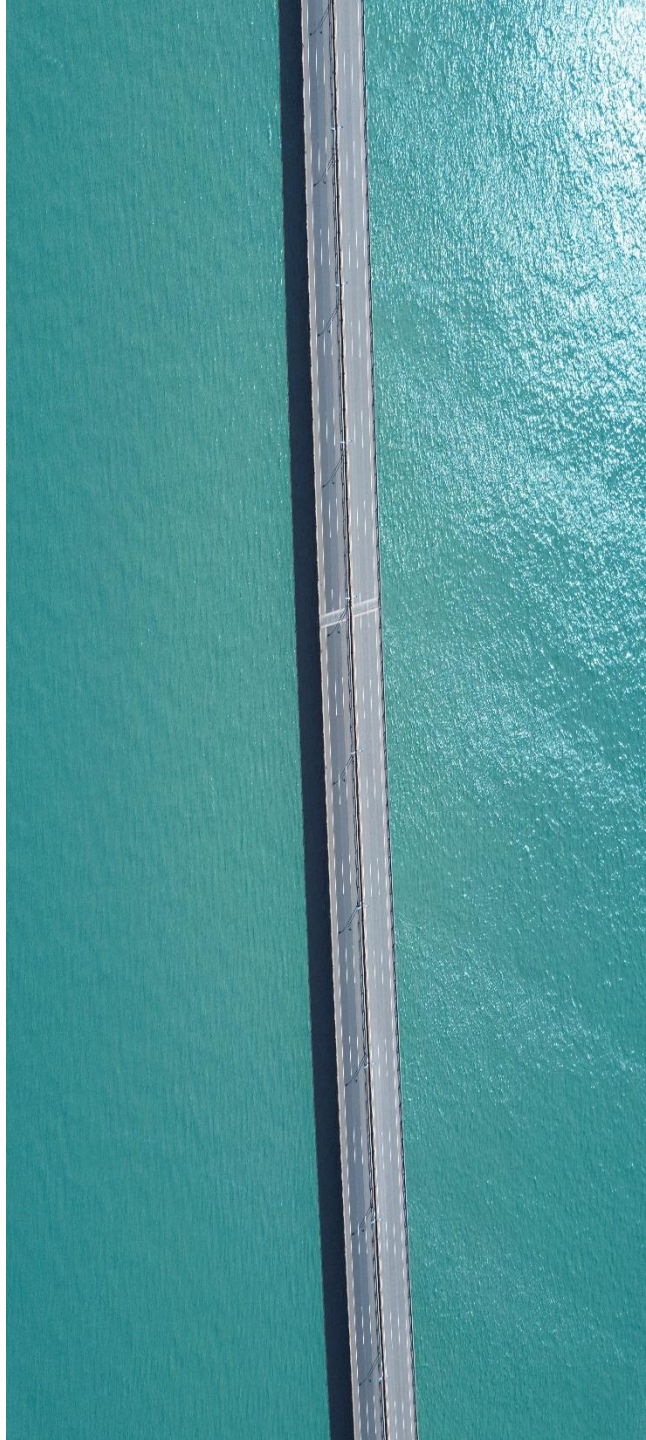
Scope

Step 1	Organize to Prepare the Plan
Step 2	Involve the Public
Step 3	Coordinate
Step 4	Assess the Hazard
Step 5	Assess the Problem
Step 6	Set Goals
Step 7	Review Possible Activities
Step 8	Draft an Action Plan
Step 9	Adopt the Plan
Step 10	Implement, Evaluate, & Revise the Plan

Hazard Identification & Risk Assessment (HIRA) Process

Risk = combination of hazard, vulnerability, and exposure; each factor is assessed in the process

Hazard Identification



FEMA Major Disaster and Emergency Declarations

Total Declarations: 28

- Major Disaster Declarations: 15
- Emergency Declarations: 13
  - 22 Hurricanes (78% of all declarations)
  - 2 Severe Storms
  - 2 Biological Events
  - 1 Tornado
  - 1 Snowstorm

County*	Declaration Type	Disaster #	Declaration Date	Incident Type	Event Title
C, D	EM	3586	10/1/2022	Hurricane	Hurricane Ian
C, D	EM	3534	8/2/2020	Hurricane	Hurricane Isaias
C, D	DR	4487	3/25/2020	Biological	COVID-19 Pandemic
C, D	EM	3471	3/13/2020	Biological	COVID-19
C, D	DR	4465	10/4/2019	Hurricane	Hurricane Dorian
C, D	EM	3423	9/3/2019	Hurricane	Hurricane Dorian
D	DR	4412	1/31/2019	Hurricane	Tropical Storm Michael
D	DR	4393	9/14/2018	Hurricane	Hurricane Florence
C, D	EM	3401	9/10/2018	Hurricane	Hurricane Florence
C, D	DR	4285	10/10/2016	Hurricane	Hurricane Matthew
C, D	EM	3380	10/7/2016	Hurricane	Hurricane Matthew
C, D	DR	4019	8/31/2011	Hurricane	Hurricane Irene
C, D	EM	3327	8/25/2011	Hurricane	Hurricane Irene
C	DR	1969	4/19/2011	Severe Storm(s)	Severe Storms, Tornados, and Flooding
C, D	EM	3314	9/1/2010	Hurricane	Hurricane Earl
D	DR	1608	10/7/2005	Hurricane	Hurricane Ophelia
C, D	EM	3254	9/14/2005	Hurricane	Hurricane Ophelia
C, D	EM	3222	9/5/2005	Hurricane	Hurricane Katrina Evacuation
C, D	DR	1490	9/18/2003	Hurricane	Hurricane Isabel
C, D	DR	1292	9/16/1999	Hurricane	Hurricane Floyd Major Disaster Declarations
C, D	EM	3146	9/15/1999	Hurricane	Hurricane Floyd Emergency Declarations
D	DR	1291	9/9/1999	Hurricane	Hurricane Dennis
C, D	EM	3141	9/1/1999	Hurricane	Hurricane Dennis
C, D	DR	1240	8/27/1998	Hurricane	Hurricane Bonnie
D	DR	1200	1/15/1998	Severe Storm(s)	Severe Storms and Flooding
D	DR	1003	9/10/1993	Hurricane	Hurricane Emily
D	EM	3110	3/17/1993	Snowstorm	Severe Snowfall & Winter Storm
C, D	DR	818	12/2/1988	Tornado	Severe Storms & Tornados

Review of Existing Plan Hazards

All existing hazards carried forward and reevaluated

Some hazard profiles consolidated to mirror the State HMP:

- Hurricanes & Coastal Hazards
- Tornadoes/Thunderstorms

Hazard	Included in 2023 State HMP?	Included in 2020 Outer Banks Regional HMP?
Coastal Hazards (Erosion, Rip Current, and Sea Level Rise)	Yes, with Hurricanes and Coastal Hazards and Flooding	Yes
Drought	Yes	Yes
Earthquake	Yes	Yes
Extreme Heat	Yes	Yes
Flood	Yes (including sea level rise	Yes
Hurricane and Tropical Storm	Yes (including coastal hazards and nor'easters)	Yes
Severe Weather (Thunderstorm Winds, Lightning, and Hail)	Yes	Yes
Severe Winter Storm	Yes	Yes
Tornado	Yes, with Tornadoes/Thunderstorms	Yes
Wildfire	Yes	Yes
Dam Failures	Yes	No
Geological Hazards (Landslide and Sinkholes)	Yes	No
Infectious Disease	Yes	No
Hazardous Materials Incident	Yes	Yes
Radiological Emergency	Yes	Yes
Cyber Threat	Yes	Yes
Terrorism	Yes	Yes
Transportation Infrastructure Failure	No	Yes
Civil Disturbance	Yes	No
Electromagnetic Pulse	Yes	No
Food Emergency	Yes	No

Hazards Profiled

Hazards NOT Included:

Dam Failure

Geological Hazards (Sinkholes, Landslides)

Civil Disturbance

Electromagnetic Pulse

Food Emergency

Hazards Included:

Drought

Earthquake

Extreme Heat

Flood

Hurricanes and Coastal Hazards

Tornadoes/Thunderstorms

Severe Winter Storm

Tornado

Wildfire

Hazardous Materials Incident

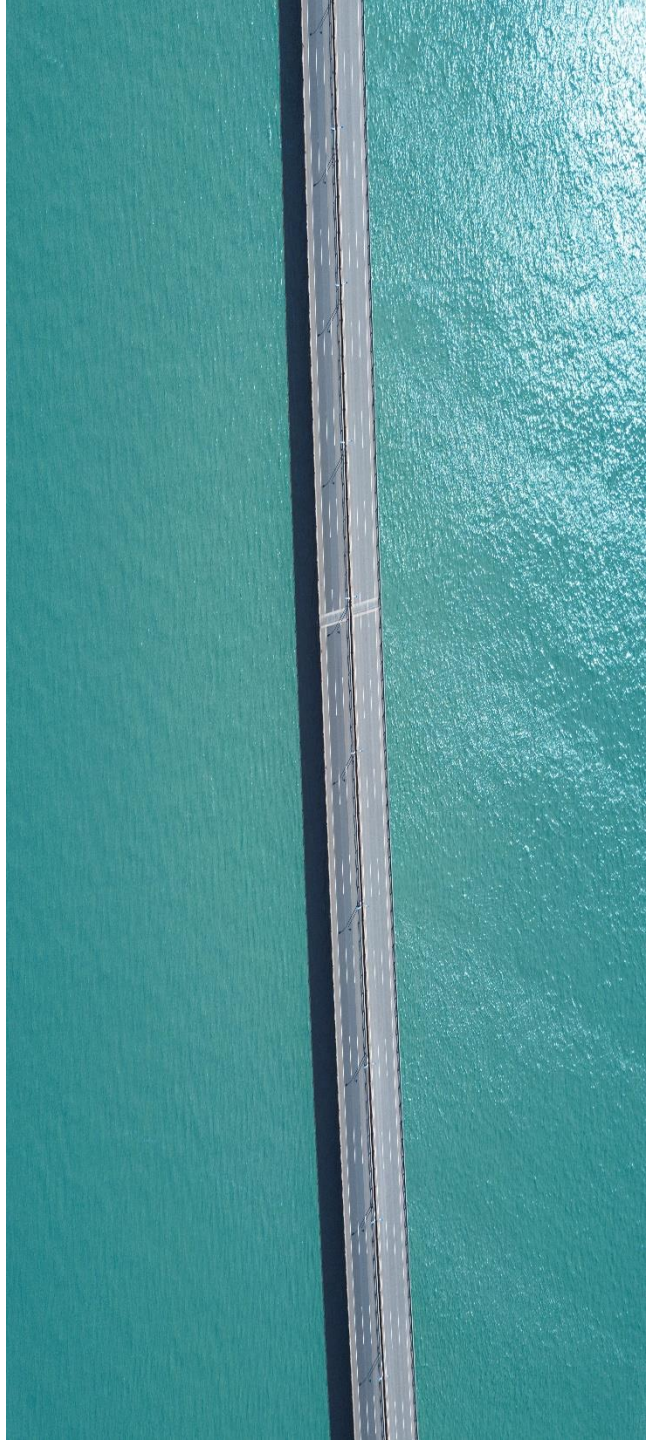
Radiological Emergency

Cyber Threat

Terrorism

Transportation Infrastructure Failure

Asset Inventory



Population (2000 – 2020)

Jurisdiction	2020 Census Population	Elderly (Age 65 and Over)	Children (Age 5 and Under)
Currituck			
Currituck County (Unincorporated Area)	31,343	5,390	1,596
Dare			
Dare County (Unincorporated Area)	24,369	4,752	1,150
Town of Duck	1,722	582	53
Town of Kill Devil Hills	7,588	1,298	260
Town of Kitty Hawk	3,903	861	137
Town of Manteo	1,360	220	80
Town of Nags Head	3,178	1,084	70
Town of Southern Shores	2,536	858	78
Subtotal Dare	**44,656**	**9,655**	**1,828**
Region Total	**75,999**	**15,045**	**3,424**

Source: NCEM IRISK Database; 2020 Decennial Census

Building Counts and Value

iRisk Asset Inventory (used for Vulnerability Assessment)

Jurisdiction	Building Count	Building Value
Currituck		
Currituck County	17,685	$3,350,427,837
Dare		
Dare County (Unincorporated Area)	14,019	$2,398,251,498
Town of Duck	2,409	$737,531,039
Town of Kill Devil Hills	6,033	$977,172,103
Town of Kitty Hawk	2,862	$640,242,261
Town of Manteo	943	$283,065,661
Town of Nags Head	4,868	$1,105,653,993
Town of Southern Shores	2,513	$685,764,229
Subtotal Dare	**33,647**	**$6,827,680,784**
Region Total	**51,332**	**$10,178,108,621**

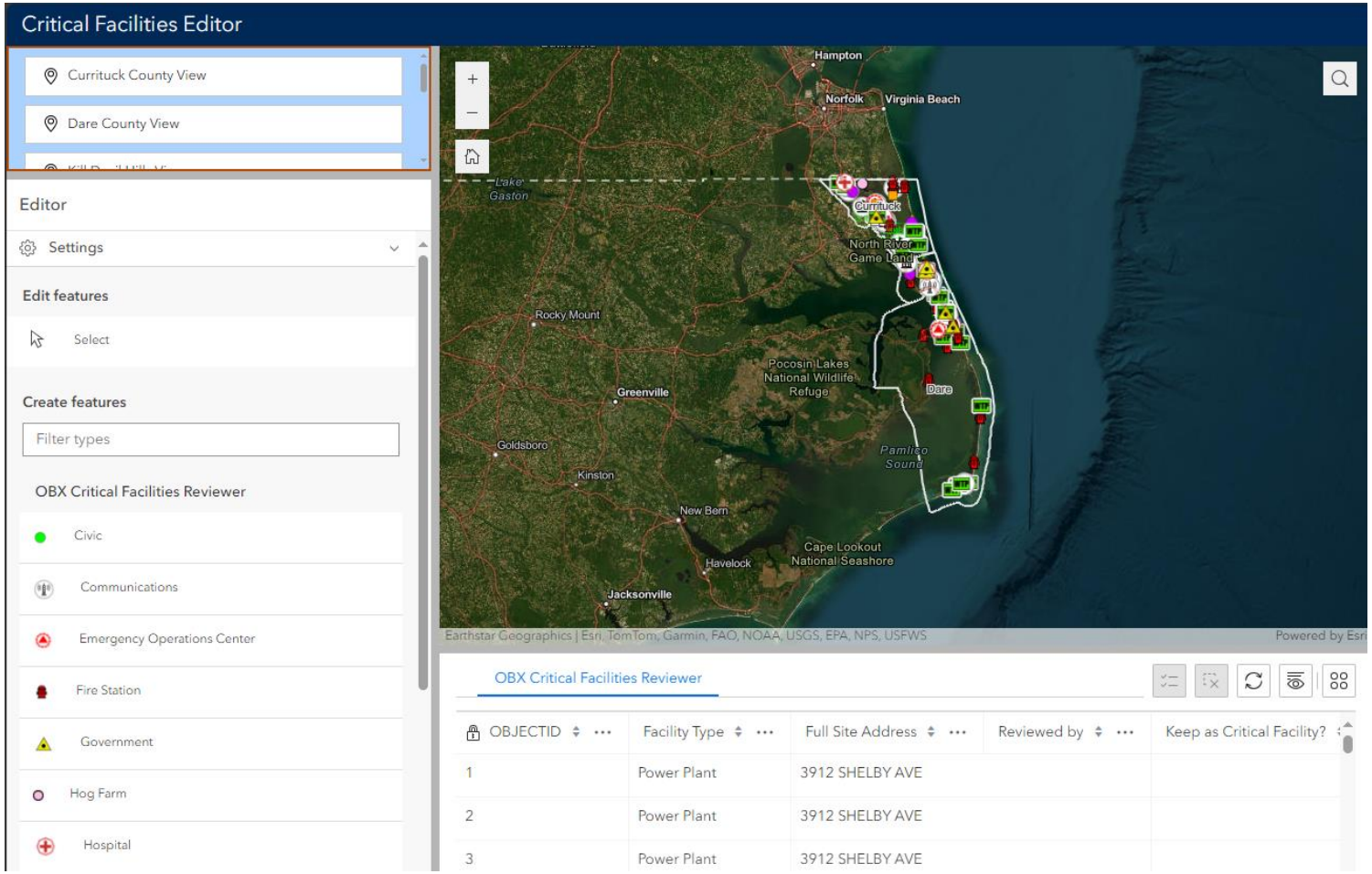
Current Asset Inventory: iRisk Assets + Additional Improved Parcels

Jurisdiction	Improved Parcel Count	Total Improved Value
Currituck County		
Currituck County	21,739	$5,072,341,006
Dare County		
Dare County (Unincorporated Area)	14,805	$2,899,953,848
Town of Duck	2,530	$800,986,995
Town of Kill Devil Hills	6,680	$1,230,546,630
Town of Kitty Hawk	3,083	$748,719,370
Town of Manteo	1,106	$335,489,696
Town of Nags Head	5,125	$1,227,680,160
Town of Southern Shores	2,749	$803,338,742
Subtotal Dare	**36,078**	**$8,046,715,441**
Region Total	**57,817**	**$13,119,056,447**

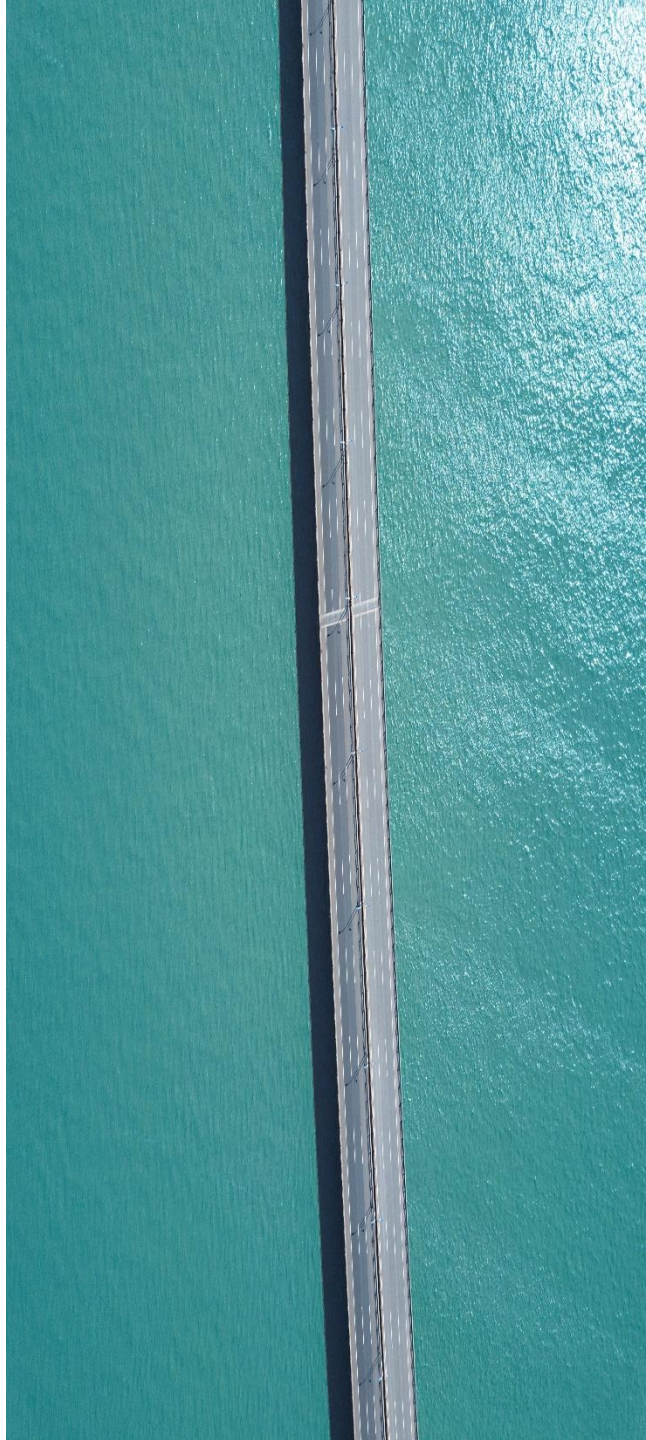
Critical Facilities

Critical facilities: buildings and infrastructure that support continuity of operations and are essential to health and safety

REMINDER: Please provide all critical facility updates by next Friday, September 6th



Hazard Profiles



Priority Risk Index (PRI)

- The purpose of the PRI is to categorize and prioritize all potential hazards for the Outer Banks planning area as high, moderate, or low risk
- The sum of all five risk assessment categories equals the final PRI value
- The highest possible PRI value is 4.0

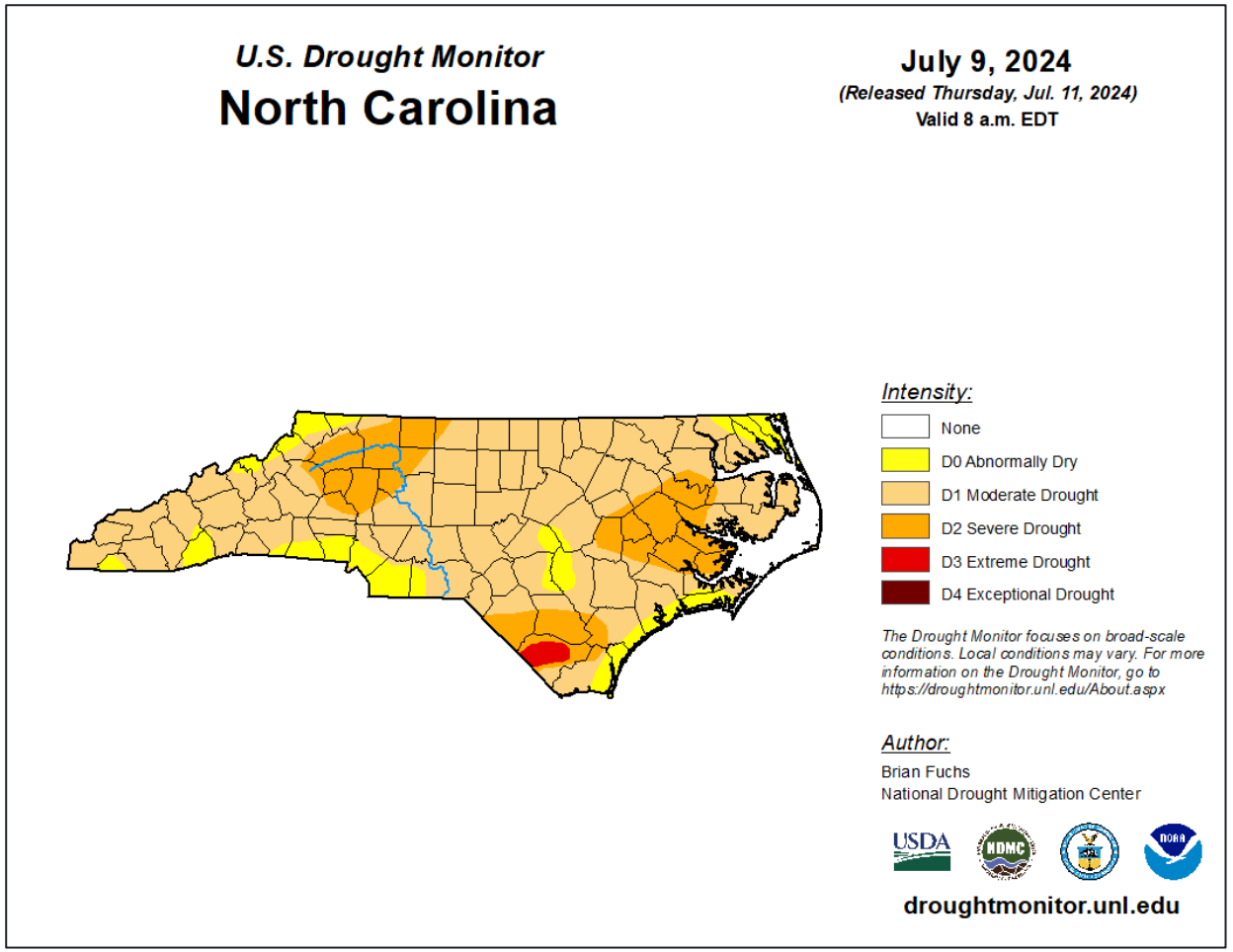
RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	4	
IMPACT In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	4	
SPATIAL EXTENT How large of an area could be impacted by a hazard event? Are impacts localized or regional?	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	MORE THAN 24 HRS	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
DURATION How long does the hazard event usually last?	LESS THAN 6 HRS	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	

PRI = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

Priority Risk Index Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Drought	Possible	Minor	Large	More than 24 hrs	More than 1 week	2.2
Earthquake	Unlikely	Minor	Large	Less than 6 hrs	Less than 6 hrs	1.9
Extreme Heat	Highly Likely	Limited	Large	More than 24 hrs	Less than 1 week	3.0
Flood	Highly Likely	Critical	Large	6 to 12 hours	Less than 1 week	3.5
Hurricane & Coastal Hazards	Likely	Catastrophic	Large	More than 24 hrs	Less than 1 week	3.3
Tornadoes & Thunderstorms	Highly Likely	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.9
Severe Winter Storm	Highly Likely	Minor	Large	More than 24 hrs	Less than 1 week	2.7
Wildfire	Possible	Limited	Moderate	Less than 6 hrs	Less than 1 week	2.5
Hazardous Materials Incident	Likely	Minor	Negligible	Less than 6 hrs	Less than 24 hrs	2.0
Radiological Emergency	Unlikely	Limited	Negligible	Less than 6 hrs	More than 1 week	1.9
Cyber Attack	Possible	Minor	Small	Less than 6 hrs	More than 1 week	2.1
Terrorism	Unlikely	Catastrophic	Small	Less than 6 hrs	More than 1 week	2.7
Transportation Infrastructure Failure	Possible	Critical	Small	Less than 6 hrs	More than 1 week	2.7

Drought

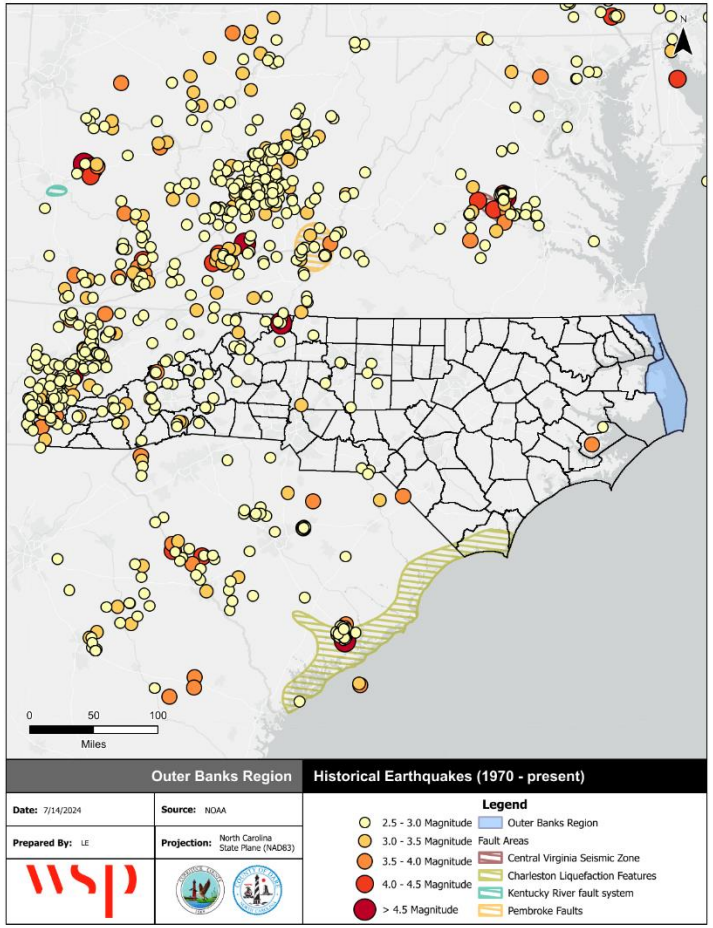


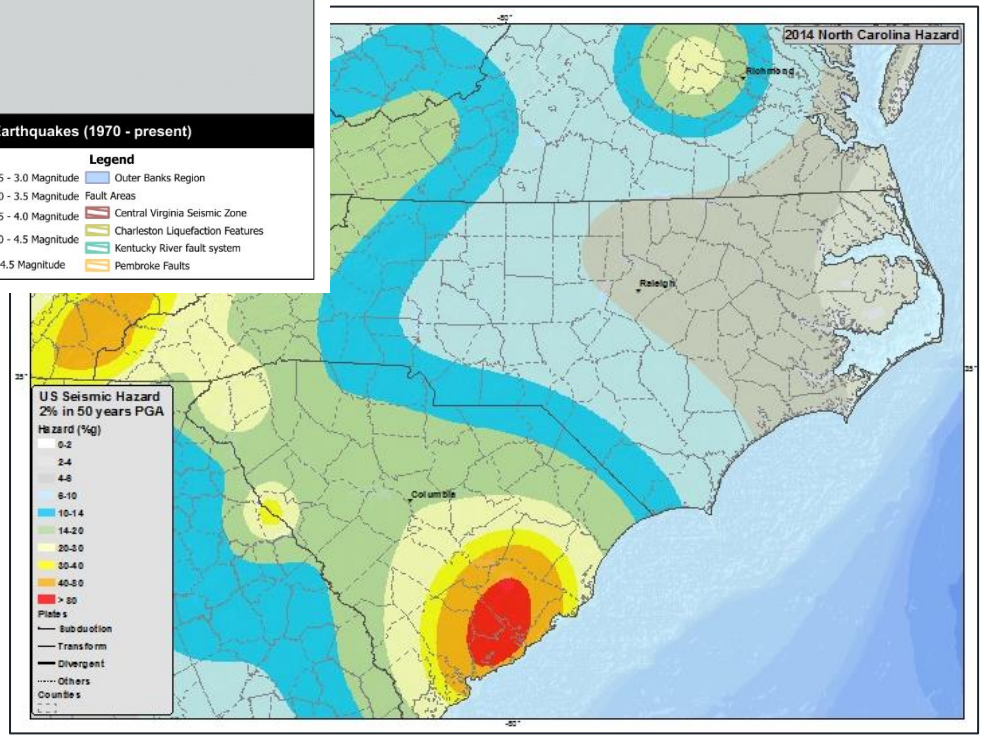
According to the U.S. Drought Monitor, from 2000-2023, **Currituck County** was in some level of drought **35%** of the time, or 443 of 1,252 weeks, and **Dare County** was in some level of drought condition **33%** of the time, or 418 of 1,252 weeks.

- Most severe impacts are on agriculture (primarily in Currituck County) and recreational industries
- Can impact public water supply if groundwater levels fall
- Can increase wildfire risk
- Droughts may become more frequent and severe

Earthquake

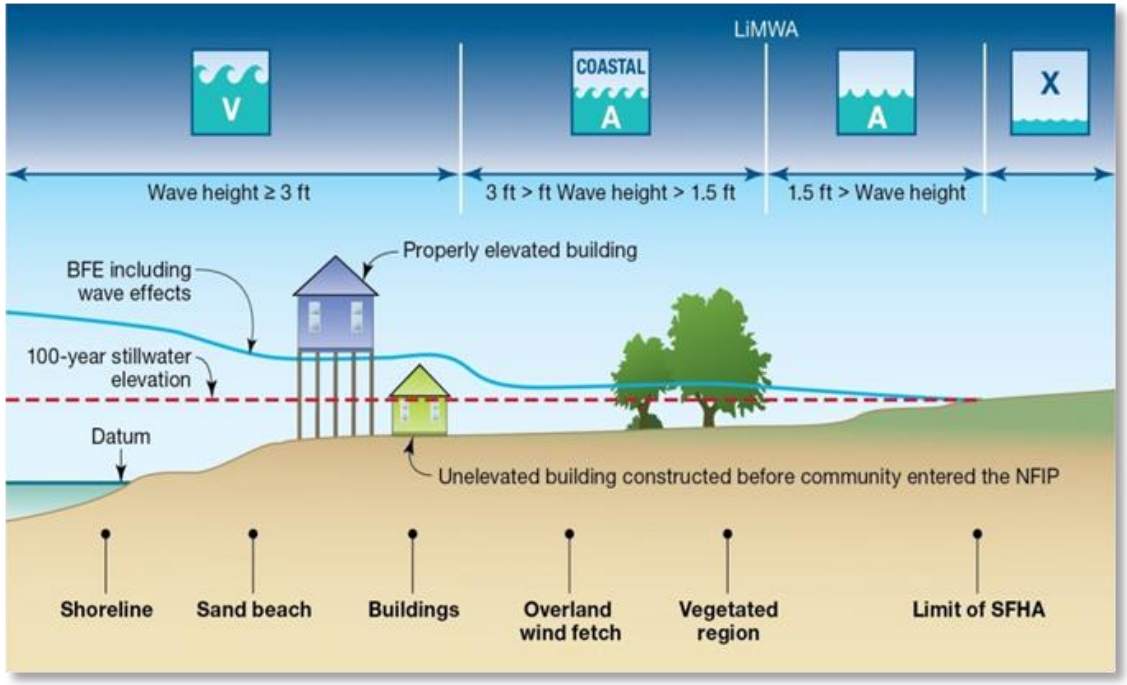
- Since 1970, 4 earthquakes within 100 miles of the region; all less than 4.0 magnitude
- Per USGS “Did You Feel It?” database of reported earthquake experiences, there are **no reported impacts felt in the Outer Banks region in the last 50 years.**
- USGS seismic hazard map shows the ground motion with a 2% probability of exceedance in 50 years.
- Probability and potential severity of ground shaking in the Outer Banks region is very low.

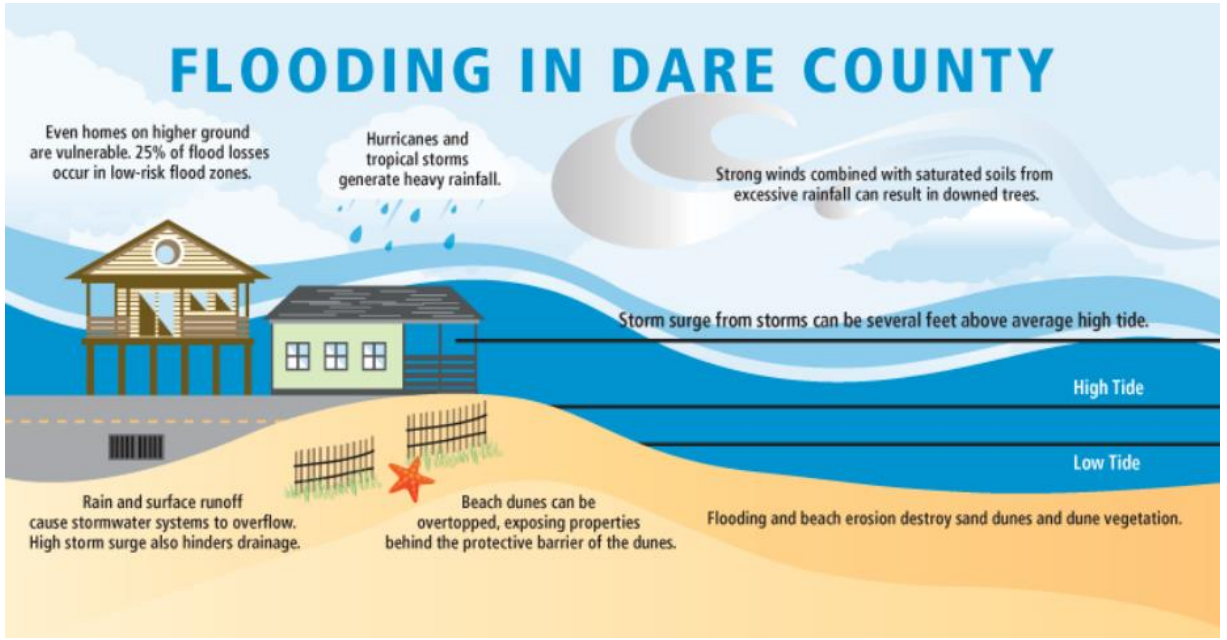




Flood

- **Coastal Flooding** – evaluated with 2006 FIRM, current effective FIRMs, FFRMS freeboard exposure analysis, and NOAA SLOSH storm surge model
- **Sea Level Rise** – evaluated with NOAA data
- **Localized Stormwater Flooding** – evaluated with anecdotal data



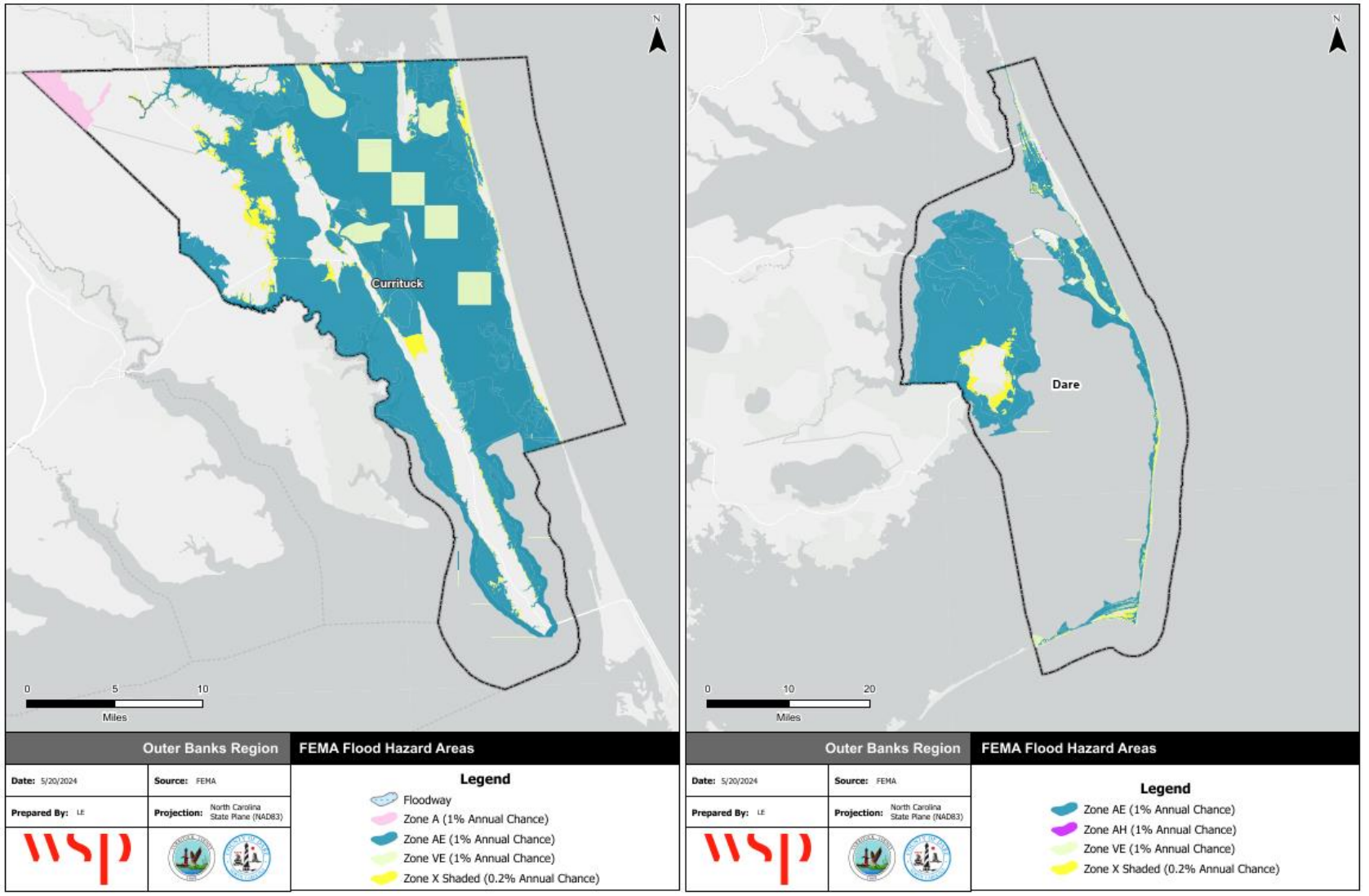


Flood

Effective FIRMs vs 2006 FIRMs:

- major decrease in Zone VE in both counties
- decrease in Shaded X Zone in both counties
- Zone AE increased slightly in Currituck County, decreased in Dare County

Current Effective FIRMs



Flood

1% Annual Chance Flood Event Vulnerability

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages
Unincorporated Currituck County	17,685	1,114	6.3%	2,172	12.3%	$7,318,894
Unincorporated Dare County	14,019	1,610	11.5%	3,520	25.1%	$34,364,423
Town of Duck	2,409	10	0.4%	78	3.2%	$2,887,736
Town of Kill Devil Hills	6,033	69	1.1%	139	2.3%	$1,655,880
Town of Kitty Hawk	2,862	320	11.2%	608	21.2%	$8,023,321
Town of Manteo	943	50	5.3%	104	11.0%	$1,301,065
Town of Nags Head	4,868	192	3.9%	621	12.8%	$12,547,085
Town of Southern Shores	2,513	15	0.6%	88	3.5%	$1,061,170
Subtotal Dare	33,647	2,266	6.7%	5,158	15.3%	$61,840,680
Region Total	**51,332**	**3,380**	**6.6%**	**7,330**	**14.3%**	**$69,159,574**

iRisk loss estimates (based on current effective FIRMs):

- 14.3% of property is at risk to the 1% annual chance flood event
- damages estimated at over $69 million

Percent of total buildings at risk is highest in:

- Dare County (25.1%)
- Kitty Hawk (21.2%)
- Nags Head (12.8%)
- Currituck County (12.3%)
- Manteo (11.0%)

Flood

Exposure analysis using FFRMS Freeboard Value Approach:

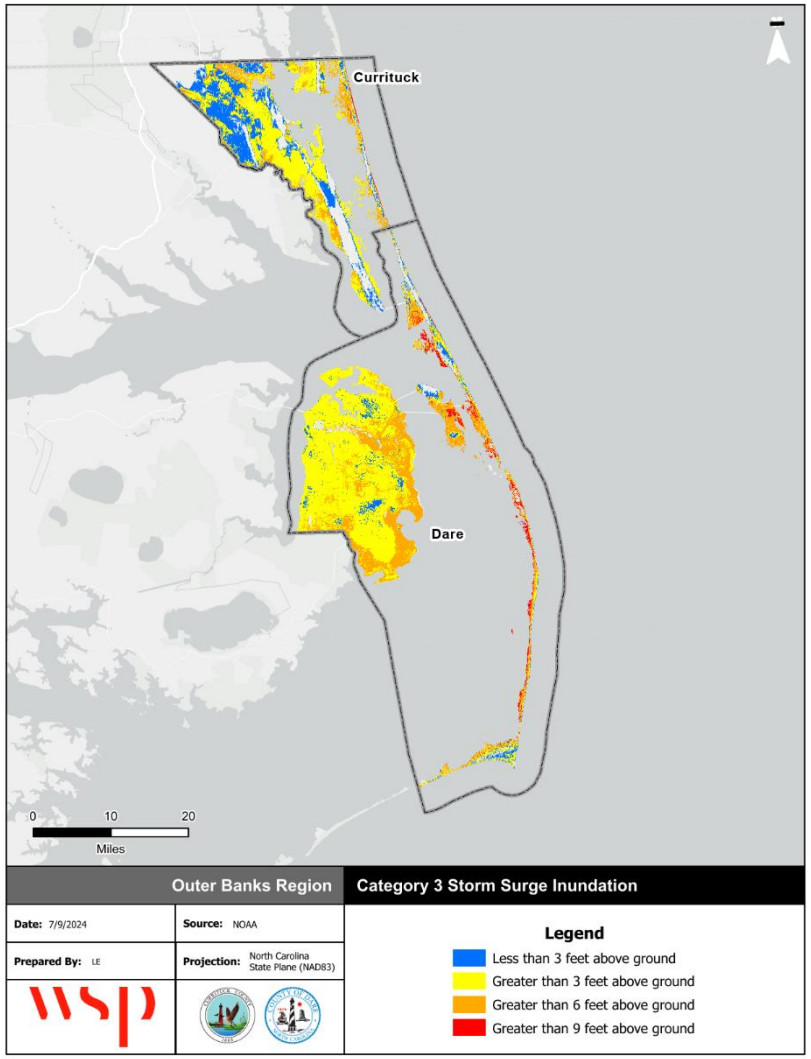
- Current effective FIRM as a baseline; 1% annual chance floodplain re-established with current DEM for the +0 freeboard (standard FFRMS approach)
- Property exposure estimated for 1, 2, and 3 feet of additional flooding using current parcel inventory
- Provides context for increased exposure under potential future flood conditions

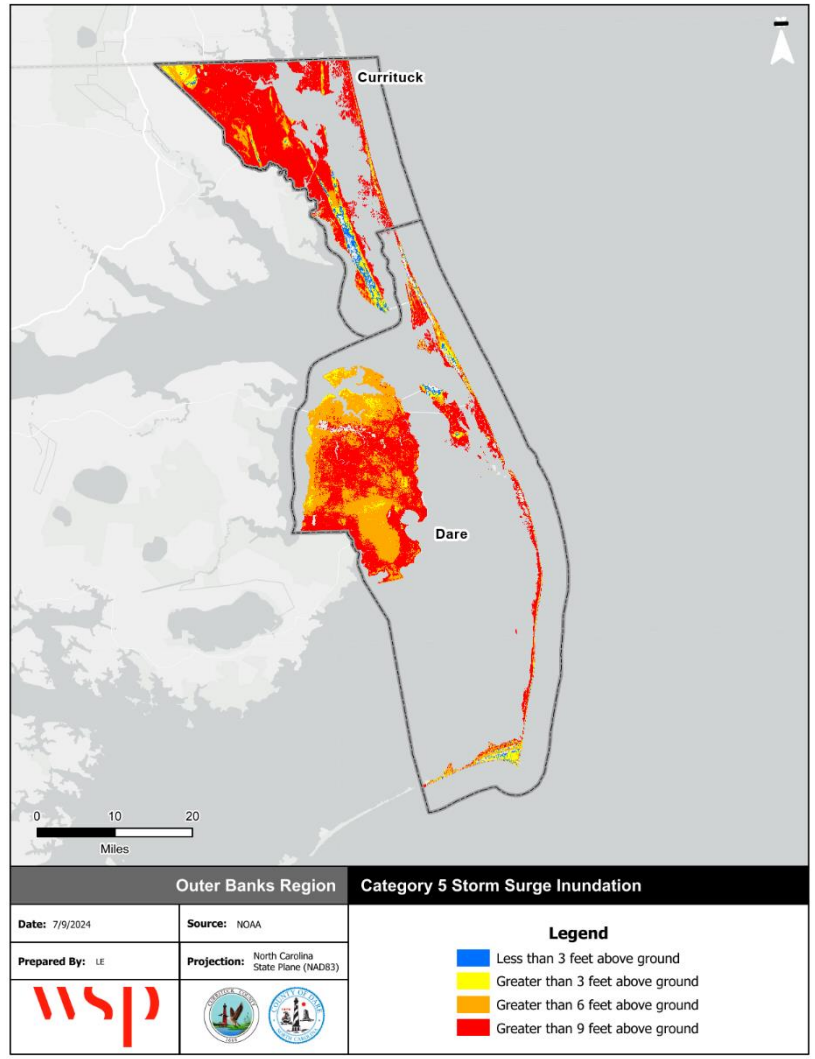
Occupancy	Estimated Parcel Count	Structure Value
+0 Foot Freeboard	**24,674**	**$5,981,841,102**
Agriculture	59	$2,611,675
Commercial	946	$309,170,944
Education	11	$48,230,865
Government	299	$98,971,990
Industrial	120	$190,959,420
Religious	54	$19,711,990
Residential	23,185	$5,312,184,218
+1 Foot Freeboard	**55,460**	**$13,206,795,236**
Agriculture	82	$3,910,729
Commercial	1,127	$373,412,477
Education	13	$52,924,107
Government	320	$104,236,920
Industrial	141	$204,021,718
Religious	68	$23,787,909
Residential	29,035	$6,462,660,274
+2 Foot Freeboard	**90,254**	**$21,330,506,418**
Agriculture	117	$5,942,583
Commercial	1,254	$432,421,149
Education	17	$74,567,589
Government	347	$118,286,962
Industrial	178	$238,579,273
Religious	77	$29,663,219
Residential	32,804	$7,224,250,407
+3 Foot Freeboard	**129,284**	**$30,432,942,980**
Agriculture	166	$8,691,245
Commercial	1,402	$497,848,712
Education	24	$99,754,566
Government	364	$122,530,586
Industrial	206	$340,562,909
Religious	92	$35,937,232
Residential	36,776	$7,997,111,312

Flood

NOAA SLOSH model approximates maximum surge potential by storm category;

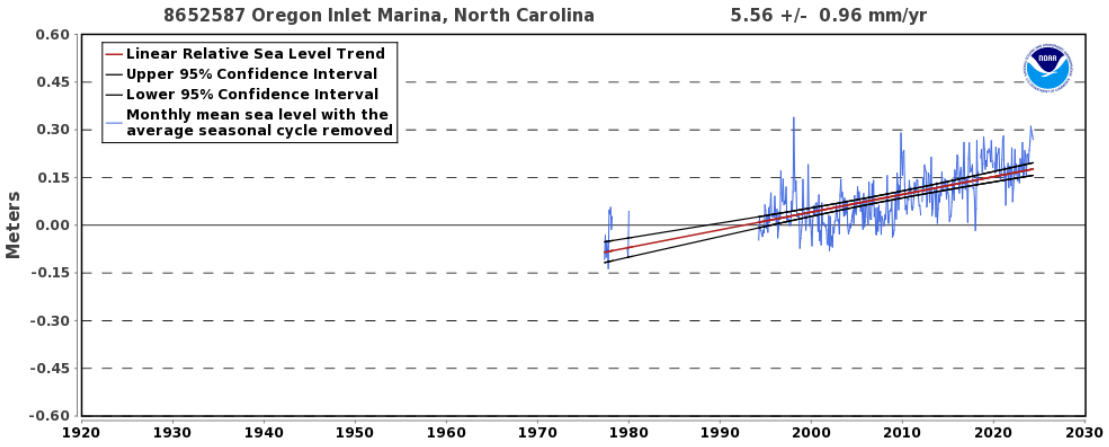
*does not accurately represent risk from sound side flooding

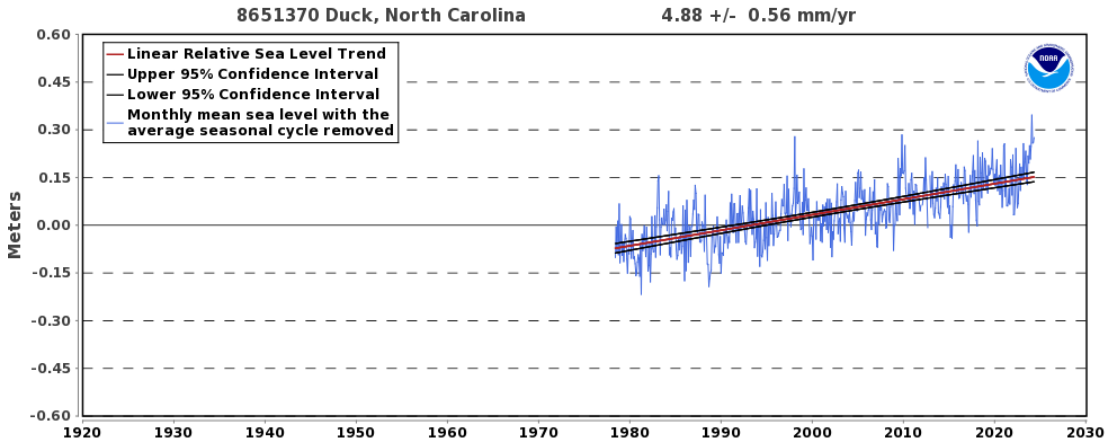




Flood

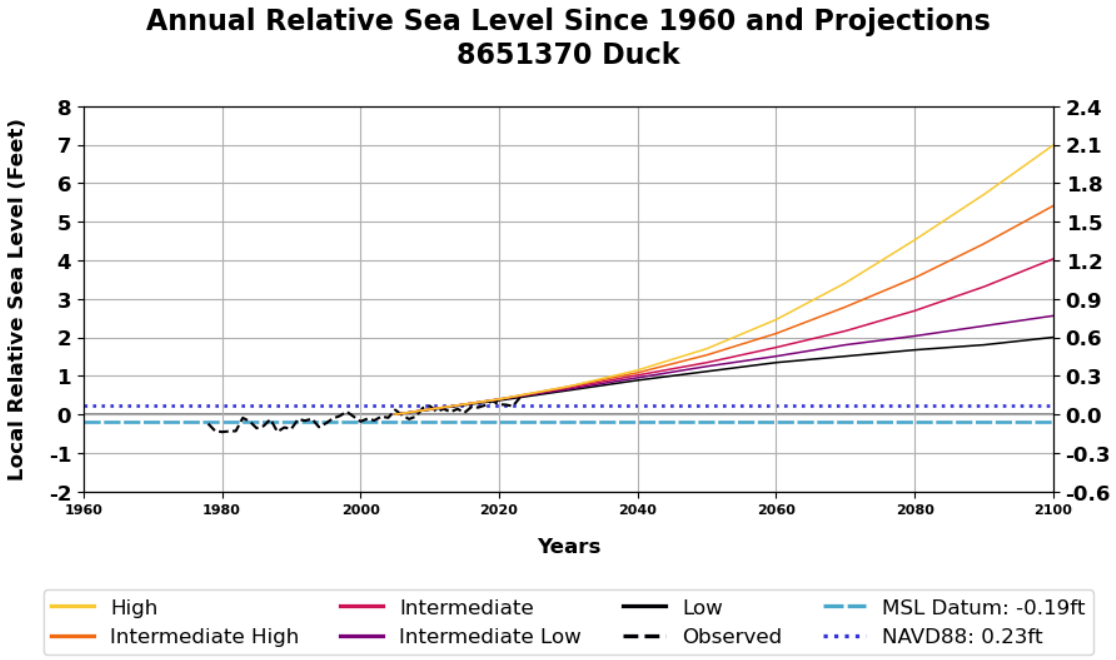
Relative sea level trend: 4.88 to 5.56mm/year

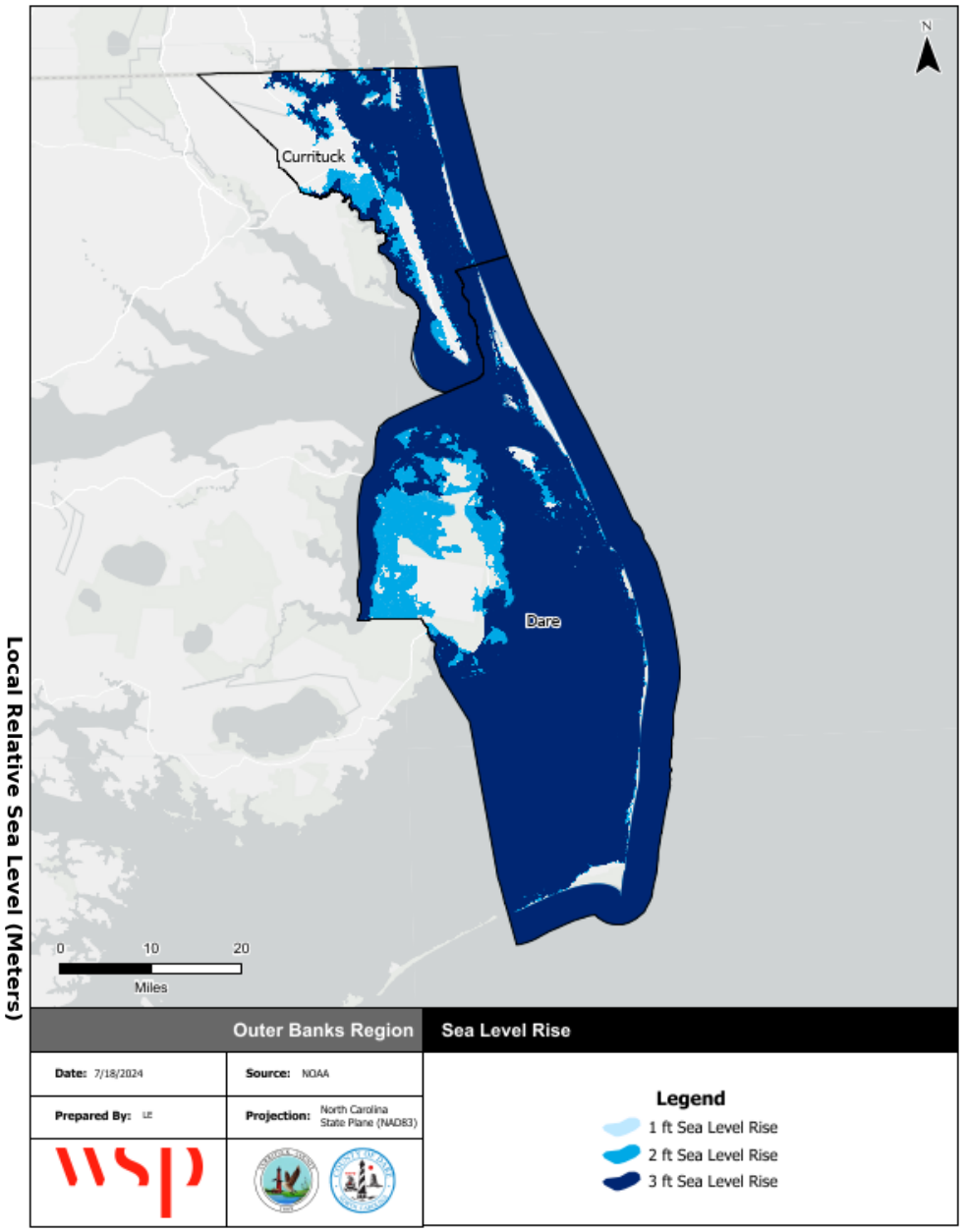




Flood

NOAA Intermediate curve projects about 1.75’ of sea level rise by 2060; over 4’ by 2100 (relative to 1996-2014 baseline)





Flood

Sea Level Rise Exposure:

- Property exposure estimated for 1, 2, and 3 feet of sea level rise above 1996-2014 baseline mean higher high water

Occupancy	Estimated Parcel Count	Structure Value
1 Foot Sea Level Rise	**1,899**	**$464,836,822**
Agriculture	2	$36,606
Commercial	62	$19,384,233
Education	0	$0
Government	138	$38,278,512
Industrial	14	$1,893,790
Religious	5	$618,118
Residential	1,678	$404,625,563
2 Foot Sea Level Rise	**5,532**	**$1,238,059,604**
Agriculture	7	$209,857
Commercial	130	$37,889,175
Education	0	$0
Government	170	$51,636,593
Industrial	23	$3,041,373
Religious	12	$2,968,239
Residential	3,291	$677,477,545
3 Foot Sea Level Rise	**13,939**	**$2,852,874,390**
Agriculture	30	$1,054,642
Commercial	321	$87,547,903
Education	2	$180,505
Government	194	$53,664,460
Industrial	46	$6,160,951
Religious	24	$6,483,492
Residential	7,790	$1,459,722,833

Hurricane & Coastal Hazards

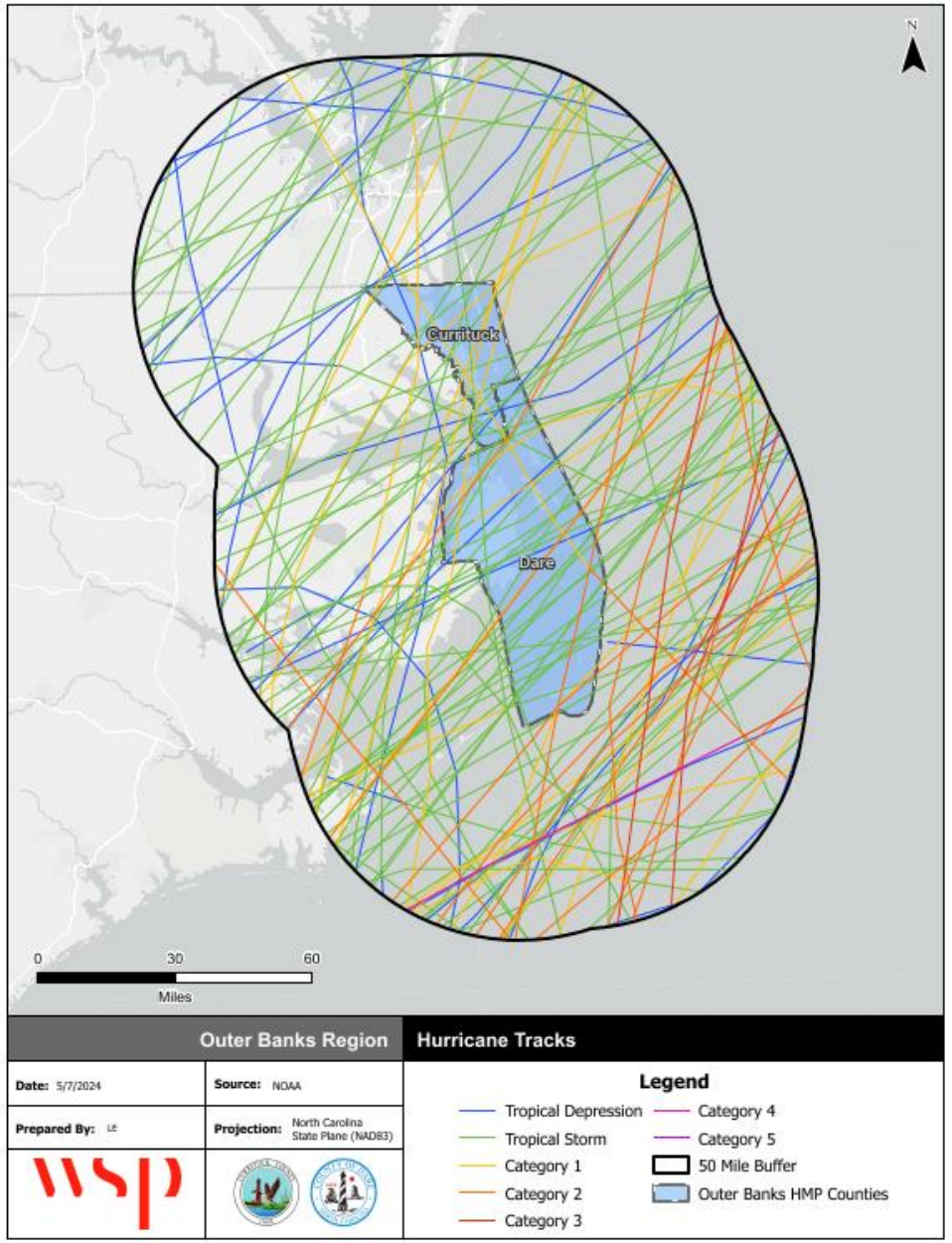
Hurricanes and Nor'easters

NCEI reports 6 new hurricane and tropical storm events reported since the last plan update

Date	Storm	Deaths/ Injuries	Property Damage	Crop Damage
9/5 – 9/6/2019	Hurricane Dorian	0/0	$150,000	$0
8/4/2020	Hurricane Isaias	0/0	$500,000	$0
7/8/2021	Tropical Storm Elsa	0/0	$20,000	$0
9/30/2022	Hurricane Ian	0/0	$0	$0
8/31/2023	Hurricane Idalia	0/0	$0	$0
9/22/2023	Tropical Storm Ophelia	0/0	$0	$0

$390 million in property damages in NCEI due to hurricanes and tropical storms from 1996-2023 (25 events)

The last plan included local storm damage reports to supplement these records – are there updates for recent storms?



Hurricane & Coastal Hazards

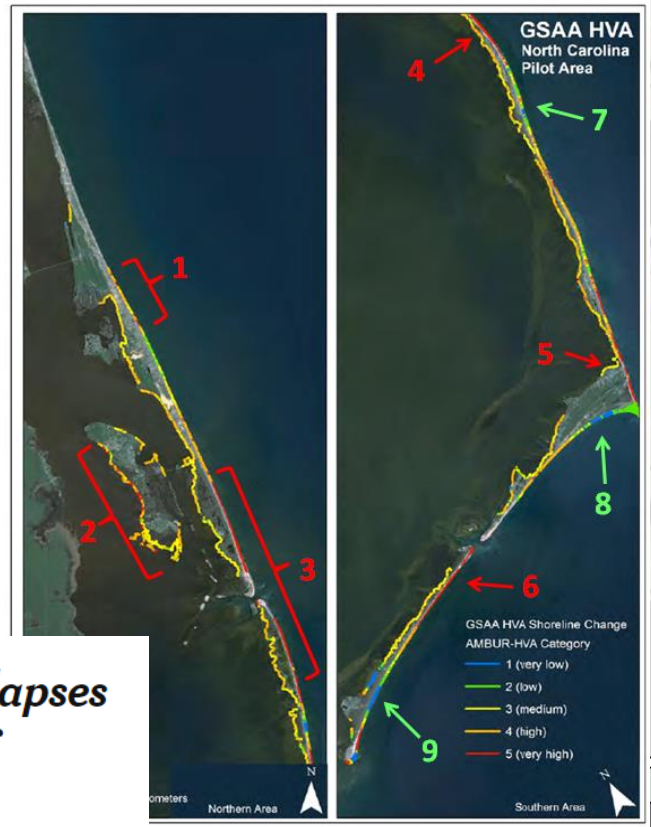
Erosion

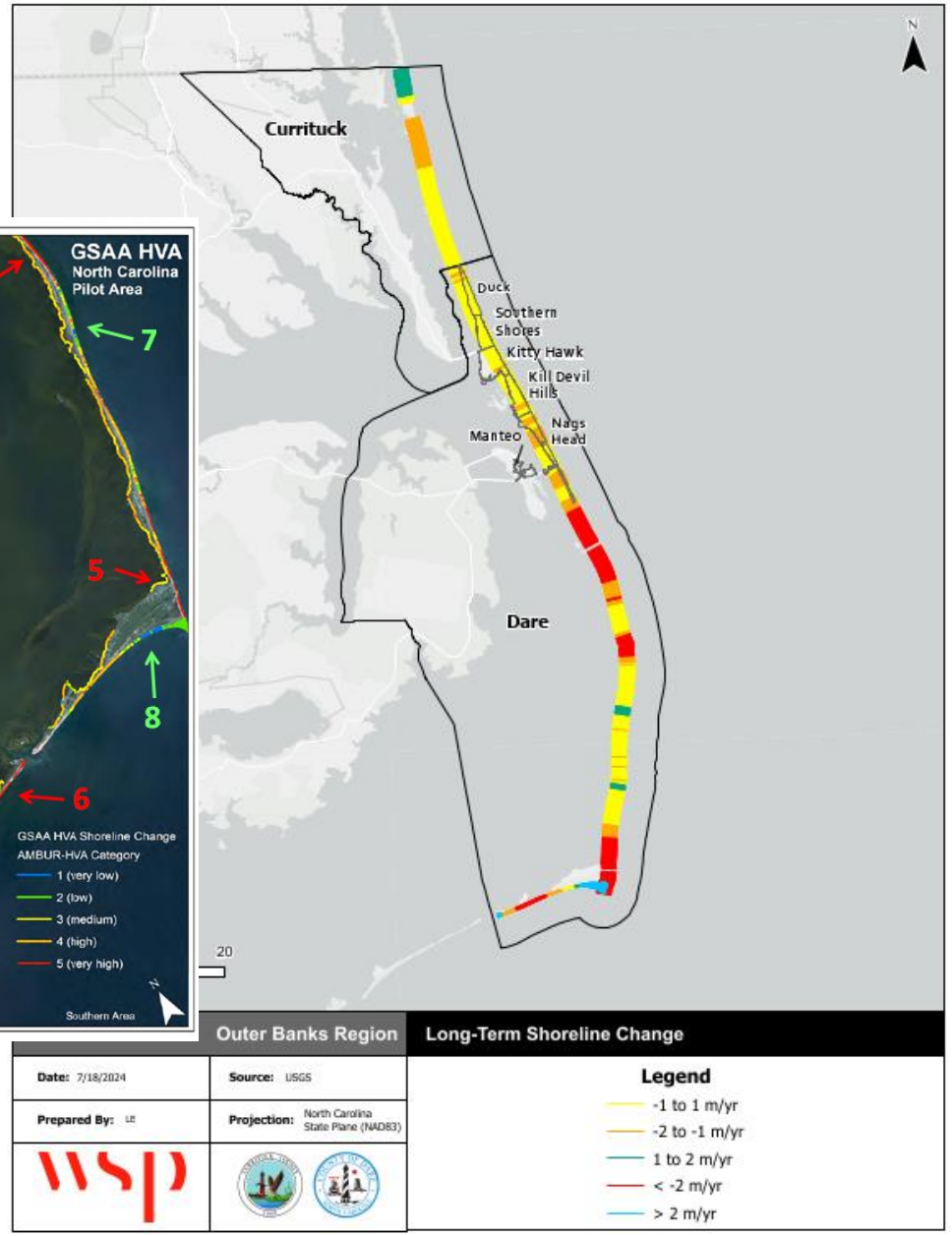
Estuarine erosion hotspots identified in southern and western portions of Roanoke Island and along stretches of coastline near Rodanthe and Buxton.

Multiple oceanfront homes destroyed by erosion in Rodanthe, erosion rates estimated at 10-15ft/yr

Another Outer Banks Home Collapses Into Ocean, a Stark Reminder of Climate Change

In Rodanthe, N.C., seven homes have been lost to the ocean in the last four years, as rising sea levels erode shorelines and put more buildings at risk.





Hurricane & Coastal Hazards

Rip Current

30 reported rip current events in NCEI, which caused 28 deaths since 2002

National Weather Service reports 27 surf zone fatalities between 2010-2024

Vulnerability may be higher in jurisdictions with more heavily frequented tourist beaches due to less awareness of rip current safety

Surf Zone Fatalities, 2010-2024

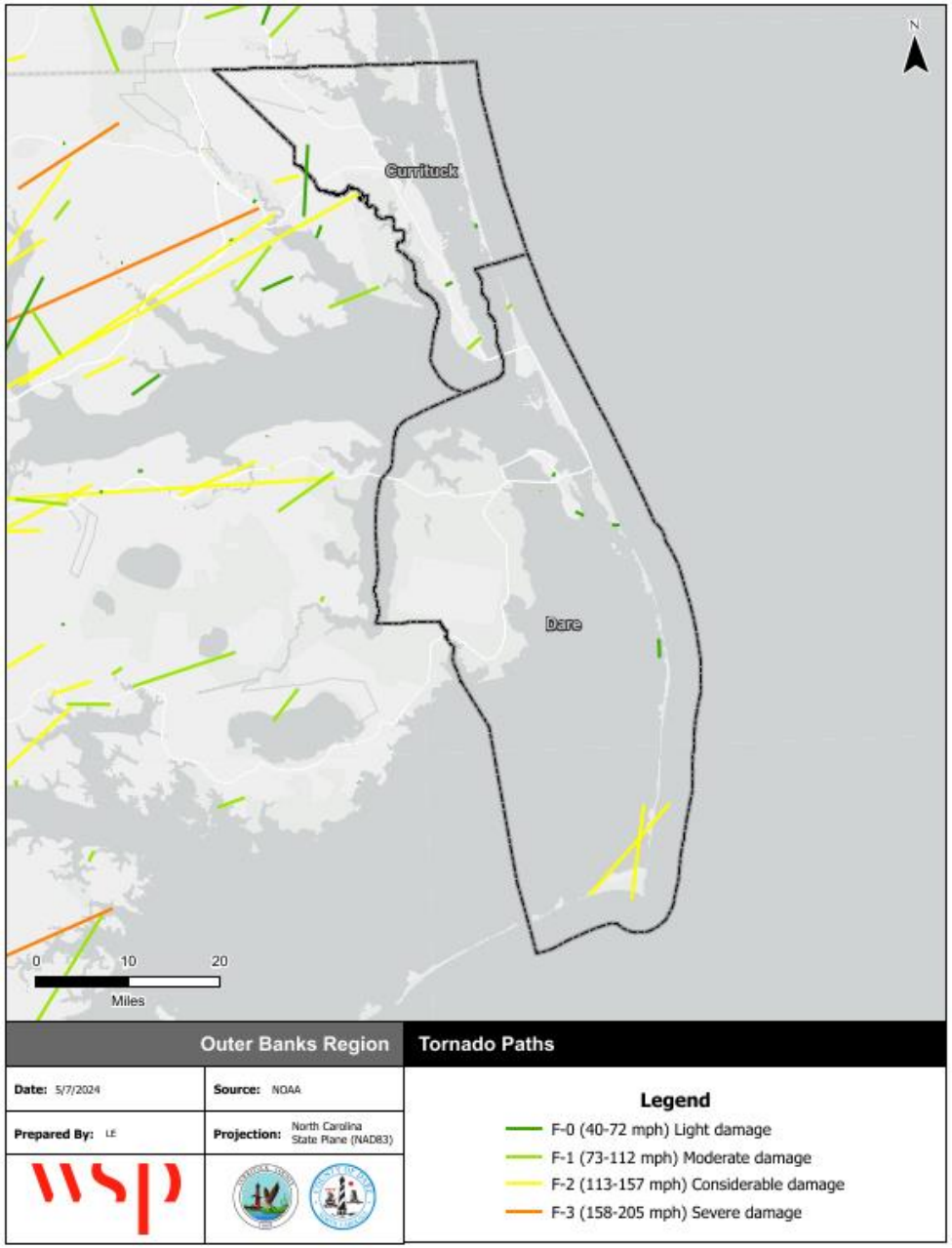
Year	Cause	Count	Locations
2024	Rip Current	1	Nags Head
2022	Unknown	1	Kill Devil Hills
2020	Unknown	1	Duck
2020	Rip Current	1	Kitty Hawk
2019	Rip Current	3	Duck, Cape Hatteras
2019	Unknown	1	Nags Head
2018	High Surf	4	Kitty Hawk Beach, Kill Devil Hills, Duck, Southern Shores
2018	Rip Current	3	Frisco Day, Avon, Rodanthe
2018	Unknown	1	Buxton
2017	Rip Current	3	Corolla, Hatteras Point (Buxton)
2016	Rip Current	7	Corolla, Rodanthe, Salvo, Buxton, Frisco
2015	Unknown	1	Duck

Tornado & Thunderstorm

- The Outer Banks Region has experienced **20** tornado incidents between 1996 and 2023, causing **6 injuries** and $**1,397,000 in property damage**
- Based on past occurrences, there is a **68% annual probability** of a tornado occurring somewhere in the region

Past Tornadoes in the Outer Banks Region, 1950-2023

Magnitude	Count	Related Injuries and Fatalities
F0/EF0	31	7
F1/EF1	14	3
F2/EF2	4	14
F3/EF3	1	0
Total	**50**	**24**



Tornado & Thunderstorm

- Between 1999-2023, the NCEI recorded **70** separate hail incidents across 48 days in the Outer Banks Region
- Between 1996-2023, the NCEI recorded **238** separate incidents of high winds, strong winds, and thunderstorm winds, occurring on 144 separate days
    - These events caused **$1,408,000 in recorded property damage, 9 injuries** and no fatalities or crop damage
- The Outer Banks Region averages **8.5** thunderstorm wind events, **15** lightning events, and **1.5** hail events per year

Summary of Hail Occurrences by County

Location	Number of Occurrences	Average Hail Diameter
Currituck	28	1.0104"
Dare	42	0.8993"

Recorded Lightning Strikes in the Outer Banks Region, 1996-2023

Location	Date	Time	Fatalities	Injuries	Property Damage
Moyock	5/6/1996	200	0	0	$30,000
Manteo	4/3/2002	2115	0	0	$10,000
Colington	8/24/2002	1800	0	0	$12,000
Hatteras	8/24/2002	2000	1	4	$0
Buxton	9/5/2002	1510	0	0	$20,000
Moyock	8/18/2003	1415	0	0	$2,000
Rodanthe	6/20/2008	1430	0	2	$0
Duck	7/27/2009	1600	1	0	$0
Currituck	8/6/2009	1230	0	0	$2,000
Kitty Hawk	7/21/2012	1910	0	0	$10,000
Corolla	7/10/2014	630	0	0	$25,000
Knotts Is	7/31/2016	1510	1	0	$0
Mayock	7/23/2017	1931	0	0	$3,000
Kitty Hawk	8/23/2019	1350	1	0	$0
Duck	8/10/2023	1705	0	0	$500,000
		Total	**4**	**6**	**$614,000**

Source: NCEI

Severe Winter Storm

- There has only been **1** emergency declaration due to severe winter storm in the Outer Banks Region
- NCEI records show **54** severe winter storm related events during the 25-year period from 1999 through 2023
- An average of **2.1 events occur per year** making it highly likely in any given year

Emergency & Disaster Declarations Due to Severe Winter Storms

Disaster Number	Date	Disaster Type	Incident Start	Incident End
3110	1993	Severe Snow and Winter Storm	3/13/1993	3/17/1993

Source: FEMA, August 7, 2024

Total Severe Winter Storm Impacts in the Outer Banks Region, 1999-2023

Event Type	Number of Recorded Incidents	Total Fatalities	Total Injuries	Total Property Damage	Total Crop Damage
Currituck					
Winter Storm	17	0	0	$0	$0
Winter Weather	15	0	0	$0	$0
Frost/Freeze	3	0	0	$0	$0
Blizzard	1	0	0	$0	$0
Dare					
Winter Storm	9	0	0	$0	$0
Winter Weather	4	0	0	$0	$0
Frost/Freeze	1	0	0	$0	$0
Heavy Snow	4	0	0	$0	$0
Region Total	**54**	**0**	**0**	**$0**	**$0**

Source: NCEI

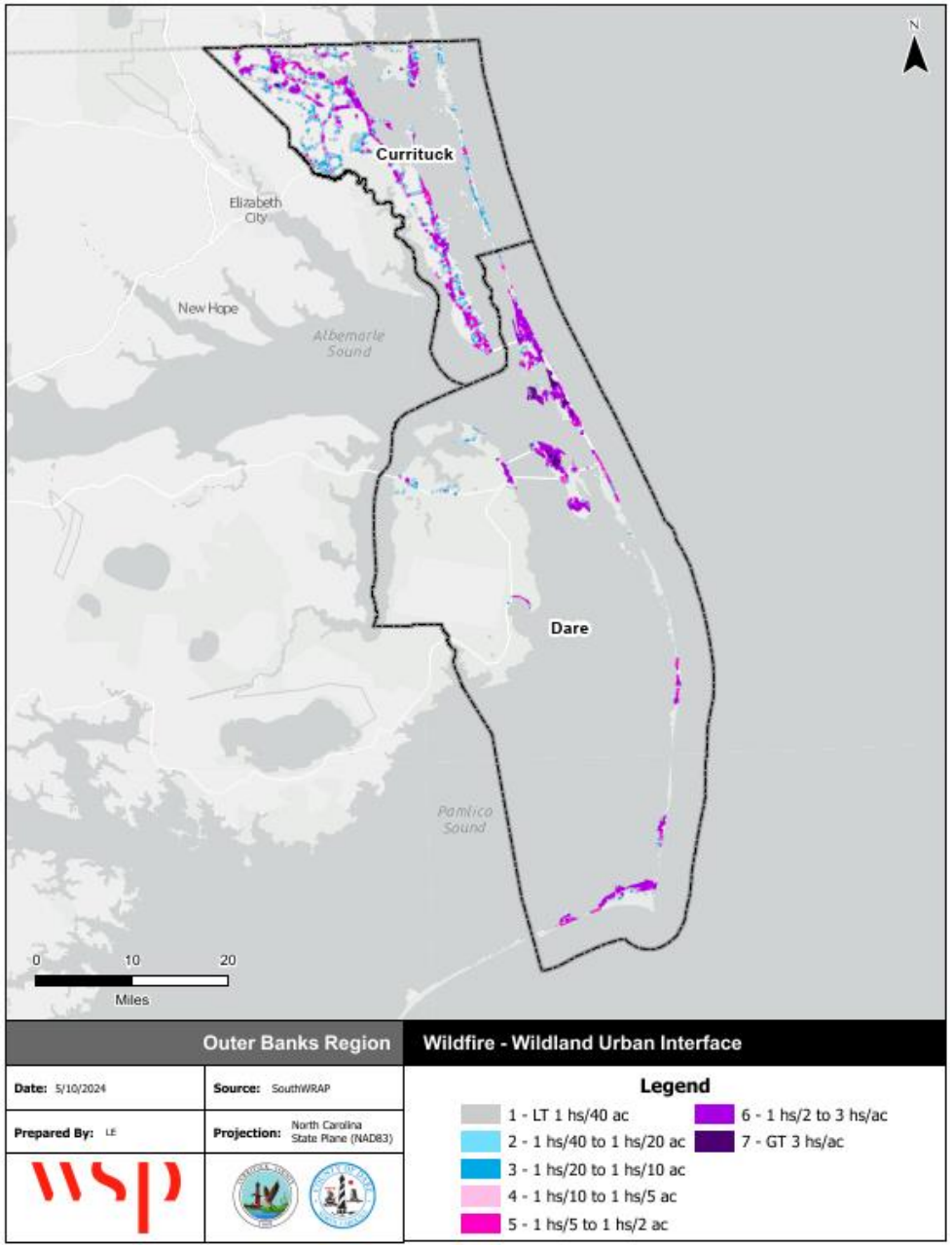
Wildfire

Wildland Urban Interface (WUI)

- The WUI is the area where structures and other human improvements meet undeveloped wildland or vegetative fuels
- It is estimated that **71.7%** of the Region's population lives within the WUI

	Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
	LT 1hs/40ac	1,945	4.24%	14,013.60	15.97%
	1hs/40ac to 1hs/20ac	1,479	3.23%	8,388.50	9.56%
	1hs/20ac to 1hs/10ac	2,753	6.01%	12,676.50	14.45%
	1hs/10ac to 1hs/5ac	3,227	7.04%	12,612.60	14.37%
	1hs/5ac to 1hs/2ac	6,852	14.95%	17,318.40	19.74%
	1hs/2ac to 3hs/1ac	20,796	45.37%	20,368.90	23.21%
	GT 3hs/1ac	8,784	19.16%	2,367.40	2.70%
	Total	45,836	100.00%	87,745.90	100.00%

Source: Southern Wildfire Risk Assessment & 2020 U.S. Census



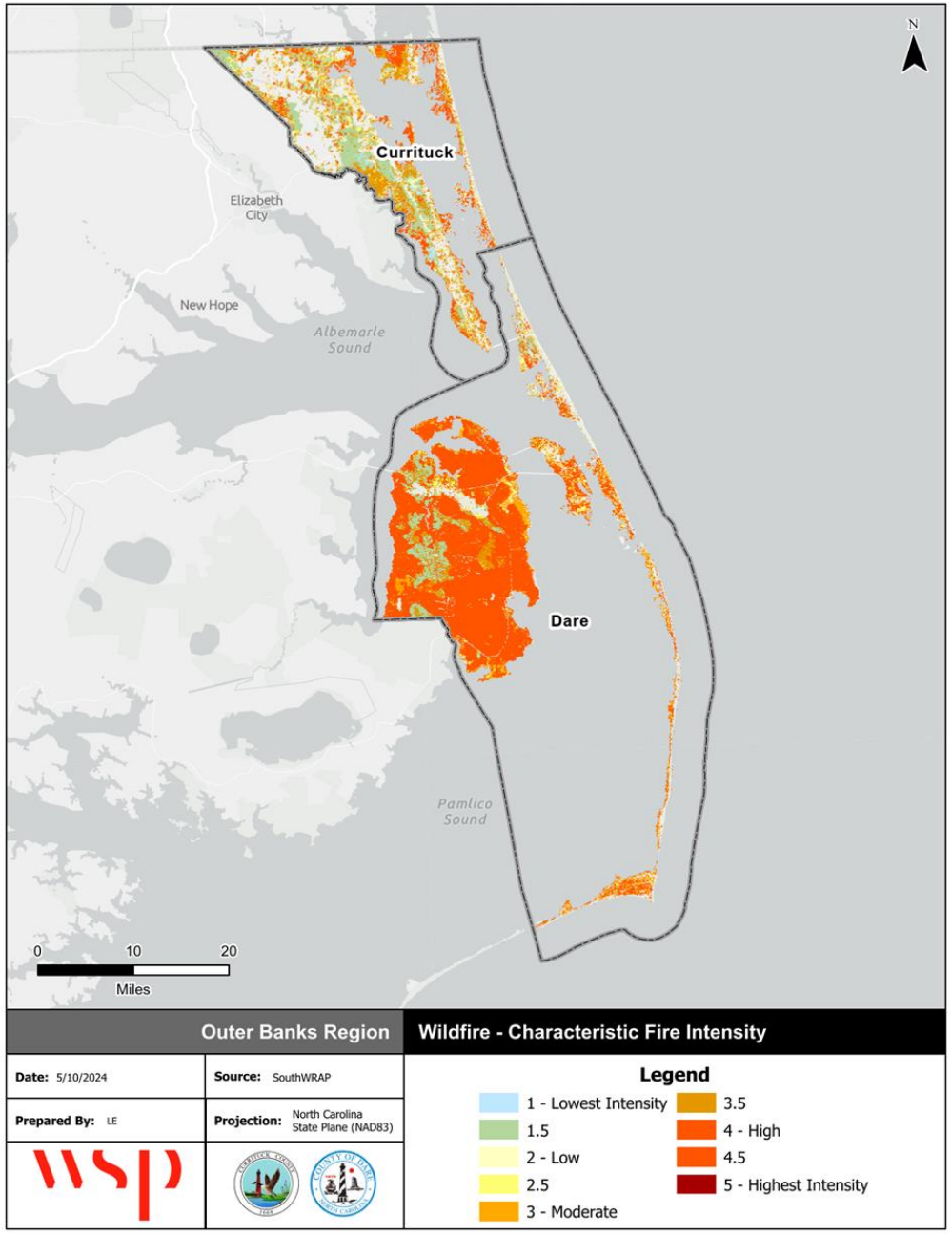
Wildfire

Fire Intensity

- Over **32%** of the Region is susceptible to Class 4 and 4.5 high intensity fires, which pose significant harm or damage to life and property
- **11.6%** of the Region may experience Class 3 fire intensities while the remainder of the Region is either non-burnable **(41.6%)** or Class 1 & 2

	Class	Acres	Percent
	Non-Burnable	232,371.37	41.68%
	1 Lowest Intensity	3,394.85	0.61%
	1.5	49,148.53	8.82%
	2 Low	8,185.78	1.47%
	2.5	18,159.64	3.26%
	3 Moderate	28,402.52	5.09%
	3.5	36,432.99	6.53%
	4 High	116,802.17	20.95%
	4.5	64,638.68	11.59%
	5 Highest Intensity	0.00	0.00%
	Total	**557,536.54**	**100.00%**

Source: Southern Wildfire Risk Assessment & GIS analysis



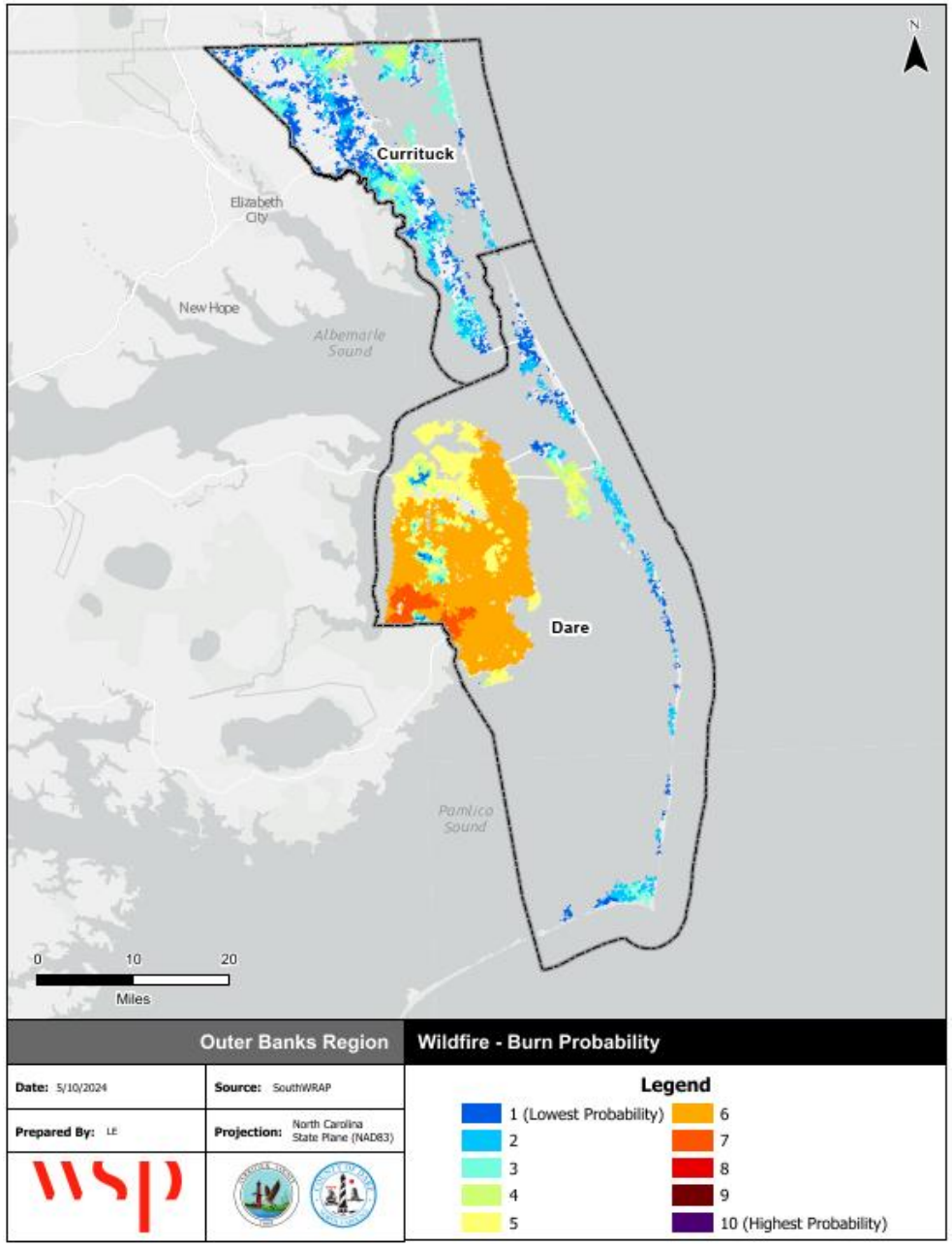
Wildfire

Burn Probability

- Most of the Outer Banks Region has a relatively low burn probability of 5 or less
- Approximately **43%** of the Region has a burn probability of 6 or 7
- Areas of higher burn probability are located primarily in Dare County.

Class	Acres	Percent
1	38,039	12.7%
2	33,901	11.4%
3	37,115	12.4%
4	16,466	5.5%
5	43,380	14.5%
6	117,198	39.3%
7	12,386	4.1%
8	0	0.0 %
9	0	0.0%
10	0	0.0%
Total	298,487	100.0%

Source: Southern Wildfire Risk Assessment



Hazardous Materials Incident

- The Toxic Release Inventory reports **4** sites with hazardous materials in the planning area
- Between 1990 and 2023 there were **8** recorded hazardous materials incidents in the Outer Banks Region
    - Of these events, **2** were flagged as serious incidents
    - In total, these events **caused $316,891 in damages**
    - The most common materials spilled in the planning area are Class 2 (Gases) and Class 3 (Flammable Combustible Liquids).
- Buxton Beach – underground petroleum tank (erosion)

PHMSA Recorded Hazardous Materials Incidents, 1990-2023

Report Number	Date	Hazard Class	Mode Of Transportation	Causes of Failure	Total Damages	Serious?
I-1991060964	6/9/1991	2	Highway		$950	No
I-1998010879	12/13/1997	2	Highway	Loose Closure, Component, or Device	$10	No
I-2000050259	4/28/2000	3	Highway	Loose Closure, Component, or Device	$100	No
I-2003060990	5/22/2003	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$311,625	Yes
I-2004041265	4/14/2004	3	Highway		$206	No
E-2009060055	5/6/2009	2.1	Highway	Corrosion - Exterior	$4,000	No
I-2011060083	5/24/2011		Air	Valve Open	$0	No
E-2016100250	9/26/2016	2.1	Highway	Corrosion - Exterior	$0	Yes

Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search

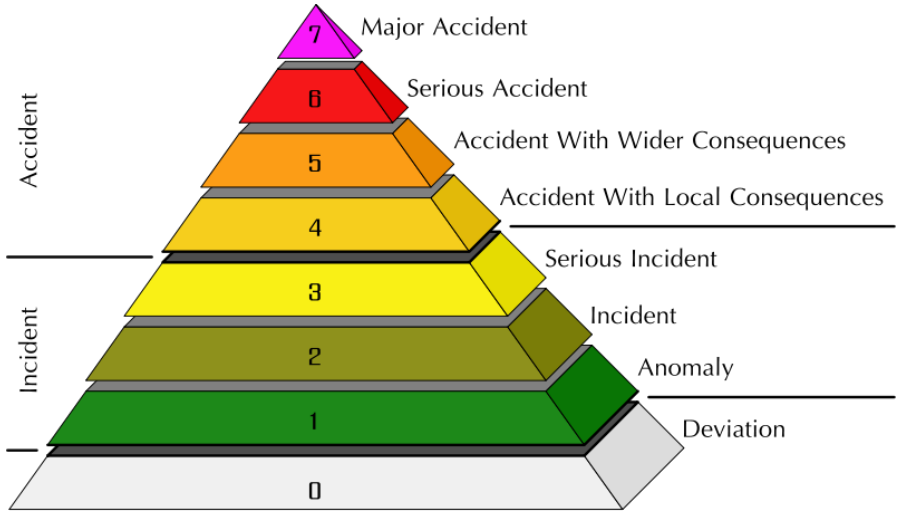
Toxic Release Inventory Sites

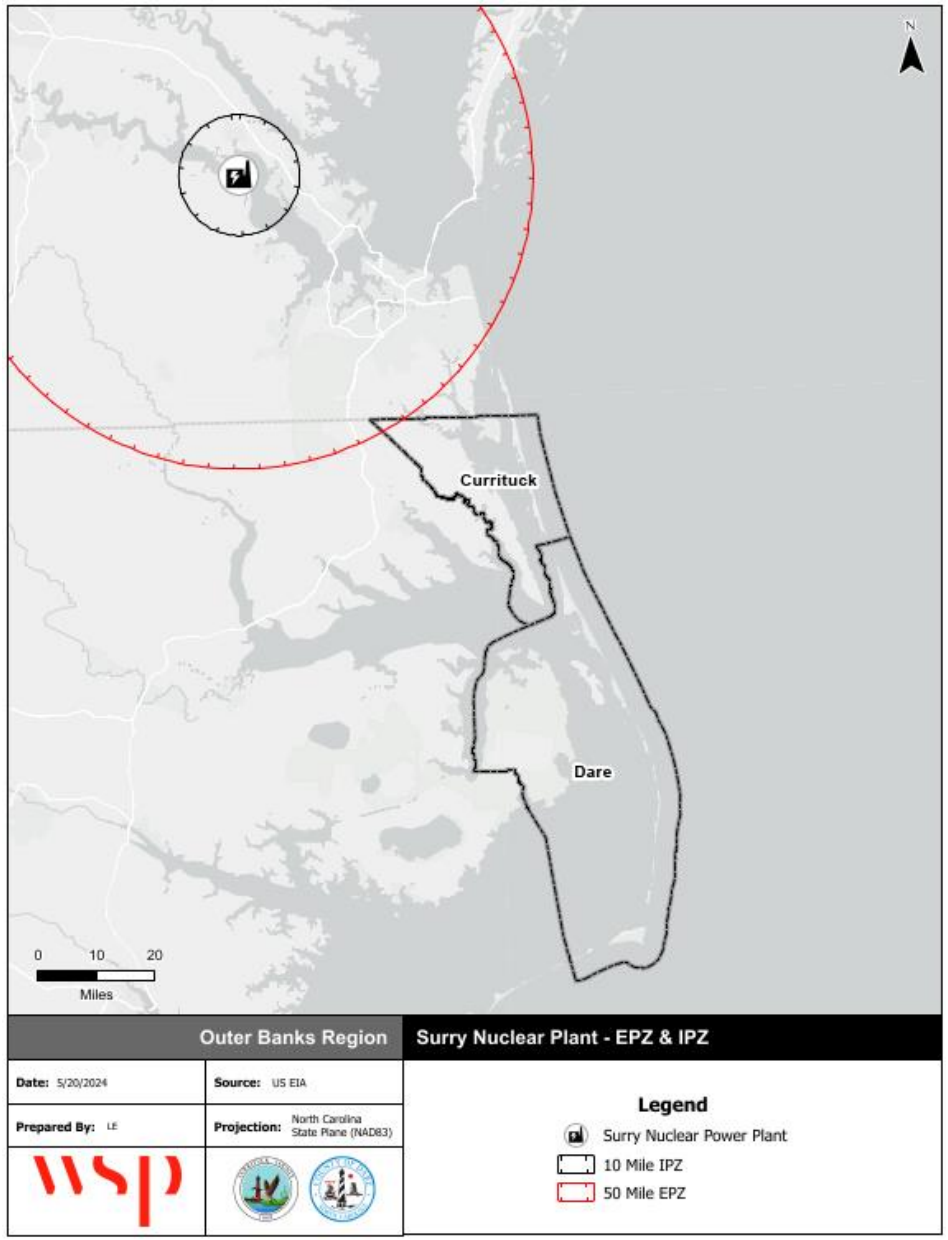
Facility Name	County	Chemicals Reported	Most Recent Release
Tidewater Agricorp Central Fertilizer	Currituck	Ammonium Sulfate, Ammonia, Phosphoric Acid	1988
W S Clark & Sons Inc	Currituck	Ammonia, Phosphoric Acid	1990
Us Air Force Dare County Bomb Range	Dare	Lead	2023
Us Natl Park Service Cape Hatteras Natl Seashore (Caha)	Dare	Lead	2018

Source: US EPA

Radiological Emergency

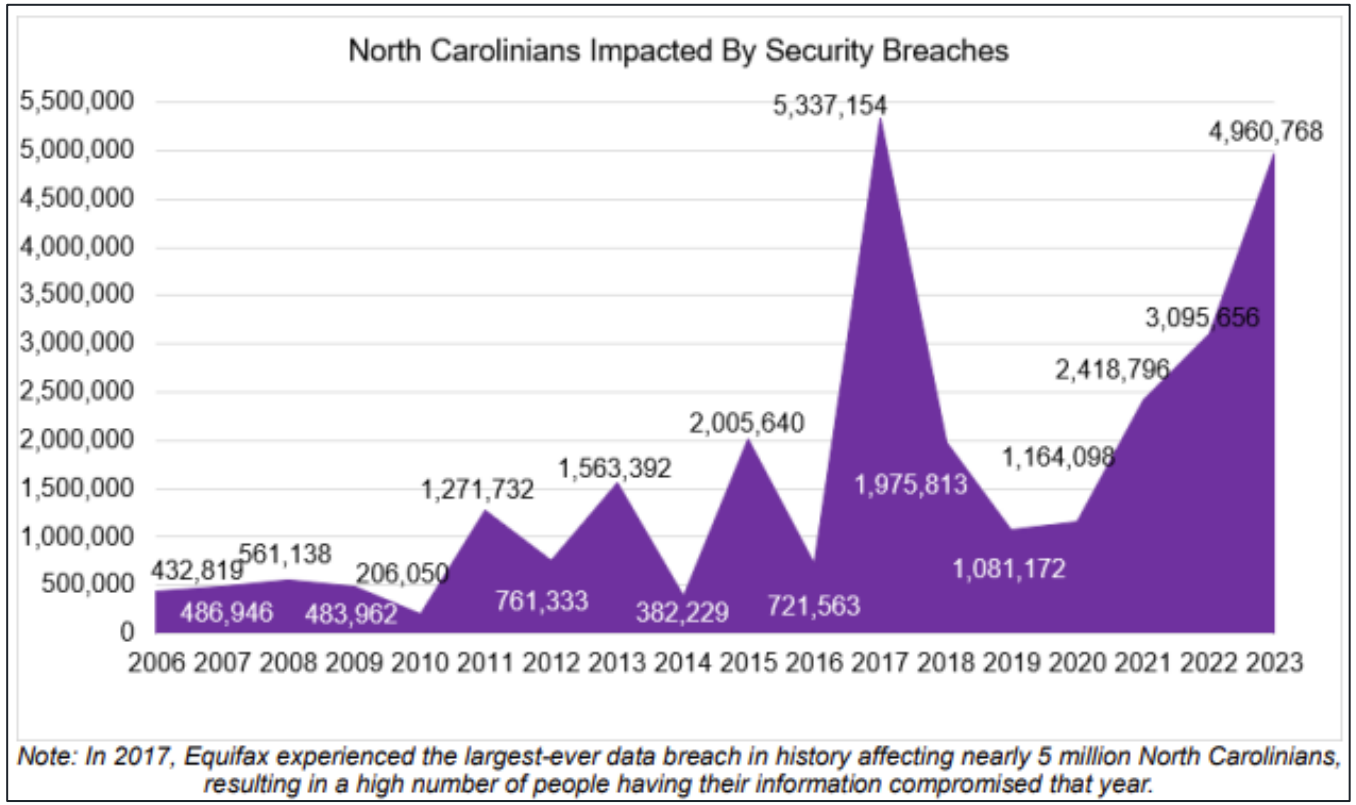
- Very small portion of northeastern Currituck County is within the 50-mile Ingestion Pathway Zone (IPZ) of Surry Power Station in Surry, VA.
- Nuclear Regulatory Commission has declared two Notice of Unusual Events at Surry Power Station, for a tornado in April 2011 and an earthquake in August 2011. No incidents or accidents are reported for the plant.





Cyber Threat

- In 2023, NCDOJ received **2,033** data breach notices from organizations
- The breaches impacted more than **4,960,768** North Carolinians
- In September 2016, The Outer Banks Hospital reported a breach where **943** records were impacted
- While the majority of breaches were not specifically targeted at the Outer Banks Region, some of them almost certainly included information on individuals who live in the region



Source: North Carolina Department of Justice

Terrorism

- In 2023, **50 active hate groups** were reported by Southern Poverty Law Center in North Carolina
    - Hate groups were defined as any group with "beliefs or practices that attack or malign an entire class of people"
- None of the identified hate groups have a specifically identified footprint in the Currituck or Dare counties

Sample List of Active Hate Groups in North Carolina

Group	Type	Location
Americans for Legal Immigration (ALIPAC)	Anti-Immigrant	Raleigh
North Carolinians for Immigration Reform and Enforcement	Anti-Immigrant	Wade
Gays Against Groomers North Carolina	Anti-LGBTQ	Monroe
Camp Constitution	Antigovernment General	Charlotte
Education First Alliance	Antigovernment General	Apex
Mom Army Charlotte	Antigovernment General	Charlotte
Moms for Liberty - Alexander County, NC Chapter	Antigovernment General	Alexander County
Moms for Liberty - Bladen County, NC	Antigovernment General	Bladen County
Moms for Liberty - Buncombe County, NC	Antigovernment General	Buncombe County

Source: Southern Poverty Law Center (SPLC)

Transportation Infrastructure Failure

- **9.3%** of bridges are rated "Structurally Deficient" in North Carolina
- There are **15 bridges** built prior to 1995 in the Outer Banks region
    - **2** of these bridges were rated as "Structurally Deficient" and **5** were rated as "Functionally Obsolete"

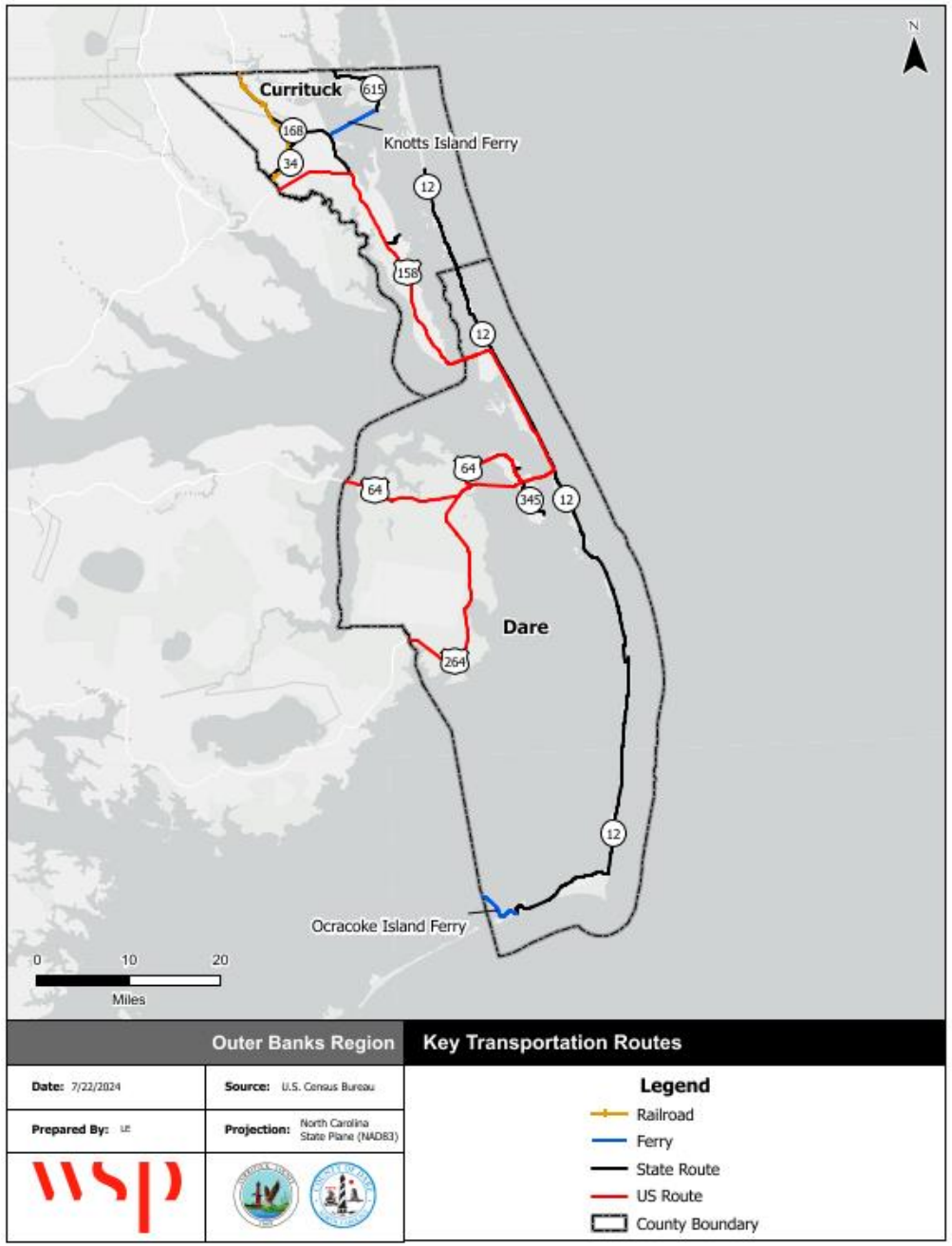
Bridges Built Prior to 1995

County	Bridge Number	Route	Crossing	Deficiency	Year Built	Age (years)
Dare	270009	US64	CROATAN SOUND	SD	1955	69
Dare	270008	NC12	THE SLASH	SD	1956	68
Currituck	260016	US158E	CURRITUCK SOUND	FO	1966	58
Dare	270004	US158	JEAN GUITE CREEK		1966	58
Currituck	260012	SR1142	C. OFF INTERCOASTAL W		1979	45
Dare	270043	NC400	DOUGH'S CREEK		1983	41
Currituck	260015	US158	INTRACOASTAL WATERWAY		1986	38
Dare	270012	US64	ROANOKE SOUND		1990	34
Dare	270044	NC12 FERRY	HATTERAS INLET	FO	1991	33
Dare	270045	NC12 FERRY	HATTERAS INLET	FO	1991	33
Dare	270046	NC12FERRY	HATTERAS INLET	FO	1991	33
Dare	270005	SR1217	CR OFF KITTY HAWK BAY	FO	1994	30
Dare	270006	SR1217	COLINGTON CREEK		1994	30
Dare	270014	US64	POND ISLAND		1994	30
Currituck	260035	US158W	CURRITUCK SOUND		1995	29

Source: North Carolina Department of Transportation, updated August 2024

Transportation Infrastructure Failure

- Region depends on several key bridges, roads, and ferry crossings for access and services – integral for the functioning of the planning area
- Loss of major highway or key bridge could cause significant disruption
- 1990 – Portion of Herbert Bonner Bridge Collapsed; left approximately **5,000 Hatteras residents along with tourists stranded**



Heat Vulnerability in the Outer Banks

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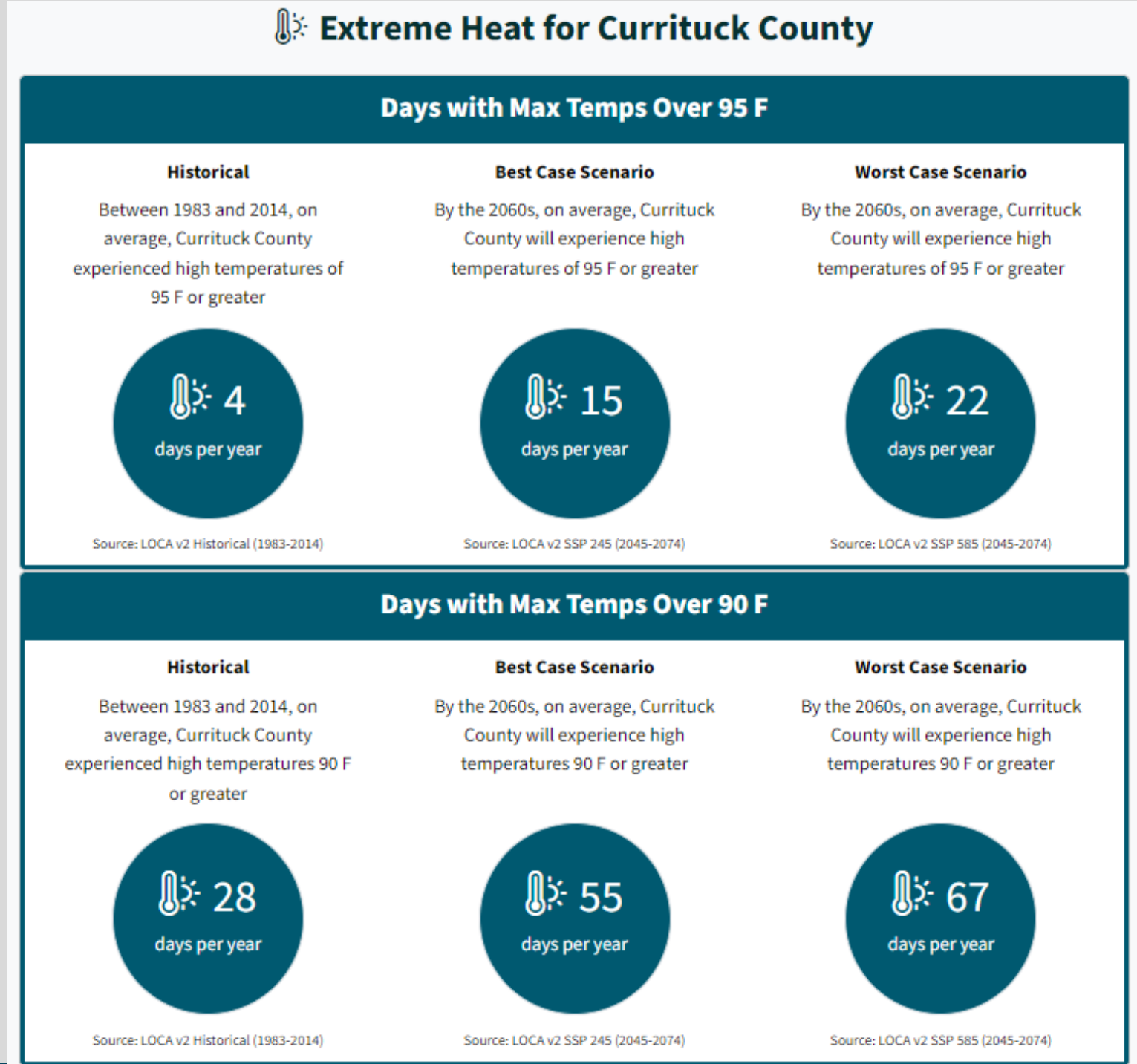
But we live in the South!

What can we expect?

- Temperatures will continue increasing

It is **likely** that the number of very hot days (95°F or higher) will increase.

It is **very likely** that the number of very warm nights (above 75 °F) will increase.



Daytime Temperatures

Daytime temperature data for Currituck and Dare Counties are very similar

www.resilienceexchange.nc.gov/
> Climate Projections

Nighttime Temperatures

Extreme Heat for Currituck County

Nights with Min Temps Over 70 F

Historical

Between 1983 and 2014, on average, Currituck County experienced low temperatures 70 F or greater

56 nights per year

Source: LOCA v2 Historical (1983-2014)

Best Case Scenario

By the 2060s, on average, Currituck County will experience low temperatures 70 F or greater

86 nights per year

Source: LOCA v2 SSP 245 (2045-2074)

Worst Case Scenario

By the 2060s, on average, Currituck County will experience low temperatures 70 F or greater

98 nights per year

Source: LOCA v2 SSP 585 (2045-2074)

Extreme Heat for Dare County

Nights with Min Temps Over 70 F

Historical

Between 1983 and 2014, on average, Dare County experienced low temperatures 70 F or greater

72 nights per year

Source: LOCA v2 Historical (1983-2014)

Best Case Scenario

By the 2060s, on average, Dare County will experience low temperatures 70 F or greater

102 nights per year

Source: LOCA v2 SSP 245 (2045-2074)

Worst Case Scenario

By the 2060s, on average, Dare County will experience low temperatures 70 F or greater

113 nights per year

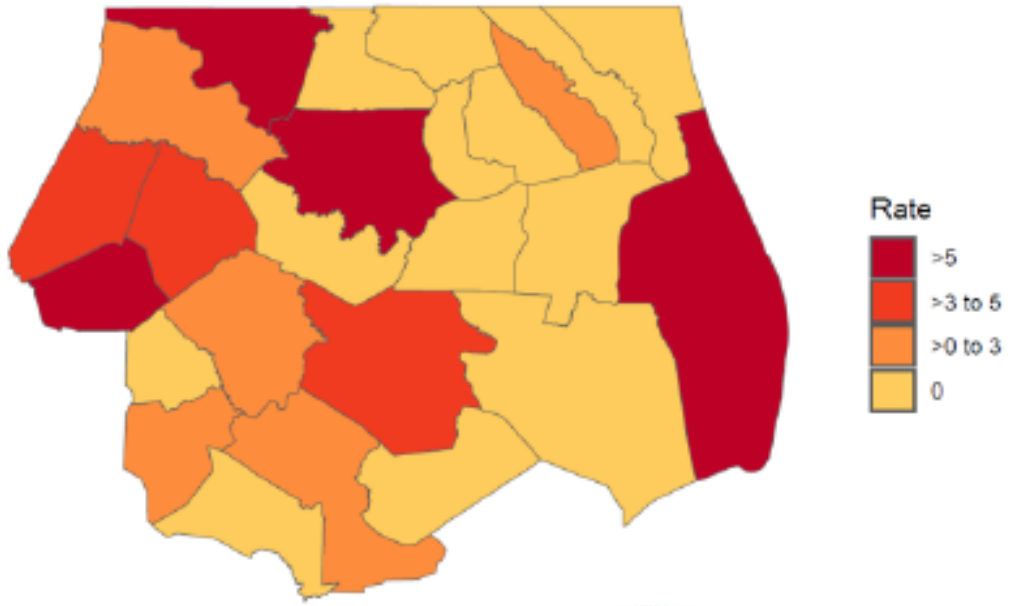
Source: LOCA v2 SSP 585 (2045-2074)

www.resilienceexchange.nc.gov/
> Climate Projections

Why should we care?

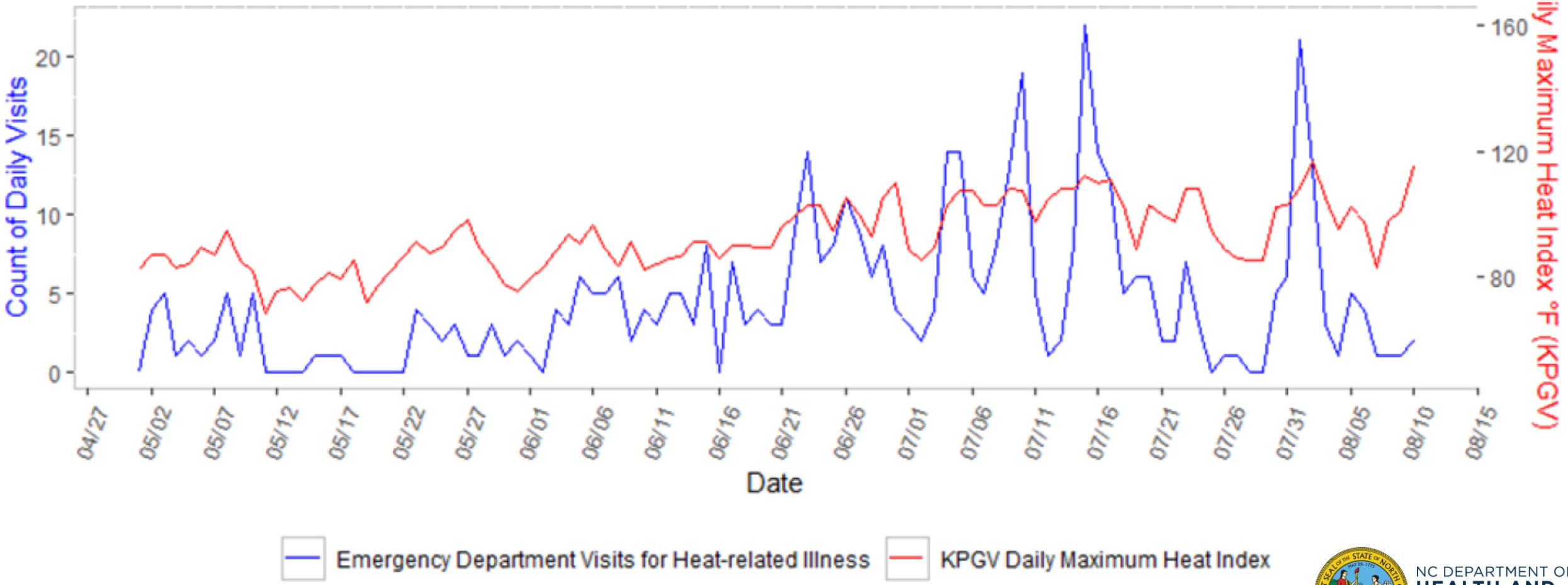
Rate of Heat-Related Illness Emergency Department (HRI ED) Visits Per 100,000 Population

June 2-8, 2024:
24 HRI ED Visits



NC DEPARTMENT OF HEALTH AND HUMAN SERVICES
Division of Public Health

Figure 3. Count of Emergency Department Visits for Heat-related Illness and Maximum Heat Index
Northeastern NC (NC DETECT Region 1): May 1 - August 10, 2024

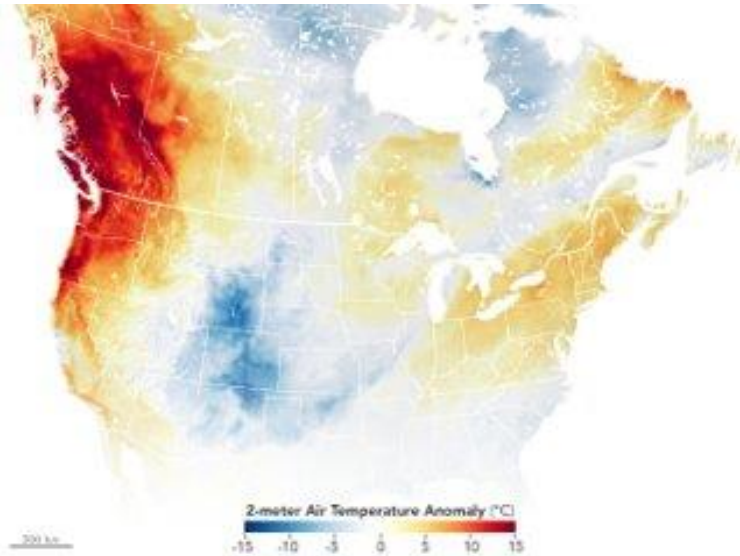


Source: NC DETECT Data and State Climate Office at NC State University

Why should we care?

People can die from extreme heat

- 2021 Pacific Northwest Heat Wave → 1,000+ deaths
- 2010 Russian Heat Wave → 55,000 deaths
- 2006 California Heat Wave → 650 deaths
- 2003 European Heat Wave → 30,000 deaths
- 1995 Chicago Heat Wave → 739 deaths (mostly poor, elderly, and black)

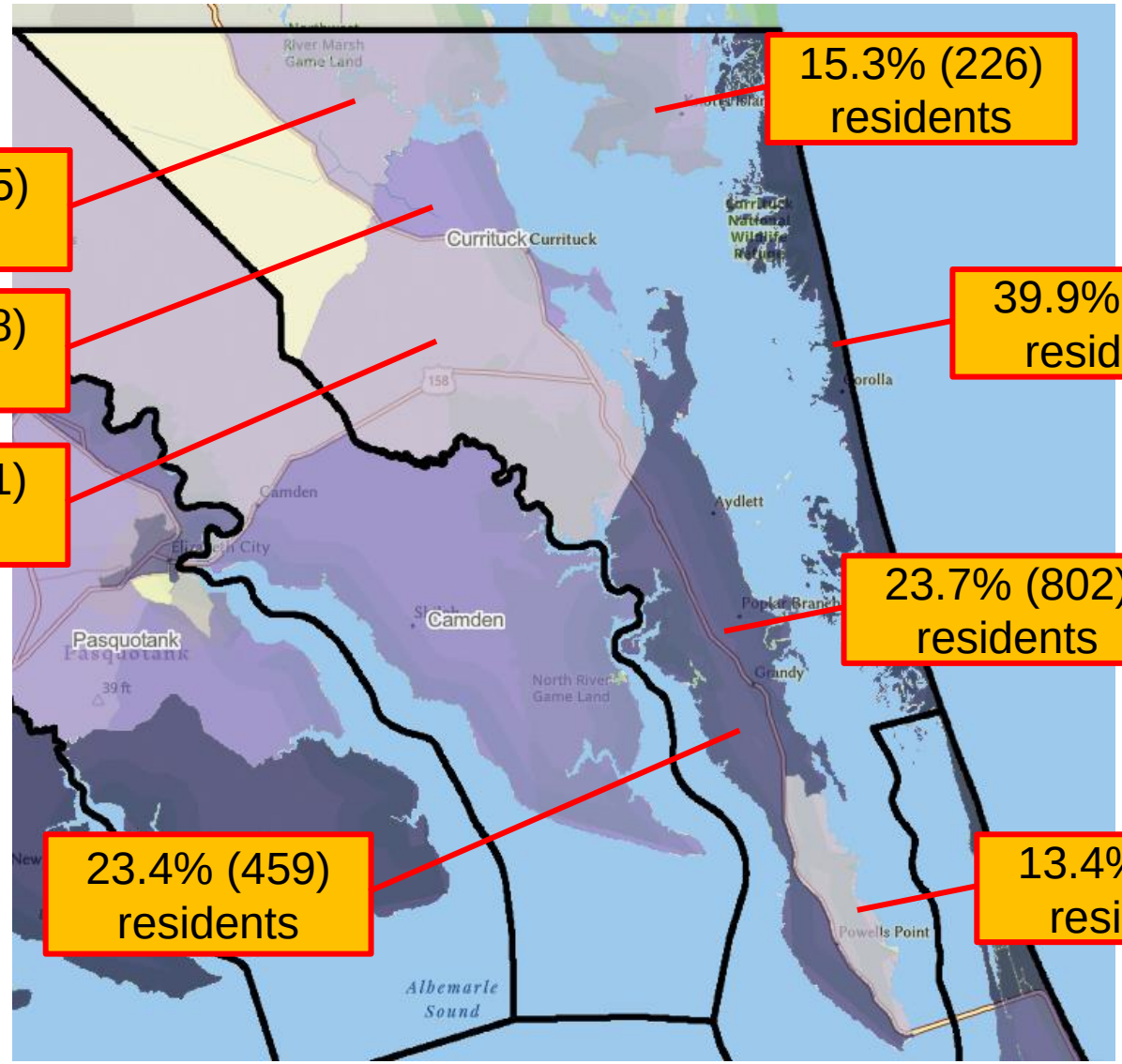


Why should we care?

Groups at Higher Risk from Extreme Heat

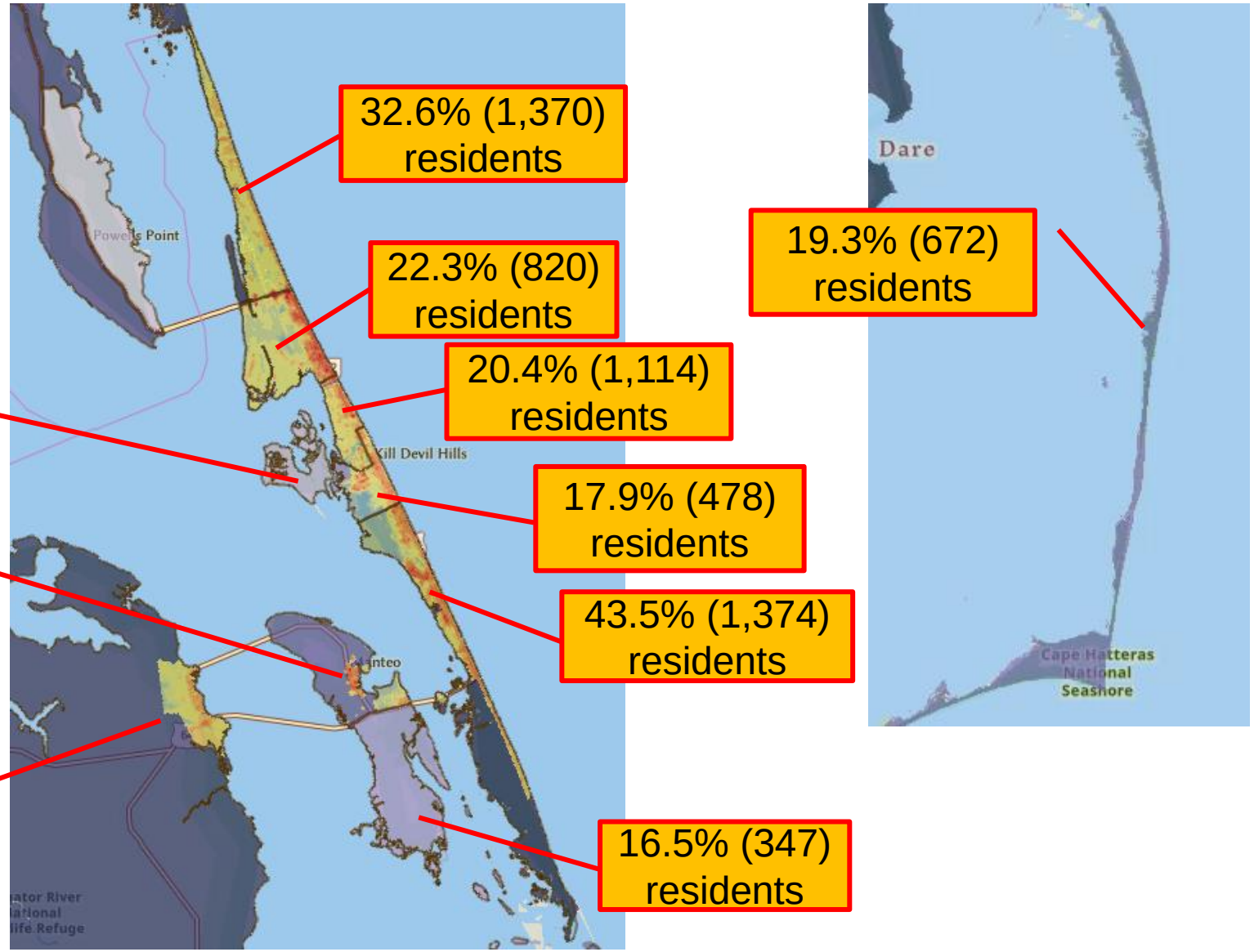
- Infants and children
- Pregnant persons
- Persons taking certain medications
- Older adults (65+)
- Outdoor workers
- Low income
- People with underlying health conditions
- Athletes

Percent of the Population Age 65 or Older
Currituck County



9/4/2024

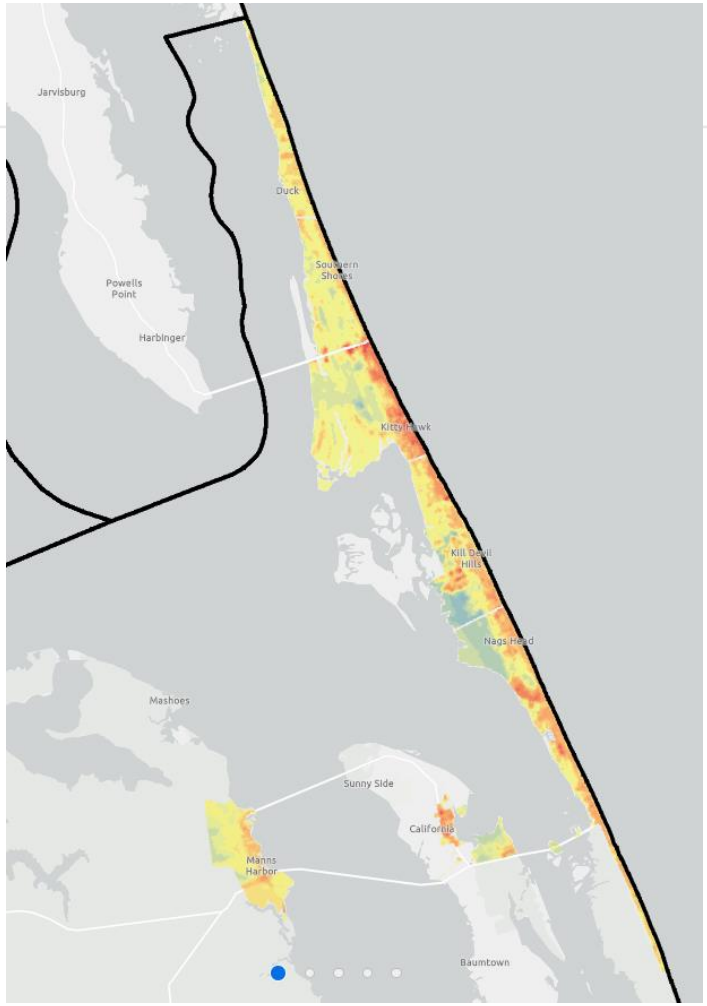
Percent of the Population Age 65 or Older
Dare County



9/4/2024

Urban Heat Islands & Tourism

Red and orange parcels on the map are hotter than the city's average temperature, and blue and green colors are cooler than the city's average temperature.



Impacts of high temperatures

Human Health

- More heat-related illnesses and deaths
- Higher temperatures means more air pollution (Heat interacts with tailpipe emissions to form ozone)

Utility Costs

- Utility needs will increase, meaning costs will increase

Infrastructure

- Materials need to withstand higher temperatures

Agricultural

- Can our crops and livestock grow productively with increasing temperatures?

Questions to consider

- Are we sure that our electricity infrastructure could withstand a heat wave?
- Do local governments have a heat wave response protocol?
- Which residents need a place to go during a heat wave?
  - How will they get there?
- Which workers need access to air conditioning?
- Would our community benefit from education about the warning signs of heat-induced illness?
- Where can we add greenery to paved and hard surfaces in our communities?
- Are our most vulnerable residents English speakers? Can we provide translation?

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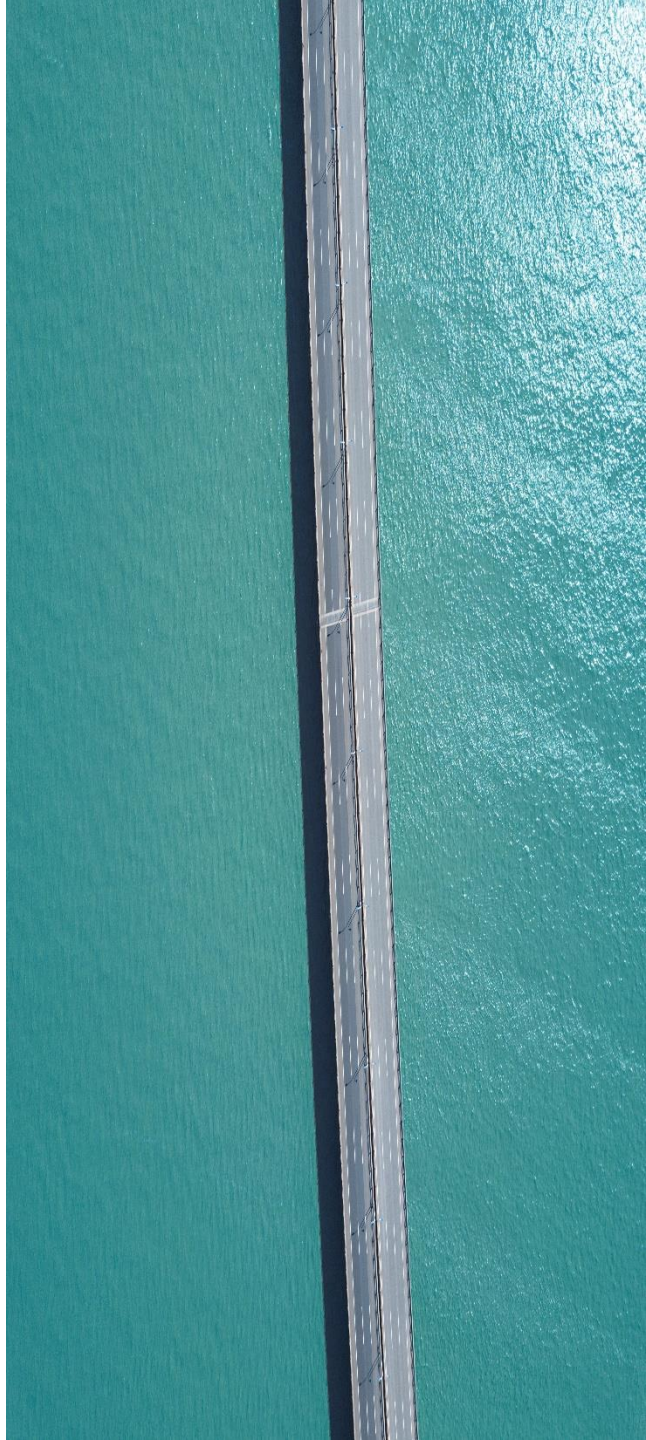
PRI Summary Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Drought	Possible	Minor	Large	More than 24 hrs	More than 1 week	2.2
Earthquake	Unlikely	Minor	Large	Less than 6 hrs	Less than 6 hrs	1.9
Extreme Heat	Highly Likely	Limited	Large	More than 24 hrs	Less than 1 week	3.0
Flood	Highly Likely	Critical	Large	6 to 12 hours	Less than 1 week	3.5
Hurricane & Coastal Hazards	Likely	Catastrophic	Large	More than 24 hrs	Less than 1 week	3.3
Tornadoes & Thunderstorms	Highly Likely	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.9
Severe Winter Storm	Highly Likely	Minor	Large	More than 24 hrs	Less than 1 week	2.7
Wildfire	Possible	Limited	Moderate	Less than 6 hrs	Less than 1 week	2.5
Hazardous Materials Incident	Likely	Minor	Negligible	Less than 6 hrs	Less than 24 hrs	2.0
Radiological Emergency	Unlikely	Limited	Negligible	Less than 6 hrs	More than 1 week	1.9
Cyber Attack	Possible	Minor	Small	Less than 6 hrs	More than 1 week	2.1
Terrorism	Unlikely	Catastrophic	Small	Less than 6 hrs	More than 1 week	2.7
Transportation Infrastructure Failure	Possible	Critical	Small	Less than 6 hrs	More than 1 week	2.7

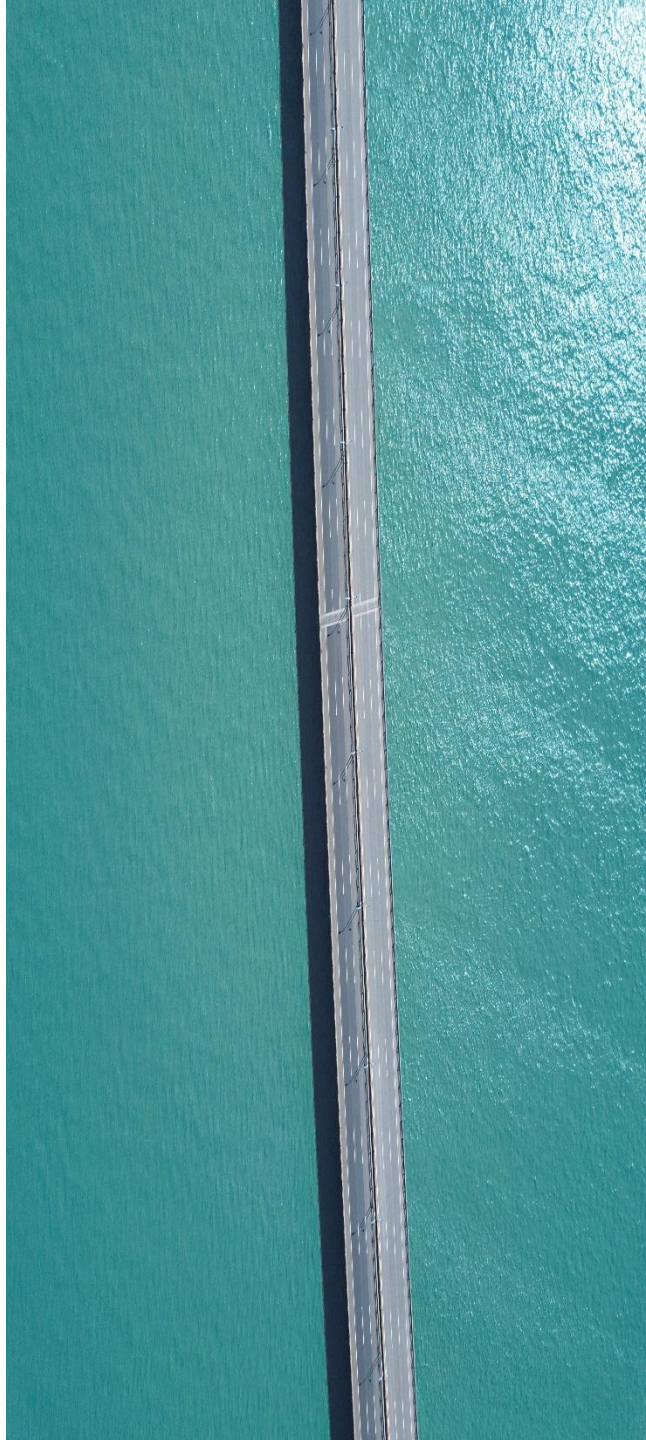
PRI Summary Results

High Risk (≥ 3.0)	Flood Hurricane & Coastal Hazards Extreme Heat
Moderate Risk (2.0 – 2.9)	Tornadoes & Thunderstorms Severe Winter Storm Terrorism Transportation Infrastructure Failure Wildfire Drought Cyber Attack Hazardous Materials Incident
Low Risk (< 2.0)	Earthquake Radiological Emergency

Questions?



Next Steps



Project Schedule

Key Milestones and Meetings

April	Initial HMPC and public meetings – Project Kickoff
August	Risk Assessment draft HMPC meeting Additional public meetings
October	Mitigation Strategy HMPC meetings
December	Final HMPC and public meetings for draft Plan Review; Proposed delivery of draft plan
June 2025	Existing plan expiration

Next Steps

Public Survey Updates

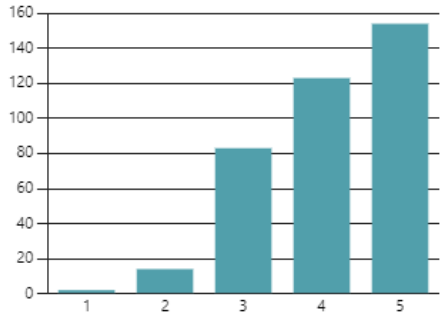
379 responses so far

Concern about future hazard events is relatively high

4. On a scale of 1-5, how concerned are you about the possibility of your community being impacted by a hazard event?

More Details Insights

4.10
Average Rating



2. Have you ever experienced or been impacted by a hazard or disaster in the Outer Banks Region?

More Details Insights

Most respondents who have been impacted by a hazard report that they have taken steps to protect their home or neighborhood

At least half of reported hazard experiences are related to hurricanes

3. If you answered "Yes" to question 2, please explain your experience and where it occurred.

More Details Insights

200
Responses

Latest Responses

"Hurricanes. Corolla. Short power outages. Corolla."

"Overwash on NC12"

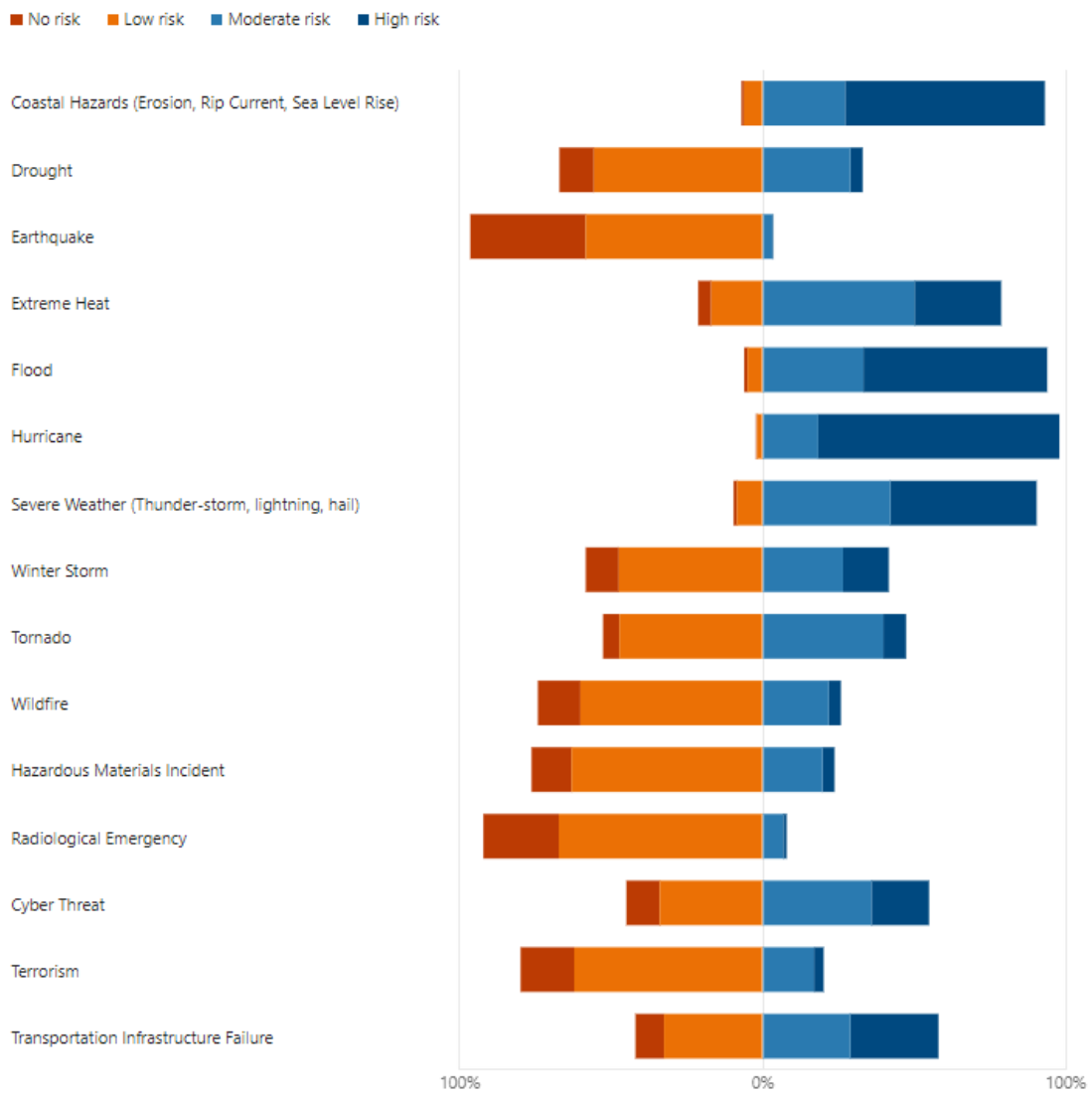
"Owned an oceanfront house in Duck for 20 yrs . Sold in 2020 . We lost most of ...

97 respondents (**49**%) answered **hurricanes** for this question.

Public Survey Updates

Public input on hazard rankings align with PRI findings:

- Hurricane & coastal hazards, flood, extreme heat, and tornadoes/thunderstorms are high & moderate priority hazards
- Earthquake and radiological emergency are low priority hazards



What's Next

HMPC Action Items:

- Provide any critical facility updates to WSP team by Friday, Sept. 6th
- Review existing mitigation action plans and prepare status updates for each action

WSP Action Items:

- Post updated draft HIRA on plan website for review by Friday, Sept. 13th
- Schedule next HMPC meetings for October

Thank you

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