WELCOME

**U.S. Army Corps of Engineers
Galveston District**

**Summer Stakeholder Partnering Forum
August 23, 2023**

Nexus of Communities and Flood Risk Management

US Army Corps of Engineers®

WELCOME AND OPENING STATEMENT

BYRON WILLIAMS

Deputy District Engineer, Programs and Project Management

U. S. Army Corps of Engineers

Galveston District

STAKEHOLDER WELCOME AND OPENING REMARKS

COL. RHETT A. BLACKMON
District Commander

U. S. Army Corps of Engineers
Galveston District

INTEGRATED CATCHMENT MANAGEMENT

CLAIRE NEALE

Service Line Director
Nature Based Solutions at Atkins
(London based)
Engineering a better future for our planet and its people

World-class global expertise delivered locally

We are strongly positioned with a leading presence across Canada, the U.S. and the U.K., as well as targeted operations in Europe, the Middle East, Asia Pacific, and Latin America.

OUR WORKFORCE

Over **31,000 employees**

Speaks over **70 languages**

Represents over **130 nationalities**

CANADA

U.S.

LATIN AMERICA

EUROPE

U.K.

ASIA PACIFIC

MIDDLE EAST

Through a market and customer driven approach

Primary focus on the built and natural environment across seven clearly defined end markets.
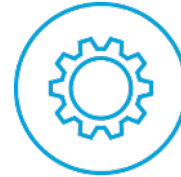
TRANSPORTATION

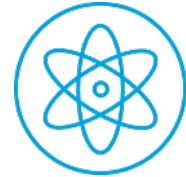Rail and Transit, Road and Bridges, Aviation and Ports

BUILDING & PLACES

Social Infrastructure, Commercial and Residential Property, Urban Development

INDUSTRIAL & MINING

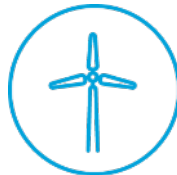Pharma, Agri-food, Data Centres, Industrial, Life Sciences, Mining and Metallurgy

NUCLEAR

Waste Management and Decommissioning, Reactor Support, New Build

WATER

Water Utilities, Industrial Water Users, Water Resource Management

POWER & RENEWABLES

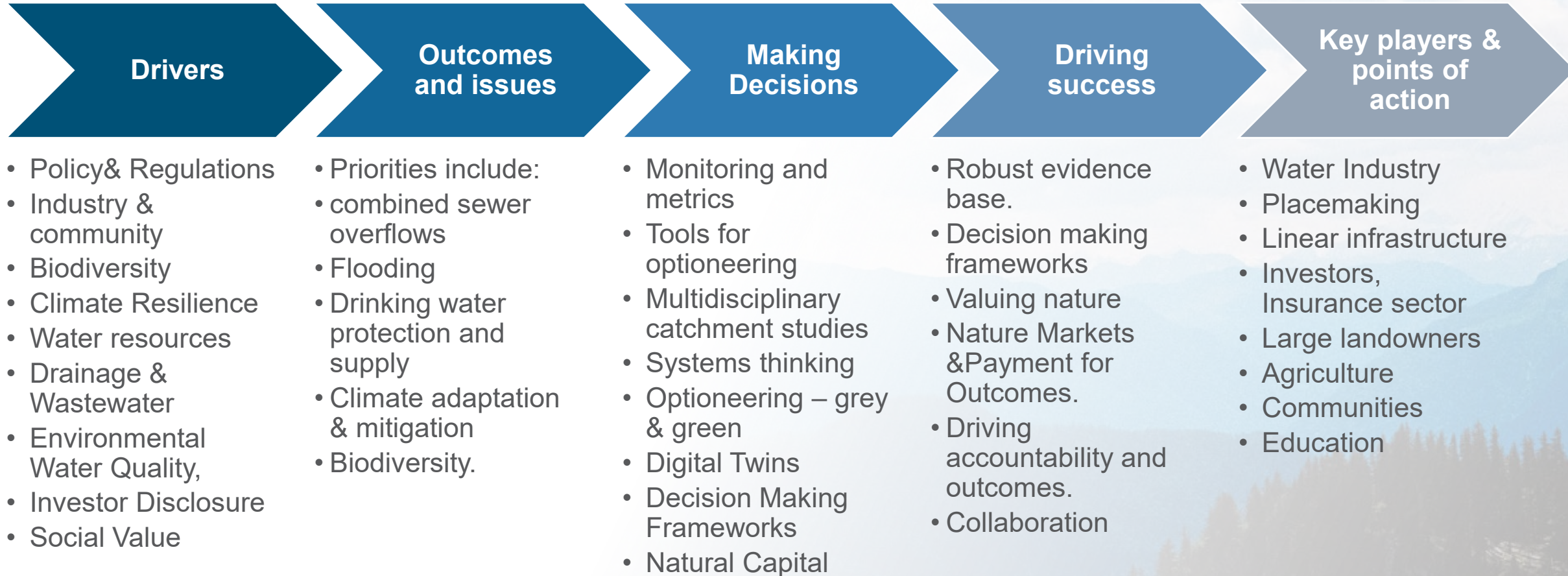Transmission and Distribution, Energy Storage, Hydropower, Renewable Energy

DEFENCE

Aerospace, Defence, Security

Integrated Catchment Management & Nature Based Solutions

Drivers	Outcomes and issues	Making Decisions	Driving success	Key players & points of action
• Policy& Regulations • Industry & community • Biodiversity • Climate Resilience • Water resources • Drainage & Wastewater • Environmental Water Quality, • Investor Disclosure • Social Value	• Priorities include: • combined sewer overflows • Flooding • Drinking water protection and supply • Climate adaptation & mitigation • Biodiversity.	• Monitoring and metrics • Tools for optioneering • Multidisciplinary catchment studies • Systems thinking • Optioneering – grey & green • Digital Twins • Decision Making Frameworks • Natural Capital	• Robust evidence base. • Decision making frameworks • Valuing nature • Nature Markets &Payment for Outcomes. • Driving accountability and outcomes. • Collaboration	• Water Industry • Placemaking • Linear infrastructure • Investors, Insurance sector • Large landowners • Agriculture • Communities • Education

SNC·LAVALIN

ATKINS
Member of the SNC-Lavalin Group

Protecting homes and habitats from storm overflows

- Water Industry driven collaborative approach
- To address historic issues
- To future-proof urban drainage & wastewater
- Drainage & Wastewater Management Plans
- Strategic and adaptive approach -25 years
- Risk assessments, root cause analysis
- Grey and green infrastructure design
- Strong Nature Based Solution drive
- Consultation & community focused

Resilient cities

- Underpins green blue infrastructure policies in Edinburgh City Plan 2030
- Supports planning and investment to future proof against climate change
- Develop strategic network of green blue corridors
- Integration of ecosystem service and natural capital assessments with flood risks, habitat connectivity, active travel and social data
- Identifies opportunity areas for ICM and nature-based solutions
- Multiple benefits to people and nature

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City of Edinburgh Council
Edinburgh Green Blue Network

Stage 1: The Strategic Network

Enhance and safeguard biodiversity by protecting and expanding habitat networks

Create better places through consideration of wildlife, water and wellbeing

Maximise sustainable water management using nature-based solutions

Investment in communities

Integrate and expand walking and cycling networks with green/ blue infrastructure

Enhance quality of life making Edinburgh a great place to live work and visit

Provide a integrated framework of information to support Council decision making and strategies

Increase Edinburgh's climate change resilience

Front Cover Photo: View of Edinburgh 's historic City Centre | Shutterstock

·EDINBVRGH·
THE CITY OF EDINBURGH COUNCIL

Studio Toolkits: SuDS, NFM, Biodiversity, Natural Capital

- Atkins bespoke toolkits – NFM, SuDS, BNG, NC
- Rapid assessment of NBS opportunities
- Valuation of Natural Capital outcomes
- SuDS Studio assesses features incl:
- Stormwater Management Benefits
- High Level Costing
- Carbon Calculation
- Natural Capital and Social Benefits
- Common Platform for Strategic Planning
- Bringing Partners Together Unlocking Funding
- Enables direct comparison of costs and benefits
- Enables prioritisation
- Supports development of business cases

Legend:
- Bioretentions
- Attenuating rain garden
- Swale
- Surface rain garden
- Rain garden box
- Tree pits
- Green roof
- Water butt
- Soakaway
- Filter drain
- Disconnect downpipes
- Wetland
- Pond
- Drain to Thames
- Gravel paving
- Permeable paving

SNC·LAVALIN
ATKINS
Member of the SNC·Lavalin Group
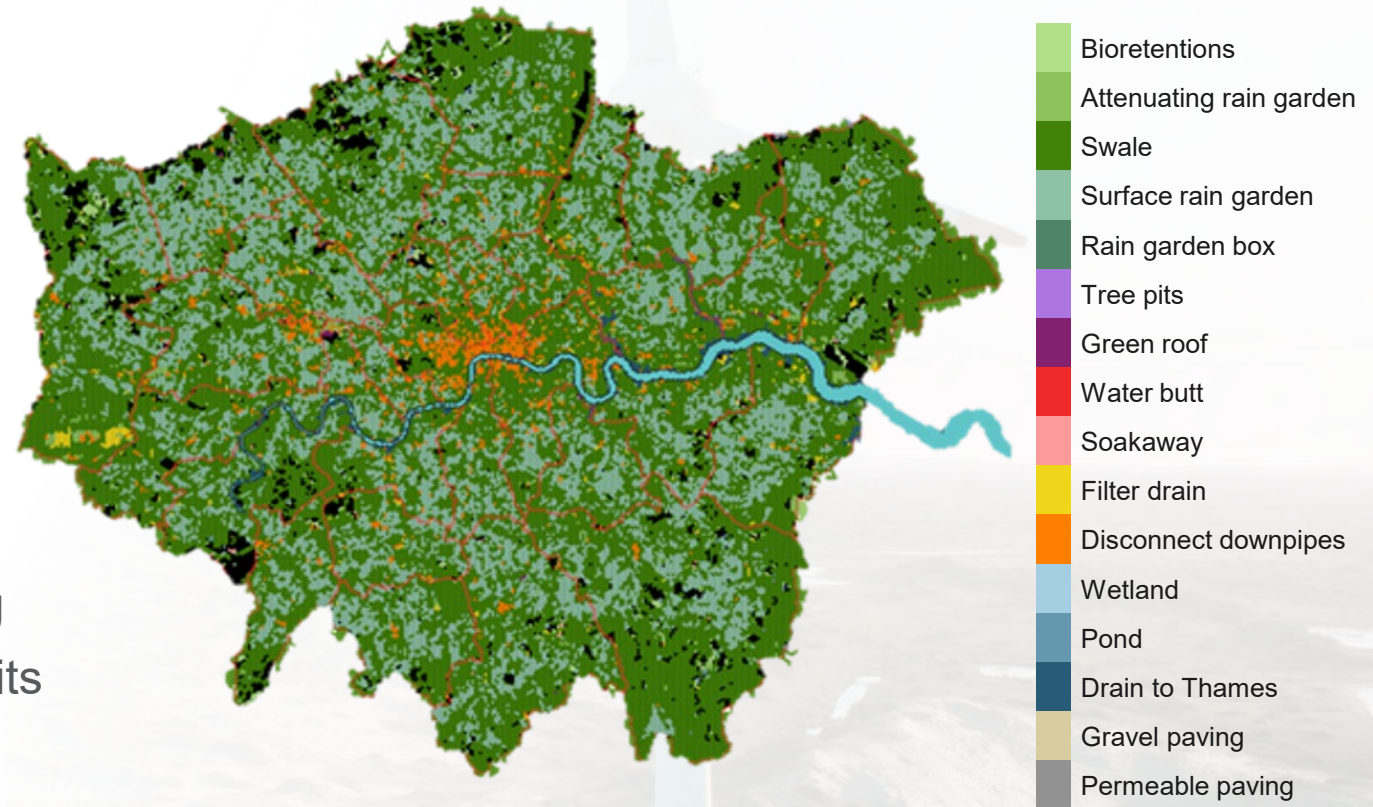
Community Flooding in the Calder catchment

Run NFM Studio and Natural Capital tool
Evaluate land runoff and flood storage potential for NFM interventions (land change and management options, flow pathways and in-channel) across the catchment and estimate the wider environmental benefits.

Modify and run hydraulic models
Take the reductions in peak flow from the average of the combined measures and translate within the 5 hydraulic models across a series of return periods.

Use Flood DamaGIS 2 tool
Compare the flood economics between baseline and post NFM model runs with climate change uplifts to quantify food risk benefits.

Estimate NFM costs and delivery rates
Provide indicative costs for catchment wide NFM and estimate delivery rates based on implementation of measures in the Calder catchment over the past 5 years.
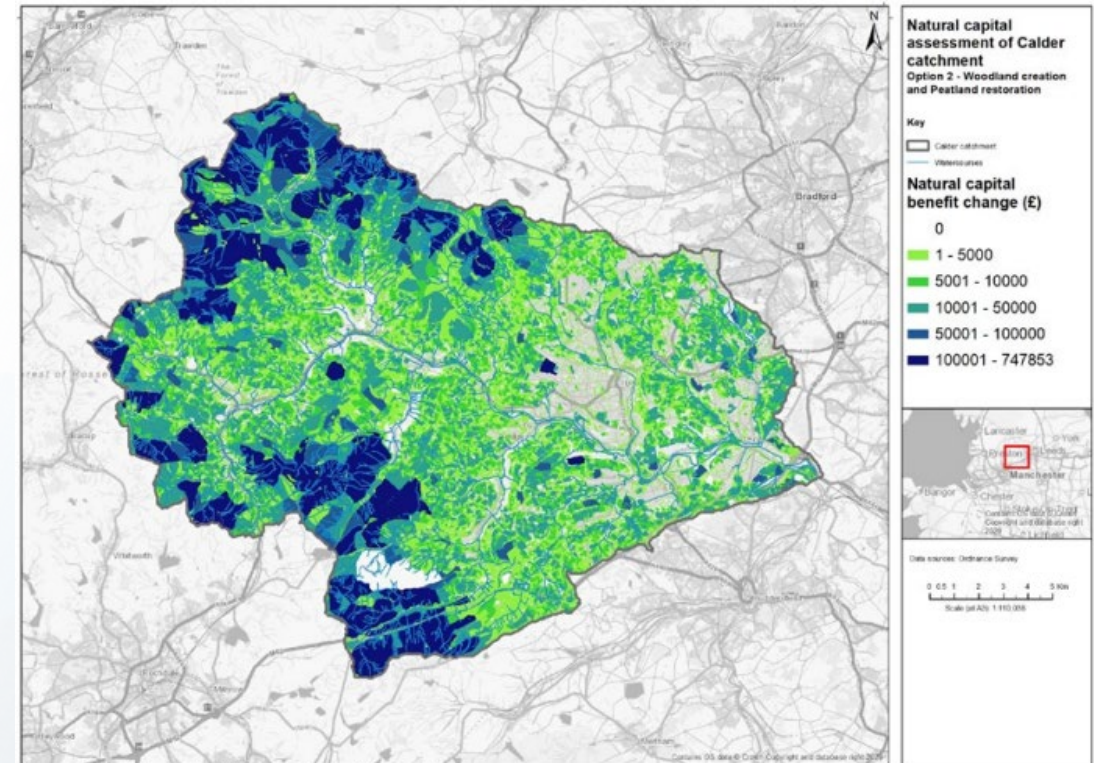
Figure 2 Natural capital change (£ per year) with Option 2 woodland creation and peat restoration

Protecting water quality Evenlode - ICM & Catchment Risk

- Drinking water quality drivers – agriculture
- Wastewater treatment – phosphorus
- Catchment approach alternative to P-stripping
- Additional flood resilience outcomes
- Regenerative agriculture & soil health
- Farming community innovation incentives
- Natural Flood Management
- Natural Capital & broader business case
- Linear infrastructure link – road, rail
- Approaches transposed elsewhere

Linear infrastructure risk management

- Can NFM be used to manage flood risk on motorways and trunk roads

- Partnership with tech companies, Rivers Trusts and landowners to select, fund and implement NFM at strategic locations upstream of flood 'hotspots'

- Implementation - over 120 measures across 20 farms, 2 catchments.

NFM measures funded by Pilot

- Land management (soil de-compaction)
- Land use (cross slope woodland & hedges)
- Flow pathway (storage)
- In-channel (leaky barriers & bundles)

Flow paths and connectivity

- 0.25 (low connectivity)
- 0.50
- 0.75
- 1.00 (high connectivity)

General

- Section of road liable to flooding
- A616 Road
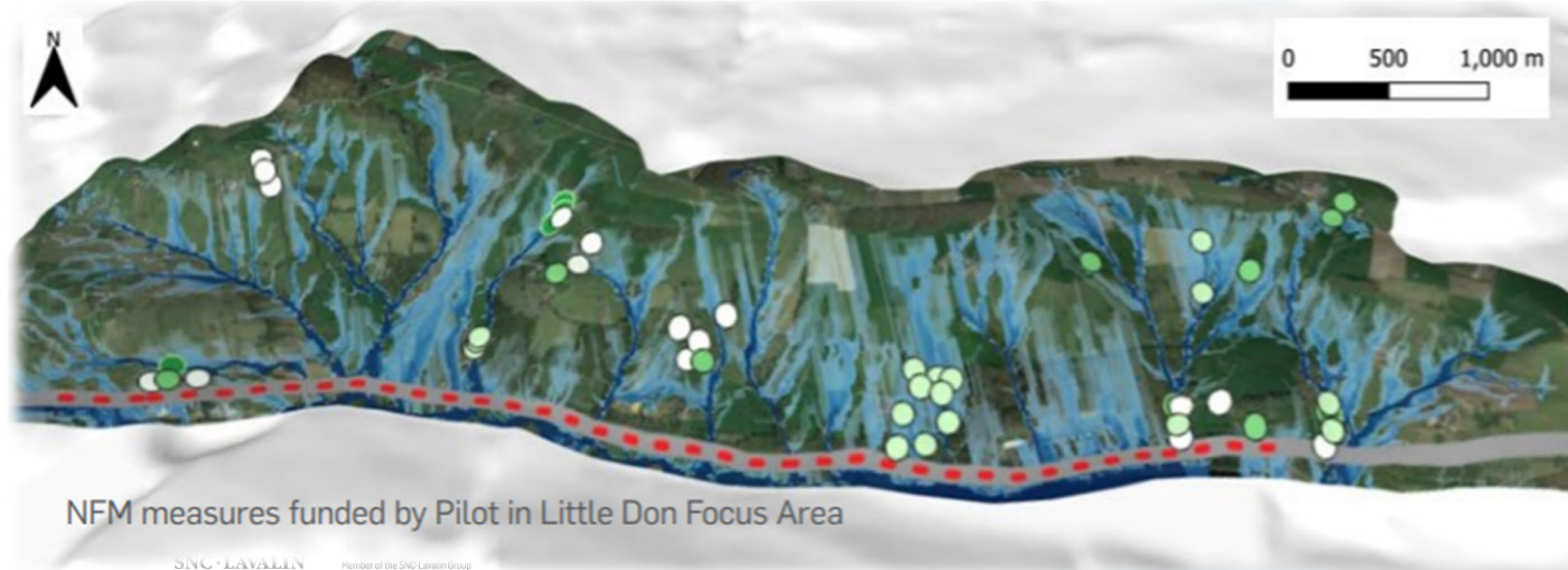
NFM measures funded by Pilot in Little Don Focus Area

Resilient rivers – stage zero approach

- Full valley floodplain reconnection: infilling incised channel with excel floodplain material
- Strategic mapping of opportunities
- Trials - Beaver dam analogues using local tree fell
- Water spills into floodplain - Natural processes take over – low cost, low disturbance – low carbon solution
- Outcomes: Flood resilience; Habitat and biodiversity benefits; Water quality; fish passage; social value
- Nature market credits

Understanding the value of nature

- Catchment scale natural capital account and a suite of natural capital assessments on a blend of environmental enhancement options.

- Site visits; Workshops; application of tools e.g. EA NCRAT, FARMSCOPER, ORVal, NWEBS, BNG Metric

- NC and ecosystem service benefits of projects

- Evidence base to drive best value business case for investing in catchment resilience

- Proof of concept

- Transfer to other areas

Annual Natural Capital Value £23.09m

- Agriculture: £4.73m
- Water supply: £3.67m
- Timber: £.08m
- Climate regulation: £1.40m
- Air quality: £.87m
- Hazard regulation: £.08m
- Recreation: £10.35m
- Physical Health: £1.91m

Catchment baseline
£286m
(30 year PV – 2020/21)

Combined scheme benefits
£3m
(30 year PV – 2020/21)

Uplift in catchment natural capital value
1.05%
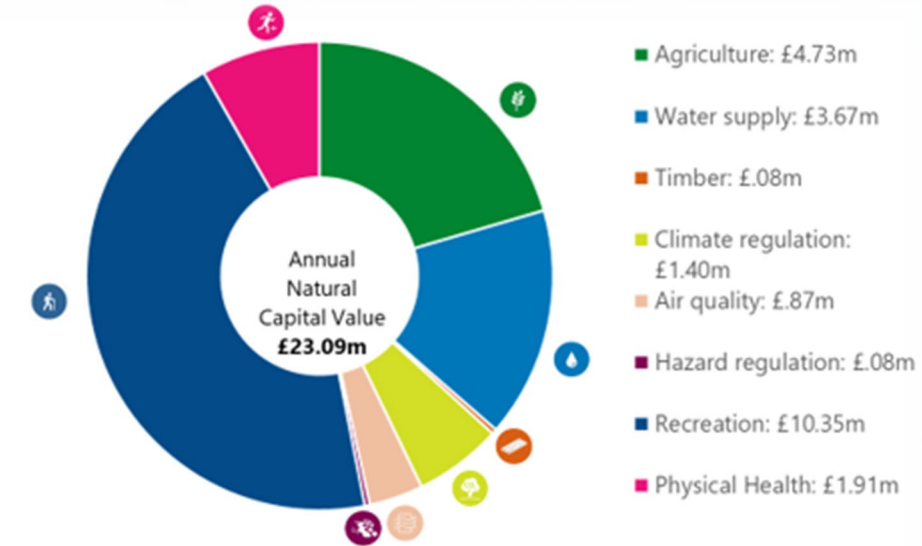
+£1,247 per ha of INNS removal

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Tamar Estuary habitat creation scheme

- 14 hectares of new intertidal habitat

- Partnership with landowner

- Offset predicted loses of habitat from sea level rise

- Historical man-made embankment flood risk (agricultural area creation)

- Remove section, tidal reconnection. New bank further inland

- Flood resilience, birds and intertidal habitat diversity.

Downstream Impacts: Camel Estuary

- ~1,400 properties at flood and erosion risk

- Environmental designations, popular beaches, dunes, and nature reserves

- Review historic and ongoing change

- Set out next steps for assessing coastal and climate change impacts

- Geomorphological Assessment, initial conceptual model of sediment transport processes

- Review of the existing and future planned policies & plans

- Update flood and erosion risk from waves and tides, taking account of UKCP18 climate change predictions

- Identify key areas for future focus to manage future risks to the natural and built environment

- Feed into the NCERM 2 and SMP refresh programmes of work.
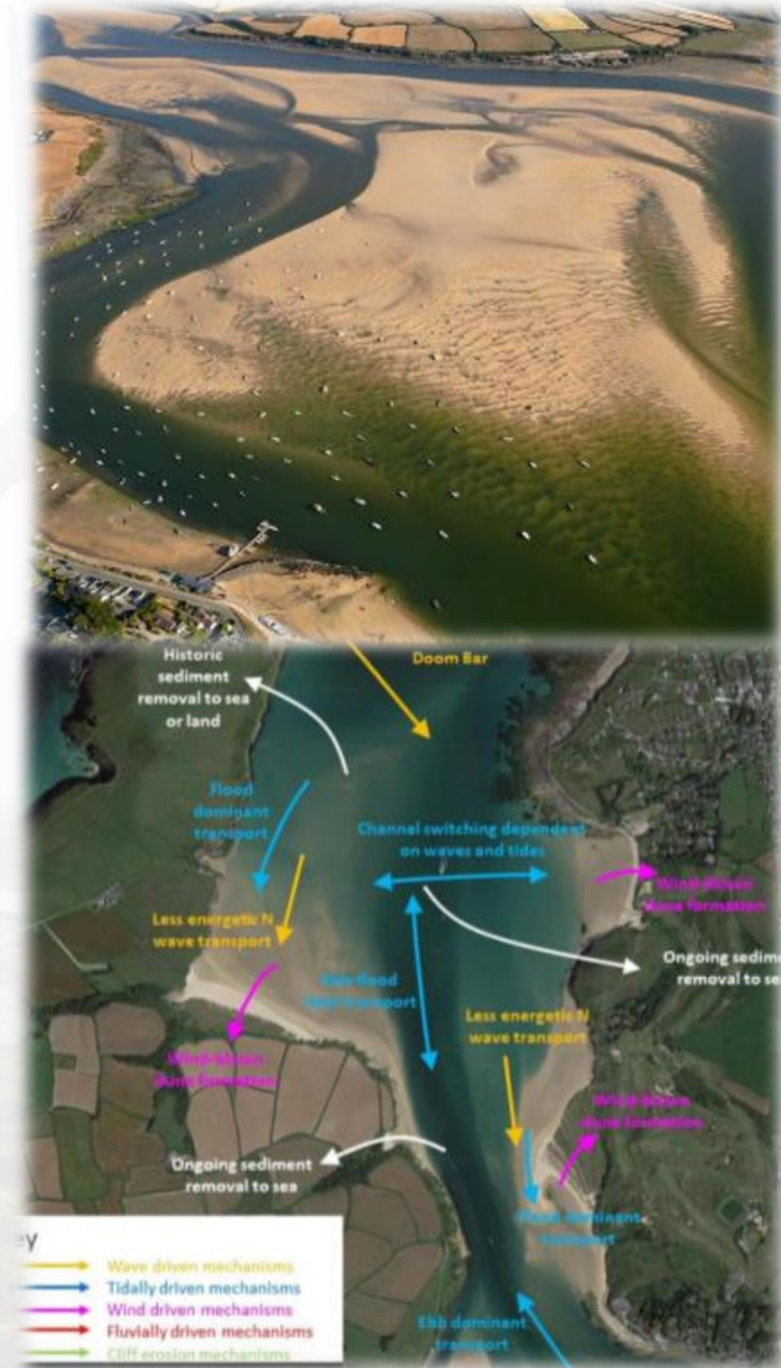
Working with others

- Engagement across sectors

- Regulatory focus through a wider outcome lens

- Future generation & STEM

- Community workshops

Community-led project focus – Spains Hall

- Rewilding - natural process take precedence to create landscape-scale changes

- Delivering: flood resilience for communities downstream; sequestering carbon; enhancing biodiversity; improving water quality, providing recreation and education benefits.

- 832 ha rural estate - Quantify & monetise benefits – Atkins Natural Capital Studio tool

- Explore environmental credit opportunities

Translating risk into opportunity

- Working with nature requires a different way of managing risk & consequence

- But outcomes can be greatly enhanced for people and places

- Combined hybrid approaches needed

- Grey infrastructure for compliance, green infrastructure for resilience

- NBS requires collaboration

- Match funding / green finance opportunity

- Important to collaborate, learn and adapt.

Engineering a nature-positive future – SNC-Lavalin (snclavalin.com)

Biodiversity Net Gain
Our Approach

Environmental Net Gain
An Introduction

Valuing Our Natural Capital
The Atkins Approach

Dr Lee Swift
Principal Research Scientist, Flood & Coastal Erosion Risk Management (FCERM) Research, Environment Agency, UK
lee.swift@environment-agency.gov.uk
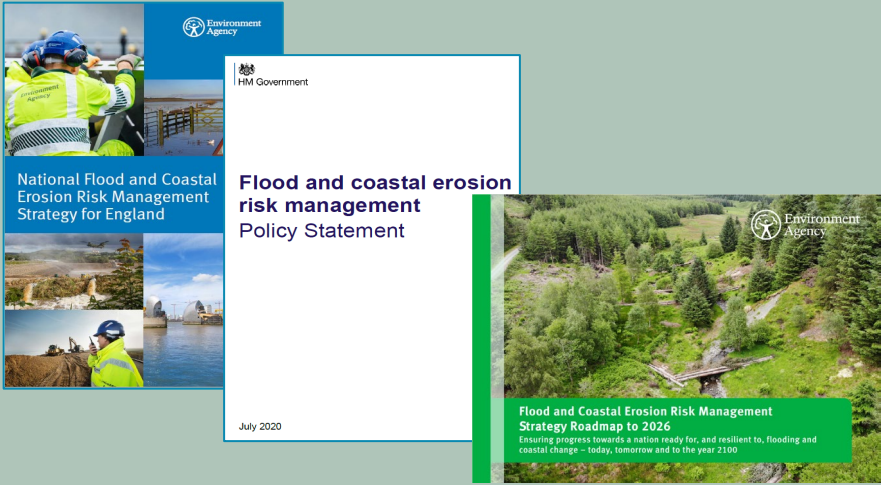
Adaptation and resilience

Nature based solutions on the coast

Lessons from pilots

What next?

Mainstreaming NBS

The Environment Agency

We work to create better places for people and wildlife and support sustainable development.

What is at risk of flooding and erosion in England?

- **Over 5.5 million properties are at risk of flooding**
  - **2.8 million properties at risk from river and coastal flooding**
  - **3.2 million at risk from surface water flooding**

- **Two thirds of all properties rely on infrastructure which is at risk of flooding**

- **1.9 million properties are at risk from sea flooding and erosion**

- **Approx. 2,000 properties at risk from coastal erosion over the next 50 years.**

- **85% of inter tidal coastal habitat lost since 1850**

Environment Agency

Capital Investment Programme

Press release

Multi-billion pound investment as government unveils new long-term plan to tackle flooding

Schemes Receiving Investment 2021-27

FCERM Strategy and Roadmap

Agriculture Bill

25 Year Environment Plan

National FCERM Strategy

Defra flood policy statement
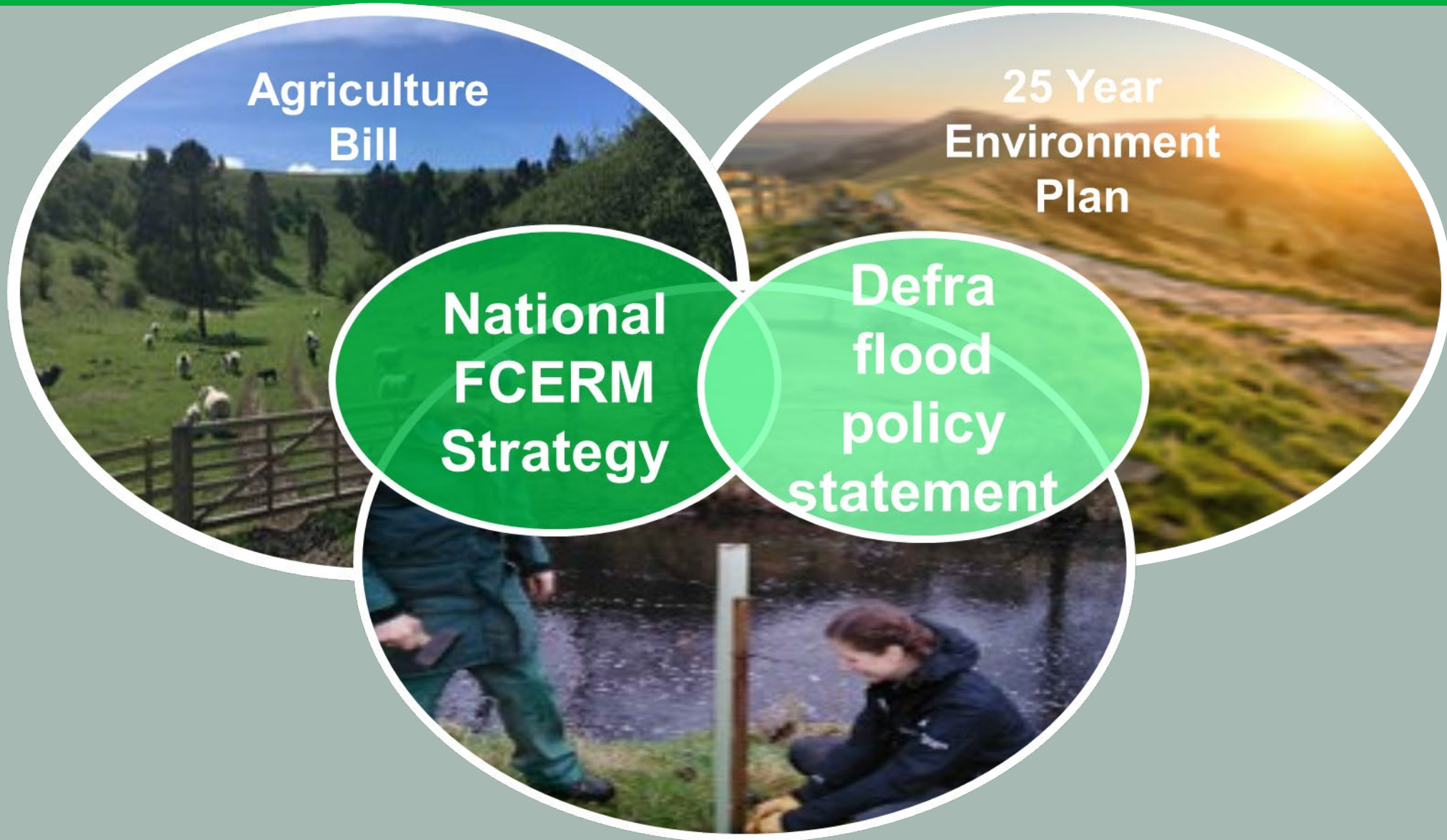
A nation ready for, and resilient to, flooding and coastal change

Adaptation and Resilience

- Flood and Coastal Resilience Innovation Programme
  - 25 projects (6 coastal) – test and demonstrate innovative practical resilience actions
- Coastal Transition Accelerator programme
- Catchment to coast approach

Legend: Coastal, Community, Catchment, Technology, Groundwater, SuDS

Promoting Adaptation to Changing Coasts

Coastal Transition Accelerator Programme

Happisburgh, 2001

Happisburgh, 2014
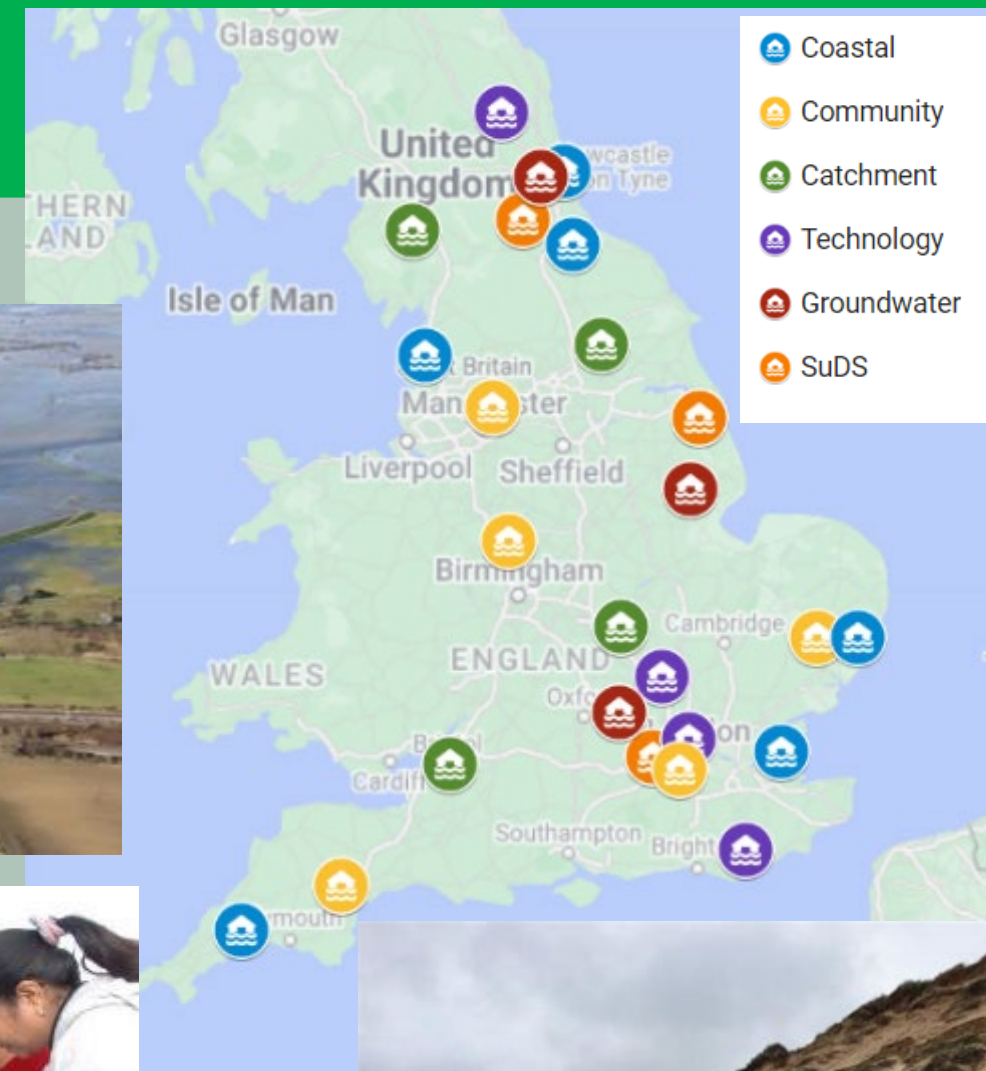
Aim: to be a catalyst for innovative action to support vulnerable coastal communities to adapt to coastal erosion risks – by transitioning back from areas of the coast that cannot be defended in the long term

Mainstreaming nature based solutions

Learning from Natural Flood Management pilots

1. Successful NFM projects are dependent on strong community based partners and support of land owners

2. Standard funding rules and business cases are not suitable for assessing the benefits of NFM

3. NFM projects are often best managed by the third sector in collaboration with community groups

4. The effectiveness of NFM should be monitored and evaluated over time

5. NFM needs to be sustained in the longer term alongside local nature recovery and environmental land management

Environment Agency

Working with Natural Processes Evidence Directory
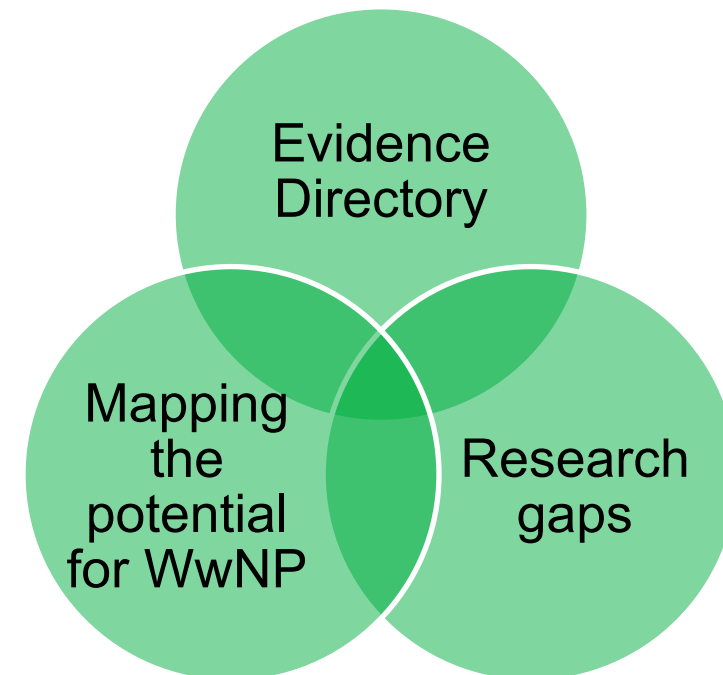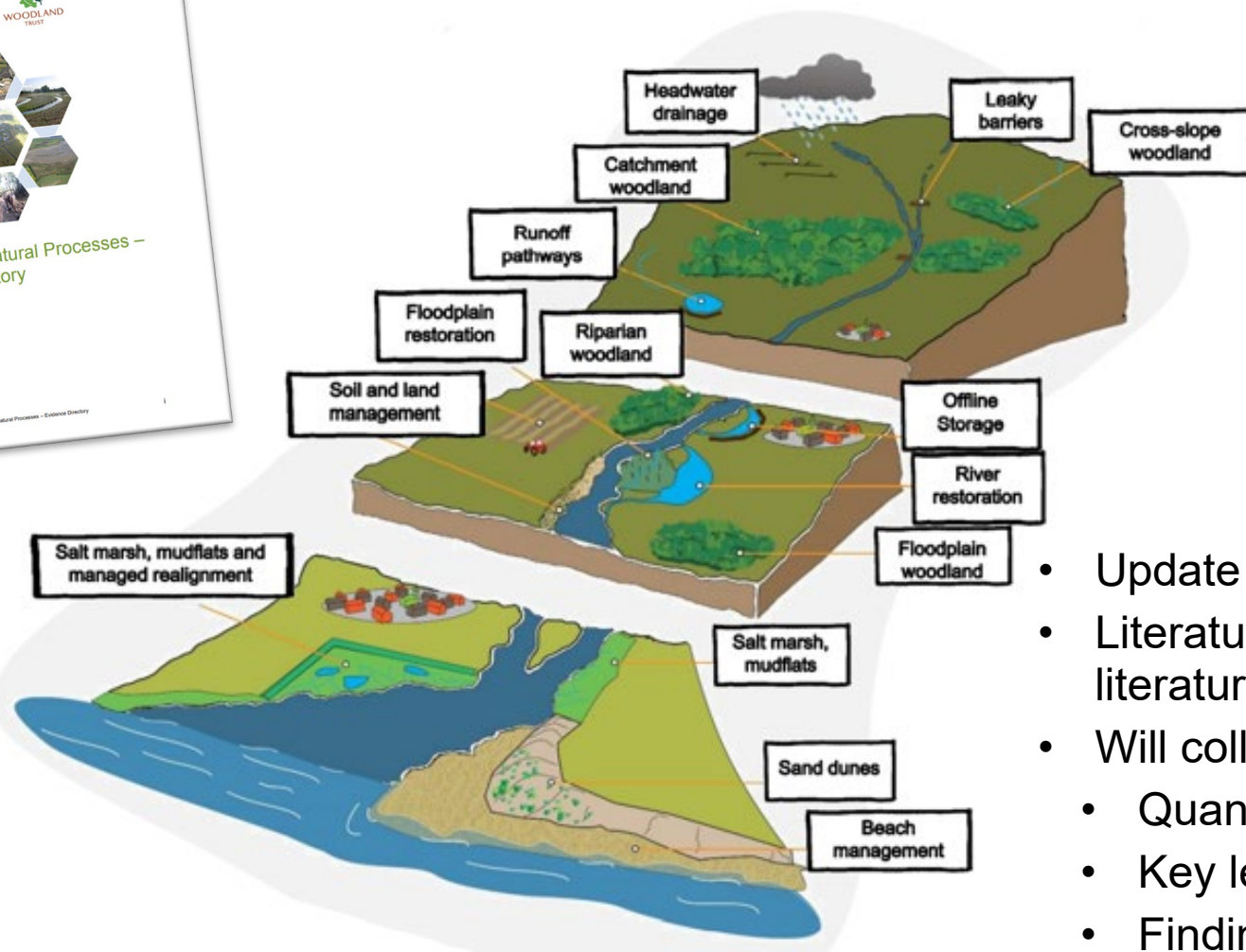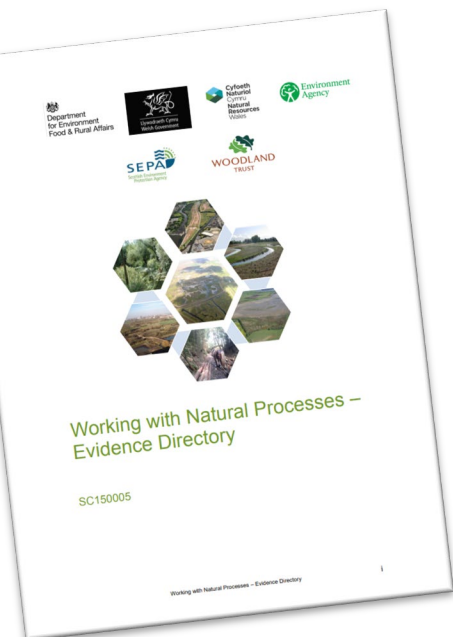
- Update to the 2017 Evidence Directory underway
- Literature scoping review to identify published and grey literature from last 5 years
- Will collate existing evidence including:
  - Quantitative analysis of data available from pilots
  - Key learning pilot programmes
  - Findings from literature review.

Linked initiatives and future work

ReMeMaRe

SALTMARSH RESTORATION HANDBOOK
UK & IRELAND
MAY 2022
Editors: Rachel Hudson, Joe Kenworthy, Mike Best

SEAGRASS RESTORATION HANDBOOK
UK & IRELAND
NOVEMBER 2021
Editors: Celine Gamble, Alison Debney, Azra Glover, Chiara Bertelli, Ben Green, Ian Hendy, Richard Lilley, Hanna Nuutt, Maria Potouroglou, Federica Ragazzola, Sam Rees, Richard Unsworth, Joanne Preston.

RESTORING ESTUARINE AND COASTAL HABITATS WITH DREDGED SEDIMENT: A HANDBOOK
NOVEMBER 2021
Editors: Will Manning, Colin Scott, Eve Leegwater.

CO-OPT
Resilient Coasts:
Optimising Co-Benefit Solutions

MANABAS COAST | Interreg North Sea | Co-funded by the European Union

- ReMeMaRe – restoring meadows, marshes and reefs
  - Restoration handbooks
- Environmental Land Management Schemes (ELMS)
- Greening coastal infrastructure through eco-engineering
- Multidisciplinary research partnerships

Environment Agency

Summary and contact details

- Flood and coastal erosion risks are changing..

- ..so are the ways people (and decision makers) communicate, understand and respond

- The challenges are big and complex

- Nature based solutions can be part of the solution

- To succeed, applied cross-disciplinary, catchment to coast partnerships and community engagement are crucial

R&D website on GOV.UK

lee.swift@environment-agency.gov.uk
Bi-annual partner summary

@FCRMResearchEA

Warrington, UK (Galveston today)

Environment Agency

Thanks for listening!

DEVELOPMENTS IN INFORMING REALTIME STORM DATA FOR SETX

Liv Haselbach PhD, PE, BCEE, F.ASCE

Director of the Center for Resiliency
Lamar University

How did the SETx Flood Coordination Study start?

- 2017 Hurricane Harvey hit and Jefferson County received the greatest amount of rainfall ever recorded in the US.

- September 2019 Tropical Storm Imelda hit Jefferson County.

- Encouraged by UT, TDEM, TxDOT, USACE SWG and local agencies and municipalities we decided to develop a data and communication hub……..

- First official monthly meeting in November 2019. Except for rare occasions (like a tornado watch), has been held monthly since then.

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

How is the SETx FCS funded?

- In the spring of 2020 the Lower Neches River Authority granted 100k to Lamar University to work on the SETx FCS.

- Followed by a matching grant from the Sabine River Authority of Texas.

- Then in the fall of 2020 Lamar University asked for a Legislative Appropriation to start a Center for Resiliency (CfR) for disasters.

- Signed by Governor Abbott in July 2021 and started off of the one-pager on September 2021. (Details later)

- The SETx FCS is the largest funded program in the CfR.

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

Monthly Meetings

- **Let Liv know if you would like to be on the invite list for the monthly meetings. lhaselbach@lamar.edu**

- **SETxFCS monthly meeting 7 (06/17/2020)**:
Summary: Focused on the data of high-water marks, introduction on reading post-event high water marks and the related online sources. Presenters: Jeff East (USGS)

- **SETxFCS monthly meeting 8 (07/15/2020)**:
Summary: Presentation from West Gulf River Forecast Center on NOAA/NWS Flood Inundation Mapping Across Texas
Presenters: Mark Null, Derek Giardino (WGRFC)

- **SETxFCS monthly meeting 9 (08/12/2020)**:
Summary: Presented on various aspects of drainage in Jefferson, Orange and Chambers counties. Presenters: Dr. Joseph Majdalani (DD6), Alan Sims (LJA representing DD7 and DD3 and TBCD), Don Carona (Orange County Drainage District)

- **SETxFCS monthly meeting 10 (09/16/2020)**:
Summary: Texas General Land Office presented on planning grants & regional watershed studies. Chris Sallese (Dannenbaum Engineering) was introduced as leading the Region 1 River Basins Planning. Presenters: Tyler Payne (GLO)

- **SETxFCS monthly meeting 11 (10/12/2020):**
Summary: Focused on TxDOT stream gauge project. Presented on area covering with National Terrain model work in SETx and also on the SETx Flood Topography Model.
Presenters: David Maidment (UT), Scott Grzyb (USGS), Al Rea (USGS), Amin Kiaghadi (TWDB)

- **SETxFCS monthly meeting 12 (11/17/2020):**
Summary: Focused on HSEEP-compliant Virtual Exercise which evaluated https://setexasrain.org/ from a public safety perspective. The exercise focused on data obtained from the website during Hurricane Delta (Oct 2020).
Planning Team: Carmen Apple and Edward Norman (TDEM); Harry Evans, Christine Thies, Larry Jantzen and David Arctur (UT)

LAMAR UNIVERSITY

Big Flood Meet

- **In October 2022 different format for two special events**: **(10/18/2022 - 10/19/2022):**

  Day 1: Data workshop: Presented on historical and real-time flood data. Presenters: Tyler Payne (GLO), David Maidment (UT), Suzanne Pierce (TDIS)

  Day 2: MEET and GREET: Panels on Flooding: What we do and what you can do for us! Agenda:

  8:30 Welcome

  9-9:45 USACE Panel (SWG Colonel and Chiefs, ERDC) 15 min meet break!

  10-10:45 County Judge Panel (Jefferson, Hardin, Orange, Chambers) 15 min meet break!

  11-11:45 State Agency Panel (TDEM, GLO, TxDOT, TWDB) 15 min meet break!

  12-12:15 UT and LU updates and thank yous! More meet and greet.

- Hope to hold a similar one in October 2023 with the workshop portion on flood inundation mapping!

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

Big Flood Meet
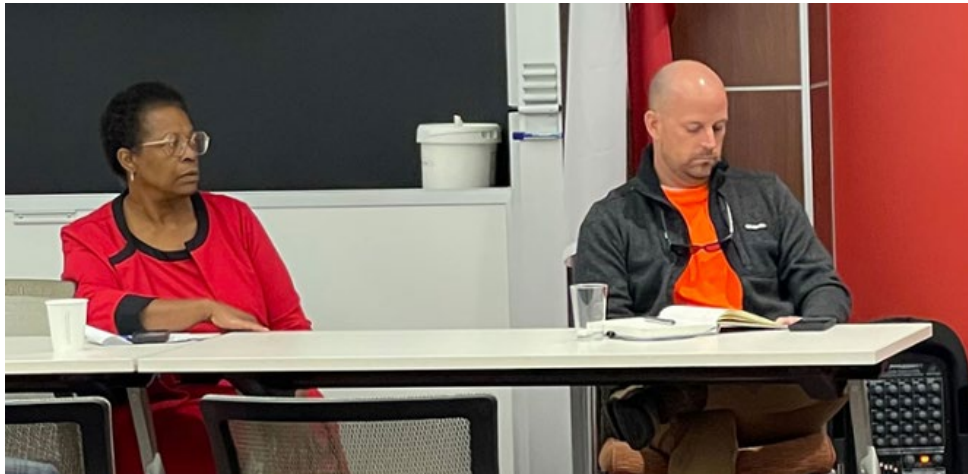
Center for Resiliency: LAR Request Excerpt

LU requests an appropriation to establish and operate The Center for Resiliency. **The Center will serve the State of Texas to assist in establishing a networking center and data collaborative providing service, outreach, and education for improved multi-disaster resiliency in the Gulf Coast region.**

……The Center presents a futuristic paradigm for higher education in Texas. **Whereas university services such as extension disseminate centralized information regionally, the Center for Resiliency provides a model for completing the circle, gathering regional information from numerous stakeholders, compiling, analyzing and then funneling the knowledge locally, regionally, statewide, and beyond.** With limited resources for funding studies, the Center will help optimize funding to bring together the best assembly of people and channel vital information, allowing for more resources to focus on developing protocols for and responding to needs for prevention, mitigation, and recovery. At no time in the last century has the need for understanding how to mitigate the impact of a disaster been more pertinent. This proposed new initiative will significantly advance the capacity of Texas' resiliency to the perils either man-made or natural that befall our citizens on a regular basis.

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

Coastal Management Plan (CMP)-26- PSM Coastal High Frequency Radar (HFR) for Texas Bays and Ports

Presented by: Christopher Fuller, Ph.D., RATES, Inc. cfuller@office.ratesresearch.org

Co-authors:

Rosa Fitzgerald- University of Texas at El Paso (Project Lead)

Liv Haselbach- Lamar University

Andrew Ernest- RATES, Inc.

May 19, 2023 Workshop at Lamar U.

Galveston Bay Study Area
25 MHz System with nominal range of 25 km

Antenna

WRUX252 – 2

CODAR Suggested Location

Pier/Antenna Foundation
Antenna Footer

Google Earth

Galveston Bay

Examples of combined total vector data for Galveston Bay. Sites at Moses Lake Gate, Smith Point and McCollum Park.

Sabine Lake Study Area
10 km nominal range

WRUX251 – 43.657 MHz

PIP Antenna

Antenna
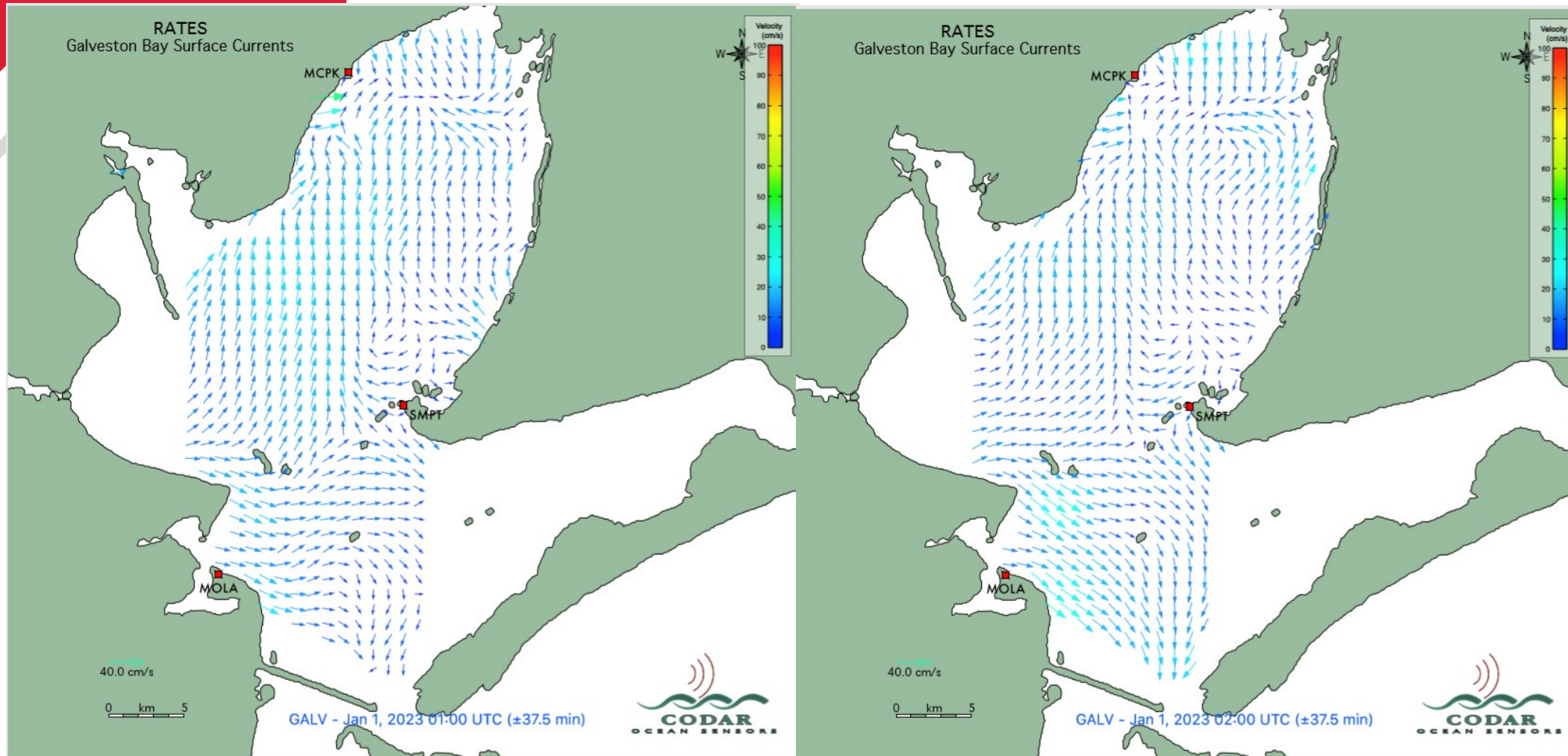
Center for Resiliency
LAMAR UNIVERSITY

Sabine Lake

Real-Time Vector Processing

- Gulf Coast Ocean Observing System (GCOOS)
- GoM regional component of the U.S. Integrated Ocean Observing System (IOOS). IOOS operates the nation's only high-frequency radar network
  - Combines data from multiple operated by multiple entities
    - RATES, TAMU-GERG, USM, USF, Fugro, LSU

- Radial vector data from this project is combined on the NOAA HF Radar National Server
  - THREDDS Data Server
    - Thematic Real-time Environmental Distributed Data Server
    - SCRIPPS Institute Oceanography-Coastal Observing Research and Development Center

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LAMAR UNIVERSITY
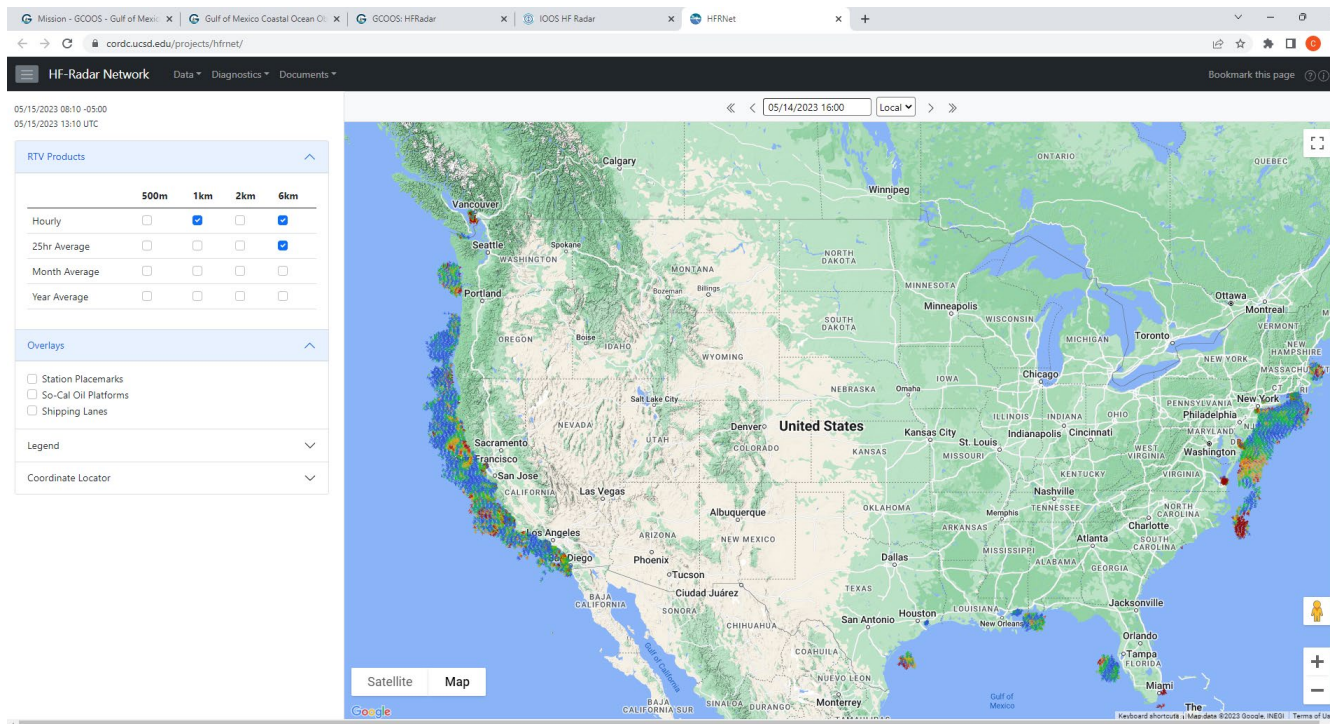
GCOOS-Data Portal
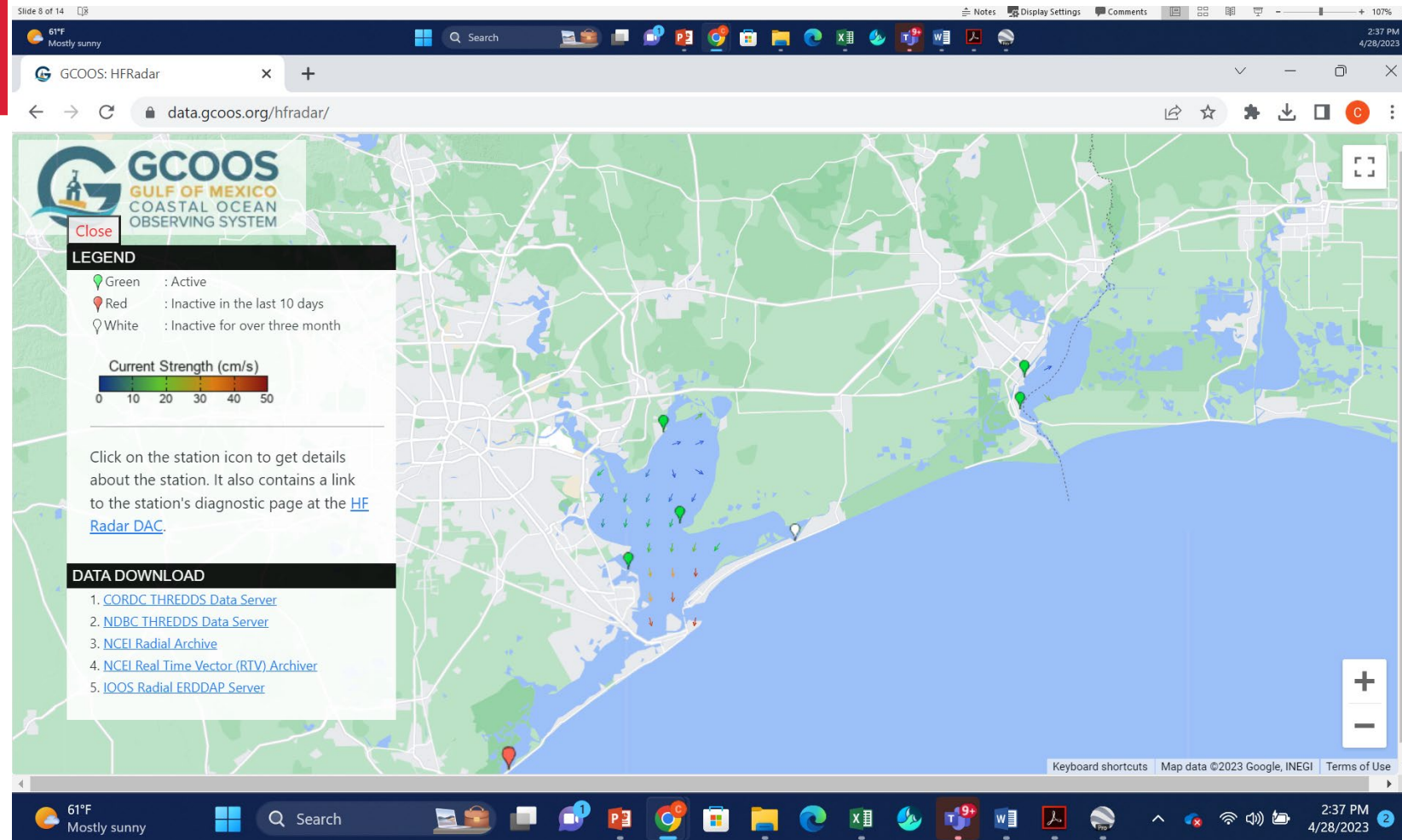
NOAA National Data Buoy System

https://hfradar.ndbc.noaa.gov/

Recent Tabular Data

- https://hfradar.ndbc.noaa.gov/tab.php
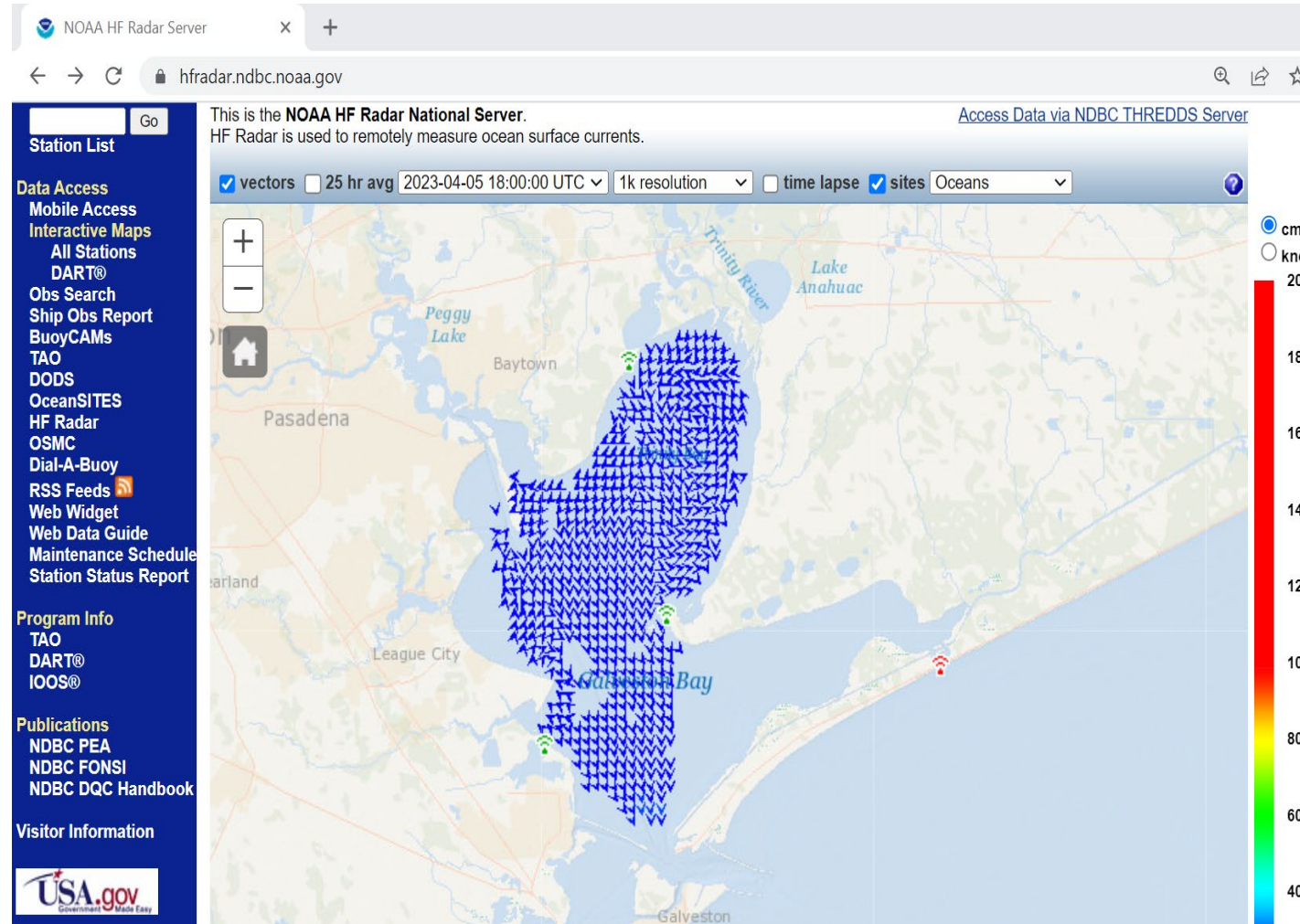
- Most recent 48 hours

- May be downloaded as TSV or CSV files

Archived Data
(Real Time Vectors)

- https://www.ncei.noaa.gov/data/oceans/ndbc/hfradar/rtv/
  - Organized in directories
    - Yearly since 2008
    - Monthly
    - Region
      - GAK   - GLNA
      - PRVI   - USEGC (US East and Gulf Coasts)
      - USHI   - USWC
    - Hourly files
      - NetCDF format
      - 1, 2, and 6 km resolutions
      - e.g. 202303010000_hfr_usegc_1km_rtv_uwls_NDBC.nc
      - Files provide data for entire regions (e.g. USEGC)
        - Recall total vectors calculated from radial vectors
        - May be parsed to focus on data of interest

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

Possible Future Enhancements

CMP-Cycle 29 Project of Special Merit

Coastwide Real Time Monitoring Program for Texas Inland Bays

Applied to GLO in June 2023

1: Expansion into other Texas Estuaries

2: Continuation, study, outreach and analysis of hardening for Upper Texas Coast

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

How did the SETx Low-Cost Flood Sensor Program start?

- In 2020 a frequent participant in the SETx-FCS Michael Ouimet (TDEM) contacted us to discuss a national project led by the DHS S&T.

- Issue, taking custody of more than 70 sensors?

- Concurrently 8 SETx counties formed the SETx Flood Control District SETx FCD). They voted to take custody with a CRADA and then to have various entities in the counties sign to take custody of the sensors.

- Lamar University volunteered to be the initial asset manager and develop workshops for deployment. (Thank you to our funders!)

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

DEPLOYMENT OF LOW COST SENSORS (LCS) IN SOUTHEAST TEXAS
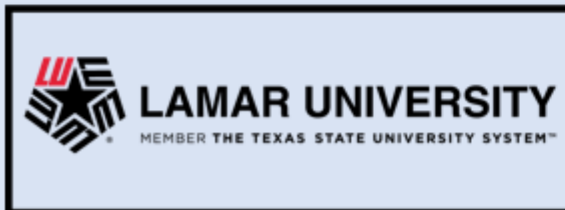
Department of Civil and Environmental Engineering
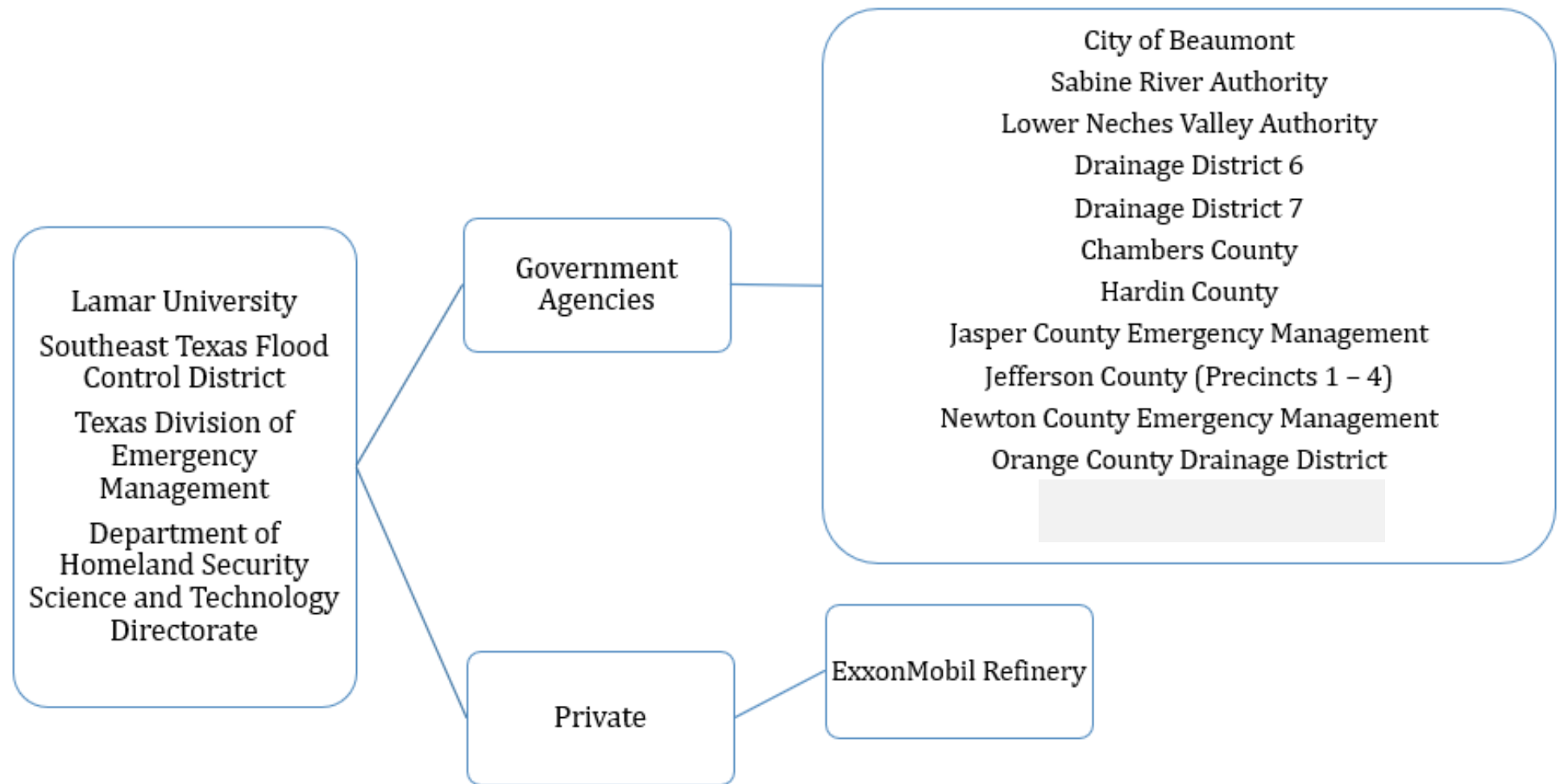
Lamar University, Beaumont, TX

Nicholas Brake, Ph.D.   Liv Haselbach, Ph.D.   Mubarak Adesina   Hossein Hariri Asli
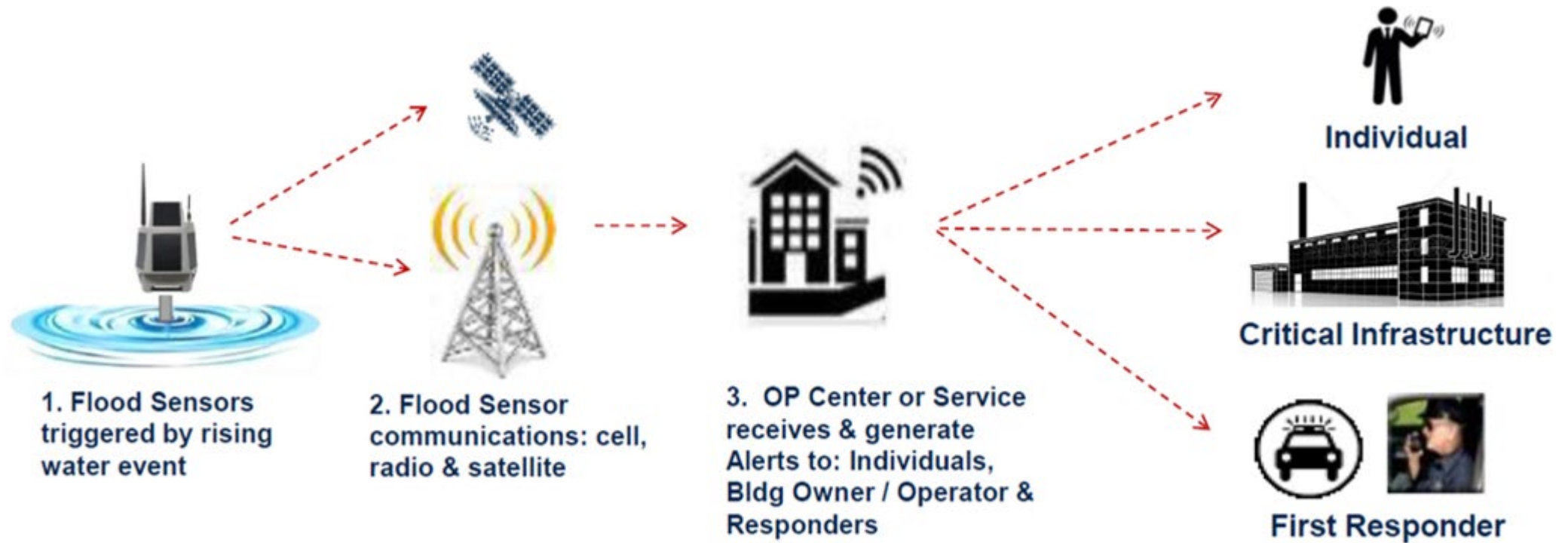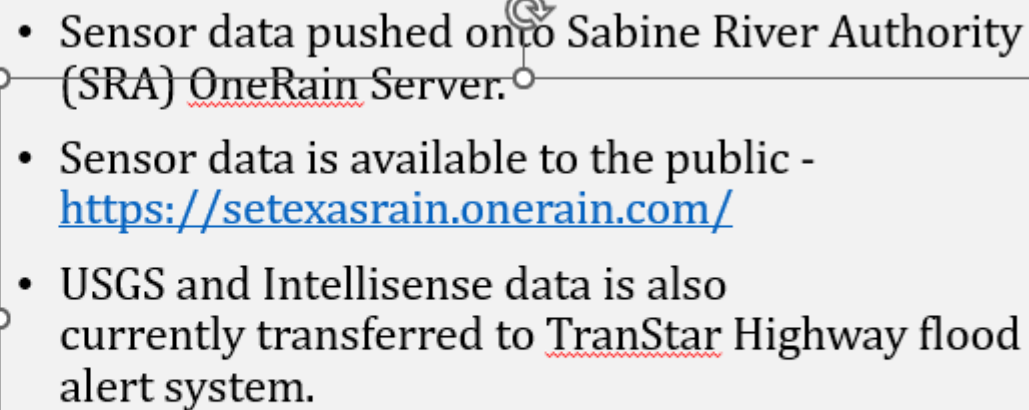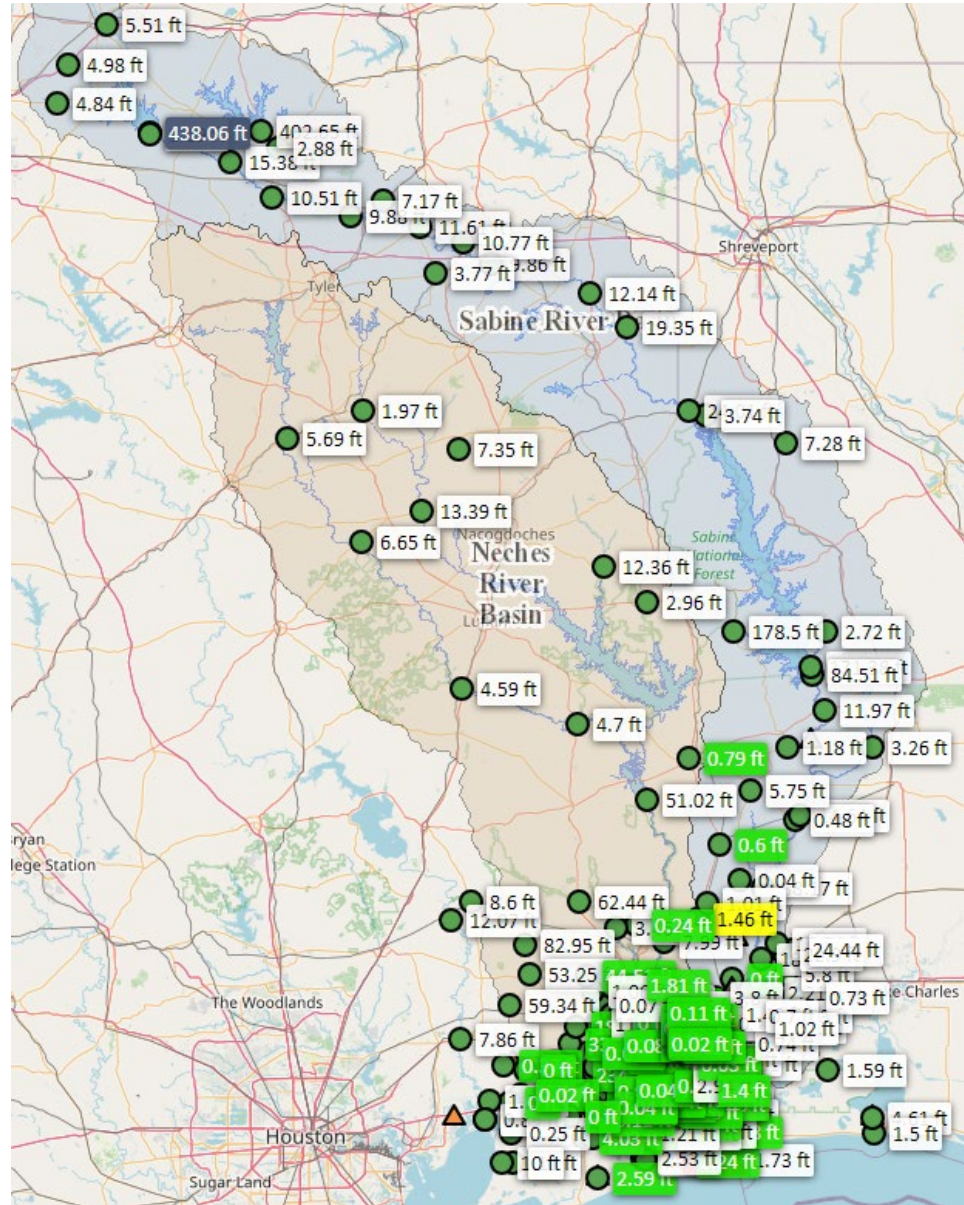
Overview of Sensing System

1. Flood Sensors triggered by rising water event

2. Flood Sensor communications: cell, radio & satellite

3. OP Center or Service receives & generate Alerts to: Individuals, Bldg Owner / Operator & Responders

Individual

Critical Infrastructure

First Responder

Image Reference: DHS S&T Sensors and Platforms Technology Center

Data Display - OneRain

- Sensor data pushed onto Sabine River Authority (SRA) OneRain Server.

- Sensor data is available to the public - https://setexasrain.onerain.com/

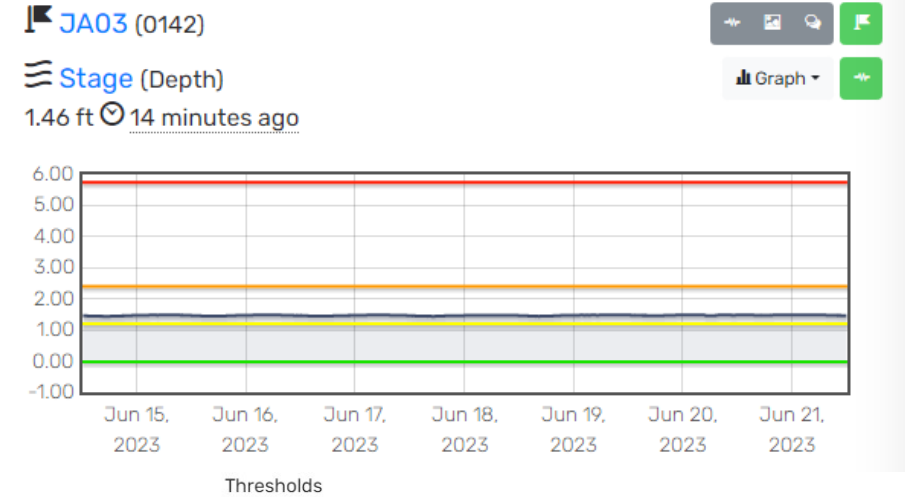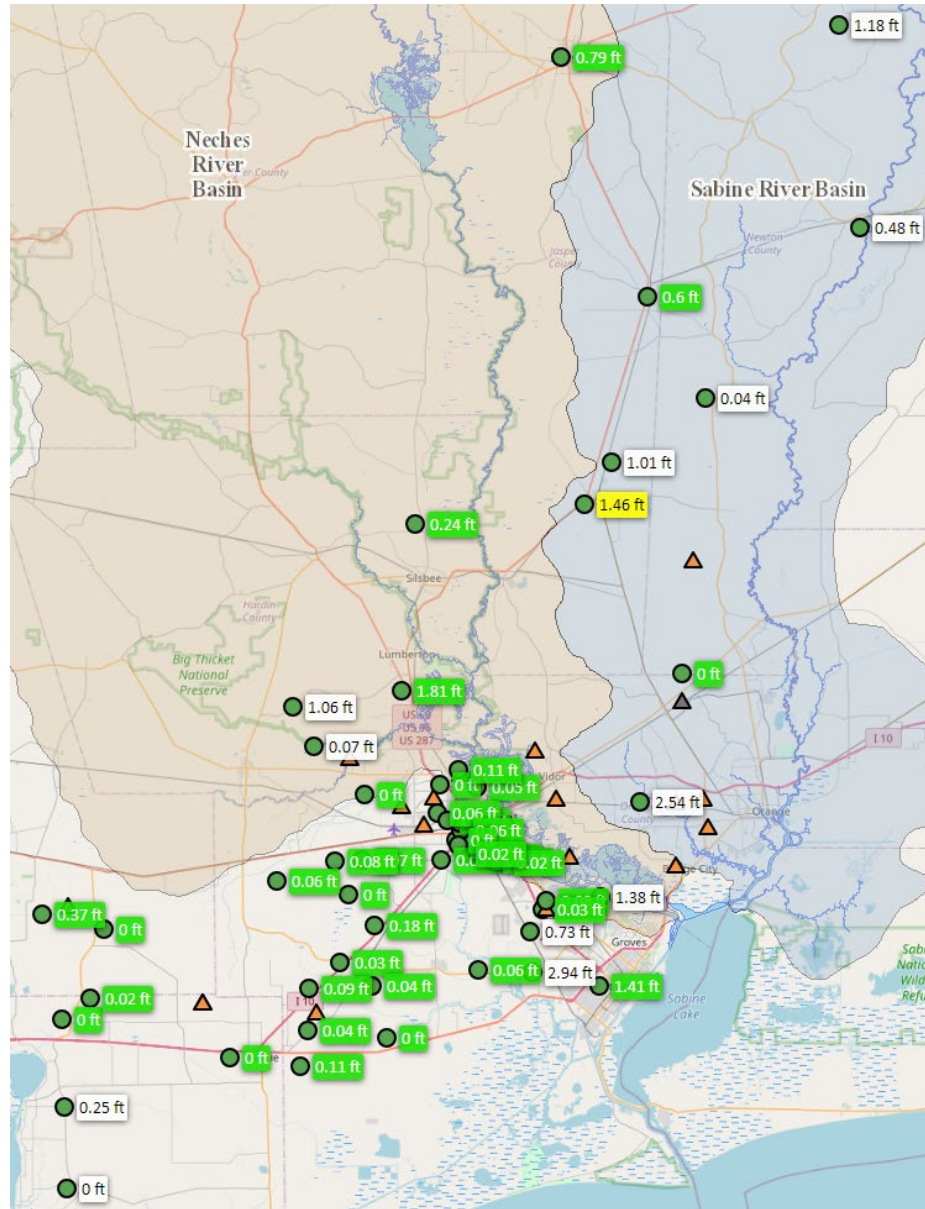- USGS and Intellisense data is also currently transferred to TranStar Highway flood alert system.

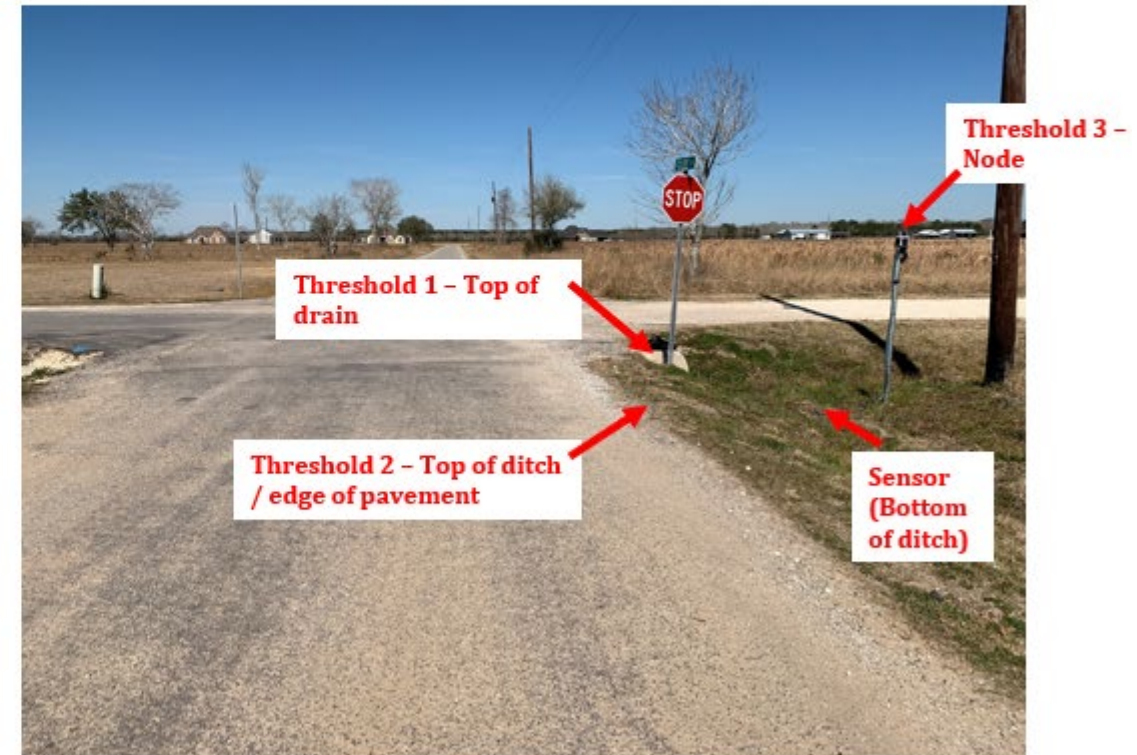# DHS S&T Sites + DD6 + USGS

DHS S&T Sites

This summer plan to add in counties, 2-Hardin, 2-Jasper, 2-Newton, 2-Orange, 1-Jefferson

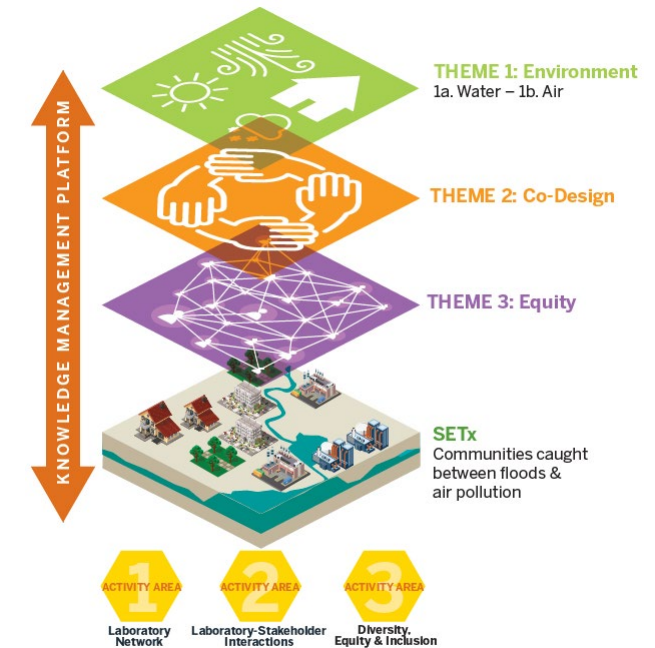# Sample Thresholds (Visual Description)

- 3 thresholds

DOE Urban Integrated Field Laboratory

Equitable solutions for communities caught between floods and air pollution

PI: Paola Passalacqua (UT)

- more flood sensors to fill in gaps (Dr. Brake LU)

- more flood modeling (Dr. Coon ORNL)

- Co-design (Dr. Lieberknecht UT)

- Equity (Dr. Meyer TAMU)

- Air Pollution (Dr. Lin LU)

KNOWLEDGE MANAGEMENT PLATFORM

THEME 1: Environment
1a. Water – 1b. Air

THEME 2: Co-Design

THEME 3: Equity

SETx
Communities caught
between floods &
air pollution

1 ACTIVITY AREA
Laboratory
Network

2 ACTIVITY AREA
Laboratory-Stakeholder
Interactions

3 ACTIVITY AREA
Diversity,
Equity & Inclusion

CENTER FOR RESILIENCY
LAMAR UNIVERSITY

FLOOD RISK MANAGEMENT
HCFCD PERSPECTIVE

SCOTT R. ELMER, P.E.,

Chief of Partnerships & Programs;
Harris County Flood Control District
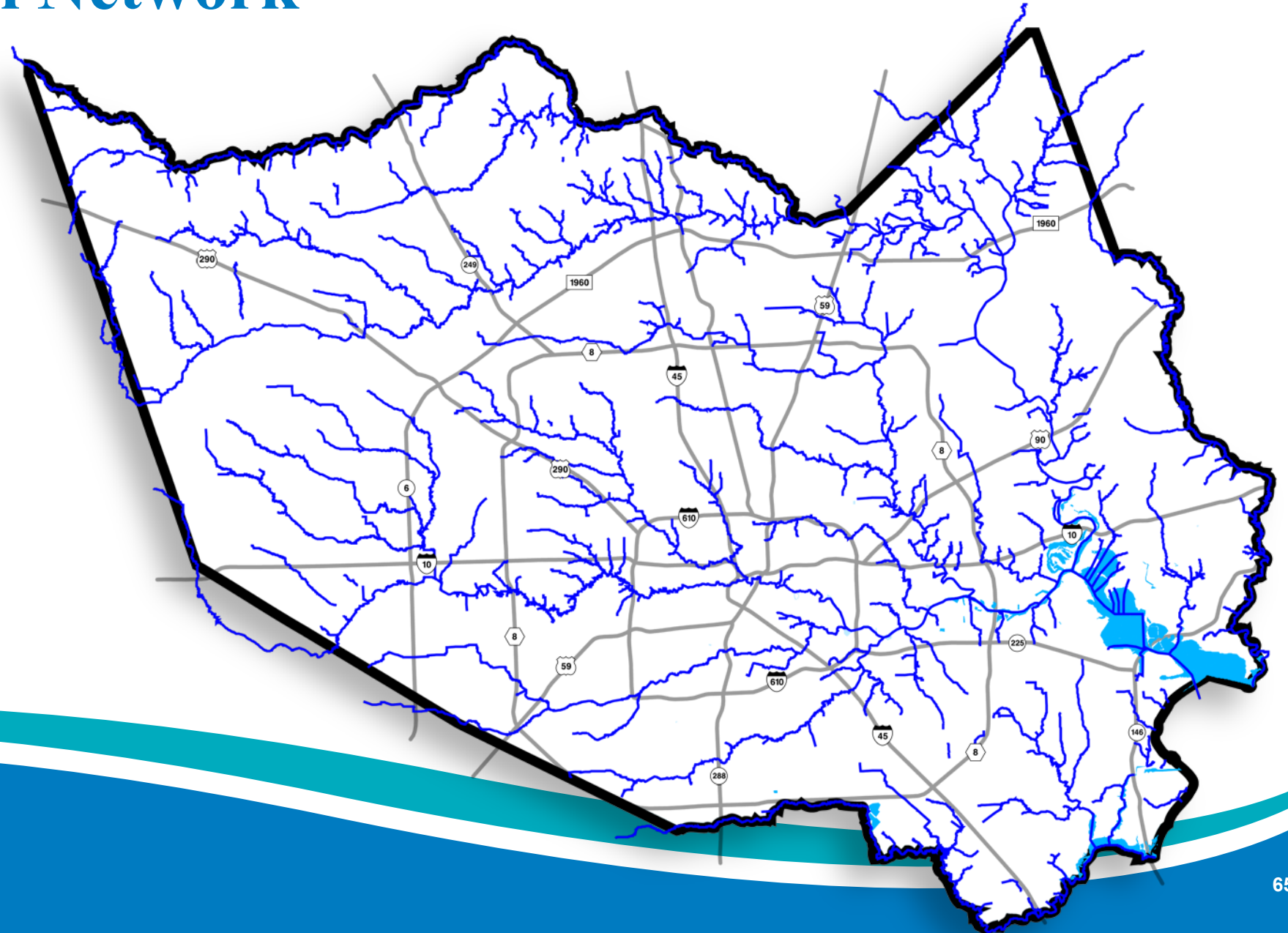
Harris County
**FLOOD
CONTROL
DISTRICT**

Harris County Watersheds

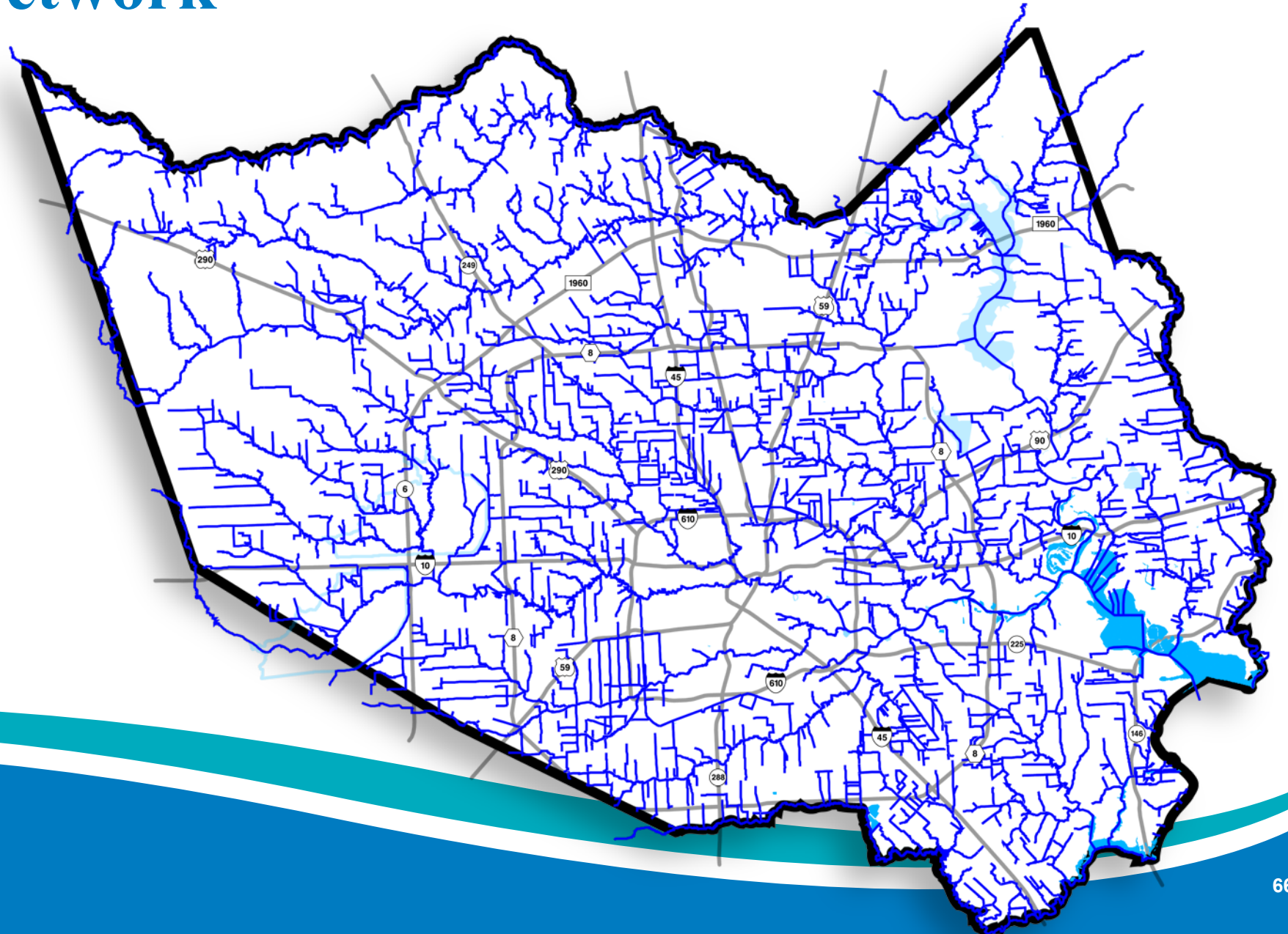**Flooding is Harris County's #1 Natural Disaster**

- 23 watersheds, or drainage areas, across the county
- Prone to extreme rainfall including tropical storms and hurricanes
- Flat, slow-draining landscape
- Clay soils that do not soak up excess rainfall quickly
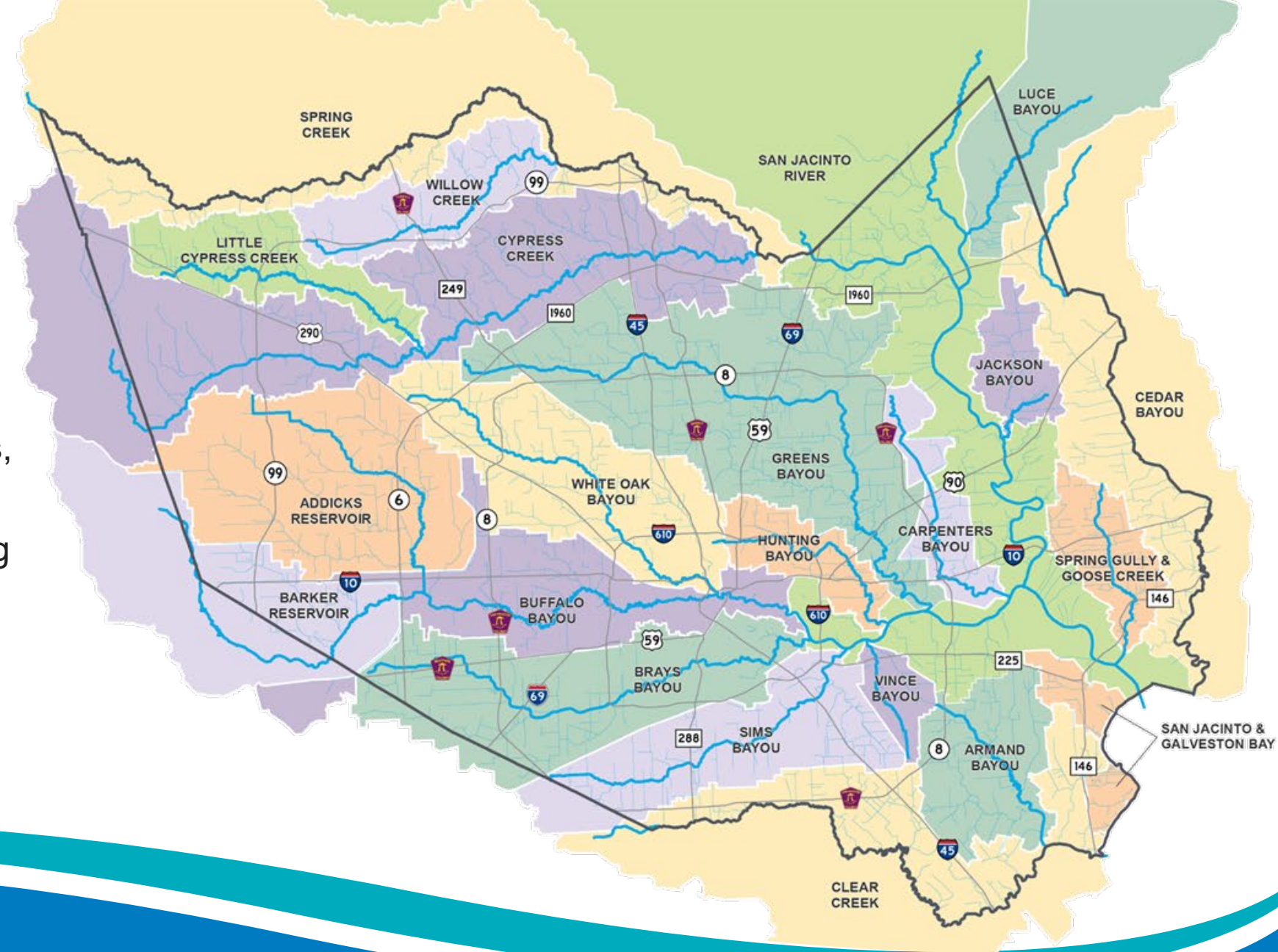
Natural Channel Network (800miles)

Total Channel Network (2,500+ miles)

Our Work

Harris County Flood Control District

- A special purpose district created in 1937 by the Texas Legislature

- In response to floods that devastated the Houston-area in 1929 and 1935

- Serves as a local partner to leverage federal dollars for flood damage reduction

- Harris County Commissioners Court serves as our board of directors or governing body

Our Mission

Provide flood damage reduction projects that work, with appropriate regard for community and natural values.

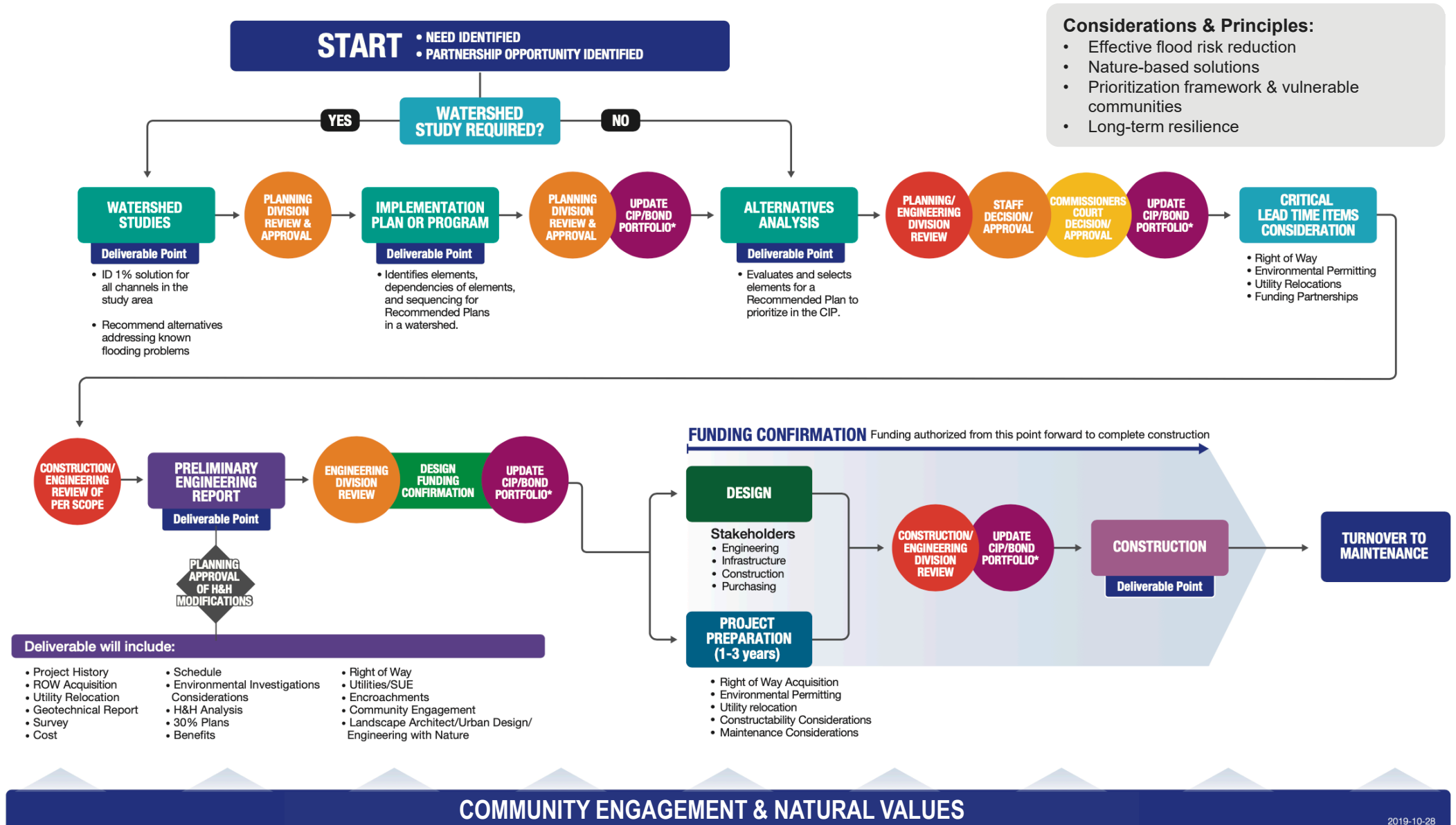*Cypress Park in the Cypress Creek watershed*

What We Do

PLAN

IMPLEMENT

MAINTAIN

Project Delivery

START
- NEED IDENTIFIED
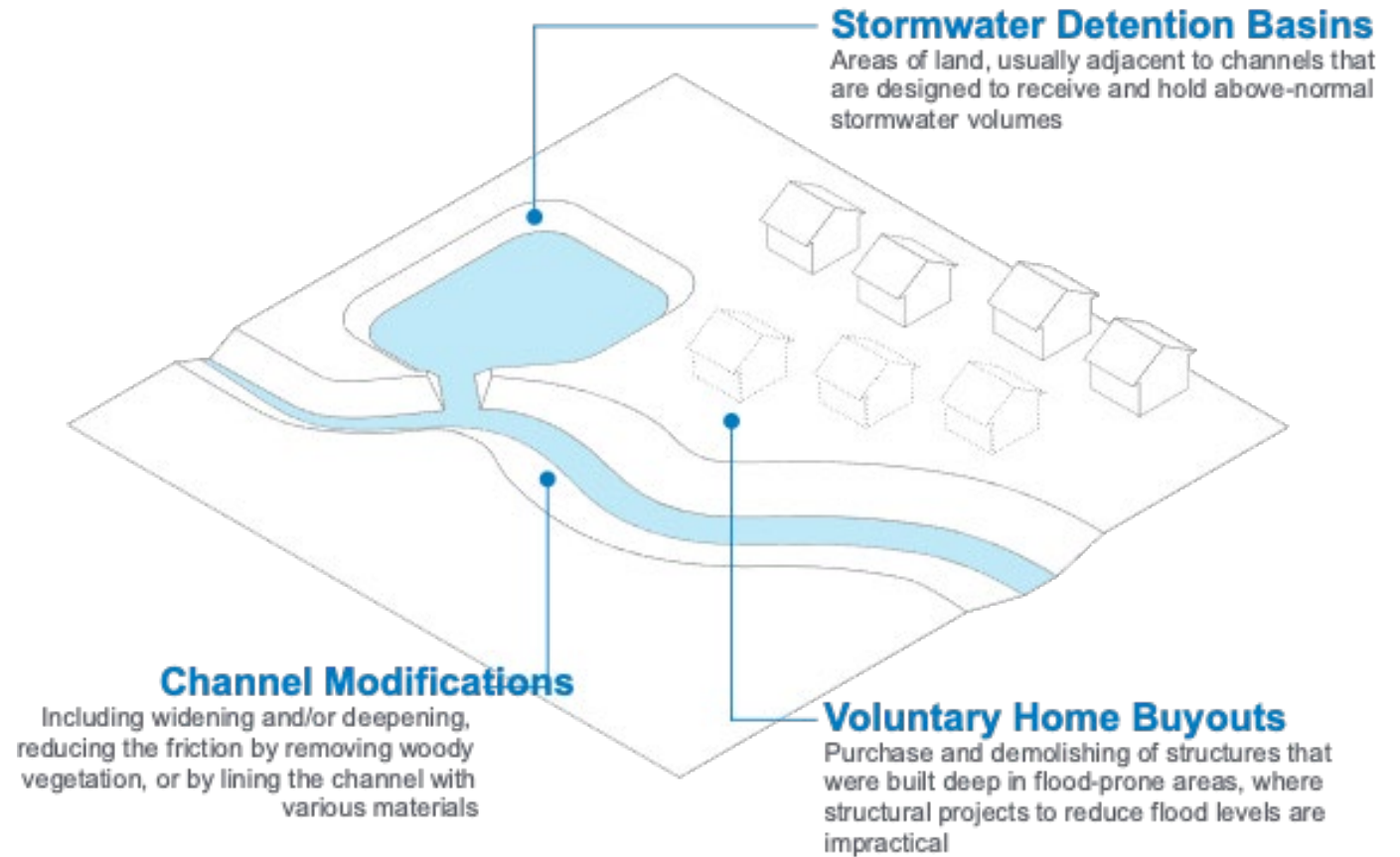- PARTNERSHIP OPPORTUNITY IDENTIFIED

Considerations & Principles:
- Effective flood risk reduction
- Nature-based solutions
- Prioritization framework & vulnerable communities
- Long-term resilience

WATERSHED STUDY REQUIRED? YES / NO

WATERSHED STUDIES
Deliverable Point
- ID 1% solution for all channels in the study area
- Recommend alternatives addressing known flooding problems

PLANNING DIVISION REVIEW & APPROVAL

IMPLEMENTATION PLAN OR PROGRAM
Deliverable Point
- Identifies elements, dependencies of elements, and sequencing for Recommended Plans in a watershed.

PLANNING DIVISION REVIEW & APPROVAL

UPDATE CIP/BOND PORTFOLIO*

ALTERNATIVES ANALYSIS
Deliverable Point
- Evaluates and selects elements for a Recommended Plan to prioritize in the CIP.

PLANNING/ ENGINEERING DIVISION REVIEW

STAFF DECISION/ APPROVAL

COMMISSIONERS COURT DECISION/ APPROVAL

UPDATE CIP/BOND PORTFOLIO*

CRITICAL LEAD TIME ITEMS CONSIDERATION
- Right of Way
- Environmental Permitting
- Utility Relocations
- Funding Partnerships

CONSTRUCTION/ ENGINEERING REVIEW OF PER SCOPE

PRELIMINARY ENGINEERING REPORT
Deliverable Point

PLANNING APPROVAL OF H&H MODIFICATIONS

ENGINEERING DIVISION REVIEW

DESIGN FUNDING CONFIRMATION

UPDATE CIP/BOND PORTFOLIO*

FUNDING CONFIRMATION Funding authorized from this point forward to complete construction

DESIGN
Stakeholders
- Engineering
- Infrastructure
- Construction
- Purchasing

PROJECT PREPARATION (1-3 years)
- Right of Way Acquisition
- Environmental Permitting
- Utility relocation
- Constructability Considerations
- Maintenance Considerations

CONSTRUCTION/ ENGINEERING DIVISION REVIEW

UPDATE CIP/BOND PORTFOLIO*

CONSTRUCTION
Deliverable Point

TURNOVER TO MAINTENANCE

Deliverable will include:
- Project History
- ROW Acquisition
- Utility Relocation
- Geotechnical Report
- Survey
- Cost
- Schedule
- Environmental Investigations Considerations
- H&H Analysis
- 30% Plans
- Benefits
- Right of Way
- Utilities/SUE
- Encroachments
- Community Engagement
- Landscape Architect/Urban Design/ Engineering with Nature

HARRIS COUNTY FLOOD CONTROL DISTRICT

COMMUNITY ENGAGEMENT & NATURAL VALUES

2019-10-28

Multiple Jurisdictions

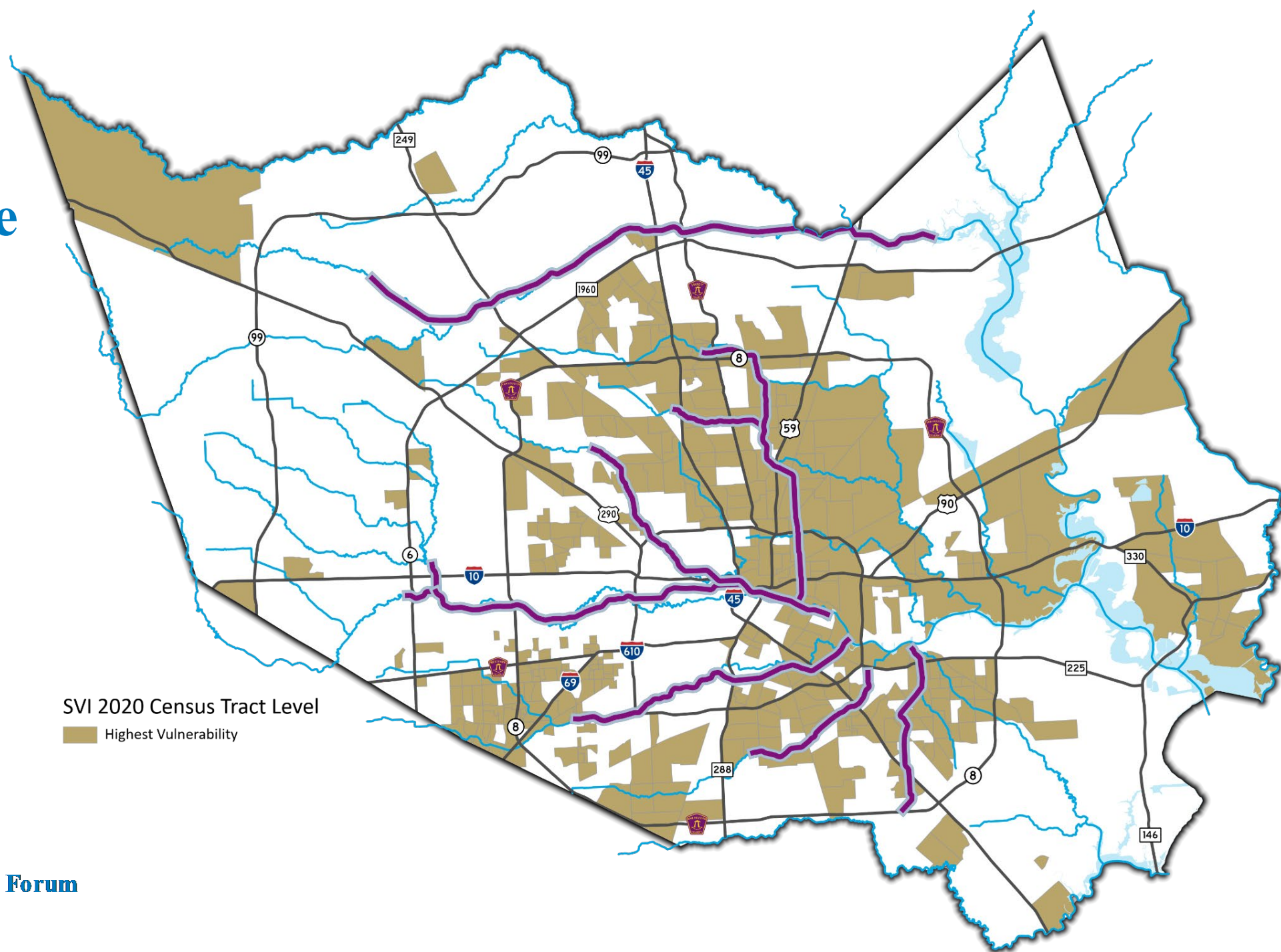City/Municipal Jurisdiction | Shared Jurisdiction | HCFCD Jurisdiction
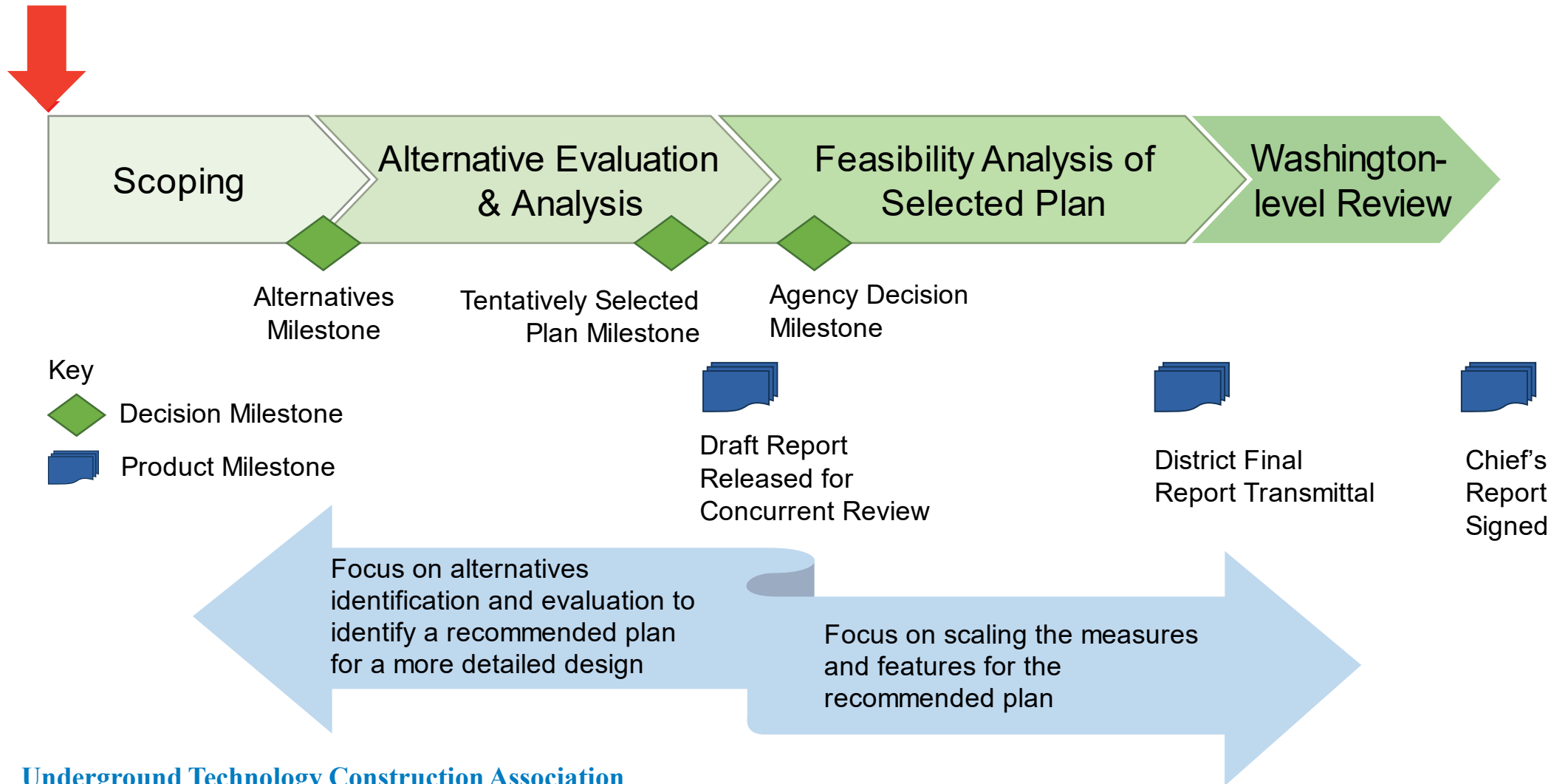
Flood Damage Reduction Tools

- **Channel modification:** Improve channel conveyance

- **Stormwater detention:** Provide temporary storage of rainwater

- **Diversion:** Redirect floodwater to a place with capacity

- **Bridge adjustment or replacement:** Remove obstructions to flow

- **Sediment removal:** Excavation of channel deposition

- **Nature-based solutions:** Mimic natural behavior and/or utilize natural materials

- **Floodplain acquisition or voluntary home buyouts:** Remove homes from the floodplain and help residents relocate

Stormwater Detention Basins
Areas of land, usually adjacent to channels that are designed to receive and hold above-normal stormwater volumes

Channel Modifications
Including widening and/or deepening, reducing the friction by removing woody vegetation, or by lining the channel with various materials

Voluntary Home Buyouts
Purchase and demolishing of structures that were built deep in flood-prone areas, where structural projects to reduce flood levels are impractical

Looking Ahead to Innovative Solutions

SVI 2020 Census Tract Level

Highest Vulnerability

USACE Partnership Forum

August 23, 2023

Timeline for Section 203 Study

Scoping → **Alternative Evaluation & Analysis** → **Feasibility Analysis of Selected Plan** → **Washington-level Review**

- Alternatives Milestone
- Tentatively Selected Plan Milestone
- Agency Decision Milestone

Key

- ◆ Decision Milestone
- ▣ Product Milestone

Draft Report Released for Concurrent Review

District Final Report Transmittal

Chief's Report Signed

Focus on alternatives identification and evaluation to identify a recommended plan for a more detailed design

Focus on scaling the measures and features for the recommended plan

Underground Technology Construction Association

Wednesday, August 2, 2023

HARRIS COUNTY FLOOD CONTROL DISTRICT

HUD / GLO Funding

Community Block Development Grants for Disaster Recovery (CDBG-DR)

- **Total Grant:** $322.5 million
- **Key Criteria:**
  - Projects with a direct tie to areas impacted by Hurricane Harvey
  - 70% spent in low-to-moderate income (LMI) areas
  - Additional "Urgent Need" projects may be considered after LMI requirement is met
- **Timing:** Funds must be spent by Aug 31, 2026

Community Block Development Grants for Mitigation (CDBG-MIT)

- **Total Grant:** $750 million ($502.5 million HCFCD)
- **Key Criteria:**
  - Projects that mitigate and build resiliency against flood risks and future disasters
  - 53% spent in low-to-moderate income (LMI) areas
  - Additional "Urgent Need" projects may be considered after LMI requirement is met
- **Timing**: Funds must be spent by Aug. 31, 2027

CDBG - DR / MIT Cost Projections
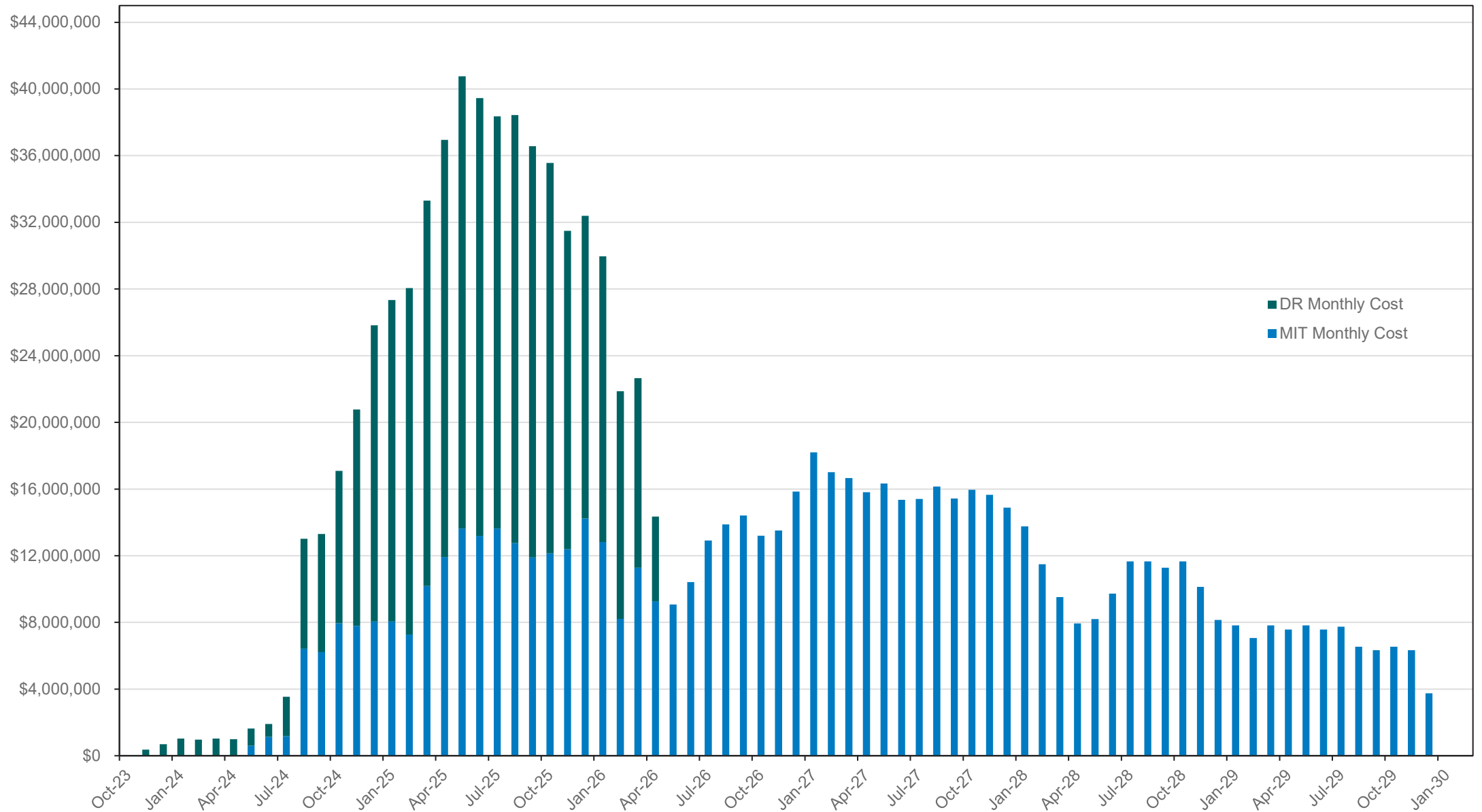
Federal Partnership Highlights & Activity

Barker Reservoir
Desilt Packages

Legend:
- Channels
- Package 1 - Construction Complete
- Barker Watershed
- Harris County Commissioner Precinct 3
- Harris County Commissioner Precinct 4

Precinct 3

Precinct 4

Barker Reservoir

Harris County / Waller County

Harris County / Fort Bend County

Waller County / Fort Bend County
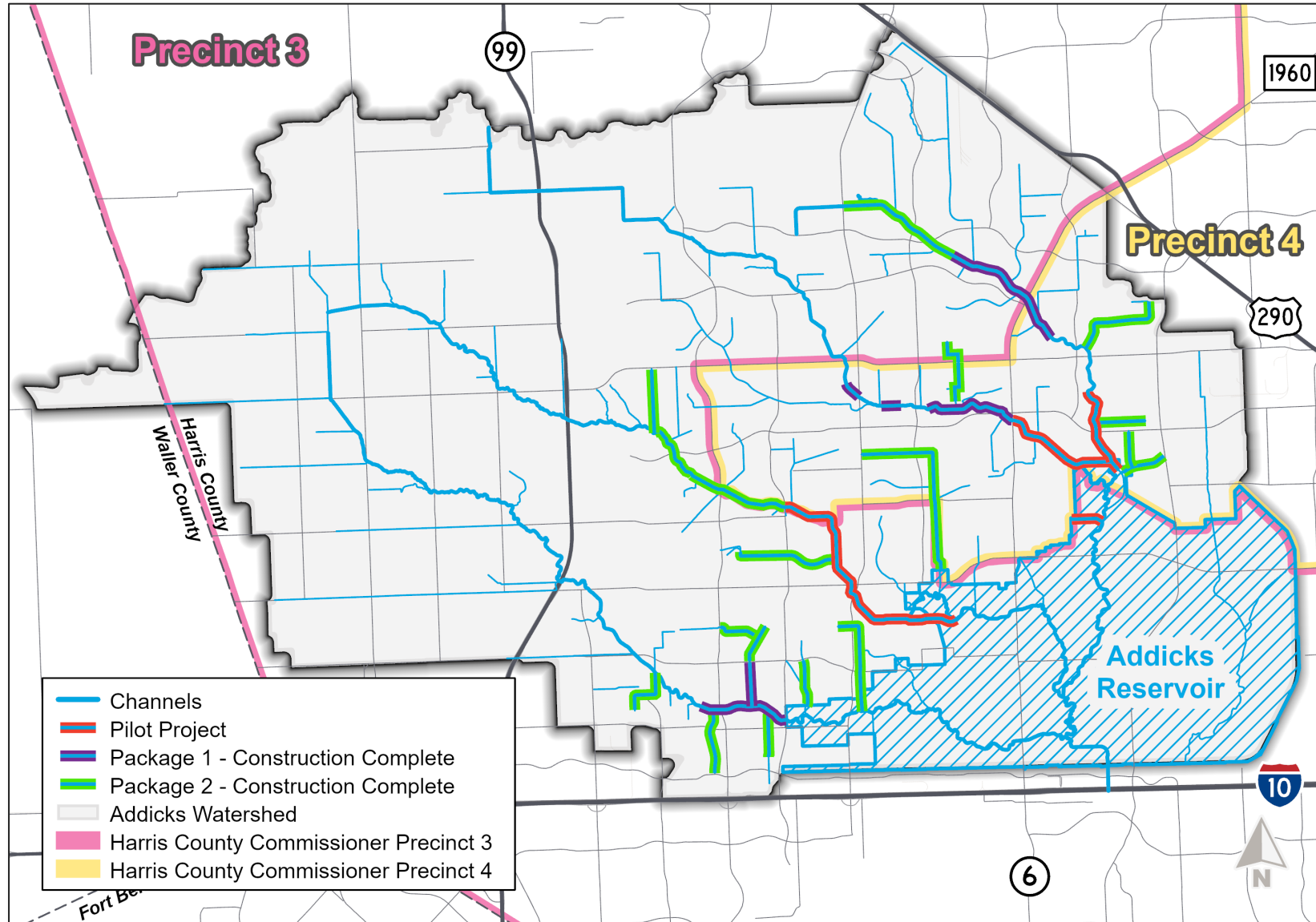
Desilt Packages

Addicks Reservoir
Program Results

- De-Silt efforts began Spring 2019, and all packages are now complete

- A total of approximately 37 miles of channels were de-silted

- A total of 730,000 cubic yards (CY) of sediment removed

    - Pilot Project = 389,000 CY (May 2020)

    - Package 1 = 164,000 CY (Sept. 2020)

    - Package 2 = 177,000 CY (June 2021)

- **That's approximately 73,000 dump truck loads!**

- **Two more packages coming soon, totaling $16 M**

Project Brays

LEGEND
- COMPLETED
- FUNDED BY BIPARTISAN BUDGET ACT OF 2018
- 2021 UNDER CONSTRUCTION
- COMPLETED BRIDGE REPLACEMENT/MODIFICATIONS
- * PEDESTRIAN BRIDGE
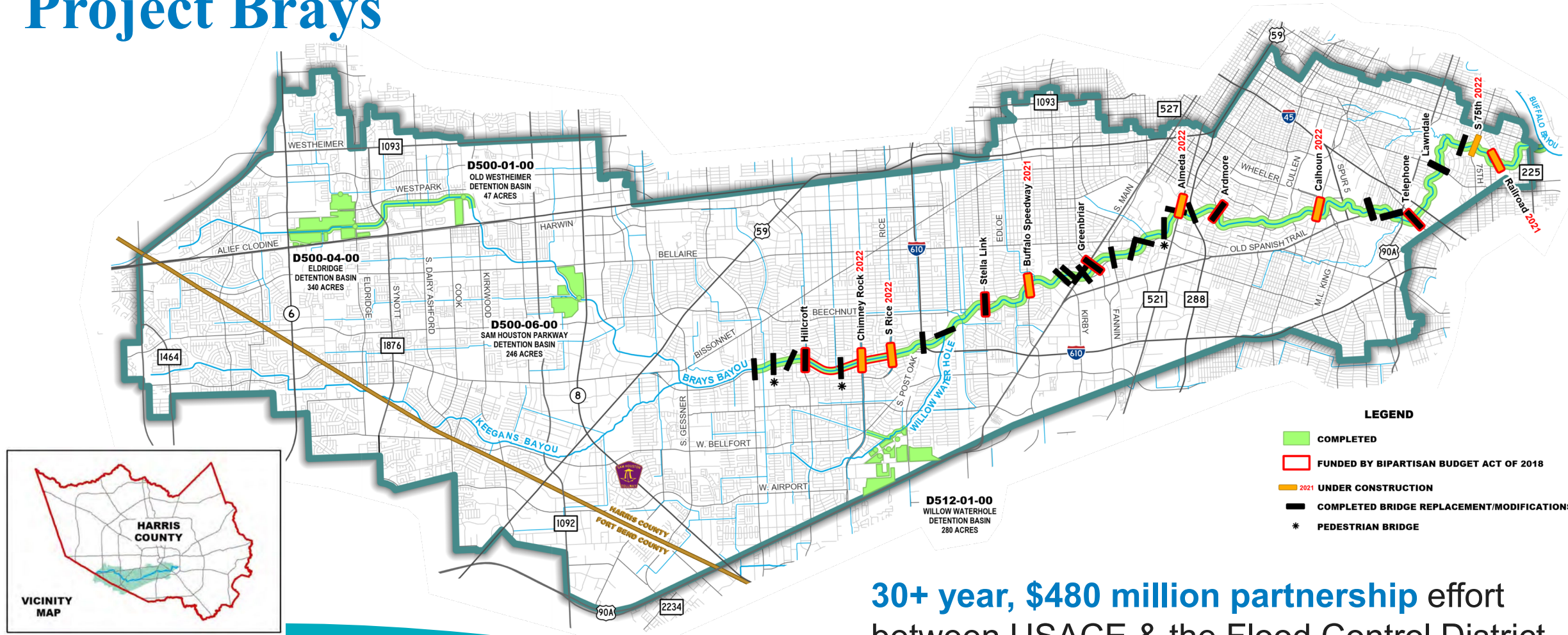
30+ year, $480 million partnership effort
between USACE & the Flood Control District

Clear Creek Federal Project

LEGEND

Proposed Bridge Replacement or Modifcation

Mud Gully Channel Modifications (Advertise Summer 2020; Design-Bid-Build)

Clear Creek, Turkey Creek and Mary's Creek Channel Modifications (Construction Start Pending; Design-Build)

Regional Projects (Not Part of Federal Project)

	HCFCD Regional Project	Name	Stage
1	A520-03-00	South Belt Basin	Construction
2	A500-04-00	Hughes Road Basin	Preliminary Engineering
3	A500-08-00	Dagg Road Basin	Construction
4	A100-00-00-P005	Detention Investigation	Final Report
5	A100-00-00-R009	Selective Clearing	Completed 2019

VICINITY MAP

HARRIS COUNTY

FEDERAL BRIEFING
Spring 2020 | Washington, D.C.
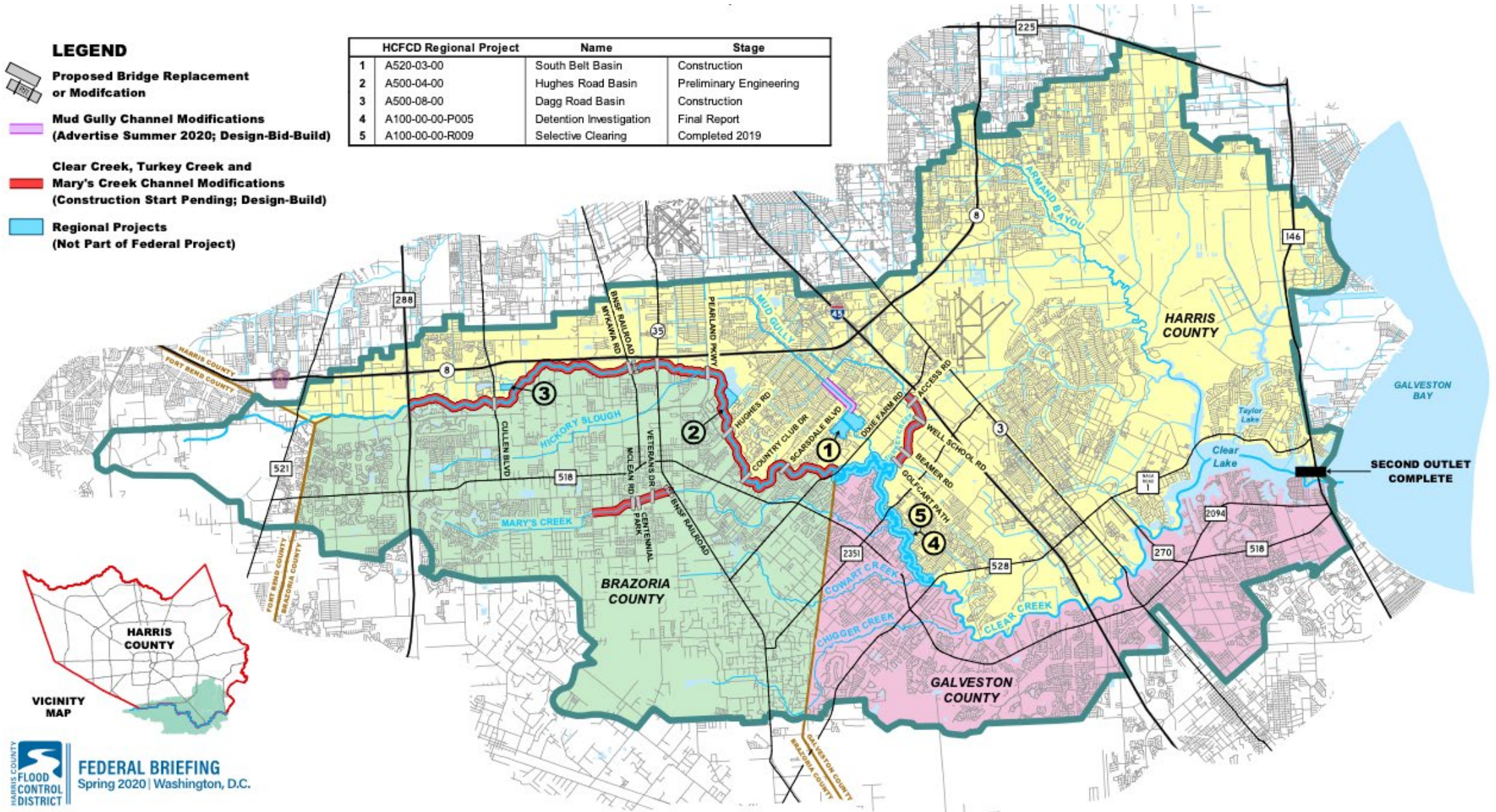
Buffalo Bayou and Tributaries Resiliency Study
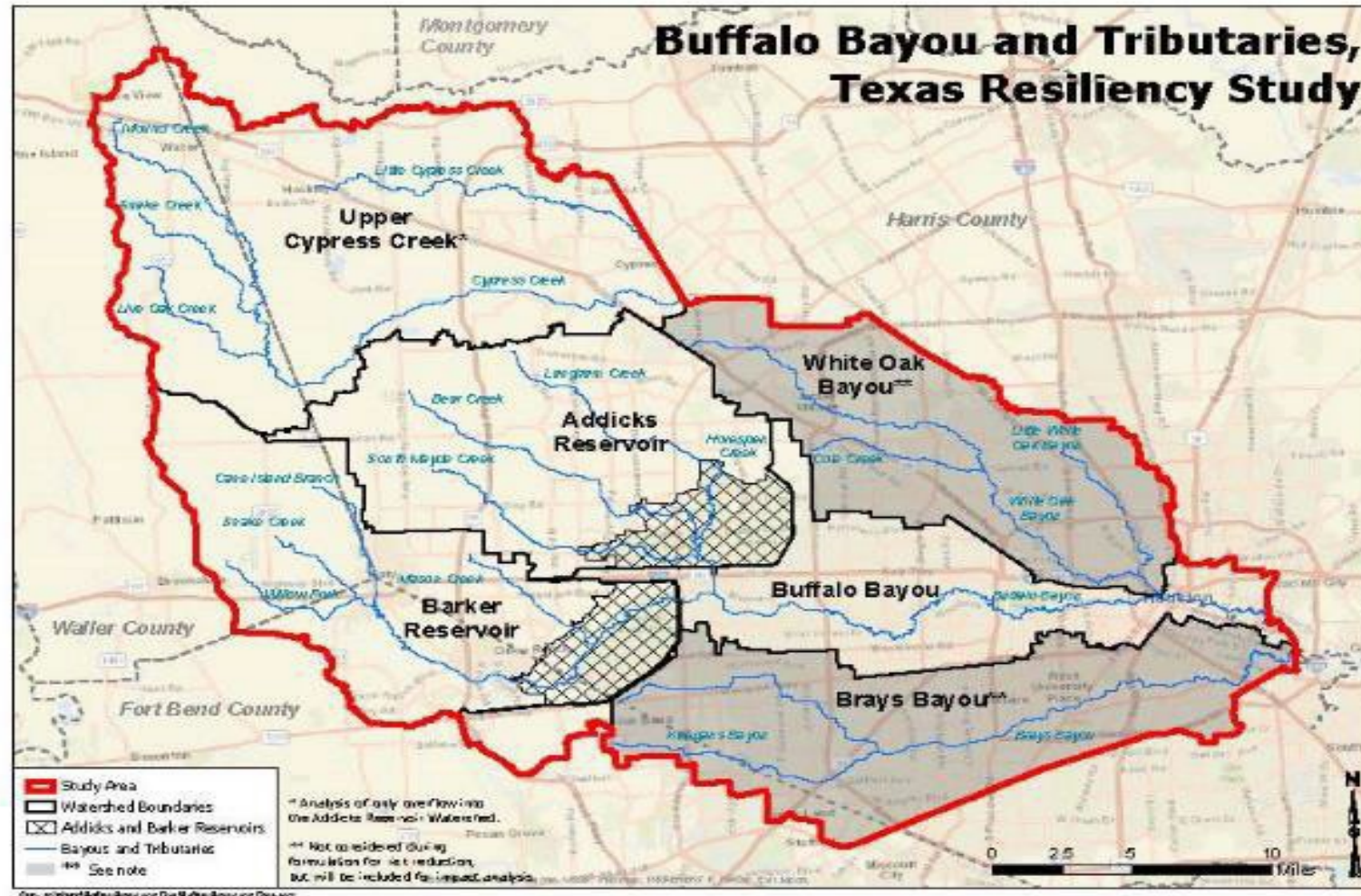
Rainfall / Influence Zones & Operational Resiliency

Zone/Scenario 1:
Addicks & Barker

Zone/Scenario 2:
Upper Buffalo

Zone/Scenario 3:
Lower Buffalo / WOB
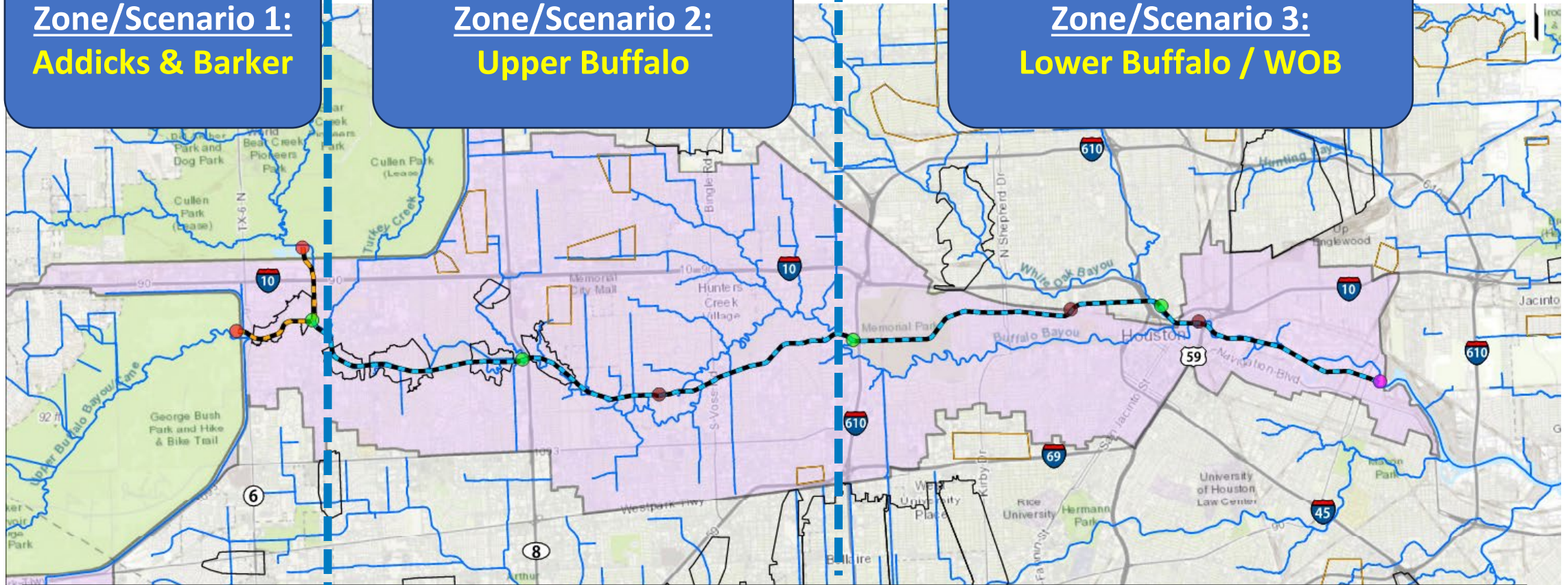
Analysis Considerations:
1. Capture the unique complexity of this large and dynamic regional flood risk management system, within a traditionally static / simplified paradigm focused on probabilistic / annualized benefits
2. Capture benefits in "total", across all four accounts (economic, social, environmental)
3. Understand performance / residual risk into an uncertain future

Resiliency Metrics

Dam Resiliency

- Max Non-Damaging Discharge Rate
  - 7-fold improvement (~14,000cfs)

- Max Emergency Discharge Rate
  - 2-fold improvement (~27,000cfs)

- Reservoir Drawdown Time
  - 7-fold reduction in estimate duration

Operational Resiliency

- Performance in Variable Events

- Geographically (Zones)

- Temporally (Longer duration events or real events)

- Sequential (Major event followed by another major event)

- Performance in an Uncertain Future (Residual Risk & Climate Change)

Flood Insurance Rate Map Updates

— FEMA-funded project representing a transformative step in the management and regulation of Harris County's floodplains, further contributing to our county's resilience

— Relies on latest estimates of rainfall risk to update Flood Insurance Rate Maps (FIRMs)

— Studying and mapping additional miles of streams to update Flood Insurance Maps

— Developing additional data that will more thoroughly communicate flood risk

Historical Storm Data + Atlas 14

Completed Flood Damage Reduction Projects

Topographic Data LiDAR + Survey

MAAPnext

Impervious and Land Use Data Updated 2018

New 1D/2D Hydraulic Models

Public Outreach & Communication
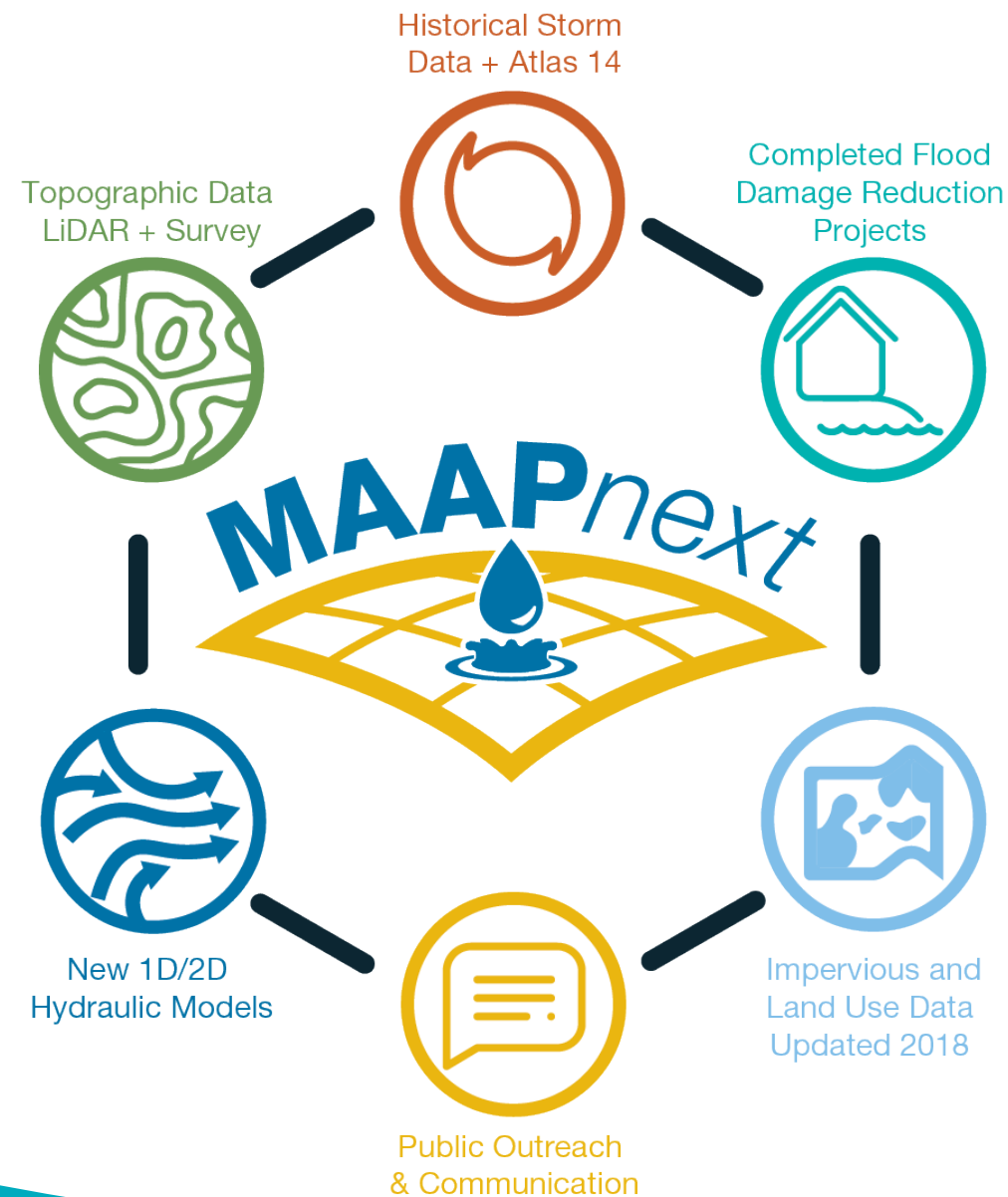
FEMA Effective Floodplains in Harris County

As of April 2022

HCFCD Effective Floodplains
- 1% (100-year) Floodway
- 1% (100-year) Floodplain; 1% (100-year) Coastal Floodplain
- 0.2% (500-year) Floodplain
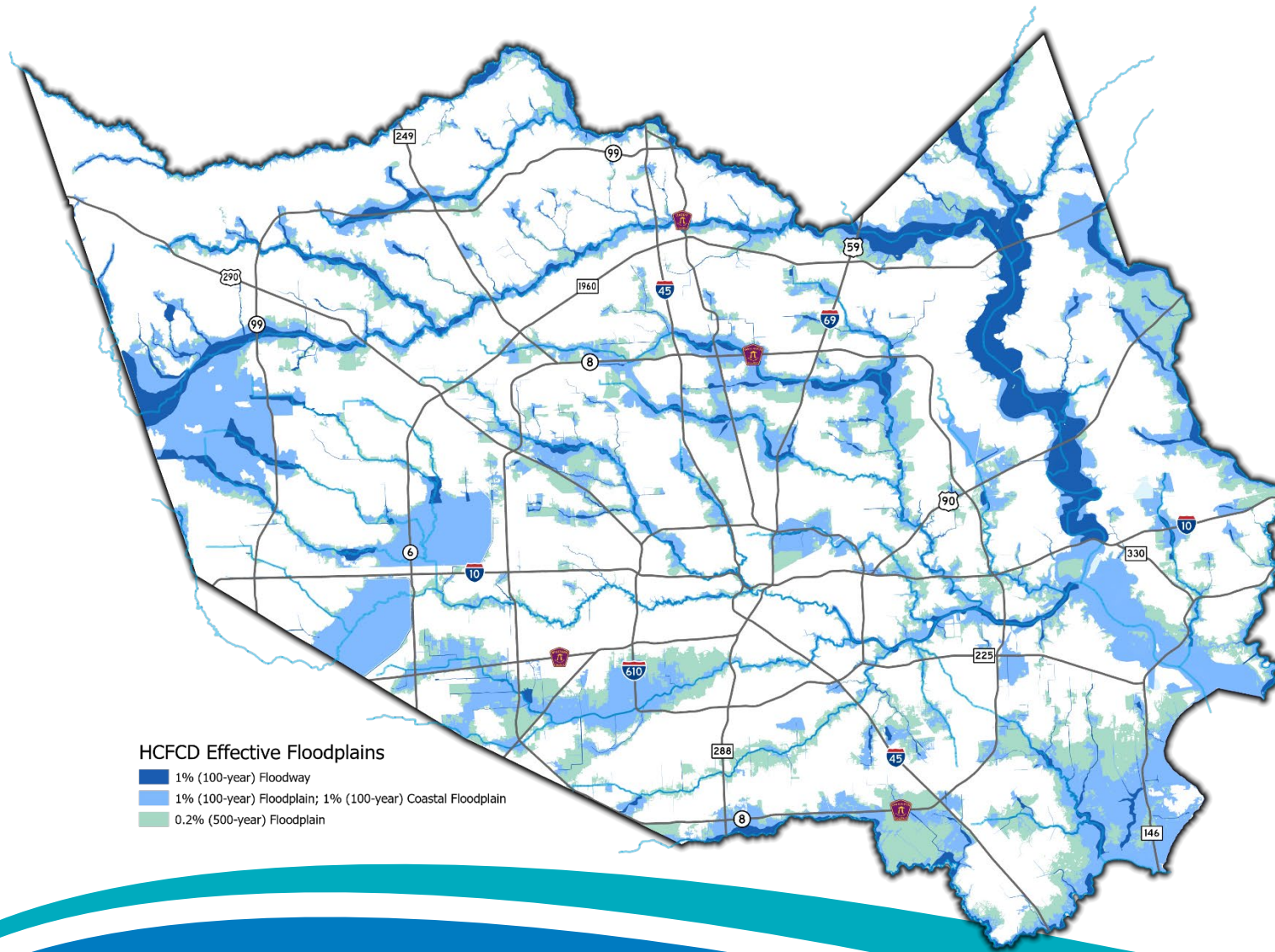
FLOOD INSURANCE RATE MAP (FIRM) UPDATE TIMELINE

Milestone Responsibility ◆ HCFCD ◆ FEMA

WE ARE HERE
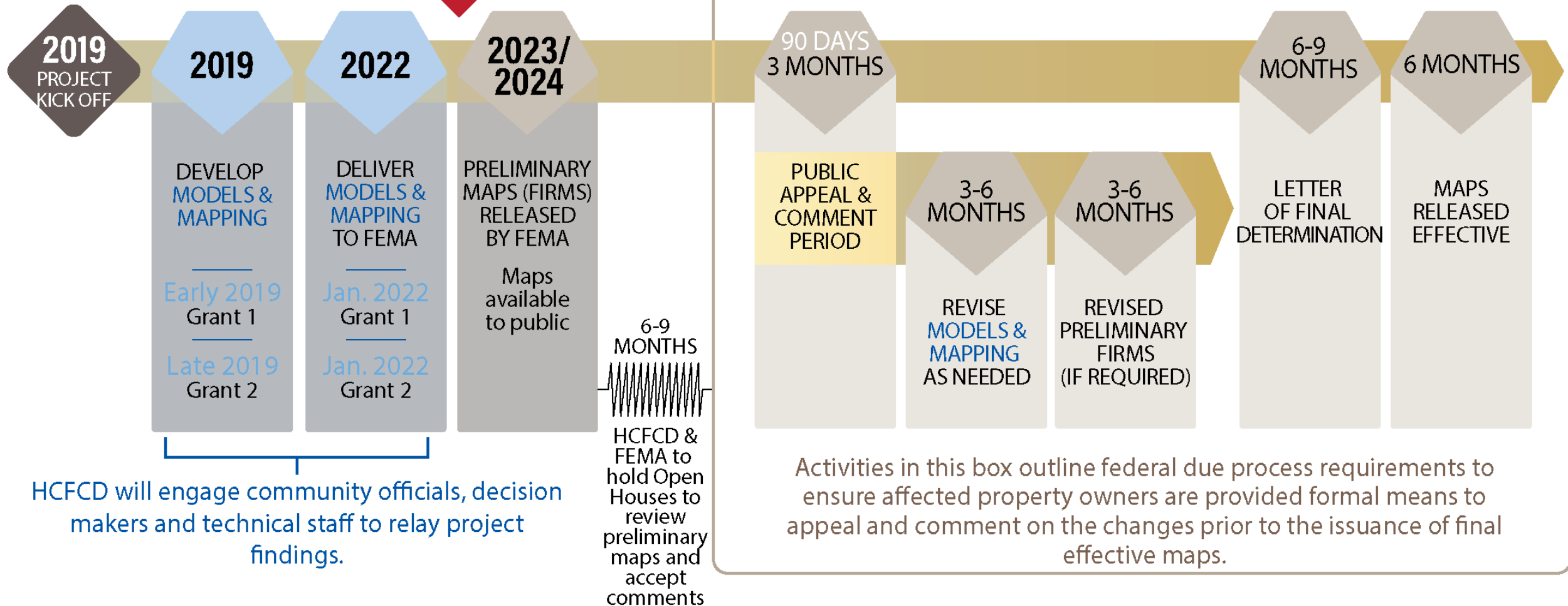
2019 PROJECT KICK OFF

2019
DEVELOP MODELS & MAPPING
_____
Early 2019 Grant 1
_____
Late 2019 Grant 2

2022
DELIVER MODELS & MAPPING TO FEMA
_____
Jan. 2022 Grant 1
_____
Jan. 2022 Grant 2

2023/2024
PRELIMINARY MAPS (FIRMS) RELEASED BY FEMA

Maps available to public

HCFCD will engage community officials, decision makers and technical staff to relay project findings.

6-9 MONTHS

HCFCD & FEMA to hold Open Houses to review preliminary maps and accept comments

18-24 MONTHS (TYPICAL)

90 DAYS 3 MONTHS
PUBLIC APPEAL & COMMENT PERIOD

3-6 MONTHS
REVISE MODELS & MAPPING AS NEEDED

3-6 MONTHS
REVISED PRELIMINARY FIRMS (IF REQUIRED)

6-9 MONTHS
LETTER OF FINAL DETERMINATION

6 MONTHS
MAPS RELEASED EFFECTIVE

Activities in this box outline federal due process requirements to ensure affected property owners are provided formal means to appeal and comment on the changes prior to the issuance of final effective maps.

For additional information on job openings and contracting opportunities visit

www.hcfcd.org/work-with-us

HARRIS COUNTY
FLOOD CONTROL DISTRICT

Questions & Discussion

National Shoreline Management Study Background

Section 215(c) of WRDA 1999 defined NSMS as: A description of (1) the extent of, and **economic and environmental effects** caused by, erosion and accretion along the shores of the U.S.; and (2) the **causes of such erosion and accretion**;

- Description of **resources committed** by fed, state, and local govts to restore and nourish shores;
- Description of **systematic movement of sand** along the shores; and
- Recommendations regarding (1) appropriate levels of **fed and non-fed participation in shore protection**; and (2) use of a **systems approach** to sand management.

NSMS Assessments Structure

- **8** Regional Assessments; **1** integrated National Assessment
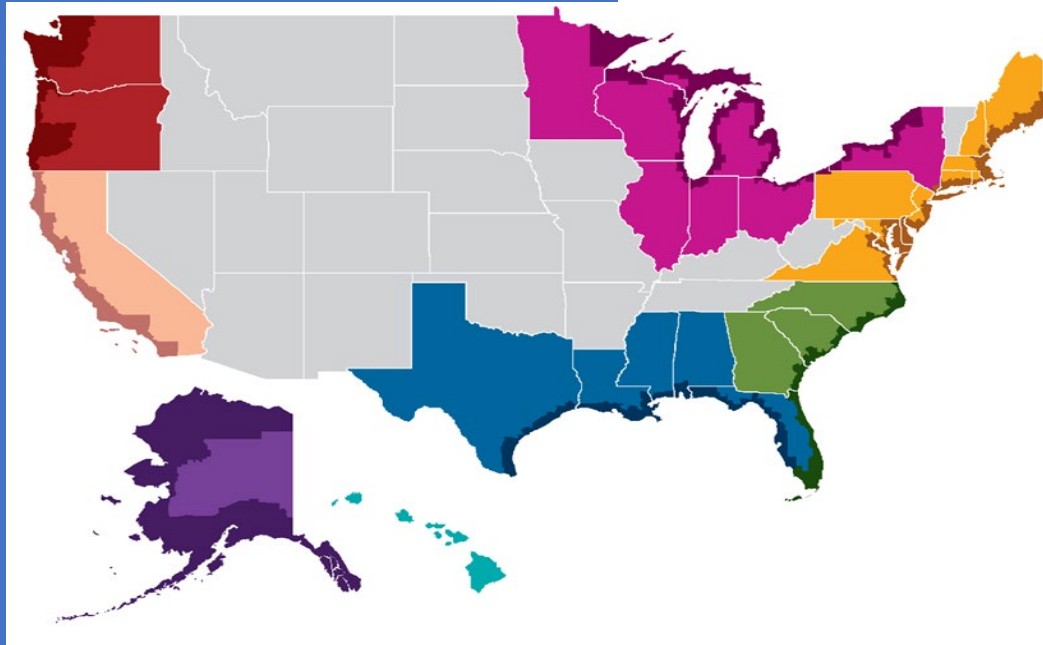
National Shoreline Management Study regions and coastal counties used in data collection

https://www.iwr.usace.army.mil/missions/coasts/national-shoreline-management/

The regional assessment process

- **Coordination** with USACE across the Gulf

- **Engagement** with regional stakeholders and partners (federal agencies, tribes, state/local agencies, NGOs)

- **Document** shoreline erosion/accretion, management approaches and economic and environmental impacts based on existing information

- **Development of** recommendations in collaboration with stakeholders/partners

NSMS Gulf Regional Assessment

The Gulf Shoreline

What makes it different?

Loop Current system in the Gulf of Mexico.
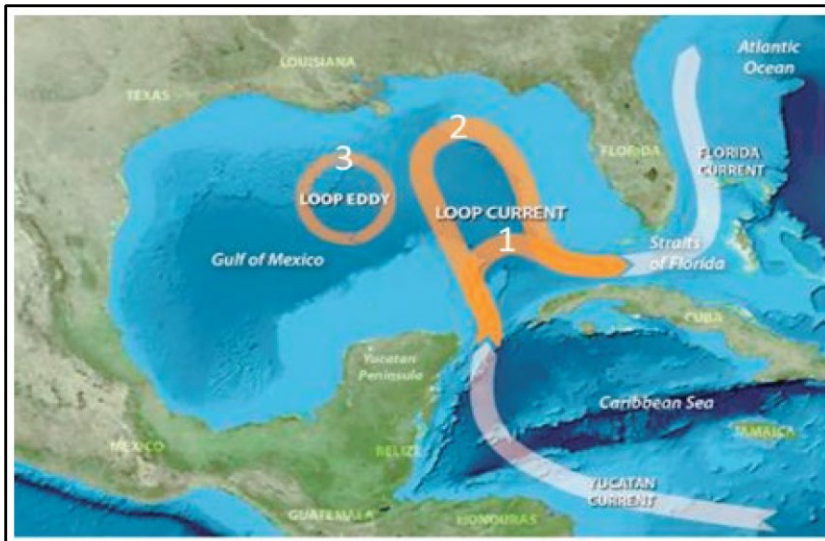
Source: NASEM, 2018a.

Average conditions for zones of origin and tracks for different months during the hurricane season.

Source: NOAA (https://www.nhc.noaa.gov/climo/#ori)
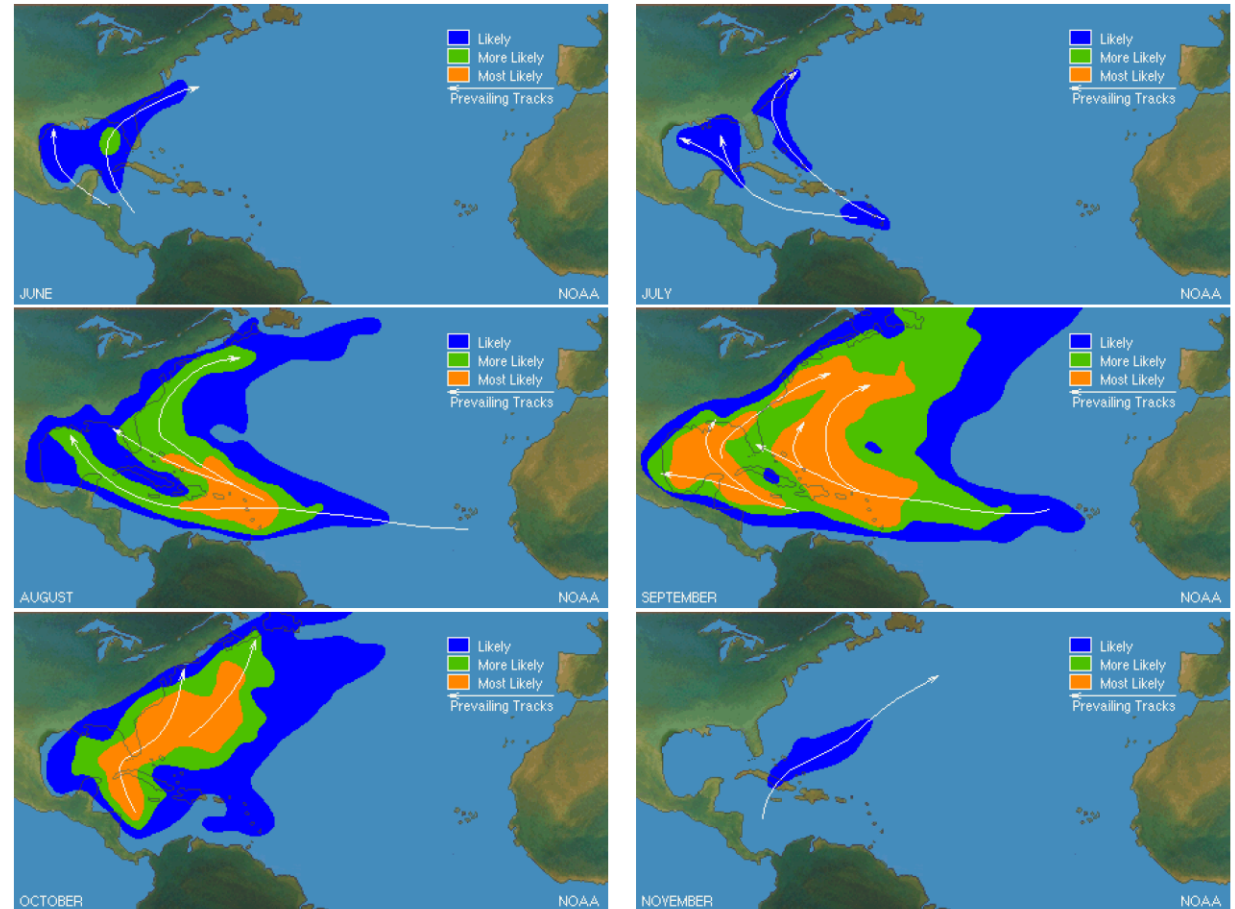
58 hurricanes impacted some portion of
the Gulf of Mexico shoreline from 1970 to 2020.

NSMS Gulf Regional Assessment

Texas

Galveston MSL
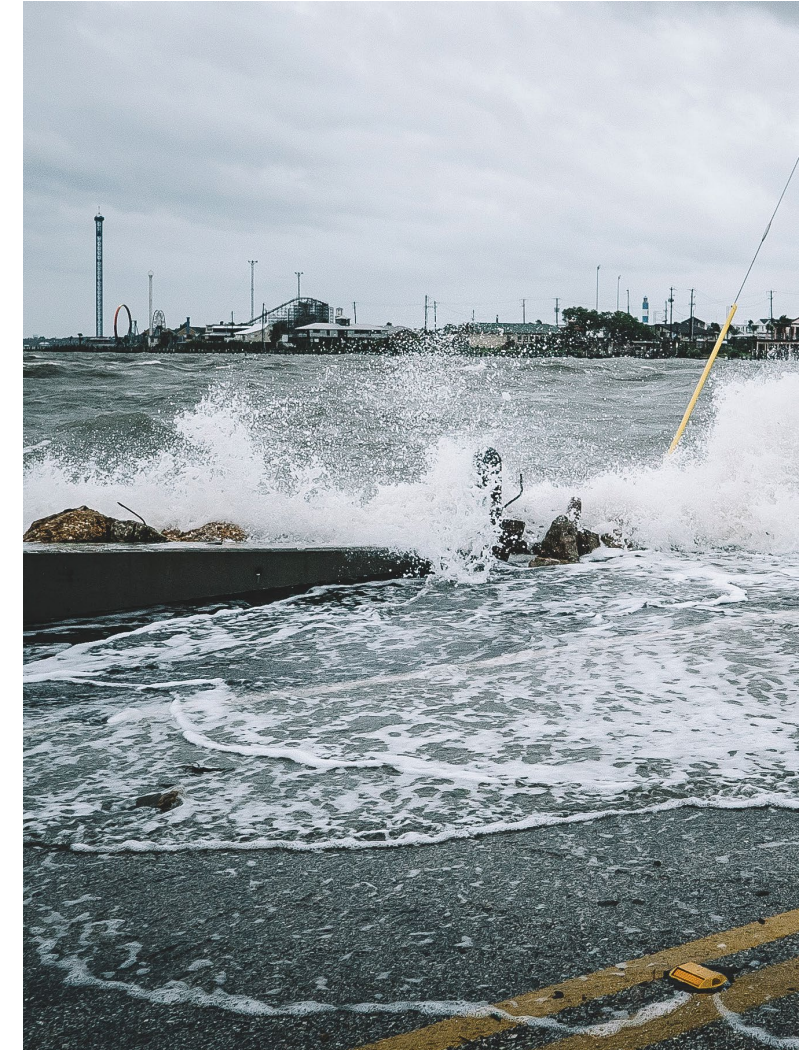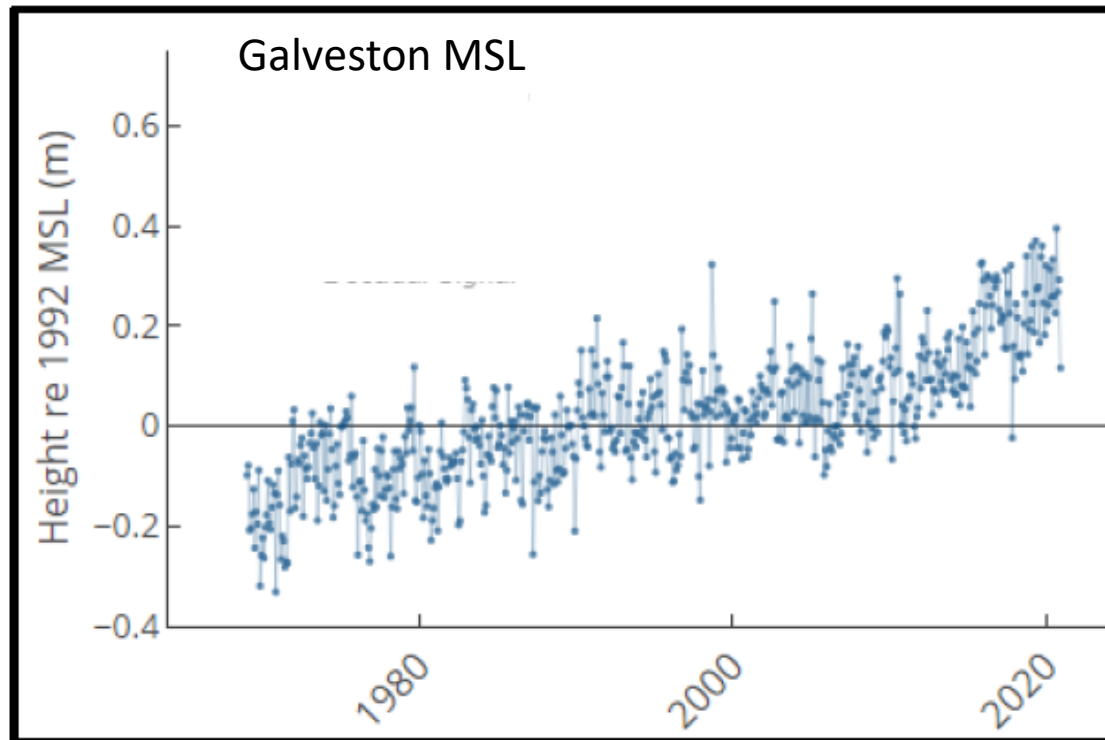
Kemah, Texas, during Hurricane Harvey

NSMS Gulf Regional Assessment

The Gulf Shoreline

How is it changing?

Long term shoreline change rates (1849-2001)

Gulf shoreline erosion rates (1930s-2019)

Source: USACE and Texas GLO, 2020.

Source: USGS Coastal Change Hazards Portal,
https://marine.usgs.gov/coastalchangehazardsportal/ui/item/CAkQKWY.
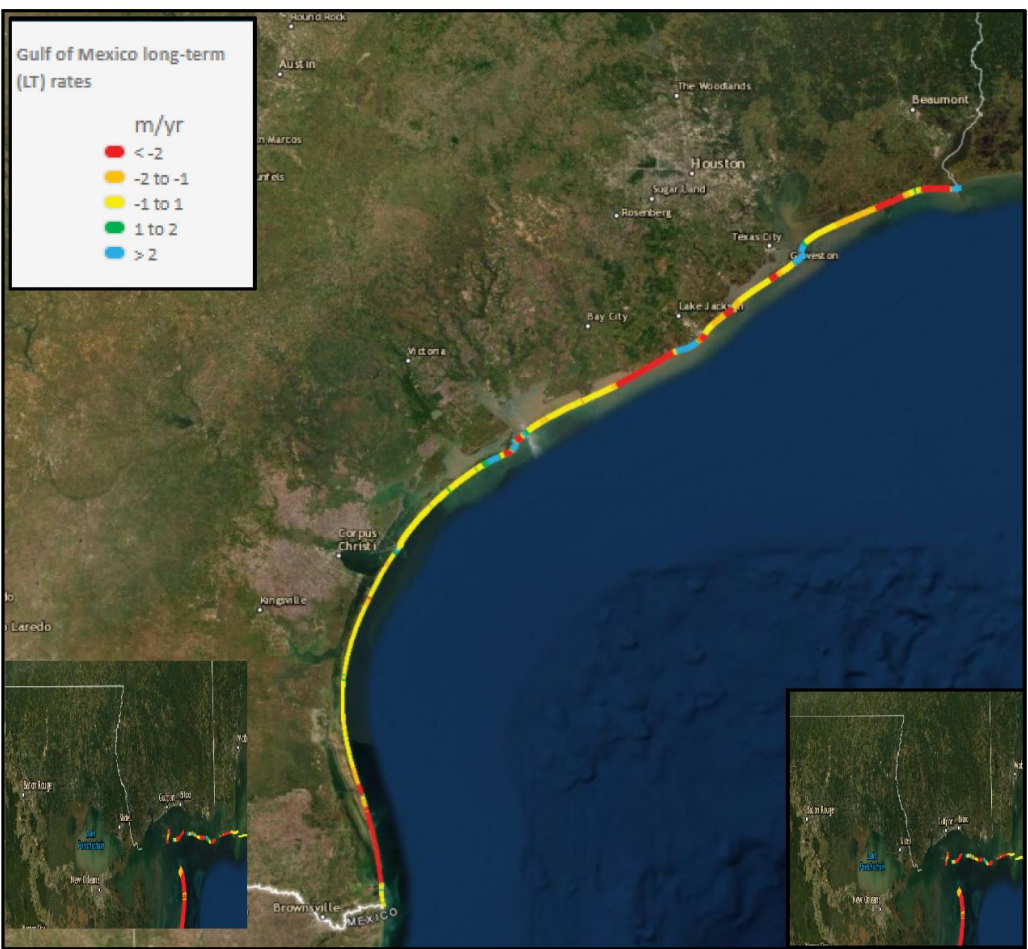
NSMS Gulf Regional Assessment

Economic Importance

Employment by ocean sector, 2018.

Legend:
- Tourism & Recreation
- Offshore Minerals
- Marine Transportation
- Marine Construction
- Ship & Boat Building
- Living Resources

Pie chart values: 69.9%, 16.8%, 8.6%, 2.0%, 1.5%, 1.3%
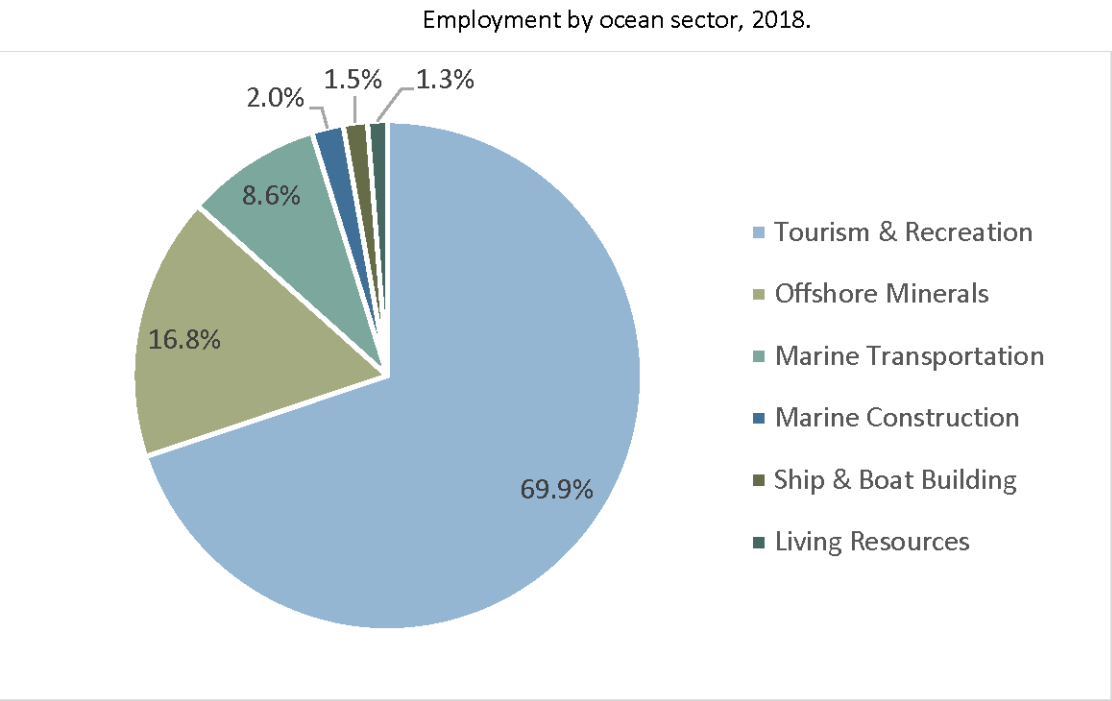
Source: NOAA Economics: National Ocean Watch (ENOW), 2021.

Corpus Christi Ship Channel

Source: Adobe Stock, 84762439.

Ocean economy is a subset of the coastal economy that is directly related to ocean activity)

NSMS Gulf Regional Assessment

People

Coastal county population in 2019.[a]

Population (thousands of people)
- Greater than 1,000
- 500 to 1,000
- 250 to 500
- 100 to 250
- Less than 100
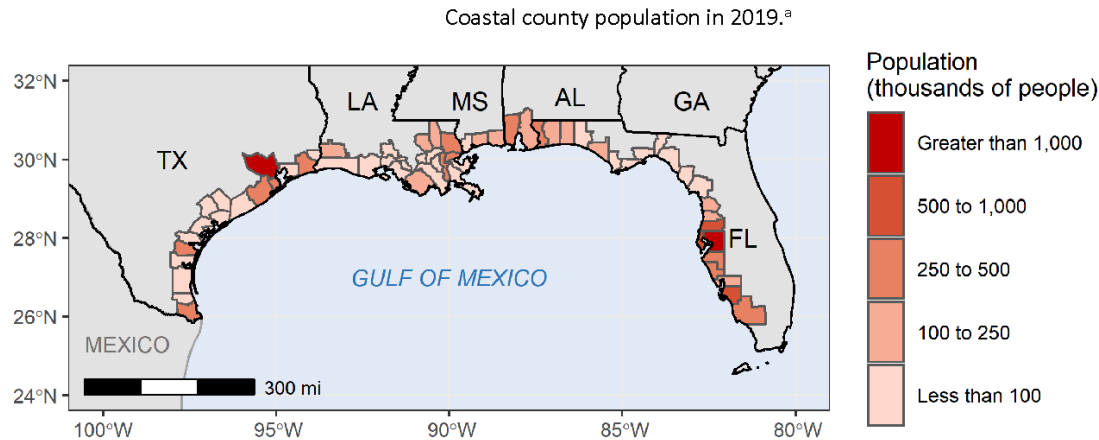
Source: U.S. Census Bureau, 2020a.

[a] Some interior counties are included because some ocean-related economic activity is based in these counties.

Employment within the ocean economy by county, 2018.

Employment (thousands of people)
- 100
- 75
- 50
- 25
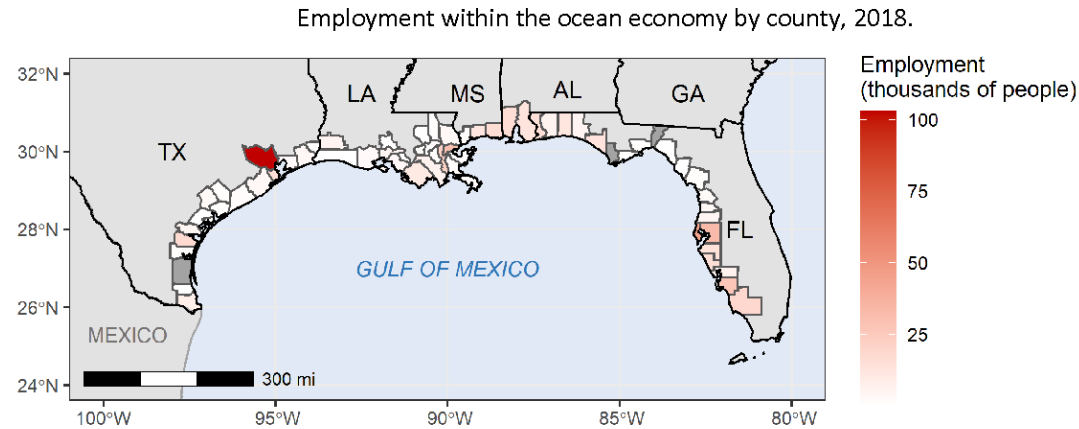
Source: NOAA ENOW, 2021.

* Gulf County and Jefferson County, Florida, and Kenedy County, Texas, are shaded a dark gray because of disclosure issues (too few establishments in any of the six ocean economy sectors).

Property value at risk by county at 1 ft, 3 ft, and 6 ft of SLR (millions of 2020$).

1ft

3ft

6ft

Property Value
- 20000
- 10000
- 5000
- 1000
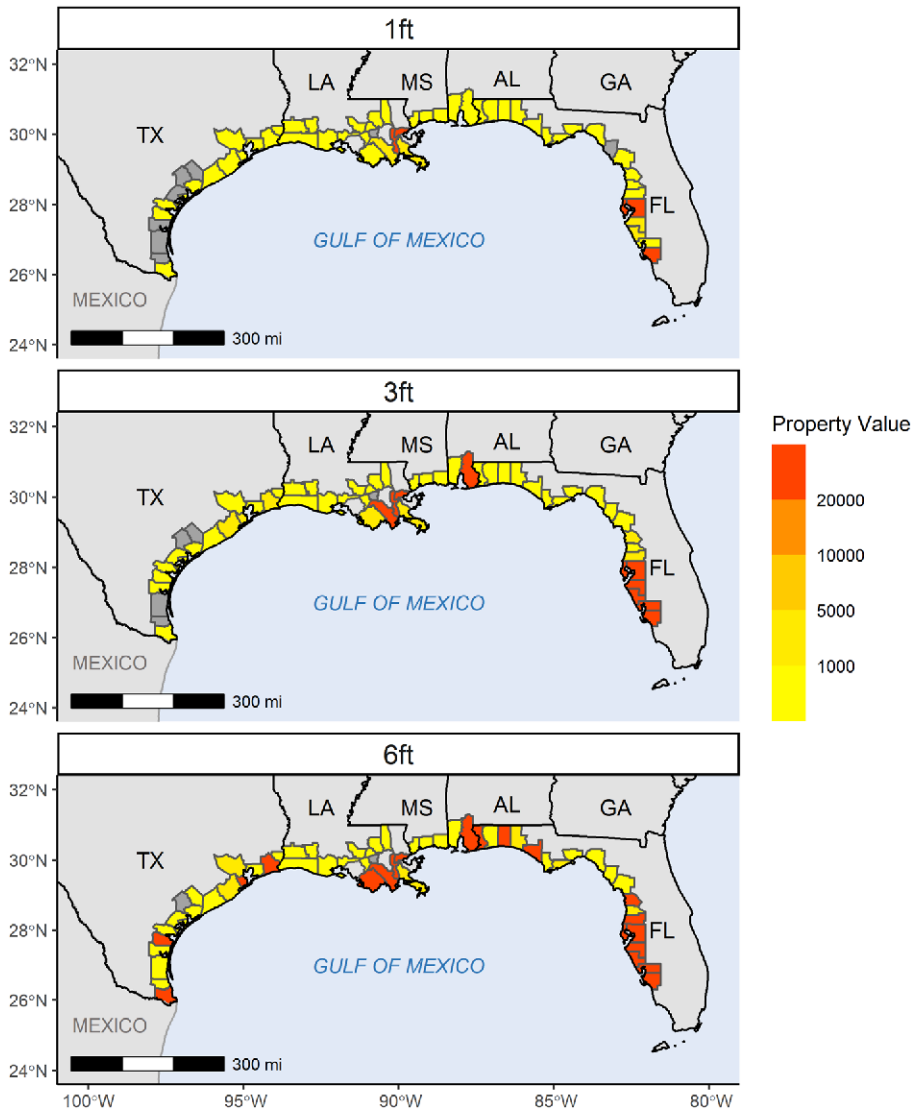
Source: Climate Central, 2021.

NSMS Gulf Regional Assessment

Case Studies

Source: USACE, 2021

South Padre Island Beach Nourishment – material from Brazos Island Harbor jetty and entrance channels dredging project

Source: Texas Commission on Environmental Quality, n.d.

Pierce Marsh Restoration Project – funding through the Malone Service Company Superfund site, used maintenance dredging material from GIWW

NSMS Gulf Regional Assessment

Regional Highlights

- Hurricanes and SLR present serious threats to coastal communities, economies, environments, and significant cultural resources.
- Sediment of all types is a valued resource, and sediment management is essential for coastal resilience.
- Established collaboration among state and federal agencies, NGOs, and others provide a platform for success.
- Nature-based solutions present an opportunity to reduce risk to communities, ensure economic sustainability, and can be integrated with existing shoreline management approaches.

Stakeholder input: *"We need to look at sediment management in the larger river systems that have been dammed up… this interrupts the natural sediment transport to the bays and Gulf of Mexico thus accelerating land loss. We need to do a better job finding ways to reconnect this transport system allow for the regrowth of our deltas and marshes."*

Stakeholder input: *"More sediment is produced by the Brazos River than all other Texas rivers combined. There is an extremely large subtidal delta. We should be using these sediments, nearshore currents, drift and allow normal beach processes to grade the material for us."*

Stakeholder input: *"None of us have yet taken sufficient steps to address the profound impacts of climate change and rising sea levels on the Gulf's low-lying coastline. Using dredged sediments to the greatest extent possible for beneficial purposes would help the Gulf's coastlines and communities adapt to rising water levels and increasing rates of coastal erosion."*

Gulf of Mexico-specific shoreline management lessons learned, outstanding issues and challenges were used to develop three overarching recommendations working with stakeholders

1. Sediment management

2. Mapping erosion hazard areas

3. Resilient shoreline management approaches

NSMS Gulf Regional Assessment

Recommendation:

Promote coordinated, efficient, effective, and adaptable uses of sediment resources to mitigate the adverse effects of natural and human-induced shoreline erosion and accretion, including those exacerbated by SLR, and improve the resilience of coastal economies and ecosystems

Stakeholder input: "Extensive, close corroboration is needed for the beneficial use of dredged material. Oftentimes, the lack of planning between USACE's dredgers and environmental planners/Federal & State agencies results in missed opportunities because sites fail to be permitted and/or constructed in time to accept material."

Example action: Develop dredge material management plans to ensure the identification and appropriate preparation of project locations for sediment placement in anticipation of maintenance dredging events, including lessons learned from experience with 'sediment banking' projects in the Atlantic Intracoastal Waterway.

NSMS Gulf Regional Assessment

Recommendation:

Ensure the availability of high-quality relevant data, including mapping of shoreline characteristics and monitoring of coastal processes, to support regional and site-specific shoreline management activities, providing integrated predictions of future shoreline change that incorporate the role of long-term and episodic factors and their implications for erosion, accretion, and coastal resilience to improve coastal communities' ability to plan and adapt to shoreline change.

High-quality relevant data could include:

- Mapping of shoreline characteristics
- Monitoring of coastal processes

NSMS Gulf Regional Assessment

3. Resilient shoreline management approaches

Recommendation:

Reduce barriers to the use of resilient shoreline management approaches that utilize natural processes and advance the use of NNBFs, where appropriate, to increase coastal resilience and the sustainability of shoreline ecosystems.

Stakeholder input: "To retain the human and ecological values of the Gulf Coast… we should envision and create a future coast that, to the extent possible, uses natural features and processes to achieve resilience, adopts hybrid approaches where needed, brings new thinking and comprehensive planning to coastal problem solving, and integrates equity into decision-making to address the challenges of climate change."

Example: Develop and implement incentives, in areas where they do not currently exist and working across jurisdictional boundaries as needed, to increase the use of natural process-based approaches to shoreline stabilization (e.g., NNBFs) as part of regional plans for the coastal resilience, and reduce barriers to their use, especially along eroded interior tidal waters.

For more information please contact:

USACE Institute for Water Resources

NSMS@usace.army.mil

Or visit

https://www.iwr.usace.army.mil/missions/coasts/national-shoreline-management/

TWDB STATE FLOOD PLAN

TIMOTHY E. BUSCHA, P.E., CFM

President & TWDB Region 6, San Jacinto River, Flood Planning Group

SAN JACINTO REGIONAL FLOOD PLANNING GROUP

R E G I O N 6

Texas Water Development Board – State Flood Plan

In the 2019 Texas Legislature the Texas Water Development Board (TWDB) role in flood planning and financing in Texas was created. A new state and regional flood planning process would begin resulting in adoption of a State Flood Plan developed from 15 regions across the state of Texas.

The legislature also created the Flood Infrastructure Fund (FIF) which will become a funding stream to support flood and drainage projects across the state

More details can be found at https://www.twdb.texas.gov/flood/index.asp

1 - Canadian-Upper Red
2 - Lower Red-Sulphur-Cypress
7 - Upper Brazos
3 - Trinity
4 - Sabine
9 - Upper Colorado
5 - Neches
14 - Upper Rio Grande
8 - Lower Brazos
6 - San Jacinto
13 - Nueces
10 - Lower Colorado-Lavaca
11 - Guadalupe
12 - San Antonio
15 - Lower Rio Grande

REGION 6

1. Canadian-Upper Red
2. Lower Red-Sulphur-Cypress
3. Trinity
4. Sabine
5. Neches
6. San Jacinto
7. Upper Brazos
8. Lower Brazos
9. Upper Colorado
10. Lower Colorado-Lavaca
11. Guadalupe
12. San Antonio
13. Nueces
14. Upper Rio Grande
15. Lower Rio Grande

County boundaries
Major river basin boundaries
Major roadways
Major reservoirs
Major rivers
County seats

DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: 05/01/2020

TNRIS
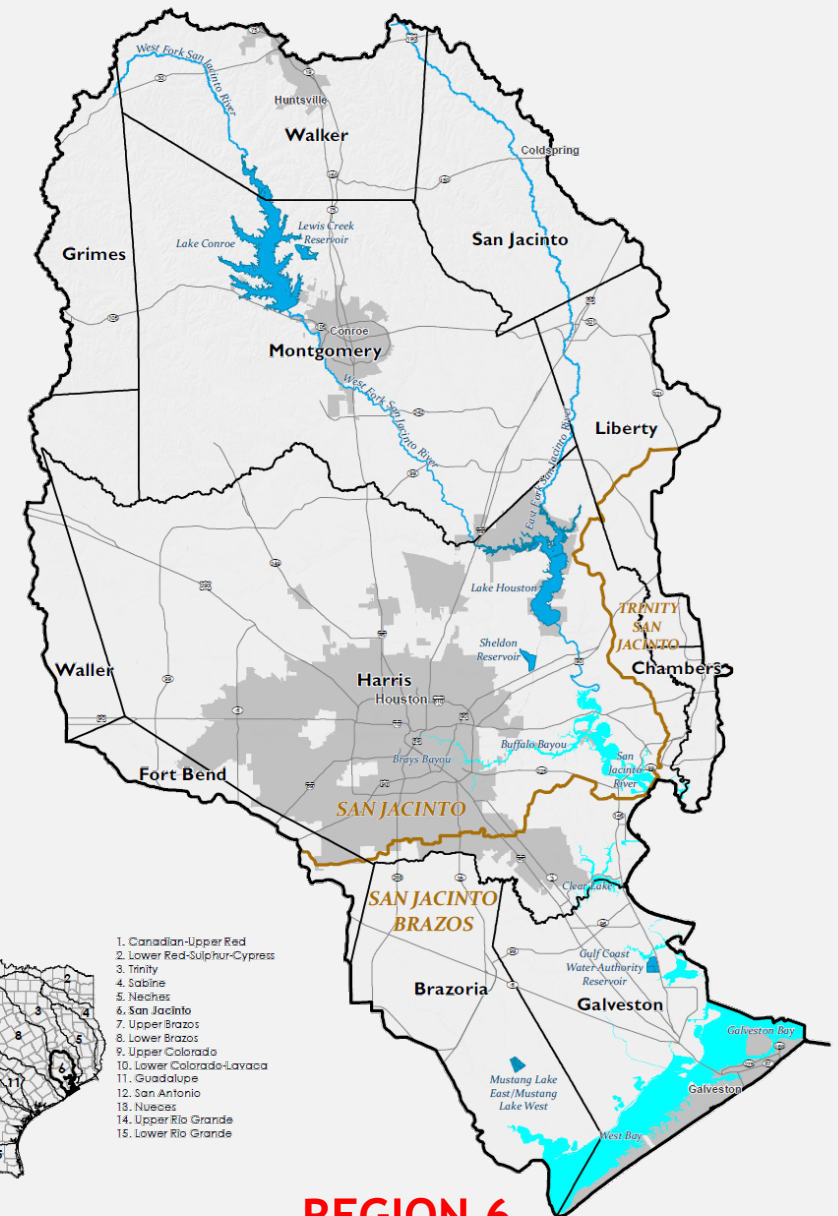
Texas Water Development Board
1700 North Congress Avenue, Austin, TX 78701
www.twdb.texas.gov - @twdb - facebook.com/twdboard

Texas Water
Development Board

Texas Water Development Board – Regional Flood Planning Grant

The Region 6 San Jacinto RFPG was established by the TWDB on October 1, 2020, with the purpose of carrying out the responsibilities placed on regional flood planning groups as required by Texas Water Code Chapter 16 and TWDB rules, including 31 Texas Administrative Code (TAC) Chapters 361 and 362.

The main goal of the SJRFPG is to develop a regional flood plan by: identifying flood risks, establishing flood mitigation and floodplain management goals; and, recommending evaluations, strategies, and projects to reduce flood risks.

- TWDB Grant is $19.5 million in funds allocated between 15 regions
- Region 6 – SJRFPG will receive a total of $3,073,500

Region 6 - San Jacinto Regional Flood Planning Group

The SJRFPG is the second most populated flood planning region in Texas and is home to the fourth largest city in the United States - Houston

- **Population Estimate:** 6,297,609
- **Approximate Area:** 5,089 Square Miles
- **Approximate Stream Miles:** 3,969
- **Counties Represented:**

  - Brazoria*
  - Chambers*
  - Fort Bend*
  - Galveston

  - Grimes*
  - Harris
  - Liberty*
  - Montgomery

  - San Jacinto*
  - Walker*
  - Waller*

*indicates this county is partially within this RFPG and is also represented by at least one other RFPG

Region 6 - Voting Members

Timothy Buscha*, Chair, Industries Voting Member Representative
Alia Vinson*, Vice Chair, Water Districts Voting Member Representative
Erwin Burden*, Secretary, Counties Voting Member Representative
Planning Group Sponsor: Harris County Engineering Department
Technical Consultant: Freese and Nichols, Inc.

Voting Members	Stakeholder Category
Gene Fisseler*	At-Large, Public #1
Matthew Barrett*	A-Large, River Authorities
Christina Quintero	Public #2
Elisa Macia Donovan	Agricultural Interests
Constance Pothier	Small Business
Dr. Tina Petersen	Flood Districts
Paul E. Lock	Electric Generating Utilities
Dr. Rifai Hanadi	Environmental Interests
Stephen Costello	Municipalities
Neil Gaynor	Upper Watershed
Todd Burrer	Water Utilities
Brian Maxwell	Coastal Communities

Note: an (*) indicates Executive Committee member

West Fork San Jacinto River near Humble, Texas after Hurricane Harvey
Image: Steve Fitzgerald, Harris County Flood Control District

Region 6 - Non-Voting Members

Non-Voting Member	Organization/Entity
Hope Zubek	Texas Parks and Wildlife Department
Michelle Ellis	Texas Division of Emergency Management
Kristin Lambrecht	Texas Department of Agriculture
Joel Clark	Texas State Soil and Water Conservation Board
Santiago Franco	Texas General Land Office
Megan Ingram	Texas Water Development Board
Melinda Johnston	Texas Commission on Environmental Quality
Justin Bower	Houston-Galveston Area Council
Elie Alkhory	Texas Department of Transportation
Tom Heidt	Port of Houston
Michael Turco	Harris-Galveston Subsidence District
Lisa Mairs	U.S. Army Corps of Engineers
Brandon Wade	Region H Regional Water Planning Group
Sally Bakko	Gulf Coast Protection District

Region 6 - SJRFPG Scope of Work

Task 6A & 6B — Impacts of regional flood plan | Impacts on water supply

Task 7 — Flood response information and activities

Task 8 — Administrative, regulatory, and legislative recommendations

Task 9 — Flood infrastructure financing analysis

Task 10 — Public participation and plan adaptation
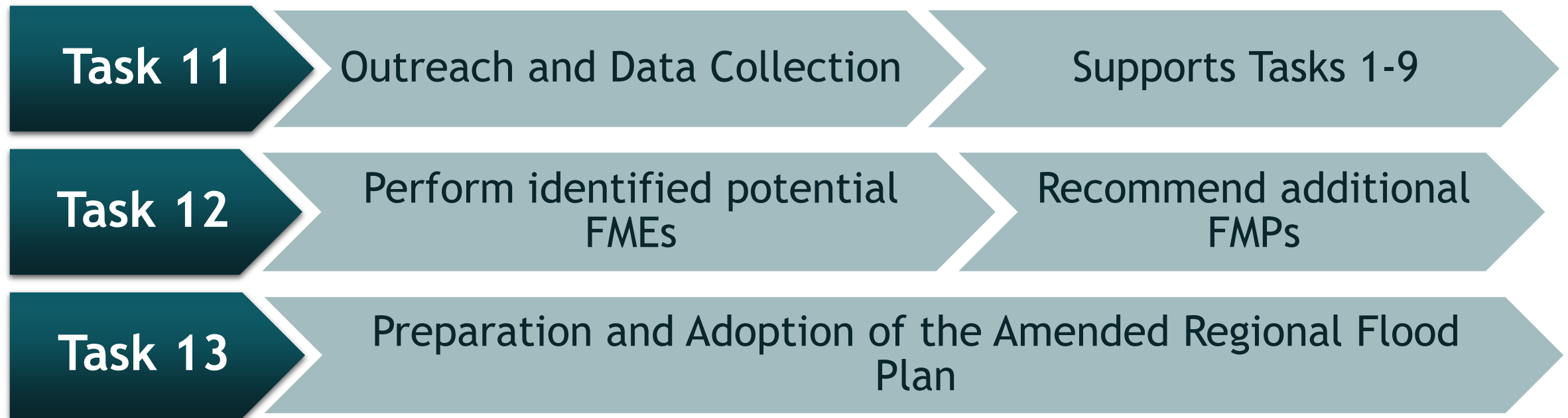
Region 6 - Key Deliverable Timeline

May 18, 2021
Pre-Planning Meeting

Mar. 7, 2022
Supporting Geospatial Data for Technical Memorandum due to TWDB

Jan. 10, 2023
Final Regional Flood Plan due to TWDB

Sept. 1, 2024
First State Flood Plan due to Legislature

Jan. 7, 2022
Technical Memorandum due to TWDB

Aug. 7, 2022
Draft Regional Flood Plan due to TWDB

July 14, 2023
Amended Regional Flood Plan due to TWDB
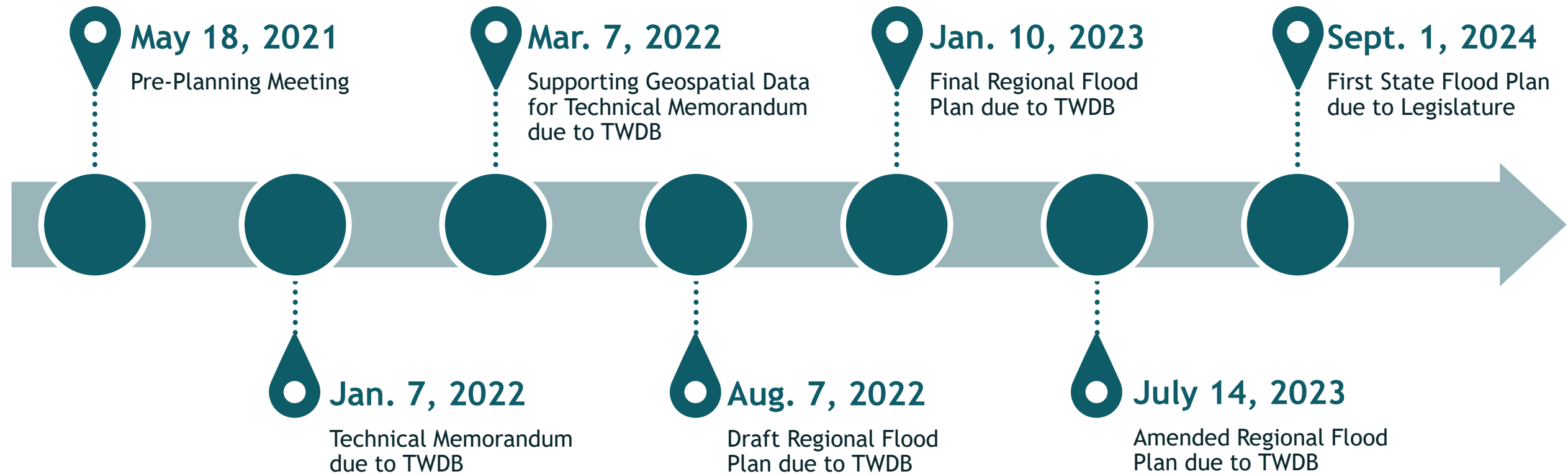
6,360,000 people

2020 estimated population

11 Counties

11 counties, or portions of them, are within the basin

43 Major Flood Events

43 out of 63 Federally Declared Disasters since 1953 are attributed to severe storms and flooding

>$11.7 Billion in FEMA Flood claims since 1975

Task 1: Planning Area Description
The San Jacinto Region

West Fork San Jacinto River near Humble, Texas after Hurricane Harvey
Image: Steve Fitzgerald, Harris County Flood Control District

Tasks 2 & 3

Task 2: Flood Risk Analysis

- Defined 100-year and 500-year flood hazard for existing and future conditions
- Performed exposure analysis to determine who and what is at risk
- Performed vulnerability analysis of communities and critical facilities
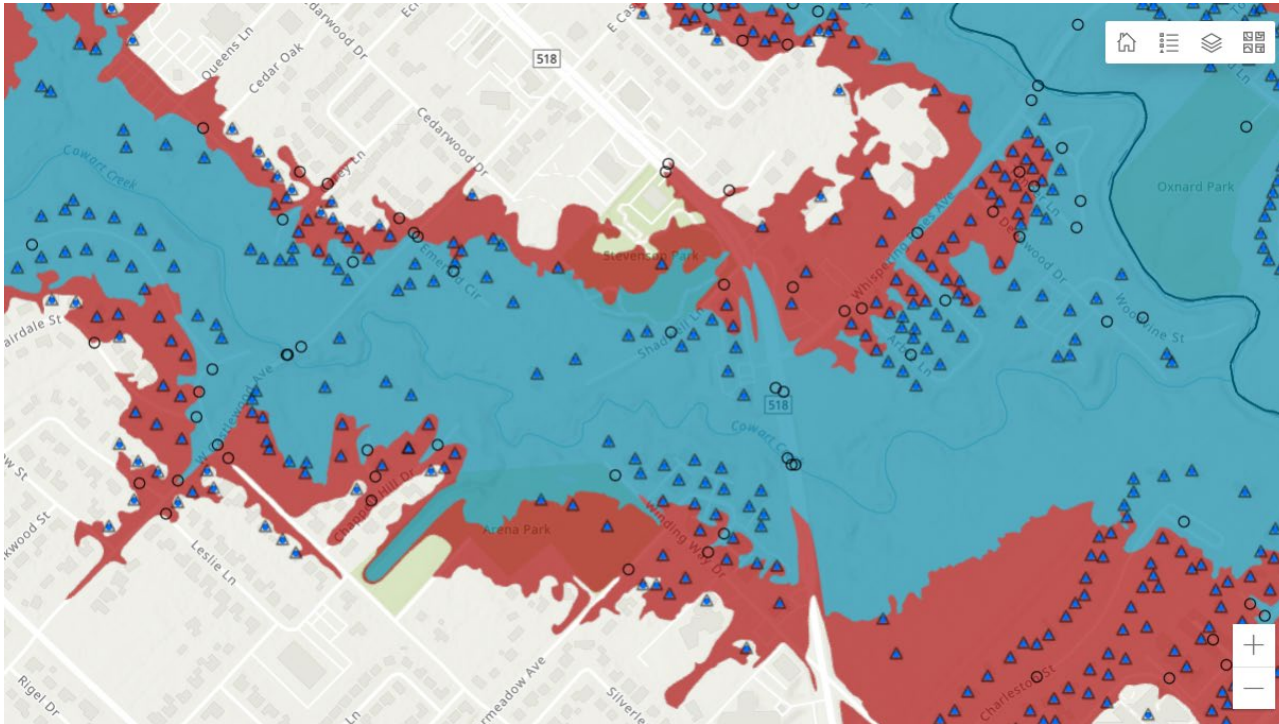
San Jacinto Regional Flood Plan Interactive GIS Dashboard

Task 3: Flood Management Practices & Flood Protection Goals

- Evaluate and recommend floodplain management practices
- Develop floodplain management goals

NATIONAL FLOOD INSURANCE PROGRAM®

98% of cities and counties meet or exceed minimum standards of NFIP

Recommended a set of 8 minimum standards for the region

Adopted 8 short-term (10-year) goals
Adopted 7 long-term (30-year) goals

Tasks 4-6

Task 4: Assessment and Identification of Flood Mitigation Needs

San Jacinto Regional Flood Plan — Greatest Flood Risk — MAP 15

San Jacinto Regional Flood Plan — Recommended Flood Management Evaluations — MAP 19

Flood Management Evaluations	
Project Planning	258
Watershed Planning	113
Preparedness	1
Other	2
Total	374
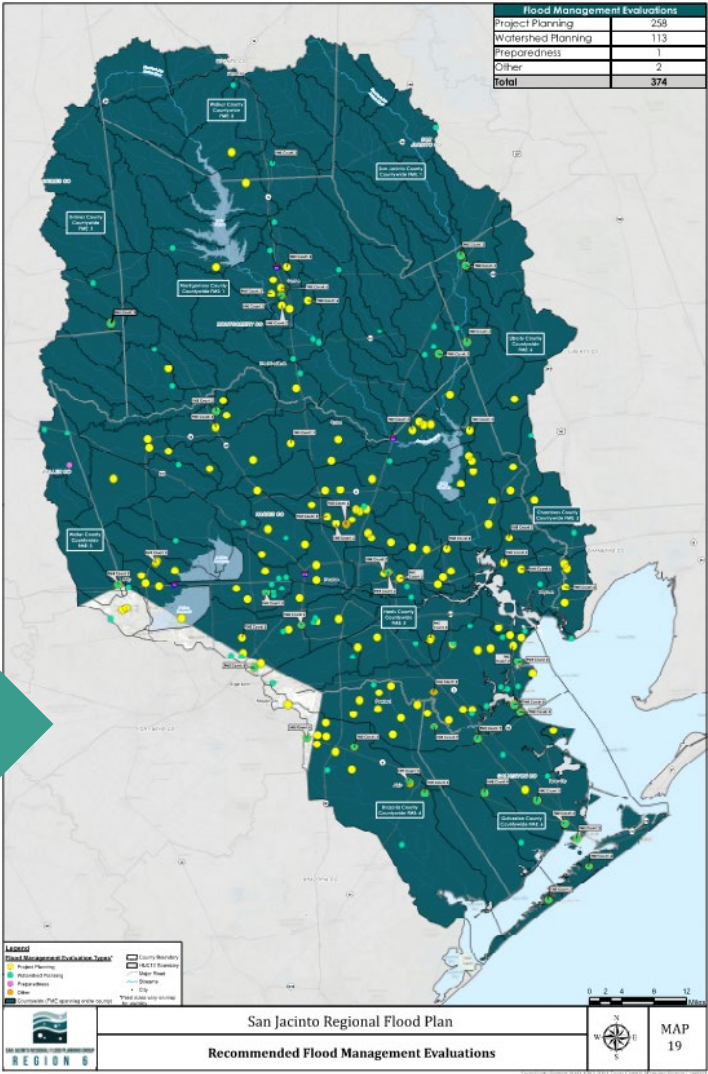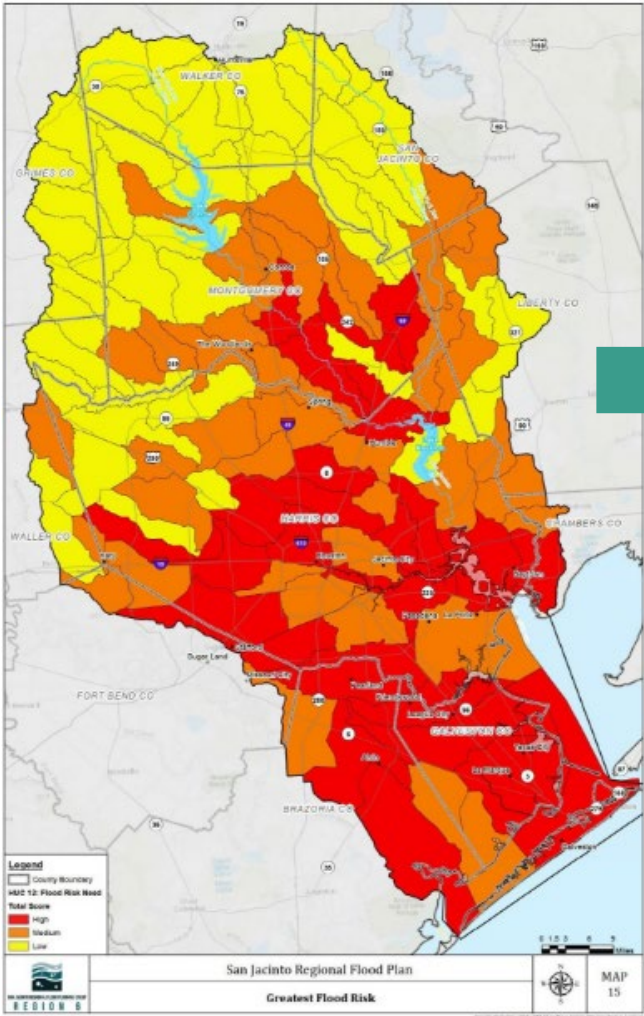
Task 5: Recommendation of Flood Management Evaluations, Strategies, and Projects

Task 6: Impacts and Contribution of the Regional Flood Plan

100-year Flood			
	Existing Conditions	After Implementation	Reduction in Exposure
Population	1,736,303	1,305,267	431,036
Total Structures	384,489	273,183	111,701
Residential Structures	319,489	240,261	79,228
Critical Facilities	7,291	5,110	2,181

	Cost (Millions)
FME	$201
FMS	$1,137
FMP	$28,898
Total	$30,236

Recap on FMXs

FME

A **proposed flood study** of a specific, flood-prone area that is needed in order to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs

FMP

A **proposed project, either structural or non-structural**, that has non-zero capital costs or other non-recurring cost and when implemented will reduce flood risk, mitigate flood hazards to life or property

FMS

A **proposed plan** to reduce flood risk or mitigate flood hazards to life or property

Tasks 7-10

Task 7: Flood Response Information and Activities

Task 8: Administrative, Regulatory, and Legislative Recommendations

Task 9: Flood Infrastructure Financing Analysis

Task 10: Public Participation and Plan Adoption

Provide Input on the Draft Plan

RFPG Website
Sanjacintofloodplanning.org

Leave a written comment

Email
SJRFPG.TechCon@freese.com

Provide oral comment at an RFPG meeting

Final 2023 Regional Flood Plan

- Submitted to the TWDB on 1/10/2023
  - Volume 1: 316 pages
  - Volume 2: 18,908 pages
  - Submittal size = 17.8 GB

- 2 hard copies delivered to TWDB
  - 2 x 3in binder
  - 12 x 6in binders

- Public Comment Responses issued 1/19/2023
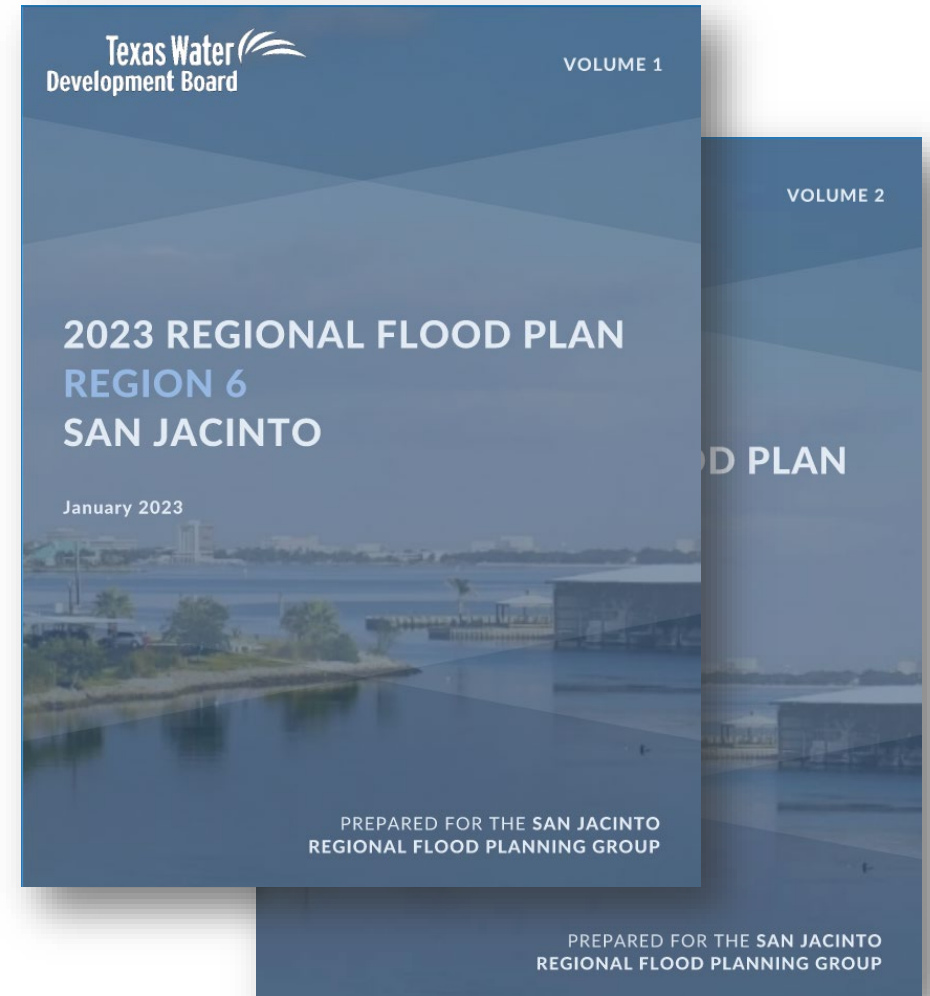
First RFP - Major Accomplishments

Compiled and Processed Significant Amount of Flood Data

- Developed regionwide datasets useful for flood management
  - Flood Infrastructure
  - Ongoing/Proposed Projects
  - Critical Infrastructure
  - Exposure/Vulnerability
- Developed tools/processes to improve efficiency on repetitive tasks
- Developed Interactive GIS Dashboard accessible to the public
- Laid the foundation for future cycles of flood planning
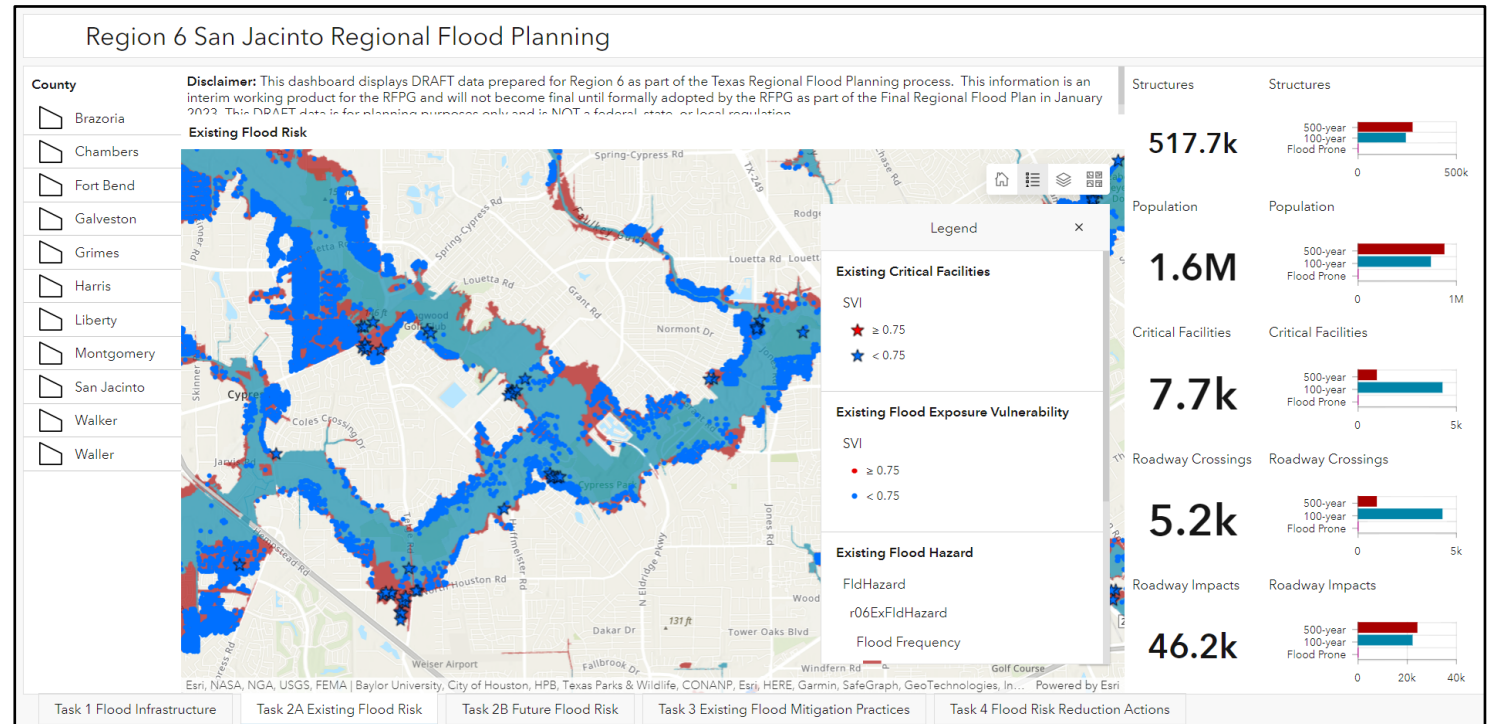
Interactive GIS Dashboard accessible through sanjacintofloodplanning.org

First RFP - Major Accomplishments

Developed Regionwide Flood Hazard

- Full regionwide coverage of riverine and coastal flood hazard

- Developed regionwide flood hazard for both existing and future conditions

- Laid the foundation for future cycles of flood planning
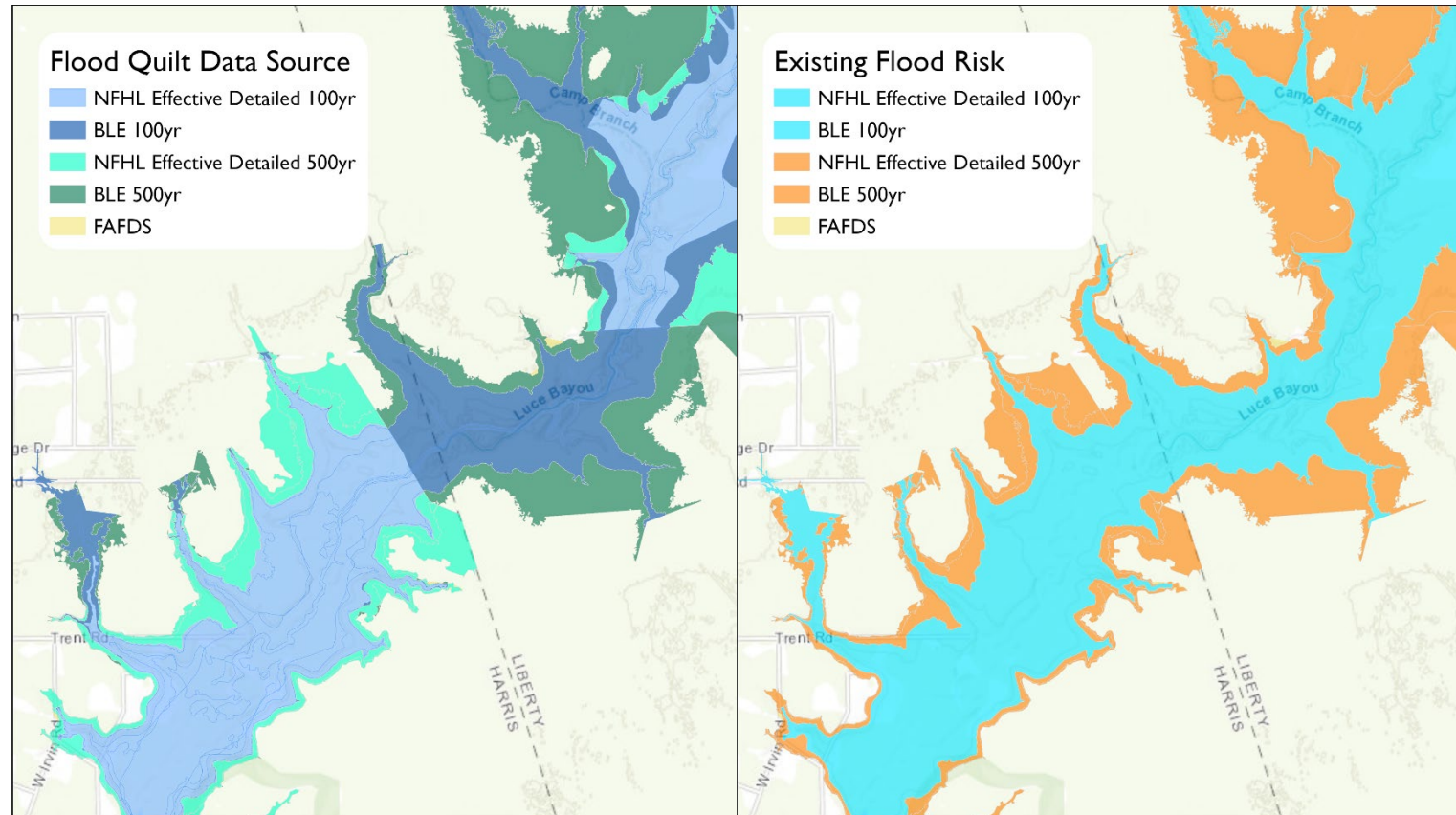
Region 6 – Flood Plan

Identifying and Recommending Actions to Improve Regionwide Understanding of and Reduce Flood Risk

349 FMEs

63 FMSs

36 FMPs
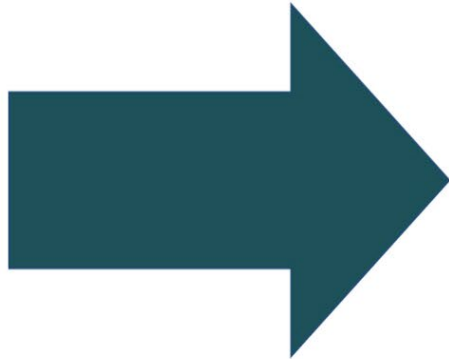
$30.6B

Total reported costs of recommended FMEs, FMSs, and FMPs
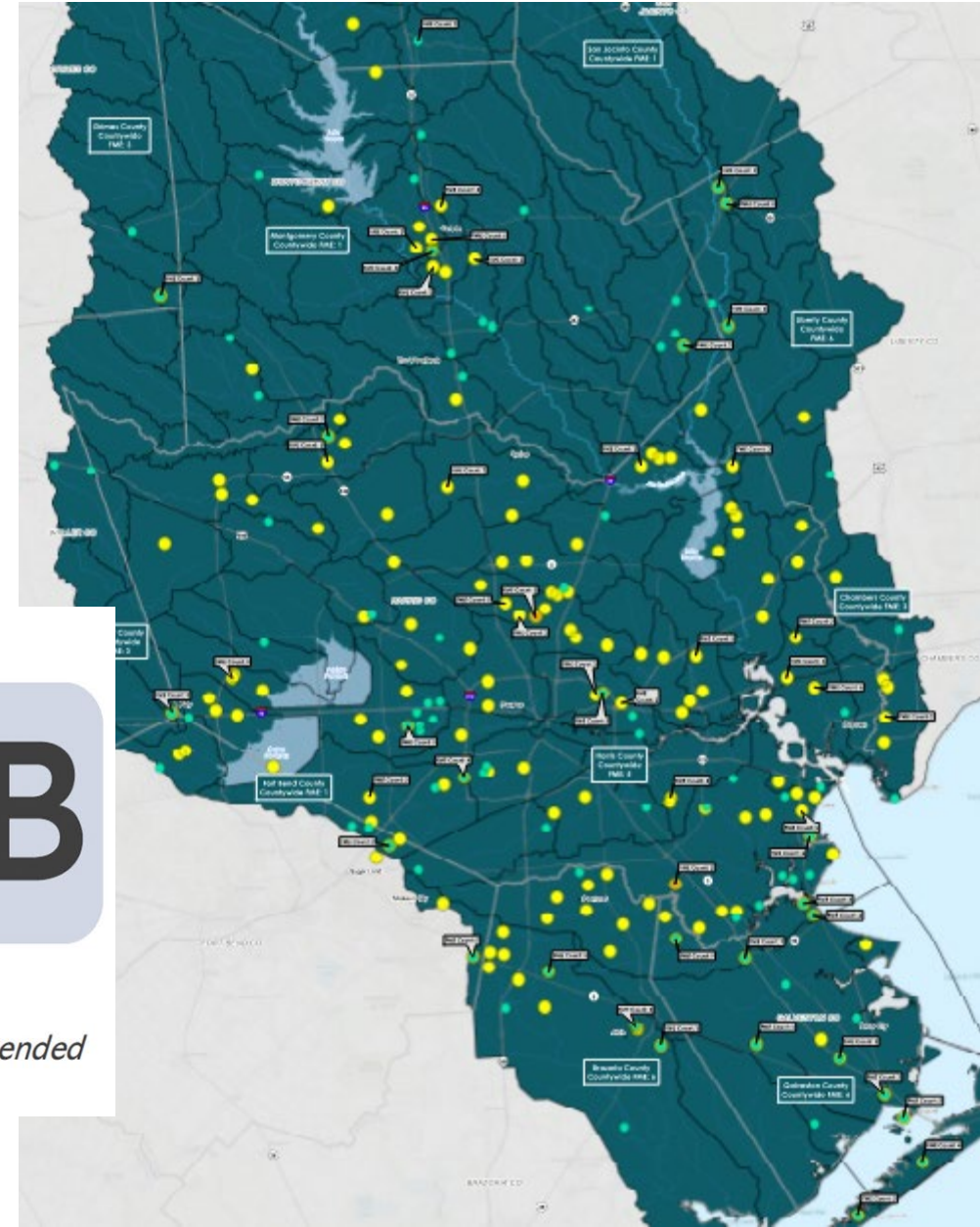
Region 6 – Flood Plan Benefits

The recommended flood mitigation action would have a positive impact on flood preparedness and flood risk reduction, including helping to address flood data gaps and identifying high flood risk areas, resulting in the identification of future flood mitigation projects.

Flood Exposure Region-wide	Existing Conditions	1.0% ACE After Implementation	Reduction in Exposure
Total Structures	396,908	296,899	⬇ 100,009 ⬇
Residential Structures	330,596	248,009	⬇ 82,587 ⬇
Critical Facilities	7,432	5,151	⬇ 2,181 ⬇
Population	1,781,873	1,305,267	⬇ 443,327 ⬇
Low Water Crossings	195	172	⬇ 20 ⬇

Annual chance event (ACE) refers to the likelihood a flood of a specific magnitude will happen in a given year. A 1.0% flood is often referred to as a 100-year flood.

Flood Exposure Region-wide	Existing Conditions	0.2% ACE After Implementation	Reduction in Exposure
Total Structures	731,868	603,306	⬇ 110,562 ⬇

A 0.2% flood is often referred to as a 500-year flood.

Region 6 – Amended Flood Plan

Following the submission of our regional Flood Plan in January 2023, our region among others had $$ allocated in Task 12 and 13 of the scope of work to coordinate with sponsors to elevate and add projects.

- Through public engagement, additional sponsors and existing sponsors brought forward projects or better data

- Technical consultant worked with sponsors to fill in gaps in project data

- Work efforts from January through April resulted in:
    - 13 FMEs elevated to FMPs
    - 84 New FMEs
    - 21 New FMPs
    - 2 New FMSs

Region 6 – Amended Flood Plan

In the Region 6 Planning Group Meeting on June 8, 2023 our Amended Flood Plan was adopted and reflects the following changes from our January 2023 plan in flood resiliency needs:

405 FMEs

65 FMSs

70 FMPs

$33.8B

Total reported costs of recommended FMEs, FMSs, and FMPs
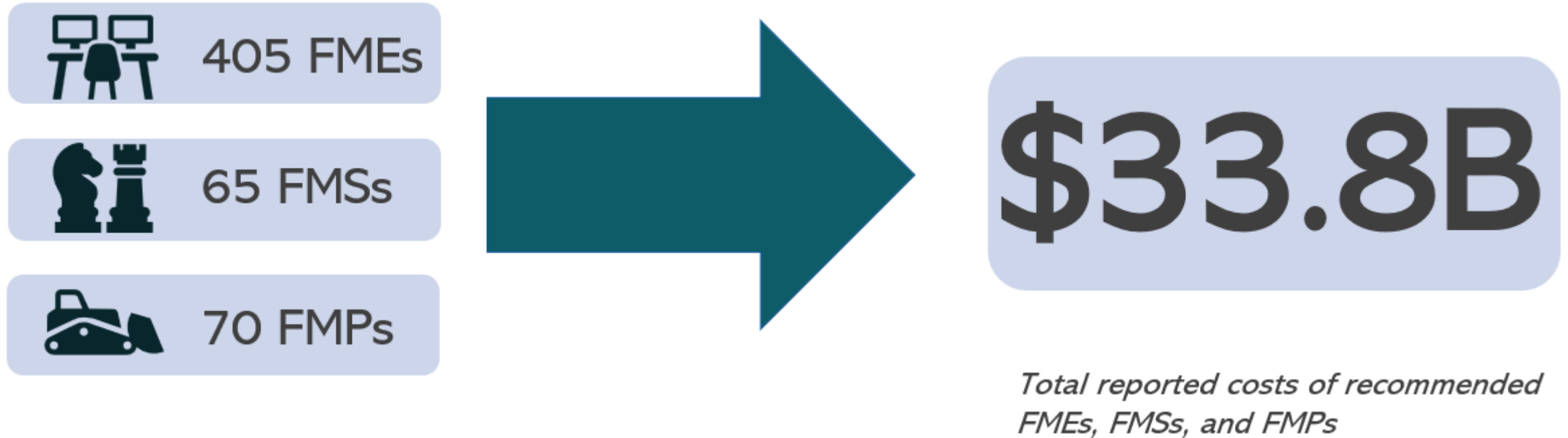
* Region 6 and other regional plans approved by TWDB July 25, 2023

Region 6 - Flood Plan by Region
Statewide Comparison

Final 2023 Regional Flood Plans

FMPs
FMSs
FMEs

Number of Recommended FMXs

Flood Planning Region

Statewide Comparison

Final 2023 Regional Flood Plans
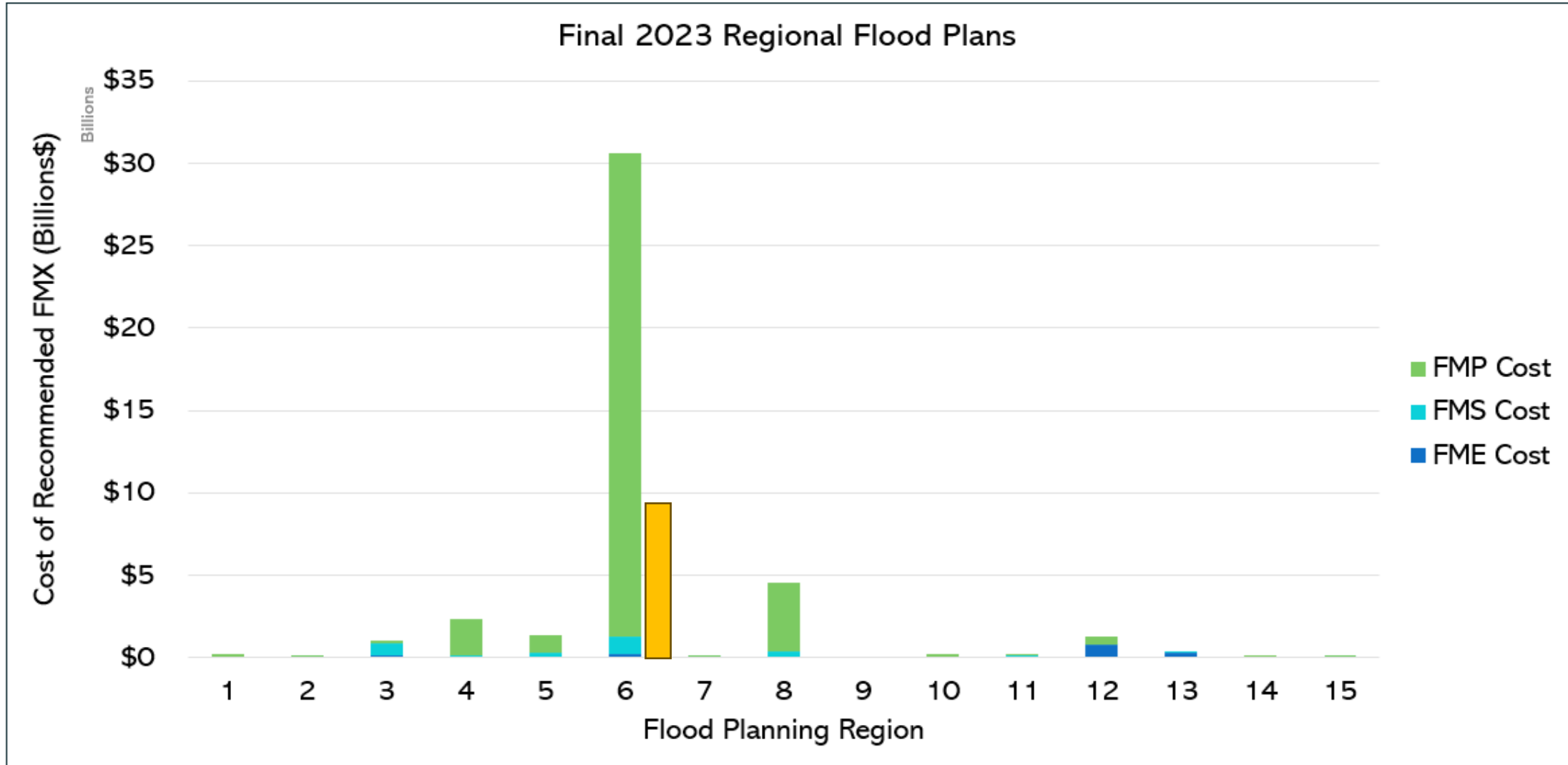
Including Texas Coastal Study

Region 6 – Flood Infrastructure Fund (FIF)

Established by 86th Legislature (2019) and seeded with $750M

- Nearly $500M committed to over 138 projects
- Remaining dollars programmed for other projects

88th Legislature (2023) has programmed $625M

- To be used for projects included in the 1st State Flood Plan to be adopted on September 1, 2024
- Anticipated that funding will be provided through loans and grants based upon project ranking, project categories, and legislative priorities

Region 6 – Flood Infrastructure Fund (FIF)

While there will be a number of considerations as to how the allocation of funds from the FIF will be made, one component will be State Flood Plan "ranking"

- In March 2023 TWDB issued draft Statewide Ranking Methodology
- Individual Ranking Criteria and Weighting specific to FMEs and FMPs

FME Weighting

5%
15%
80%

- Life, Safety, and Structures (existing risk)
- Mobility (existing risk)
- Agriculture (existing risk)

FMP Weighting

30.0%
5.0%
2.5%
2.5%
5.0%
5.0%
50.0%

- Life, Safety, and Structures (reduction in risk)
- Mobility (reduction in risk)
- Agriculture (reduction in risk)
- Percent Nature-based Solution (by cost)
- BCR
- Water Supply Benefit (Y/N)
- Other FMP Benefits & Considerations
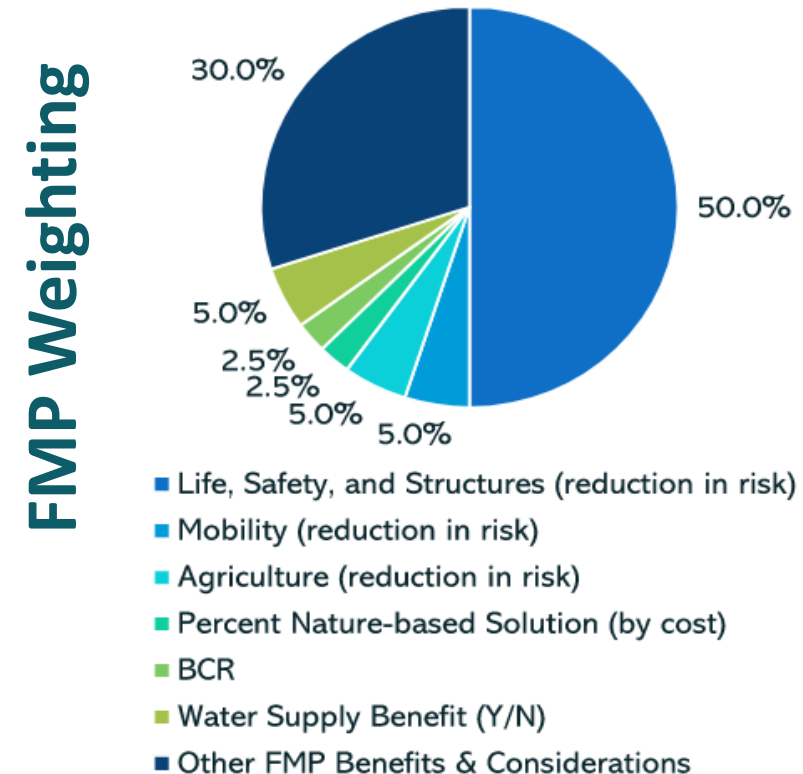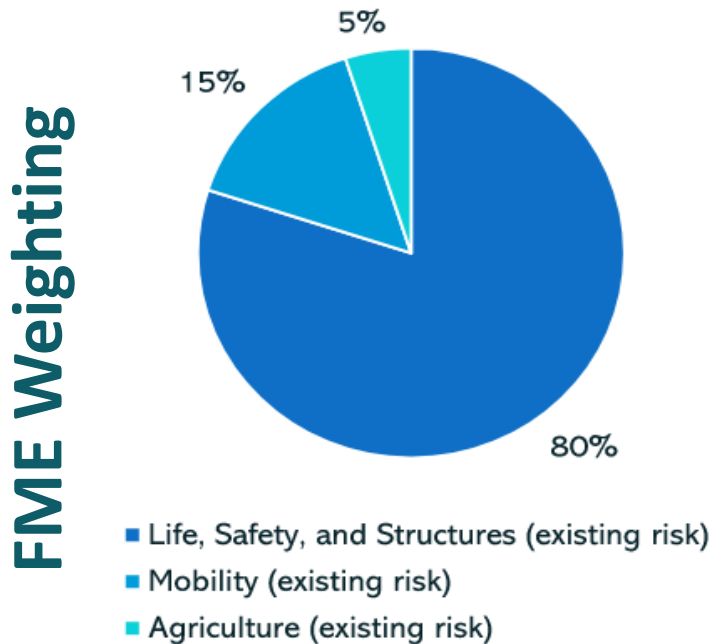
Region 6 – 2nd Cycle

The 2nd Cycle of the Regional Flood Planning Groups begins January 2024

- As the 1st cycle wraps up, Planning Groups will be confirming their Sponsoring agency, finalizing expenses, and submitting grants for 2nd Cycle funding

- The 2nd Cycle will be 5-years
    - Voting members on staggered terms
    - New funding allocations from TWDB
    - Solicitation of Technical Consultants
    - New scope of work for Technical Consultants
    - Planning Group has ability to amend regional plan during the cycle
    - 2nd Cycle will bridge the 89th and 90th legislative sessions

Region 6 – 2ⁿᵈ Cycle

What is the 2ⁿᵈ Cycle an opportunity for:

- Allow data collection and analysis to elevate FMEs to FMPs

- New project opportunities

- To define existing and future flood risk for unstudied areas

- Advocate for additional FIF funding

- To educate the public and governmental entities on flood risk and best practices on standards

- Work with selected projects from the 1ˢᵗ State Fund Plan on implementation

Region 6 - Contact Us

Visit our website at:
https://SanJacintoFloodPlanning.org

Learn more by checking out our Story Map!

QUESTIONS?

Timothy Buscha, Chair, Region 6 RFPG
tbuscha@idseg.com

We are the American Flood Coalition

A 501(c)3 nonprofit organization and nonpartisan coalition advocating for national and state solutions to flooding and sea level rise

Federal Champions

Cities, Towns and Counties

Elected Officials

Businesses

Military Groups

Civic and Academic Groups

Our Coalition Snapshot

26 staff members
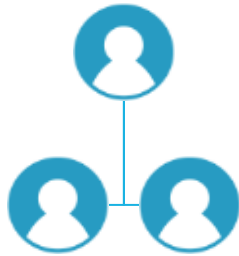
Active in 22 states

10x membership growth

34 members at launch

370 members today
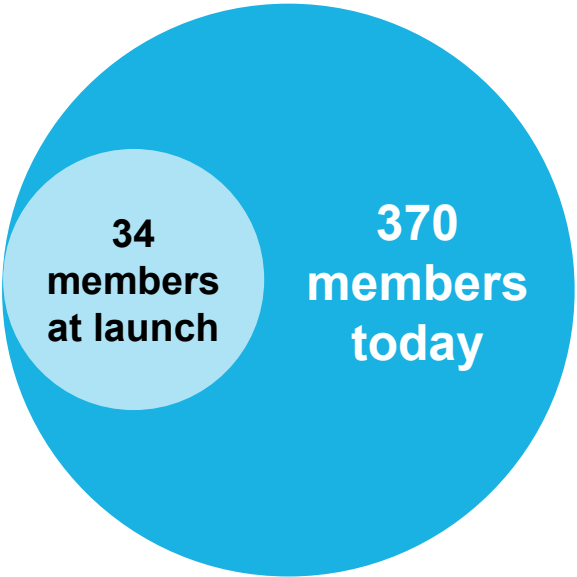
117 member municipalities

32 Federal Champions

■ 10+ members   ■ < 10 members
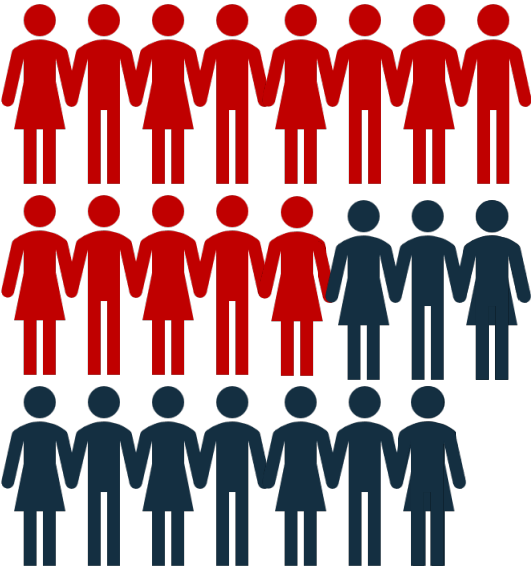
Texas members and federal champions snapshot

Elected Officials and Local Jurisdictions

Sen. Judith Zaffirini

Waller County Judge Trey Duhon

Pearland Mayor Kevin Cole

Galveston Mayor Craig Brown

Austin CM Paige Ellis

Waller County

Nueces County

Houston CM Sallie Alcorn

Civic Groups and Nonprofits

Coastal Prairie Conservancy
Formerly Katy Prairie Conservancy

hill country alliance

awbd

TEXAS WATER FOUNDATION

KATY AREA ECONOMIC DEVELOPMENT COUNCIL
ENERGY GROWS HERE

GREATER HOUSTON **PARTNERSHIP.**
Making Houston Greater.

HOUSTON **STRONGER**

BAYOU CITY INITIATIVE
Designing a flood-resilient Houston

Texas Federal Champions

Rep. Dan Crenshaw (R-2)

Rep. Lizzie Fletcher (D-7)

Rep. Al Green (D-9)

Rep. Vicente Gonzalez (D-34)

Academic Institutions

TEXAS A&M UNIVERSITY CORPUS CHRISTI | HARTE RESEARCH INSTITUTE FOR GULF OF MEXICO STUDIES

TEXAS A&M UNIVERSITY Center for Housing & Urban Development

THE MEADOWS CENTER FOR WATER AND THE ENVIRONMENT — TEXAS STATE UNIVERSITY

TEXAS A&M UNIVERSITY Hazard Reduction & Recovery Center

Businesses

HALFF®
ENGINEERS · ARCHITECTS · SCIENTISTS · PLANNERS · SURVEYORS

RTLR SYSTEMS
URBAN LIFESAVING SYSTEMS

Dept.

Local pilots and microgrants: potential models for communities across the country

Modeling multi-cropping benefits in NE Iowa

AFC provided a microgrant to a local conservation group to model the flood reduction and other benefits of having farmers plant a second crop in addition to soy or corn

Coastal Bend Regional Resilience

AFC partnered with the Regional Resilience Partnership, along with other organizations, to host a leadership training program to support resilience in the Coastal Bend region

Community-driven shoreline improvements in Virginia

AFC partnered with the City of Hampton and a community-based group to improve a local park's living shoreline and formalize community members' long term stewardship of the shoreline

Why a *state-level* Framework?

States are *the* linchpin for coordinating the large-scale reduction of flood risk.

States receive and allocate major federal and state funding streams.

States can facilitate watershed planning and management that span jurisdictional boundaries.

Robust state policy and guidelines on flooding can be leveraged by local communities.

Components of State Flood Resilience Framework

+ Leadership & Accountability   *Who is in charge?*

+ Data & Risk Assessment   *What's at risk?*

+ Strategic Planning   *What should we prioritize?*

+ Funding & Financing   *How do we pay for it?*

+ Statewide Standards   *How can we institutionalize change?*

Core Component: Leadership & Accountability

Who's in charge?

1. States should have empowered and **accountable leaders and permanent staff**.

2. State leaders should be responsible for **establishing priorities and driving agencies**, data, and state capital outlays to reduce flood risk.

3. States should **establish regional entities** with the authority to manage flood risk at the watershed level.

What's at risk?

1. States should **model and assess flood risk**.

2. Data and models should **cover the entire state** and be centralized and publicly accessible.

3. Modeling and risk assessments should be **standardized**.

Core Component: Strategic Planning

1. States should develop a **statewide strategy to reduce flood risk**.

2. States should establish a **consistent and fair methodology**.

3. States should **use flood-risk data** in planning and programs.

Core Component: Funding & Financing

How do we pay for it?

1. States should develop a **framework to guide investments** in flood risk reduction.

2. States should establish **dedicated and recurring funding**.

3. States should apply a **flood risk lens across state capital outlays** and relevant programs.

Core Component: Statewide Standards

How can we secure long-term change?

1. States should establish **minimum design standards and codes**.

2. States should incentivize **growth that does not worsen flooding.**

3. States should set incentives or direct requirements that **align local practices with a data-informed picture of flood risk**.

153

What do we know?

Data Doesn't Result in Action

Presentation of Data ≠ Changed Behavior ≠ Resilience
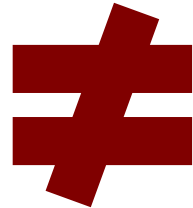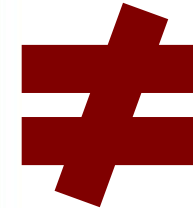
Behavioral Science

COGNITIVE BIAS CODEX, 2016
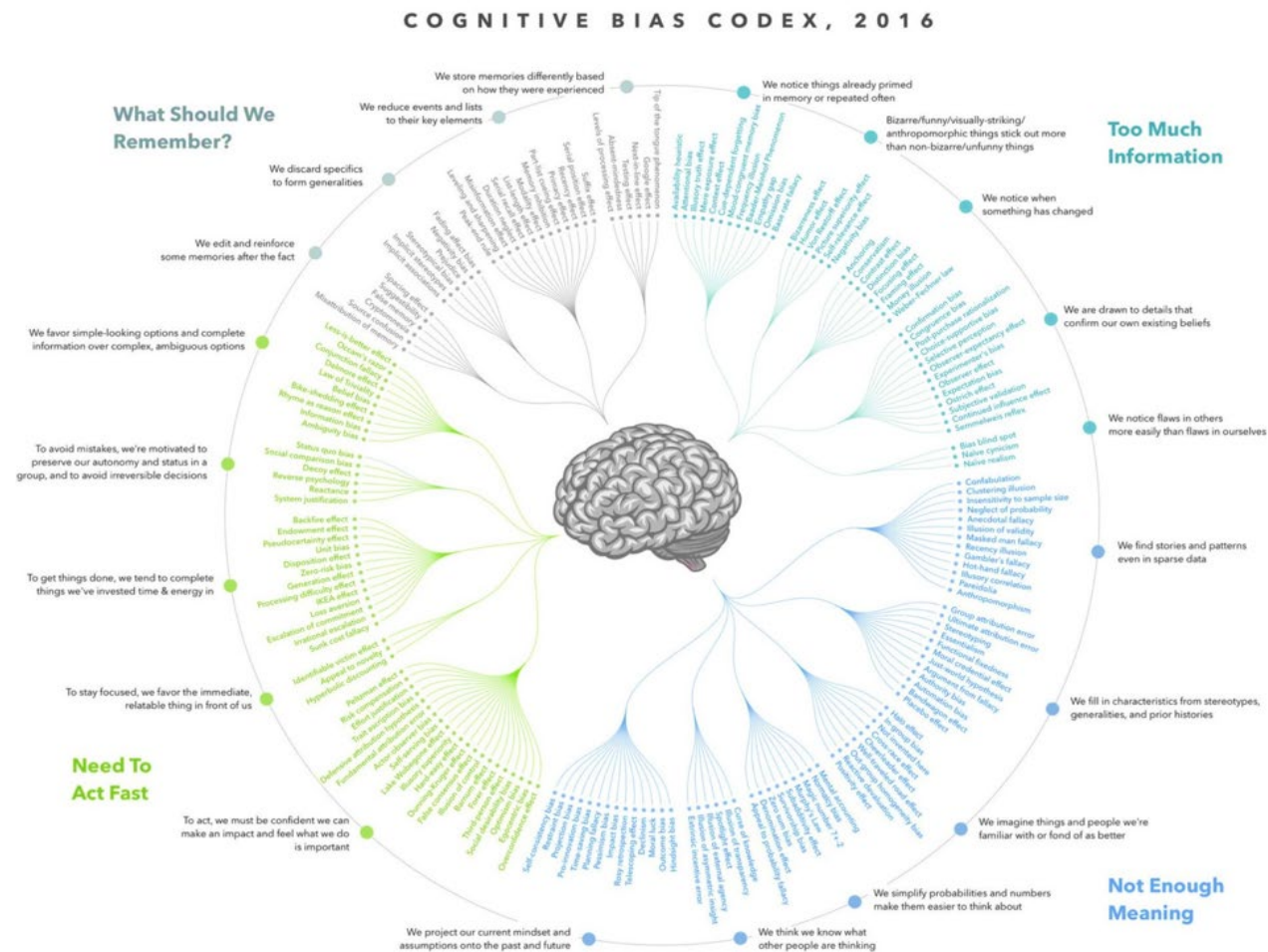
Personal Experiences

65%

Of consumers say that live events and product demonstrations helped them fully understand a product better than any commercial or other method would.

What could this mean for resilience and risk awareness?

Best Practices

Do Your Research

- Demographics

- Media Scans & Media Analysis

- Impact of Personality Traits

- Stakeholder Influencers

- And more…
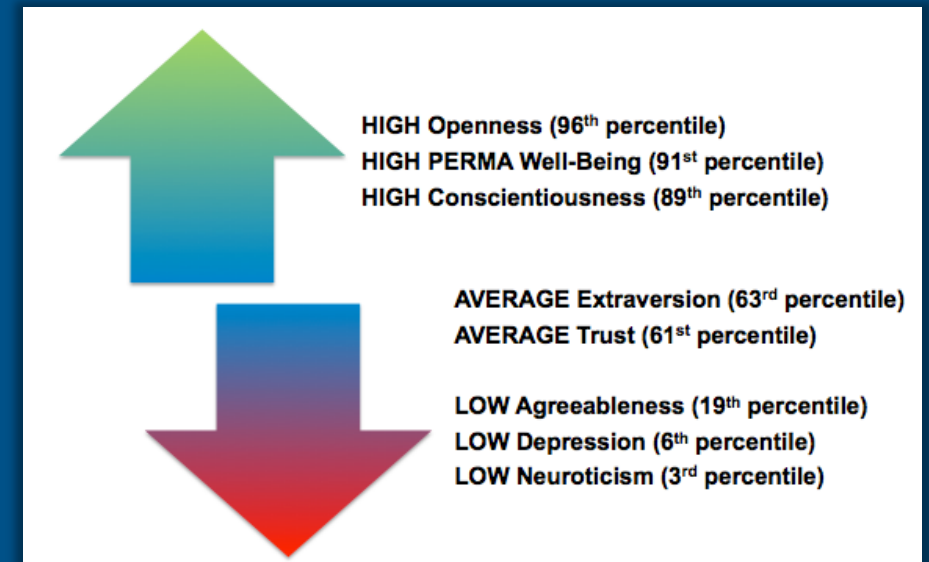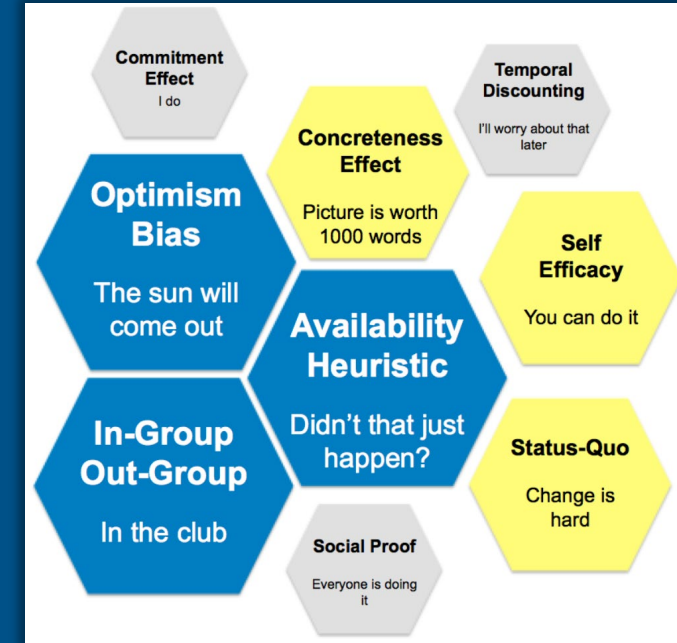
Don't just create something. Have a plan!

- What value does it provide?

- Is it tailored to your audience?

- Does it hold a reader's attention?

- How are you socializing it?

Use Plain Language

- Avoid technical jargon

- Active not passive communication

- Simplify sentence structure

- Don't use too much narrative content

If you can't explain it to a six year old, you don't understand it yourself.

ALBERT EINSTEIN
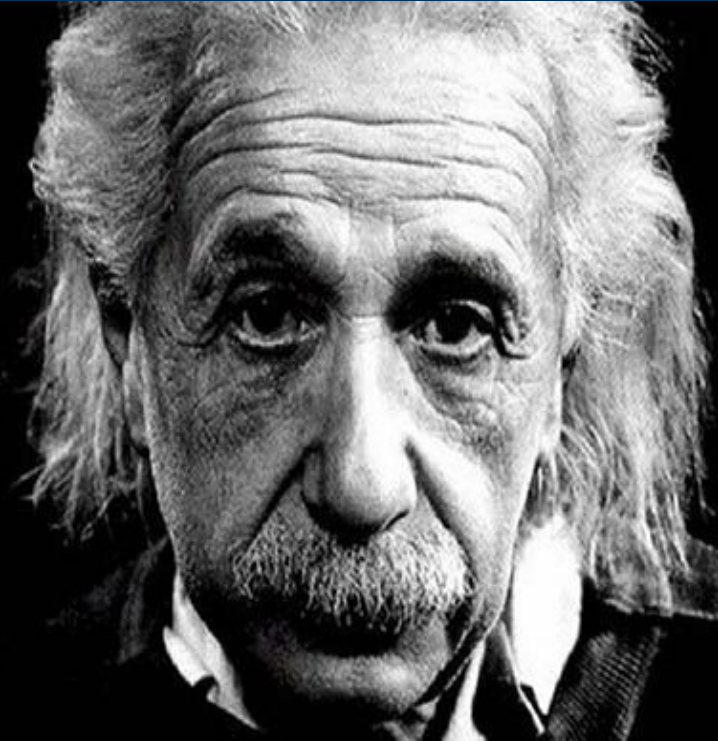
Make it an Experience

- Connect to personal experiences

- Explore experiential learning

- Leverage storytelling

Cool Things and Why They Work

IMMERSED Virtual Reality

Augmented Reality
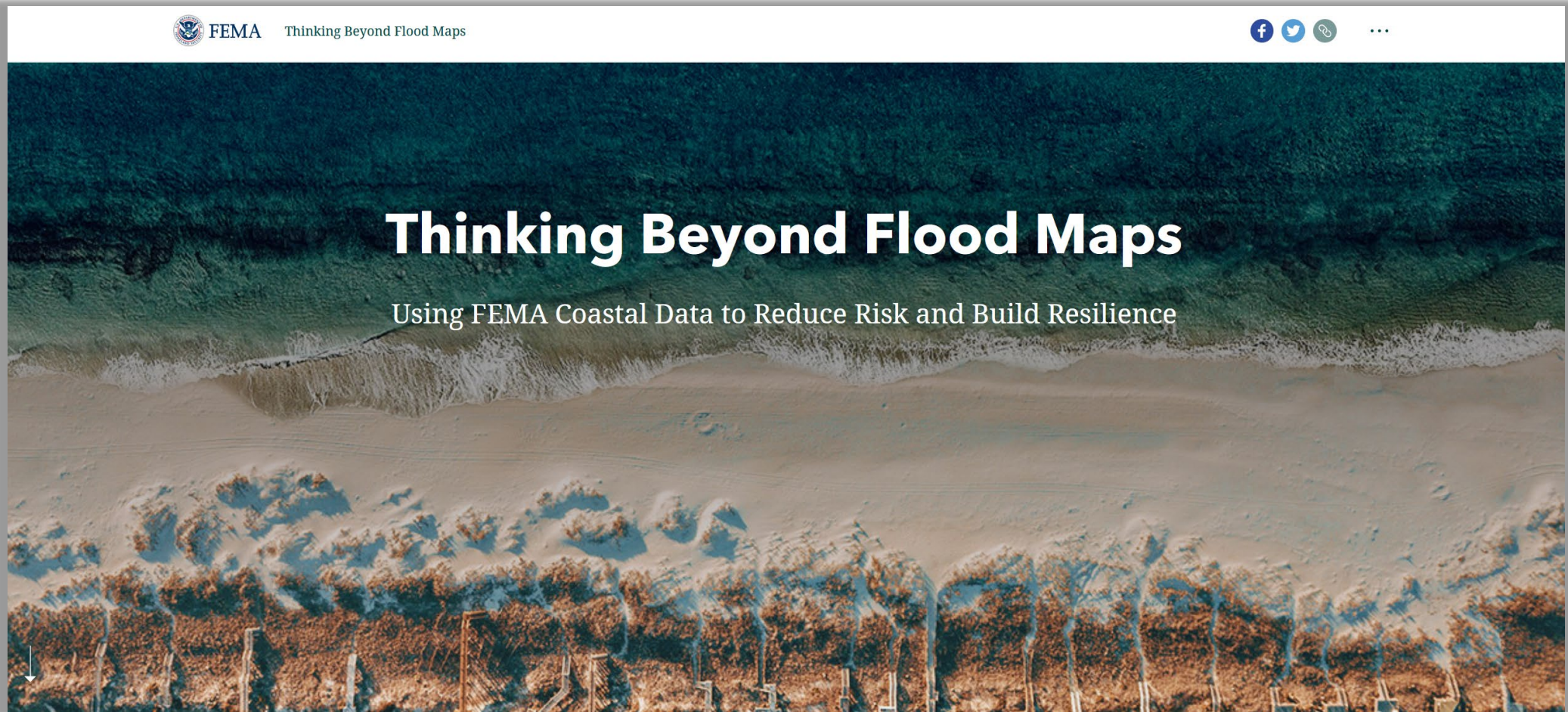
Story Maps

www.fema.gov/flood-maps/tools-resources/risk-map/story-maps

Value of Storytelling

Speak Through Others – Resilient Nation Partnership Network
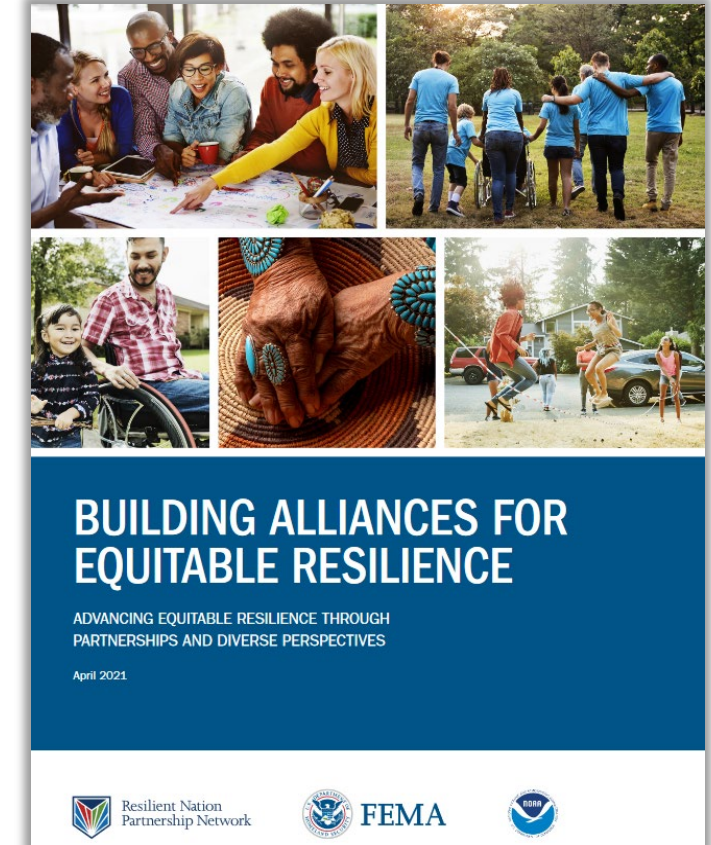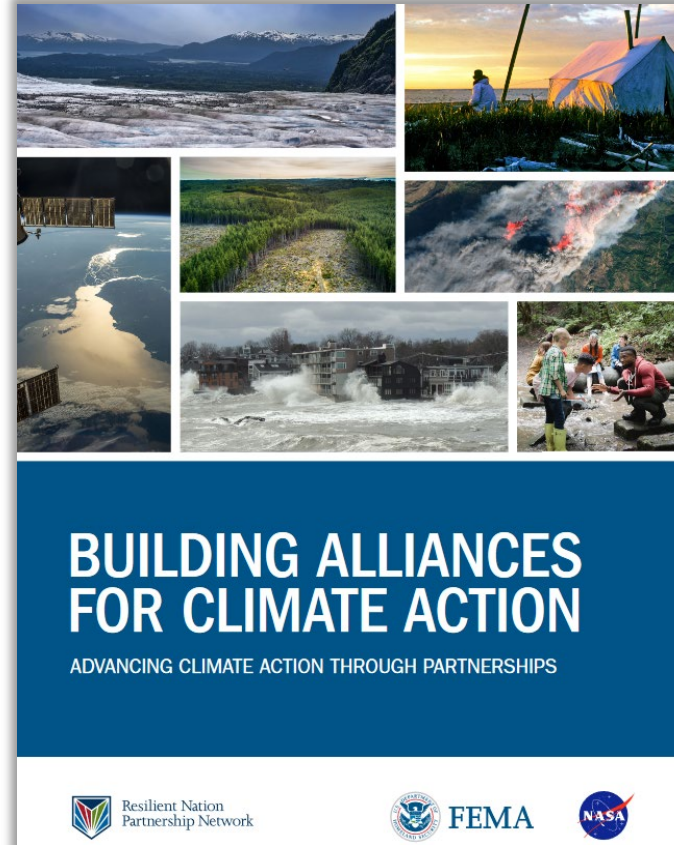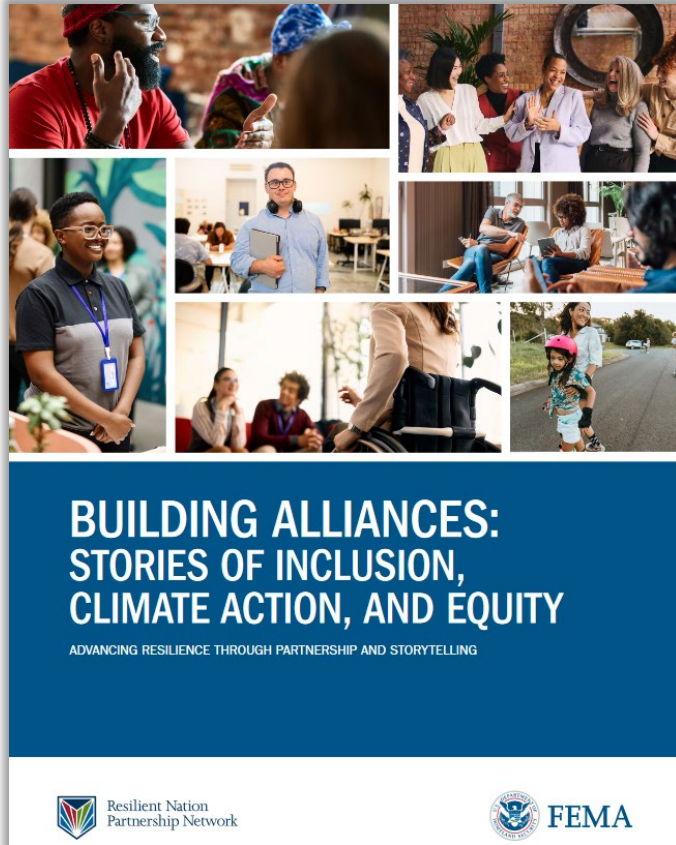
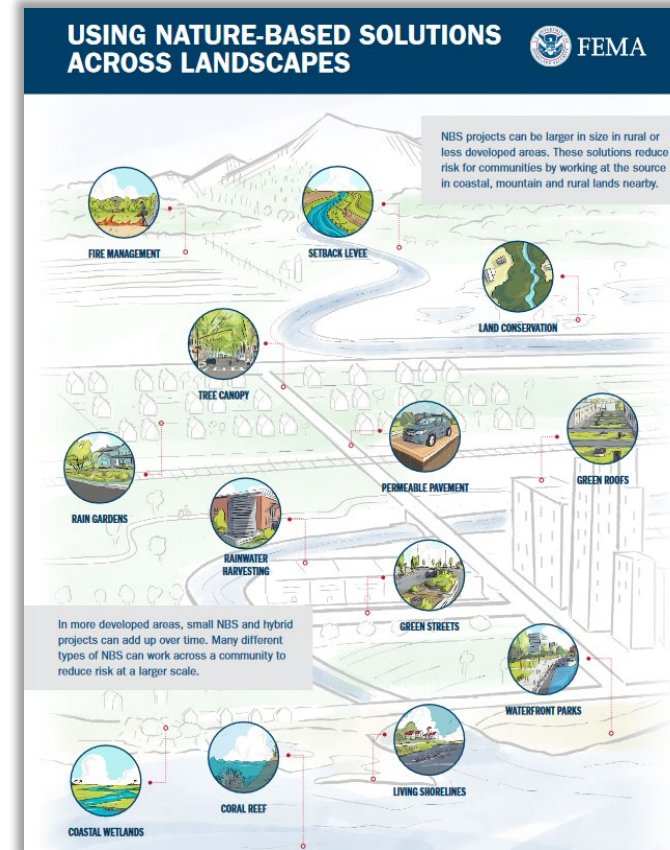www.fema.gov/partnerships/resilient-nation-partnership-network/building-alliances
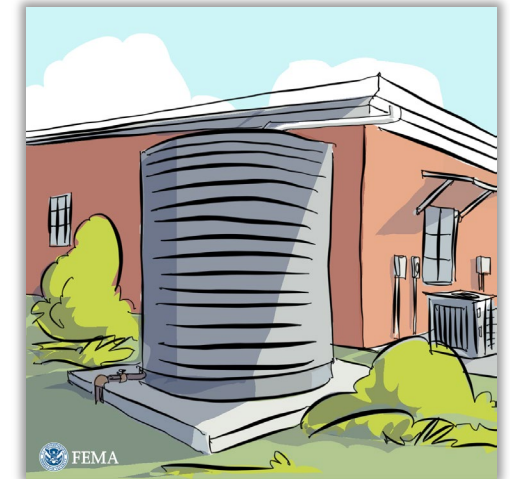
Explore Your Artistic Side
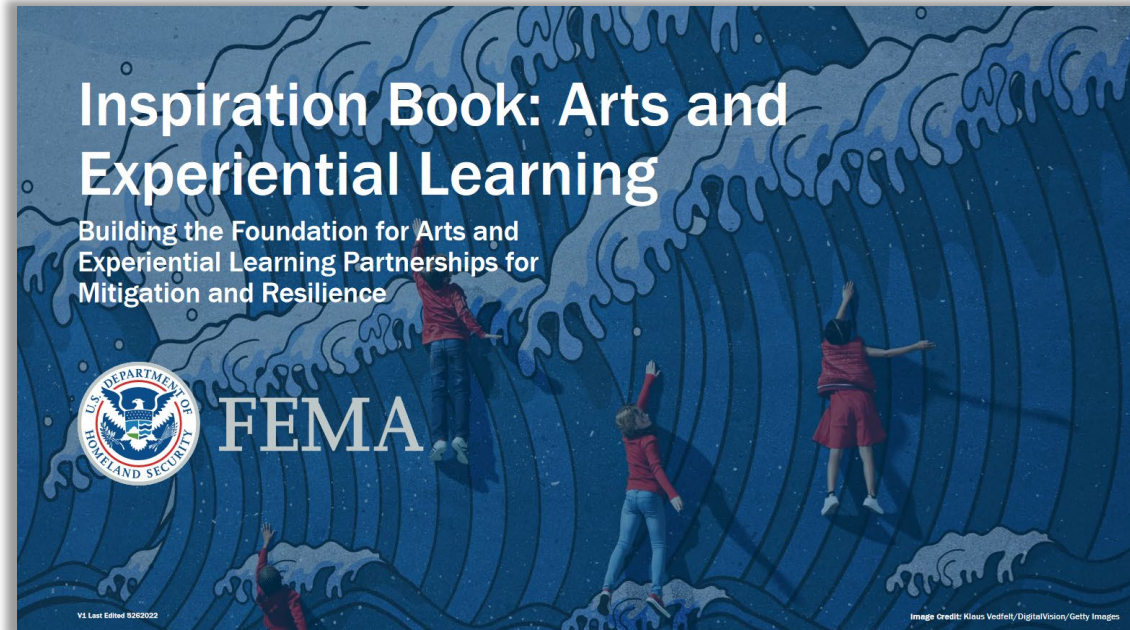
www.fema.gov/sites/default/files/documents/fema_inspiration-book-external-audience.pdf

www.fema.gov/emergency-managers/risk-management/climate-resilience/nature-based-solutions

Thank You

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FEMA

Keynote Speaker

The Honorable Michael Connor
Assistant Secretary of the Army
for Civil Works