
Critical Information for a Critical Decade

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U.S. Department of Commerce

Keeping History Above Water

Portsmouth, NH

May 9th, 2023



Outline

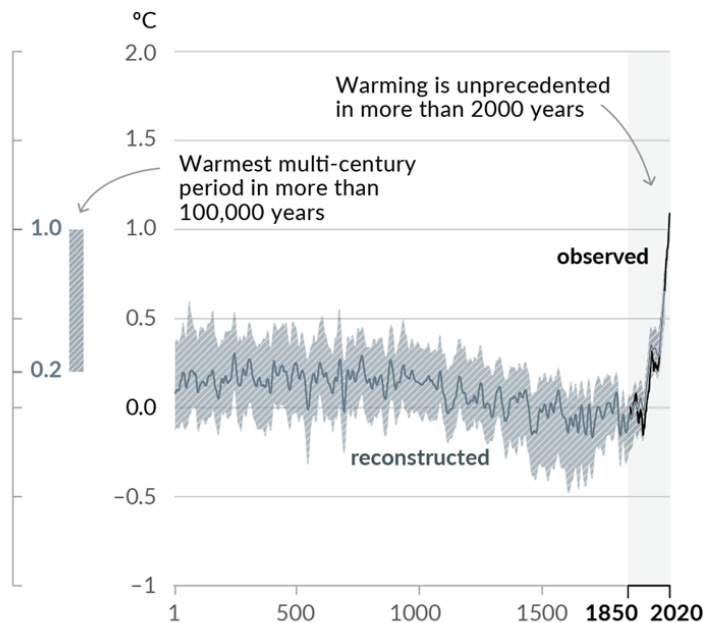
- Our Changing Climate
- NOAA's Role
- Sea Level Rise Science and Services
- Looking Forward



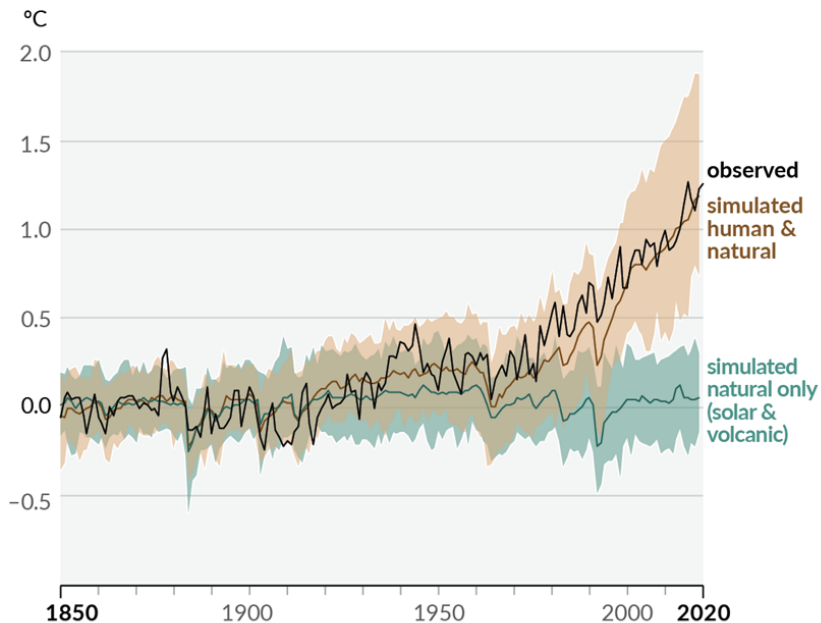
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

Changes in global surface temperature relative to 1850–1900

(a) Change in global surface temperature (decadal average) as **reconstructed** (1–2000) and **observed** (1850–2020)



(b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850–2020)



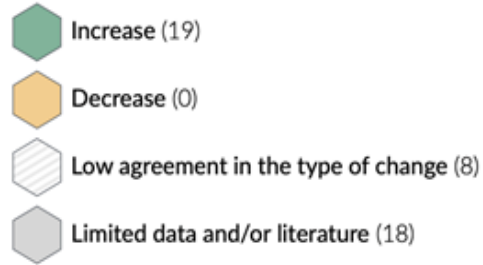
And it is not only about temperature...

- Climate change is intensifying the **water cycle**
- Climate change is affecting **rainfall patterns**
- Coastal areas will see continued **sea level rise** throughout the 21st century
- Warming will amplify **changes to snow and ice**
- Changes in the **ocean**
- For **cities**, some aspects of climate change may be amplified

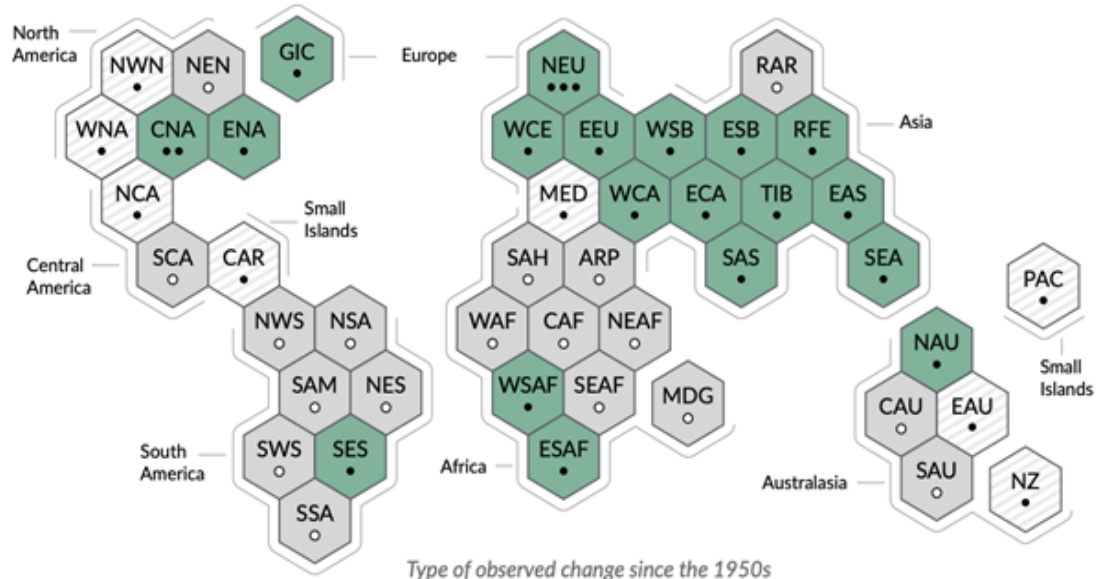
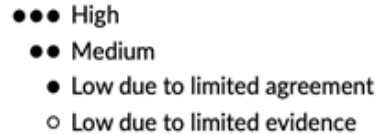
Precipitation - heavy (IPCC)

b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions

Type of observed change in heavy precipitation



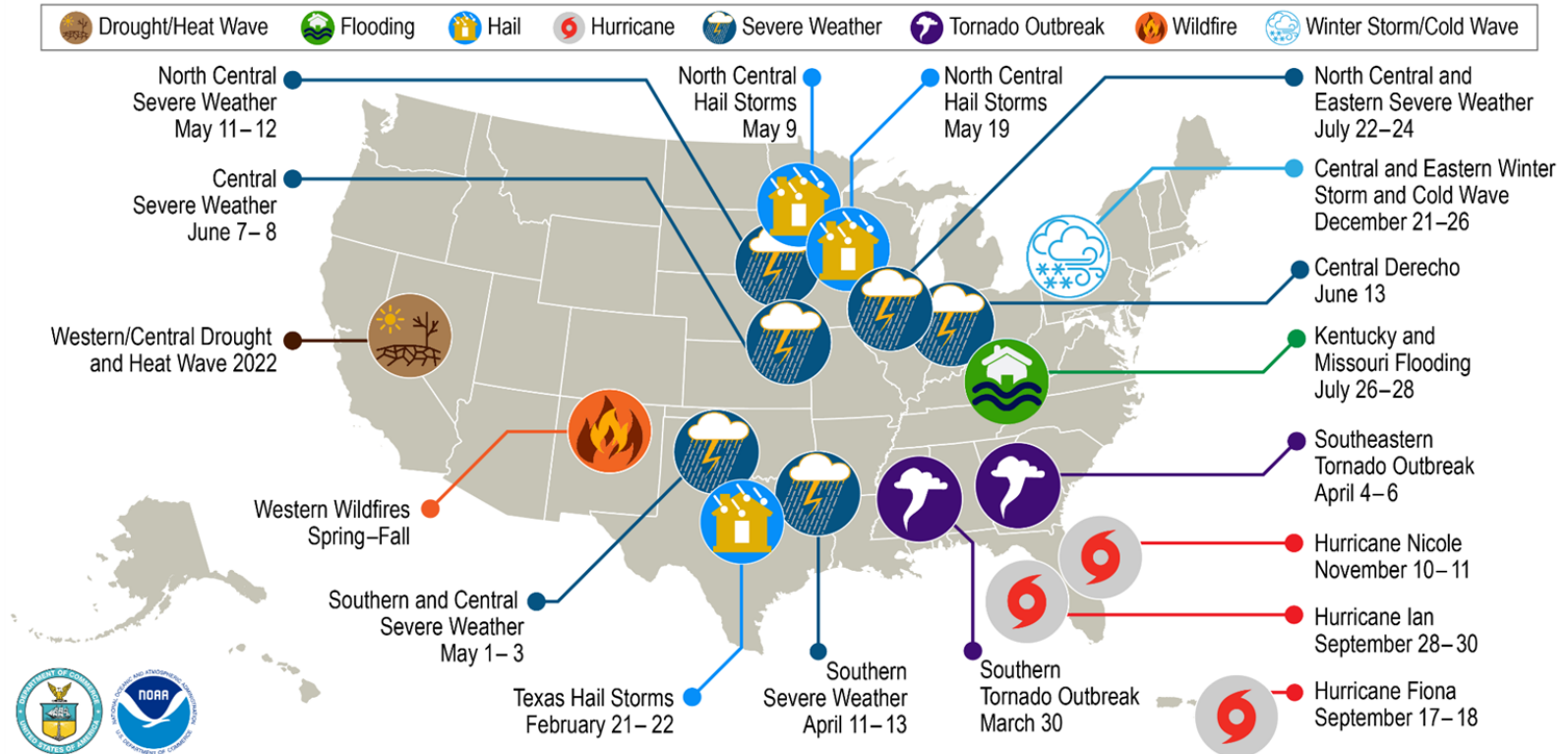
Confidence in human contribution to the observed change



Type of observed change since the 1950s

Cost of weather and climate disasters

U.S. 2022 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the 18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.

NOAA's Role in Provision of Climate Services

An aerial photograph of a coastline, showing a wide river delta or estuary with intricate channel patterns. The water is a deep blue, and the land is a lighter, sandy or silty brown. In the upper left, a sandy beach is visible with several birds, possibly terns, standing on it. The overall scene is captured from a high angle, looking down at the natural landscape.

NOAA Priorities

Science, Service, and Stewardship



Climate

Establish that NOAA is the primary authoritative source for climate products and services that can be applied to a diverse range of missions, just as we are for weather.



Balance

Advance NOAA's complementary work on environmental stewardship and economic development with a particular focus on the New Blue Economy.



Equity

Exhibit equity in how we build and provide services. Within NOAA, we will promote diversity, equity, inclusion and accessibility in the workforce. Externally, we will provide equitable access to our products and services.

[NOAA FY22-26 Strategic Plan](#)



Building a Climate Ready Nation by 2030

A thriving Nation whose prosperity, health, security, and continued growth benefit from and depend upon a shared understanding of, and collective action to reduce, the impacts of climate change

Climate Ready Nation: Initial risk and focus areas



Fire



Drought



Flood



Heat



Coasts



Marine Resources

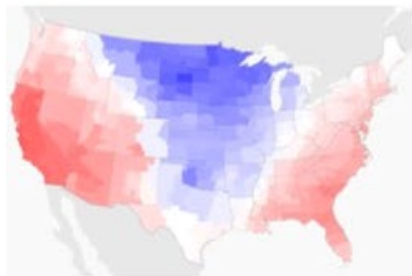


Mitigation

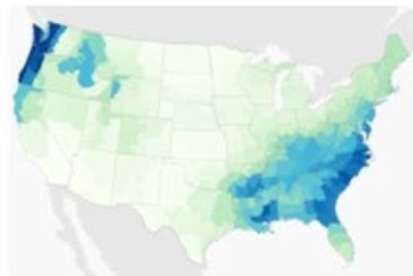


Climate.gov

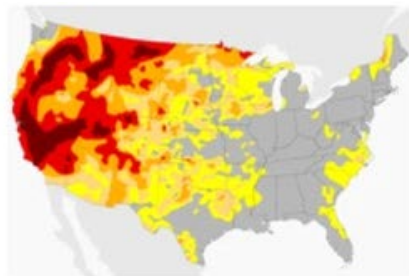
SCIENCE & INFORMATION FOR A CLIMATE-SMART NATION



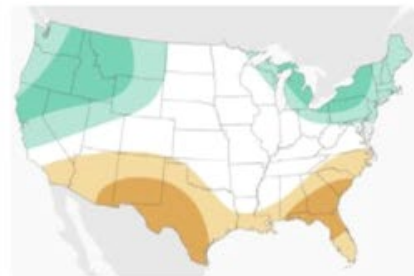
Temperature



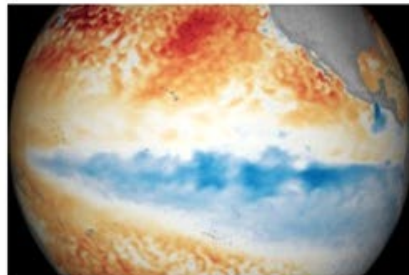
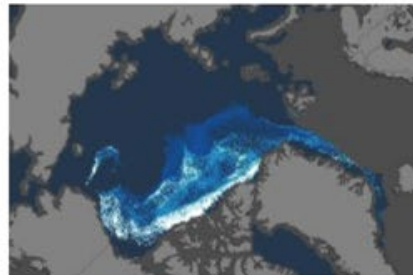
Precipitation



Drought



Outlooks



The USCRT's 5 'Steps to Resilience'

A co-production of knowledge process that synthesizes information from multiple sources to...



1 EXPLORE HAZARDS

Identify & map exposure of all valued assets to climate-related hazards.



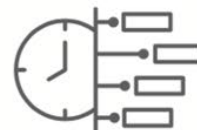
2 VULNERABILITY & RISK

Assess vulnerability & risk for all valued assets threatened by climate hazards. Rank most urgent threats to address.



3 OPTIONS

Brainstorm & list all options for reducing risks.



4 PRIORITIZE & PLAN

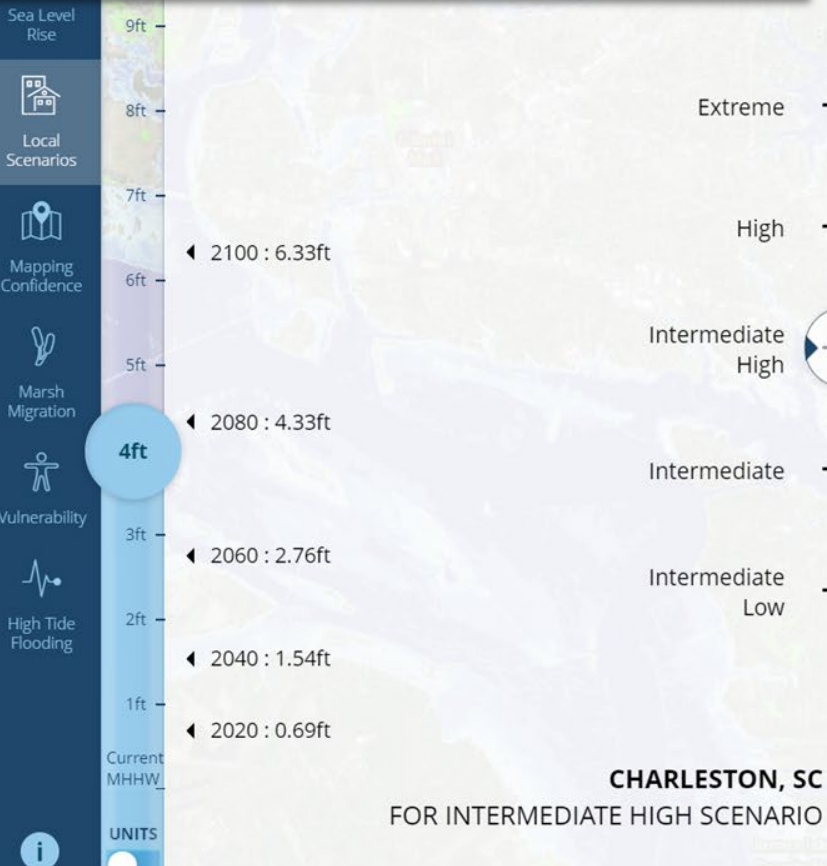
Rank options based on BCR assessment, select options to implement, define success metrics, & make an action plan.



5 TAKE ACTION

Obtain funds, implement plan, monitor results, iterate as needed, & report progress & outcomes.

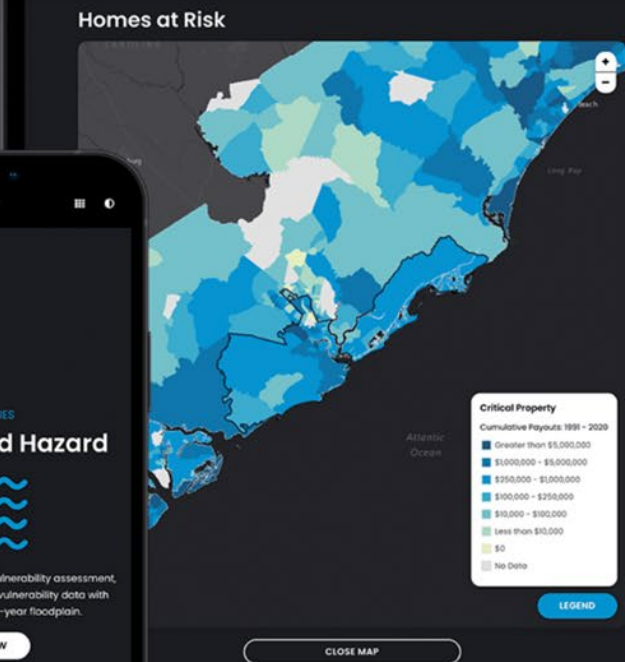
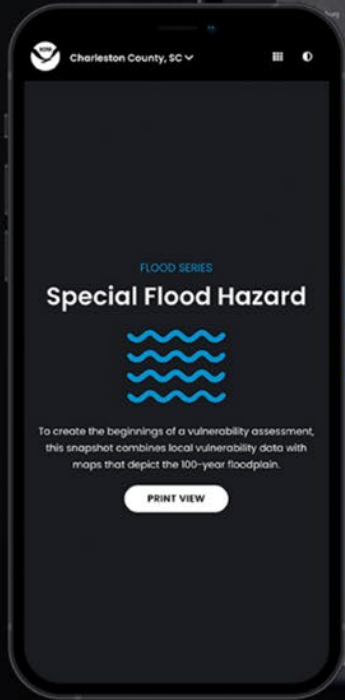
Digital Coast: SLR Viewer



CHARLESTON, SC
FOR INTERMEDIATE HIGH SCENARIO



Digital Coast: Coastal County Snapshot



Fast Fact

\$118m total value of 8,091 flood insurance claims in Charleston County between 1991 and 2020.



Data Source

FEMA (NIP) 2020



Funding Resilience

- National Coastal Resilience Fund
- Coastal Zone Mgmt (CZM) Grants
- National Estuarine Research Reserves (NERR) Grants
- Sea Grant
- Competitive Research Grants
- RISA Climate Adaptation Partnerships



Infrastructure Law: Climate ready coasts

\$1.467 billion: Helping coastal communities build the future they want to see. Investing in high-impact natural infrastructure projects that build coastal resilience, create jobs, store carbon, and restore habitat.

Includes provisions:



Coastal zone management



Habitat restoration



Marine debris - National Ocean Service



Marine debris - National Sea Grant College Program



National Estuarine Research Reserve System



National Oceans and Coastal Security Fund

Infrastructure Law: Climate data and services

\$904 million: Supporting a whole-of-government effort to address the climate crisis by getting critical information in the hands of decision-makers.

Includes provisions:



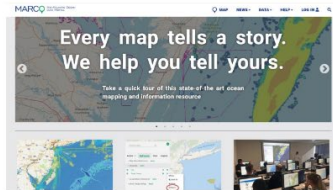
Flood and inundation mapping and forecasting



Ocean and coastal observing systems - National Ocean Service



Ocean and coastal observing systems - National Weather Service



Regional Ocean Partnerships



Research supercomputing



Soil Moisture and Snowpack Pilot Program



Water Resources Development Act data acquisition



Wildfire research operations



Wildfire infrastructure

Inflation Reduction Act

- **Inflation Reduction Act of 2022**
(H.R.5376)
 - **Section 40001** - Coastal resilience @ \$2.6B
 - **Section 40004** - Climate data and services @ \$100 M



Credit: Jennifer Dubois / 2023 Rising Tides Photo Contest, Picturing Resilience – Atlantic Coast Winner

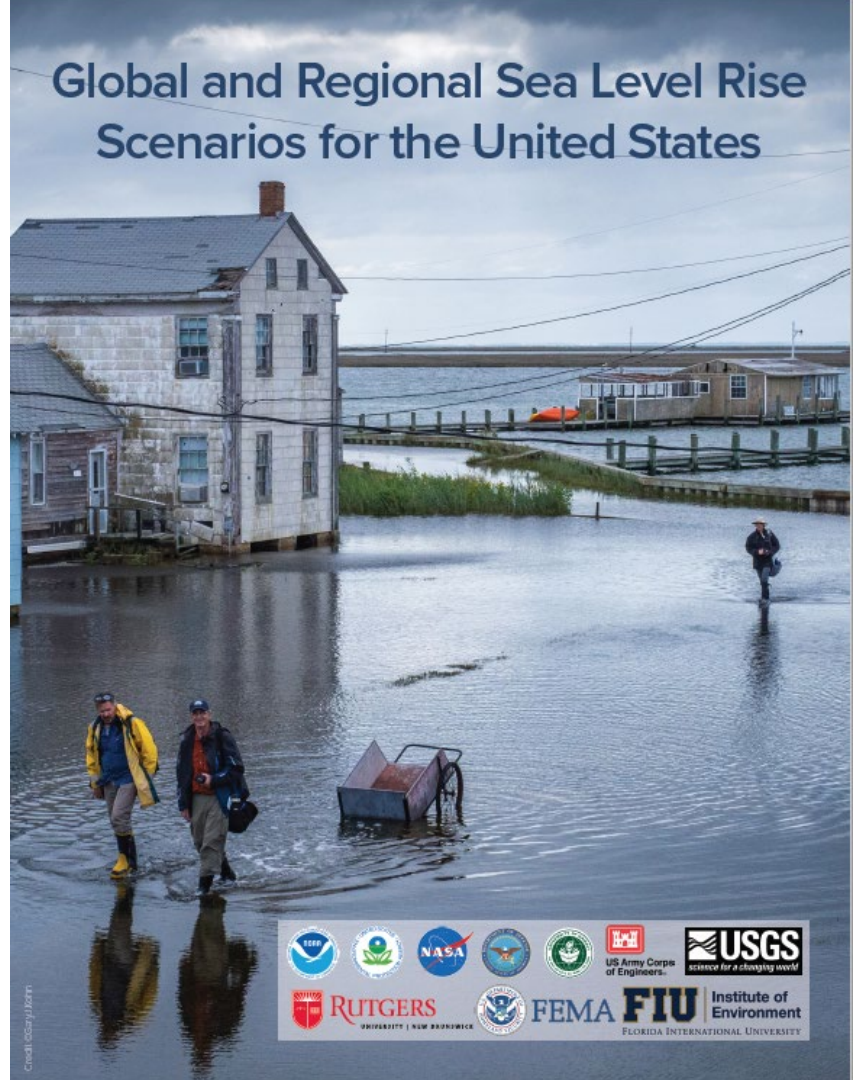
Sea Level Rise Science and Services

An aerial photograph of a coastline, showing a wide river delta or estuary with intricate channel patterns. The water is a deep blue, and the land is a lighter, sandy or silty brown. In the upper left, a sandy beach is visible with several birds, possibly terns, standing on it. The overall scene is captured from a high angle, looking down at the natural landscape.

Recent Achievements

Interagency Sea Level Rise Technical Report

- Whole-of-government approach
- Towards sealevel.coasts.gov



Recent Achievements

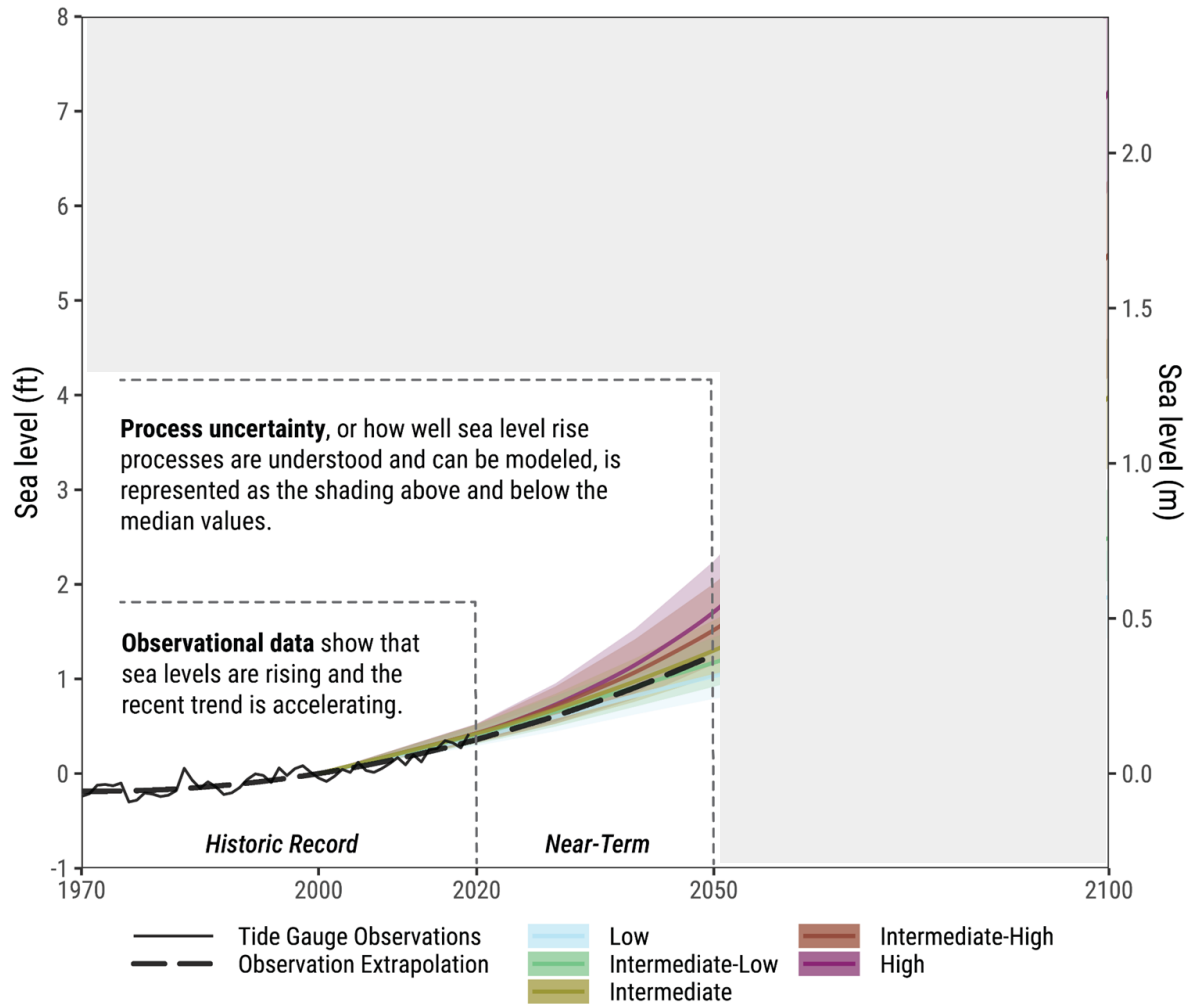
Application Guide for the 2022 Sea Level Rise Technical Report

- First of its kind effort to bridge between updating the science and serving practitioner needs
- Geographically diverse author team:
 - Technical report authors
 - Extension experts
 - External reviewers



Marine Extension and
Georgia Sea Grant
UNIVERSITY OF GEORGIA





High Tide Flooding

- Occurs when water levels exceed the daily high tide mark, typically 1.75 to 2 feet above **Mean Higher High Water (MHHW)**.
- This level of flooding is defined as the **minor flooding threshold**, but often leads to the most **significant, persistent and damaging impacts**.
- Also referred to as ***nuisance, sunny day, or King Tide*** flooding.
- **More common** due to years of **Sea Level Rise**.
- Impacts are further influenced by **new and full moon** events, **perigean cycles**, or periodic **weather patterns**.



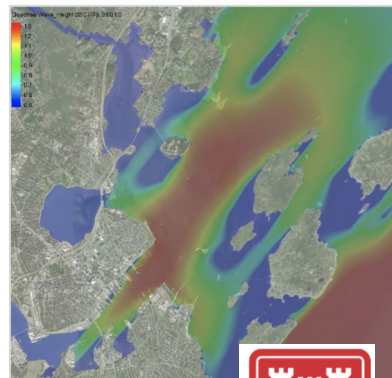
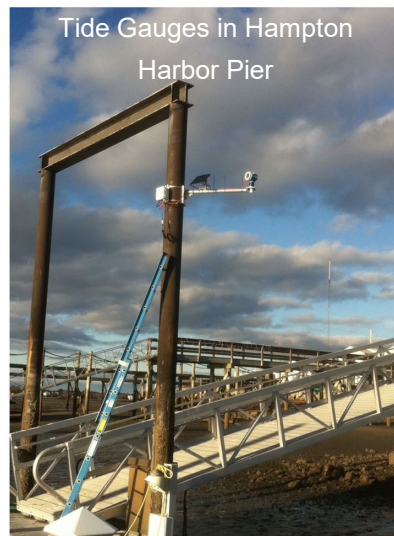


Credit: Rick Cliche / 2023 Rising Tides Photo Contest
Picturing Change – Atlantic Coast Winner

Efforts Underway

- **Tide Stations**
- **Community-Based Water Level Monitoring** NERACOOS, GMRI, NWS, NROC, US Harbors
- **Coastal Flood Risk Modeling** Silver Jackets

<https://drive.google.com/file/d/1Eo7hRZ1m mmm2vMvCEhmMb5d-9vwOZZJM/view>

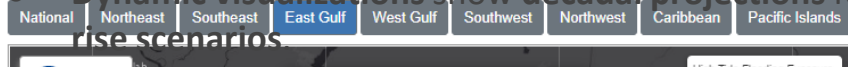


Ongoing NOAA Updates: High Tide Flooding

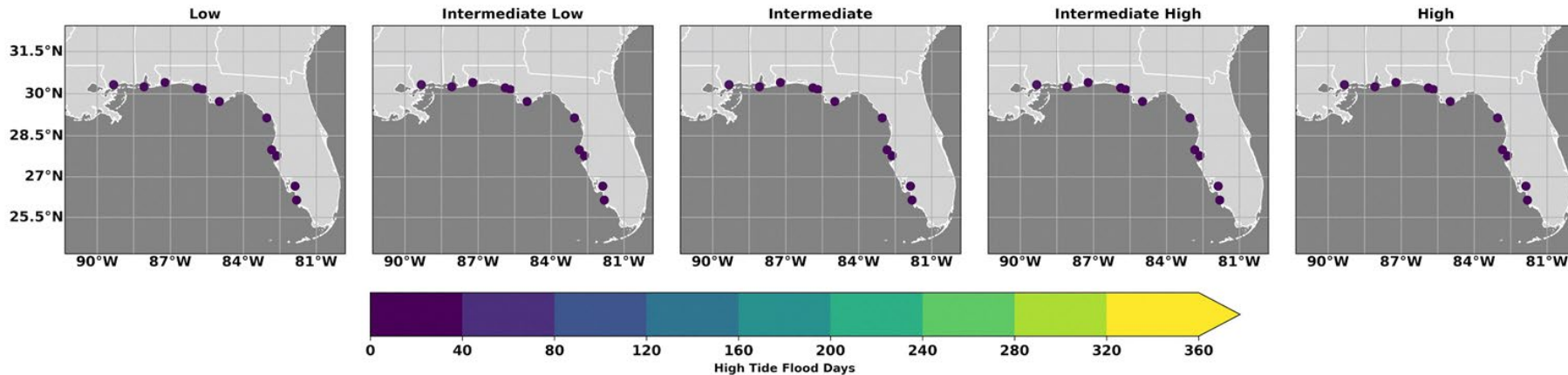
- Dense text become **organized attribute tables**.
- **Impact graphics** show the ways high tide flooding can impact regional landmarks.
- **Dynamic visualizations** show **decadal projections** for **regional high tide flooding based on updated sea level rise scenarios**

East Gulf State of High Tide Flooding & 2022 Outlook

This region of coastline is routinely impacted by severe weather that often contributes to flood events. Coupled with land subsidence and sea level rise, high tide flooding events are more frequent. This year's outlook predicts fewer flood events due to Earth's place at the furthest proximity from the moon in the Perigean cycle. Though this year's outlook is moderate, the eastern Gulf region has seen an almost 200% increase in high tide flooding events since



Eastern Gulf Projected Decadal High Tide Flooding: 2020



Seasonal Bulletin vs. Monthly Outlook

	Seasonal NOS High Tide Bulletin	HTF Monthly Outlook
Format	Text	Geospatial + Calendar + Text
Update frequency	Quarterly	Monthly
Timespan	3 months	1 year
Focus	Regional	NOS HTF stations
Delivery	NOS news webpage	HTF webpage + Coastal Inundation Dashboard + APIs

High Tide Flooding Monthly Outlook

Discover when and where you may experience above normal high tides in the next year.

Region Select: **Northeast** ▼ Month Select: **March** ▼ Map: **ON**

Map Legend:

- Gray
- Dark Gray
- Streets
- Minor Flood Layer

Flood Likelihood:

- 0-5%
- 5-50%
- 50-100%

Map Footer: Leaflet | Powered by Esri | Austin Community College, Baylor University, Boston College Campus GIS, CSU Mont...

Region: **Northeast** Station: []

Northeast

Why Will The Tide Be Higher Than Normal?

'A perigean spring tide will occur. This is when the Moon is either new or full and closest to Earth. Higher than normal high tides and lower than normal low tides will occur.'

What kind of impact might I expect along the coast?

Some locations along the Northeast coast will have their highest tides of the year. Low lying areas may flood, however high tides alone will likely not cause a significant impact on the coast in most areas unless accompanied by a storm or strong winds. Lower than normal low tides will also occur.

Visit the NOAA Coastal Inundation Dashboard for this region to view real-time water levels with forecasts out to 48 hours

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Leaflet | Powered by Esri | Austin Community College, Baylor University, Boston College Campus GIS, CSU Mont...

Region: **Bar Harbor [8413320]** | Station: **Bar Harbor [8413320]** | Station Links

Calendar Toggle: **On/Off**

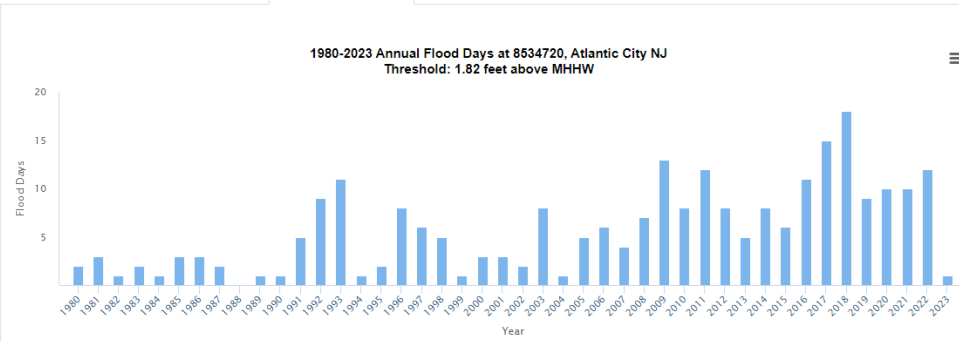
March

Su	M	Tu	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

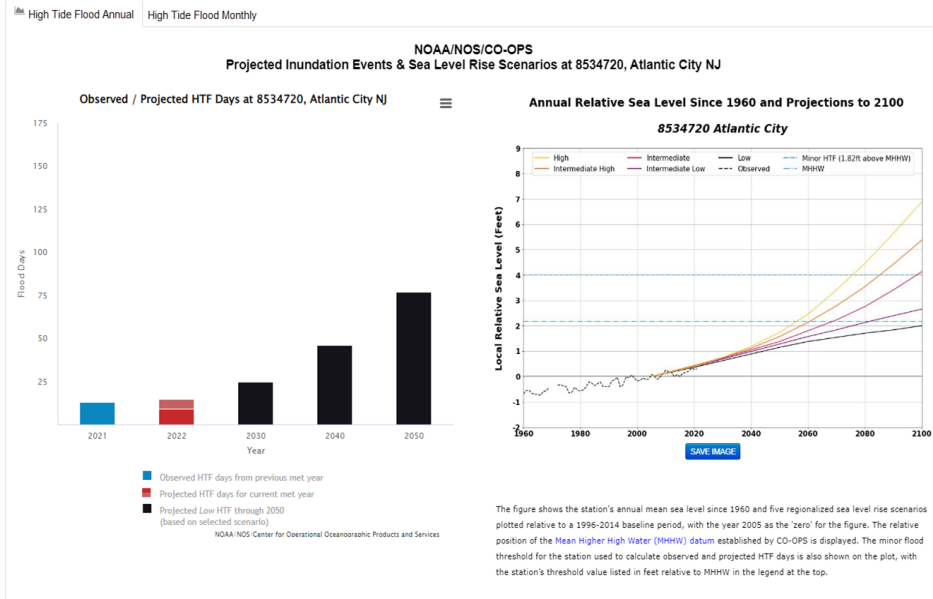
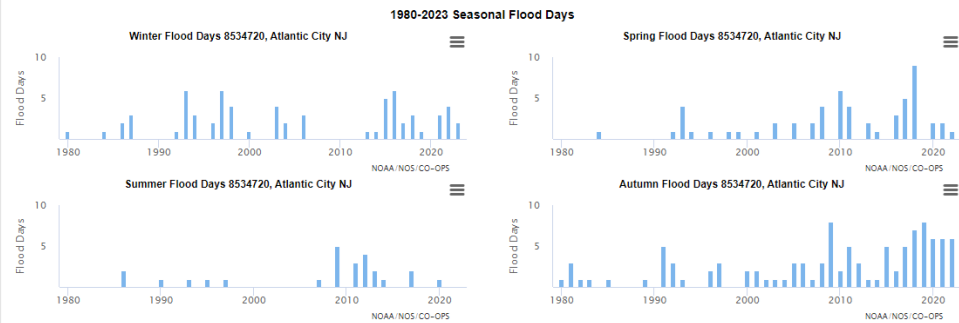
January, February, March, April, May, June, July, August, September, October, November, December

Historic Tracking and Projections

[Water Level Data](#)
[Meteorological Data](#)
[Historical Flood Days](#)
[Top-10 Water Levels](#)
[Sea Level Trend](#)
[Exceedance Probabilities](#)



Click any year above to view monthly and daily high tide flood days.



Likely Decadal HTF Range in 2050 - Low - Intermediate (75 to 110 days) ⓘ
 Select sea level rise scenario to view projected 2030 - 2050 HTF days:

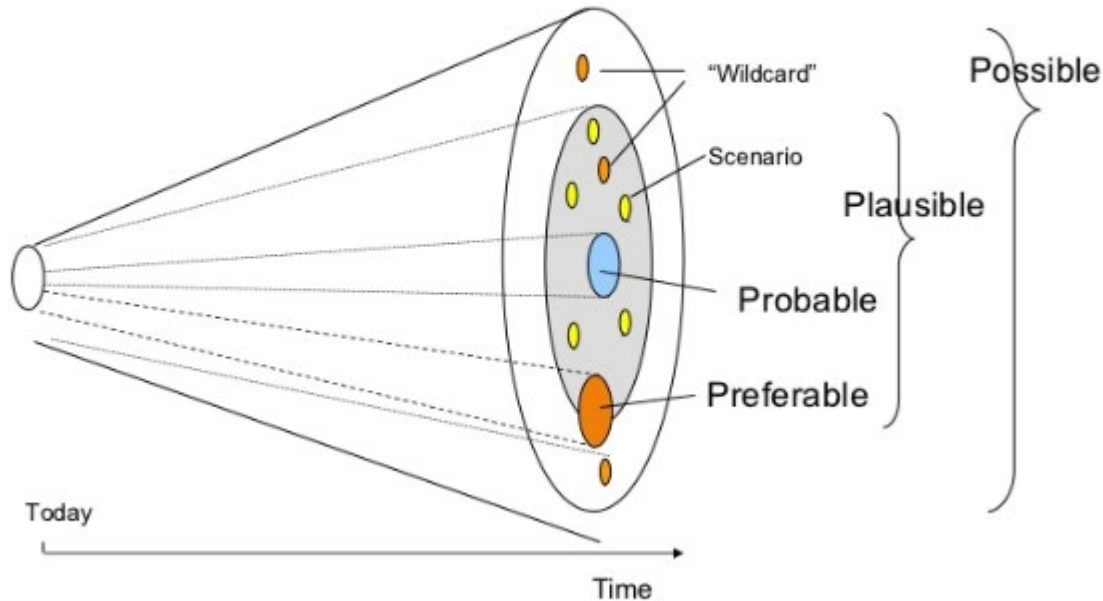
Historical Flood Statistics

Observed & Projected Flood Frequency

Looking Forward

An aerial photograph of a coastline, likely a river delta or estuary, with a prominent channel of water flowing through a sandy area. The water is a deep blue, and the sand is a lighter, textured brown. In the upper left, a small beach area is visible with several birds, possibly terns, standing on the sand. The overall scene is captured from a high angle, looking down at the landscape.

Types of Futures



- **POSSIBLE** – *might* happen in the future (future knowledge)
- **PROBABLE** – *likely* to happen in the future (current trends)
- **PREFERABLE** – *want* to happen in the future (value judgment)

Current State of Play

June 5, 2018

May 7, 2019

An aerial photograph showing a large-scale flooding event. In the foreground, a dam with multiple spillways is releasing a massive volume of water, creating white, turbulent rapids. The water flows into a wide river that has inundated a densely populated town in the background. The town's buildings, trees, and streets are almost entirely submerged in murky, brown water. A prominent long building with a red roof is visible on the right side of the flooded area. The overall scene conveys a sense of significant environmental impact and potential danger.

—
Here's What Keeps Me Up at Night

Taking Inspired Action

A wide-angle photograph of a coastal landscape. On the left, the ocean's edge is marked by gentle waves and white foam washing onto a sandy beach. The beach is heavily marked with numerous parallel and crisscrossing tire tracks, suggesting a vehicle has driven along the shore. To the right of the beach, the terrain rises into a dune area covered with sparse, green coastal vegetation. The sky is a clear, bright blue with a few wispy white clouds scattered across it. The overall scene is bright and open, conveying a sense of freedom and natural beauty.



Thank You

Mark Osler

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and Resilience**

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U.S. Department of Commerce



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