Agenda

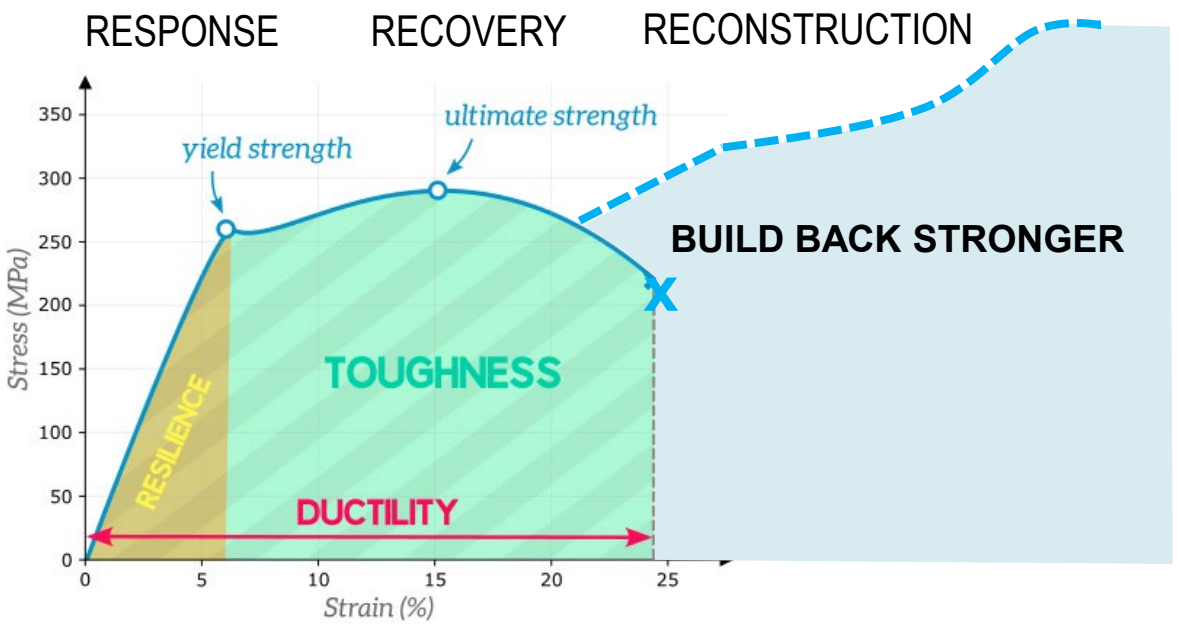
- Introduction
- Learning Objectives
- Response
- Recovery
- Reconstruction
- Summary

Introduction

Stress & Strain

Reconstruction after disaster reflects aspects of the Classic Engineering Stress-Strain Curve.

- Don't want to get to Failure
- Resilience
- Toughness
- Ductility
- Build Back Stronger



Strength, ductility, toughness and resilience represented on a stress-strain curve

https://efficientengineer.com/material-strength-ductility-toughness/

Learning Objectives

1. **Gain awareness of the differences between Response, Recovery, and Reconstruction.**
2. **Improve understanding of the National Response Framework (NRF) and National Disaster Recovery Framework (NDRF).**
3. **Build back stronger and more resilient.**
4. **The next disaster won't be like the last one. Invest in Emergency Planning and Preparedness.**

Using Examples of Recent Events:
-2005 Hurricane Katrina – New Orleans, LA
-2012 Superstorm Sandy – New York NY
-2017 Hurricane Harvey – Houston, TX

Response

National Response Framework

Fourth Edition
October 28, 2019

Homeland Security

Response Phase Priorities:

a. Save Lives
b. Protect Property and Environment
c. Meet Basic Human Needs
d. Prioritize Operations to Stabilize Community Lifelines:

e. Restore Basic Services
f. Establish a safe, accessible environment for responders.
g. Support Transition to Recovery
h. Time Frame: Days, not Weeks.

Response

Emergency Support Functions:

ESF 1 – Transportation
ESF 2 – Communications
ESF 3 – Public Works and Engineering
ESF 4 – Firefighting
ESF 5 – Information and Planning
ESF 6 – Mass Care, Emergency Assistance, Temporary Housing, & Human Assistance
ESF 7 – Logistics
ESF 8 – Public Health and Medical Services
ESF 9 – Search and Rescue
ESF 10 – Oil & Hazardous Materials Response
ESF 11 – Agriculture & Natural Resources
ESF 12 – Energy
ESF 13 – Public Safety and Security
ESF 14 – Cross-Sector Business & Infrastructure
ESF 15 – External Affairs

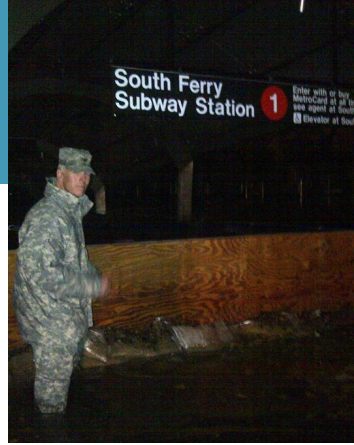
Key Tasks in ESF 3:

- Pre and Post Incident Assessments
- Emergency Repair of Critical Infrastructure
- Restore Navigation, Flood Control
- Emergency Response Support for
- Temporary Emergency Power for Critical Infrastructure
- Debris Removal
- Temporary Housing
- Temporary Roofing – “Blue Roof” Program
- Other Missions as Assigned: Unwatering

Response: Hurricane Katrina

2005 Hurricane Katrina: Emergency Levee Repairs Completed in Days.

Response: Superstorm Sandy

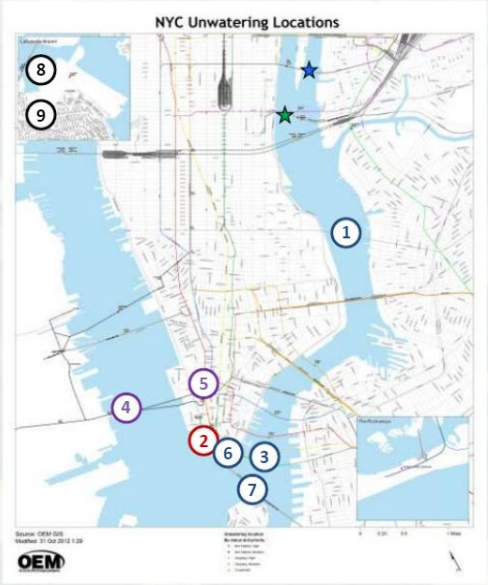


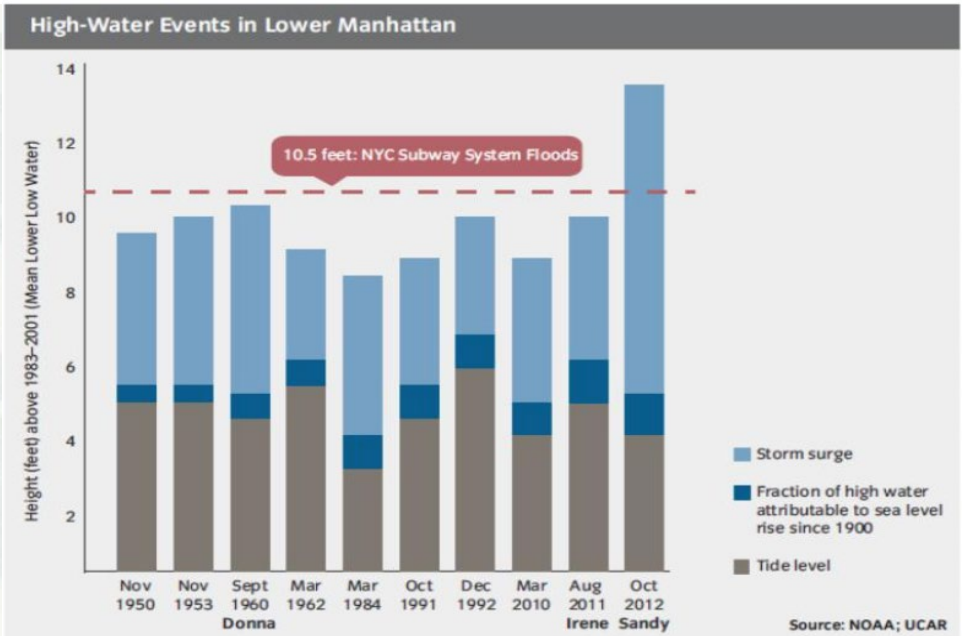
- **Pumped 760 million gallons of water from 14 tunnels in NYC in 13 days.**
- **Restored Navigation in 5 days.**

New York City
Unwatering Locaons

The U.S. Army Corps of Engineers worked with and supported various partners to unwater approximately 470 million gallons from 14 locations in 13 days to help the city restore critical infrastructure immediately following Hurricane Sandy. Here are some of the figures for amounts of saltwater removed via Task Force Unwatering:

	Asset Unwatered	Est. Water Removed	Owners/ Partners
1	14th Street Tunnel (L)	3.5 million gallons	MTA
2	Battery Park Underpass	57 million gallons	NYC DOT
3	Montague St. Tunnel (N R)	60 million gallons	MTA
4 5	PATH Train and WTC work site	20 million gallons	PANYNJ
6	South Ferry Station (1) (N R)	20 million gallons	MTA
7	Brooklyn-Battery Tunnel	86 million gallons	MTA
8	Amtrak Kearny Substation	40 million gallons	AMTRAK
9	Passaic Valley Wastewater Treatment Plant	200 million gallons	Passaic Valley Sewerage Commission

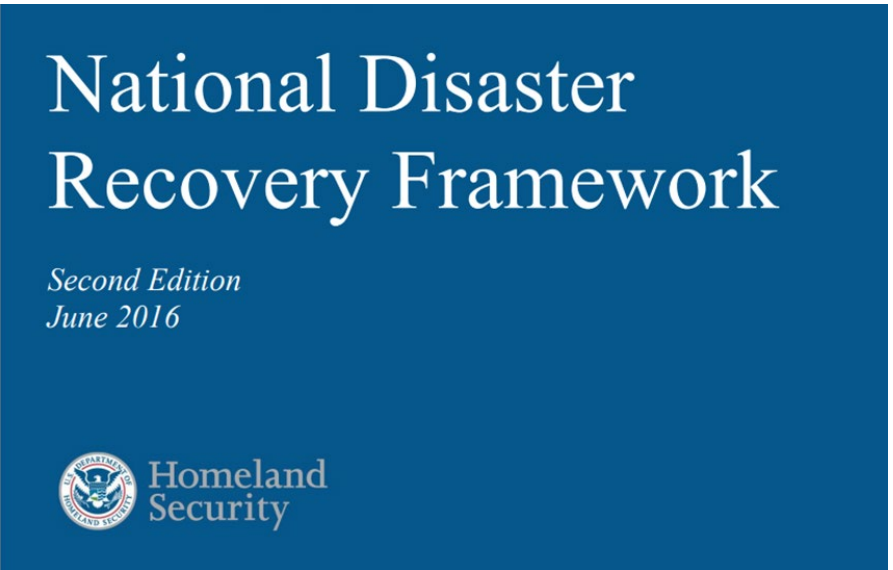




Response: Hurricane Harvey

- **Navigation Restoration along the Texas Coast**

Recovery

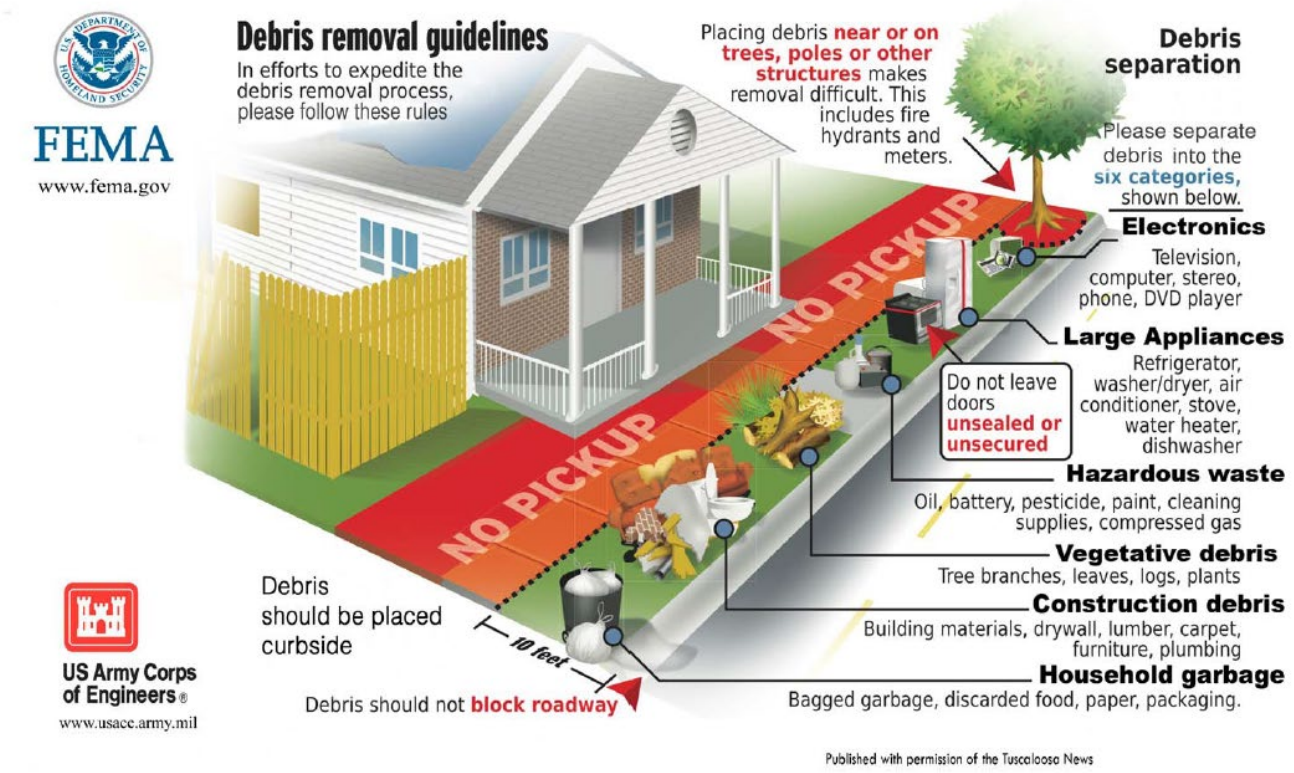


ESF 3 translates to Infrastructure Systems Recovery Support Functions

a. Return to Normalcy
b. Recovery includes the restoration and strengthening of key systems and resource assets that are critical to the economic stability, vitality, and long-term sustainability of the communities themselves.
c. Time Frame: Months, not Years.

Recovery: Hurricane Katrina

- **Debris Removal – Right of way cleared during Response Phase; “Return to Normalcy” in 18 months.**
- **-72 million cubic yards (18 Superdomes).**

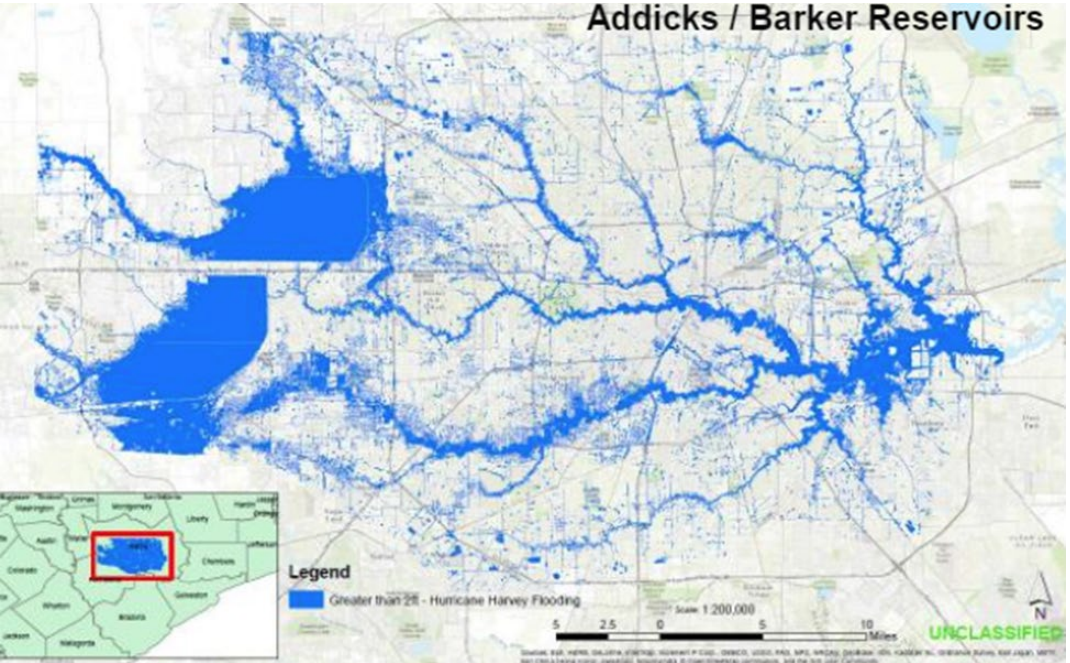


Recovery: Superstorm Sandy

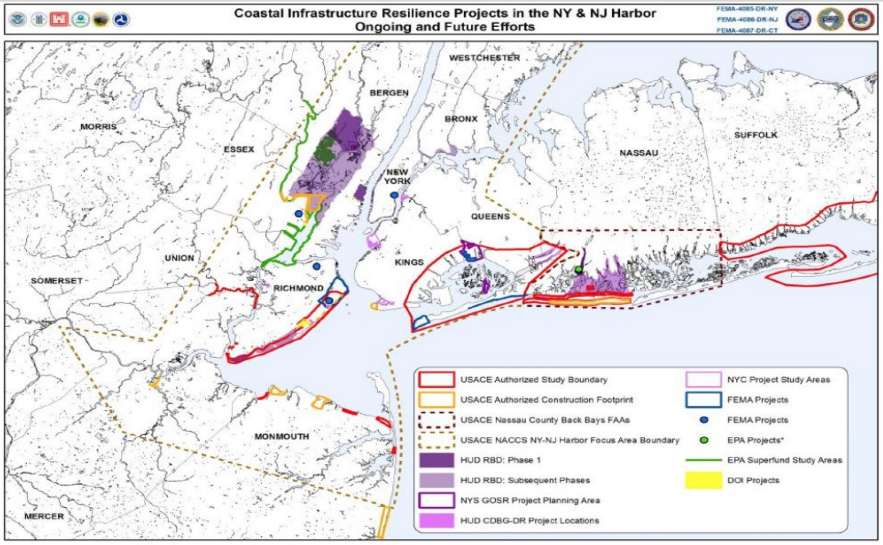
- **Restored Coastal Storm Risk Reduction by placing over 7 million cubic yards of sand on New York and New Jersey Beaches in 22 months;**
- **Emergency Repairs of Breaches on Barrier Islands**

Recovery: Hurricane Harvey

- **Efforts led by Texas to remove Debris.**
- **Minimize damage from Flood Control**



Reconstruction



*There are approximately 130 EPA SRF projects throughout the region.
**Map shows USACE currently planned projects or projects undergoing construction.
Existing/Constructed USACE projects are not displayed on this map.

a. Collaborate with ALL Stakeholders. Attempt to build consensus.
b. Anticipate Future Conditions
    a. Population Growth / Density
    b. Sea-Level Rise
    c. Climate Change
c. Build Back Stronger
d. Urgency Fades with time.
e. Consider alternatives and evaluate:
    a. Technically Feasible
    b. Economically Justifiable
    c. Environmentally Sustainable
    d. Consider Other Social Effects
f. Time Frame: Years, not Decades, but could be Decades.

Reconstruction: Hurricane Katrina

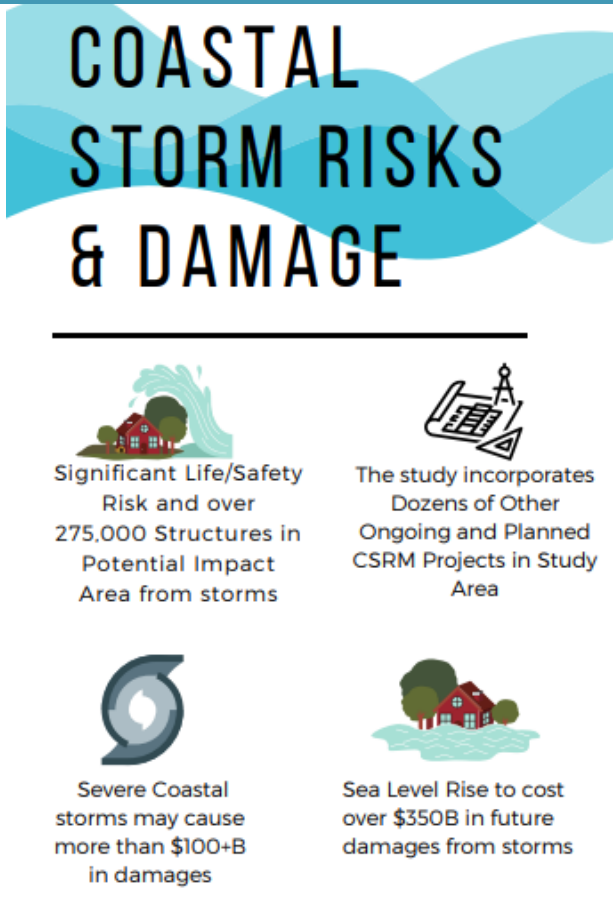
Hurricane & Storm Damage Risk Reduction System (HSDRRS) substantially complete in 2012.

Approximate Construction Costs: $14.6B

Efforts ongoing . . .

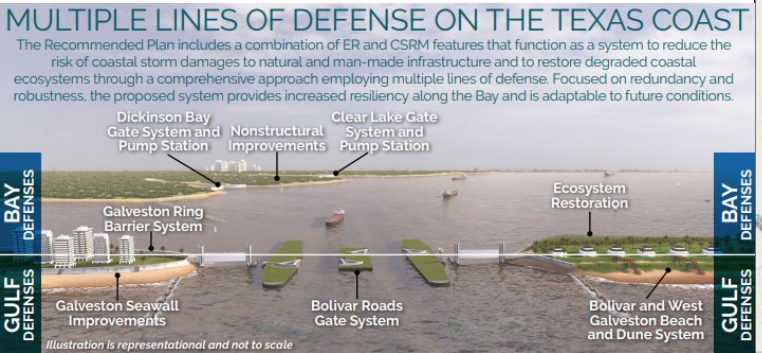
Reconstruction: Superstorm Sandy

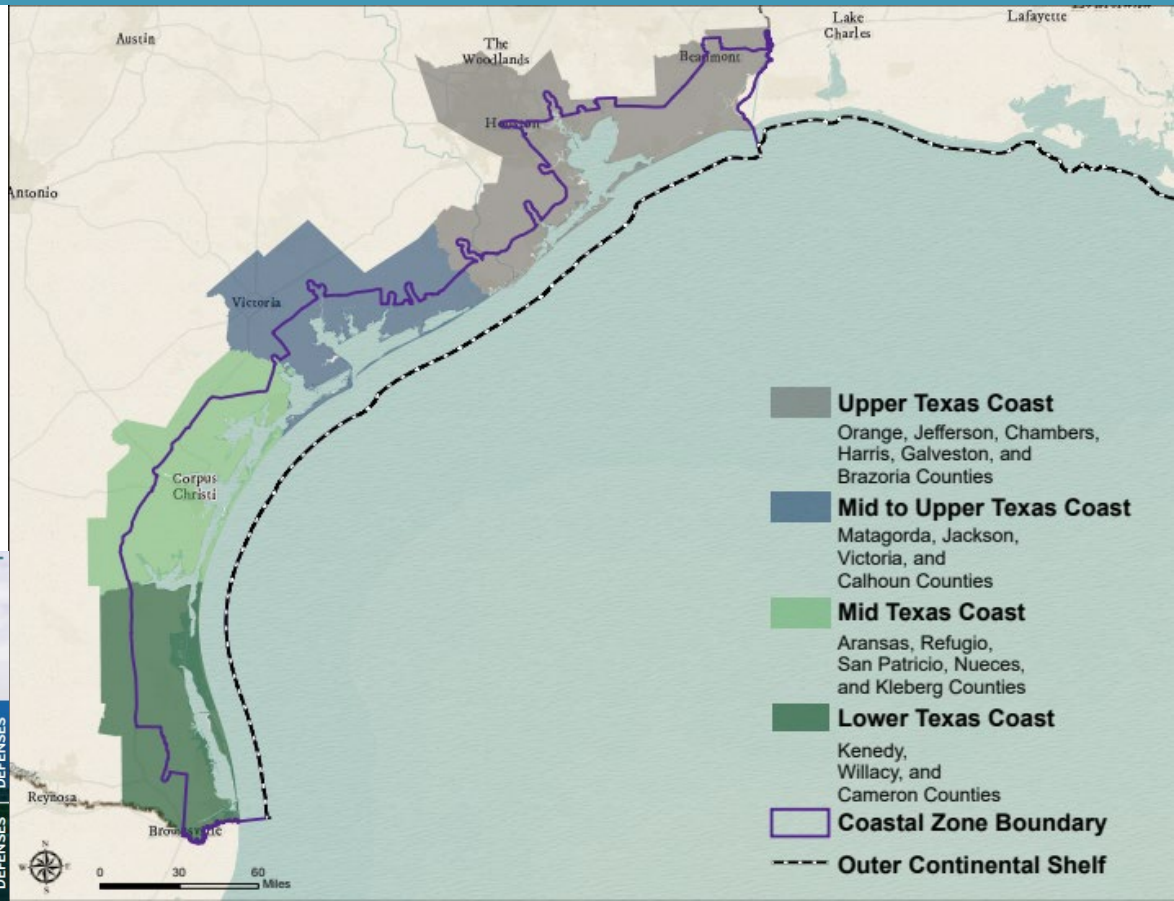
- **2012 Superstorm Sandy: Efforts on-going.**
- **New York / New Jersey Harbor and Tributary Study**
- **Estimated Construction Costs: $52B.**
- **Status: Study ongoing. Estimated completion in June 2024.**
- **Construction Appropriate and Authorization to follow.**



Reconstruction: Hurricane Harvey

- **Efforts on-going. Texas Coastal Study Complete.**
- **Pending Construction Start. Estimated Construction Costs: $36B.**
- **10-15 years to complete**





Summary

- Unity of Command vs. Unity of Effort – "Unified Coordination"
- Combination of Government and Private Industry
- Resiliency Starts with Preparedness.
  - Know your critical infrastructure.
  - Conduct Periodic Assessments.
  - Conduct Planning Exercises with Key Stakeholder
- Make a Friend before you need a Friend.

Great Chicago Fire – October 8-10, 1871
-Randolph Street Bridge
Currier & Ives Lithograph

The next disaster won't be like the last one.

Great Chicago Flood – April 13, 1992
-Merchandise Mart
Photo Credit: Chicago Tribune

Remembering Great Chicago Flood of 1992 30 years later - ABC7 Chicago

Questions?