

The background features a dark blue grid pattern on the left side. A horizontal bar at the top is composed of several colored segments: dark blue, teal, dark navy, teal, light teal, and dark blue. Below the main title, there are two vertical bars: one with three segments (dark blue, teal, dark navy) and one solid orange line.

# Integrating Geo-Social Governance with Community Flood Risk Resilience

April 25, 2024

# Agenda

- Why we are here
- Geospatial Data Integration
- Flood Risk Communication
- Local Capacity Building
- Wrap Up
- Questions?



# Why are we here?

FLOODING IN NORTH TX



**DALLAS**



**FORT WORTH**

# WHO WE ARE



**SAMUEL AMOAKO-ATTA,**  
**GISP, CFM**  
GIS Team Leader

Sam brings a wealth of knowledge relating to GIS support for water resources engineering studies and applications. He is an integral part of combining the GIS processes into FEMA's regulatory process.

With 20 years of experience, he has successfully communicated community flood needs through the Cooperating Technical Partners (CTP) program, FEMA's Discovery process, and Texas Water Development Board's (TWDB) Regional Flood Planning.



**KATY OVERBEY,**  
**GISP, CFM**  
Project Manager

Katy has experience with many local, state, and federal-related water resources projects and specializes in leading the development of flood risk projects for all phases of FEMA's Risk MAP program.

She has 10 years of experience performing flood risk identification, exposure assessments, vulnerability analyses, and floodplain management GIS integration. She is currently serving as the Regional Service Center (RSC) Lead for FEMA Region 6.



# Geospatial Data Integration

## FLOOD DATA SOURCES

# GEOSPATIAL FLOOD DATA



FEDERAL



STATE



REGIONAL



FEDERAL  
EMERGENCY  
MANAGEMENT  
AGENCY



FEMA







# UNITED STATES ARMY CORPS OF ENGINEERS



Home About the Center Training Software Library Reference Center Locations Search RMC

US Army Corps of Engineers Institute for Water Resources, Risk Management Center Website

## Welcome to the Risk Management Center

### Want to learn more about RMC software?

USACE offers a suite of software applications to model risk and assess hazards in support of its mission.

[Explore Software](#)

### Want to learn more about RMC publications?

The RMC publishes a variety of technical and programmatic resources to support successful execution of its mission.

[Explore RMC Publications](#)

### What kind of training are you looking for?

- Fundamental Dam and Levee Safety Training
- Intermediate Dam and Levee Safety Training
- Advanced Dam and Levee Safety Training
- Hydraulics / Hydrology
- Structural
- Consequences
- Construction and Cost Engineering

### Want to learn more about dam and levee safety?

USACE has a wide variety of training courses for dam and levee safety activities within the broader context of risk management that are targeted towards all audiences.

[Explore Training](#)

USGS



UNITED STATES  
GEOLOGICAL  
SURVEY



# STATE FLOOD MAPPING AGENCIES

1

Louisiana Department  
of Transportation &  
Development  
(LaDOTD)

<http://www.dotd.la.gov>



2

Mississippi Emergency  
Management Agency  
(MEMA)

<https://www.msema.org>



3

Oklahoma Water  
Resources Board  
(OWRB)

<https://oklahoma.gov/owrb>



4

Texas Water  
Development Board  
(TWDB)

<https://www.twdb.texas.gov>



- Floodplain Management
- State Flood Planning
- Mitigation
- Funding
- Flood Risk Data
- Regional, Community, and Federal Partner

# REGIONAL MAPPING AGENCIES

**LA** Amite River Basin Commission (ARBC)

**LA** Atchafalaya BASINKEEPER

**OK** Oklahoma Conservation Commission (OCC)

**OK** Oklahoma Department of Environmental Quality (ODEQ)

- Council of Governments
- River Authorities
- Watershed Authority
- Flood Districts
- River Commissions
- Environmental Commissions
- Water Districts
- Utility Districts

Flood planning entities or political subdivisions with flood-related authority

**MS** Upper Mississippi Basin River Association (UMBRA)

**MS** Lower Mississippi River Watershed Management Organization (LMRWMO)

**TX** Harris County Flood Control District (HCFCD)

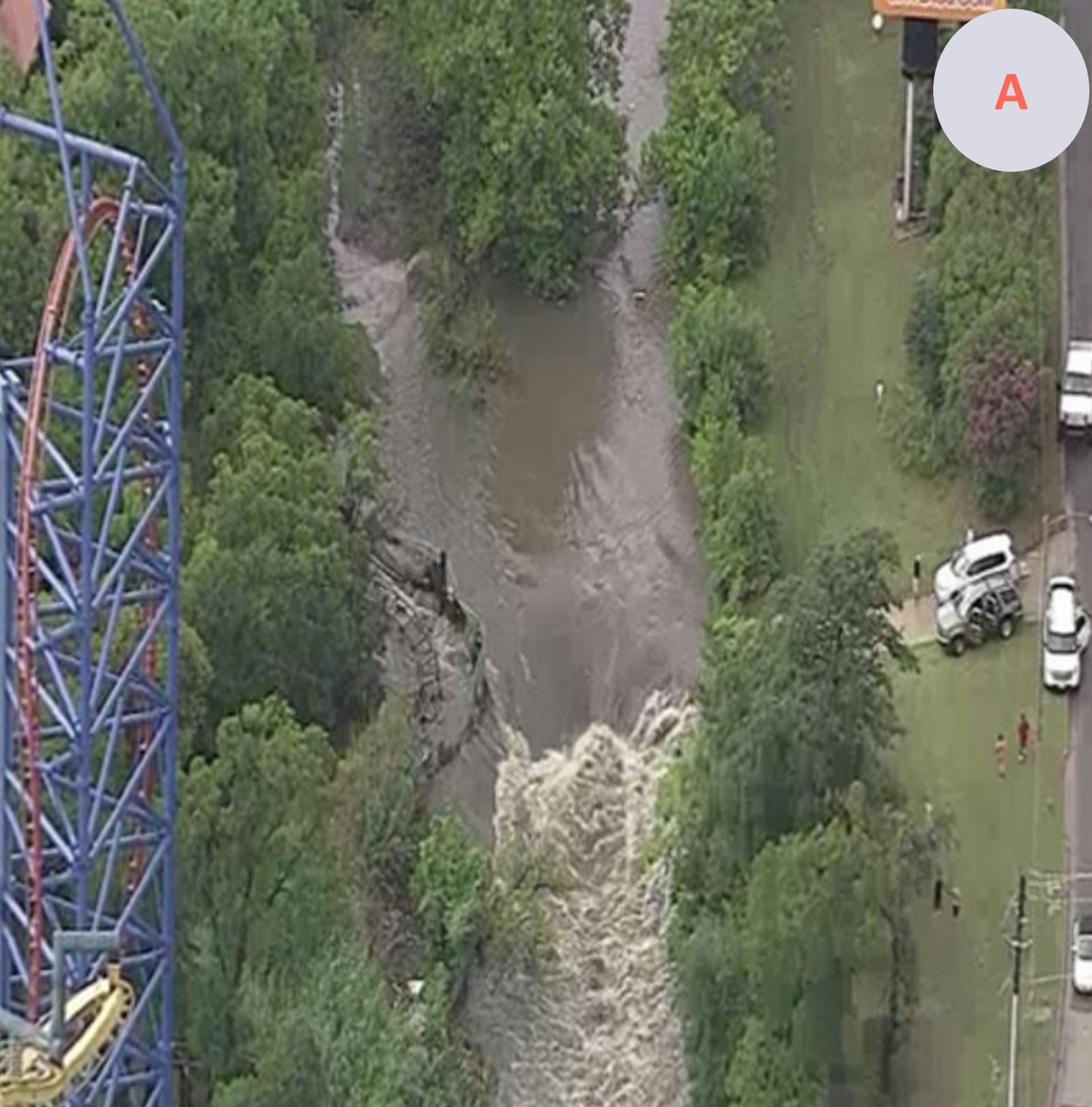
**TX** North Central Texas Council of Governments (NCTCOG)



# Flood Risk Communication

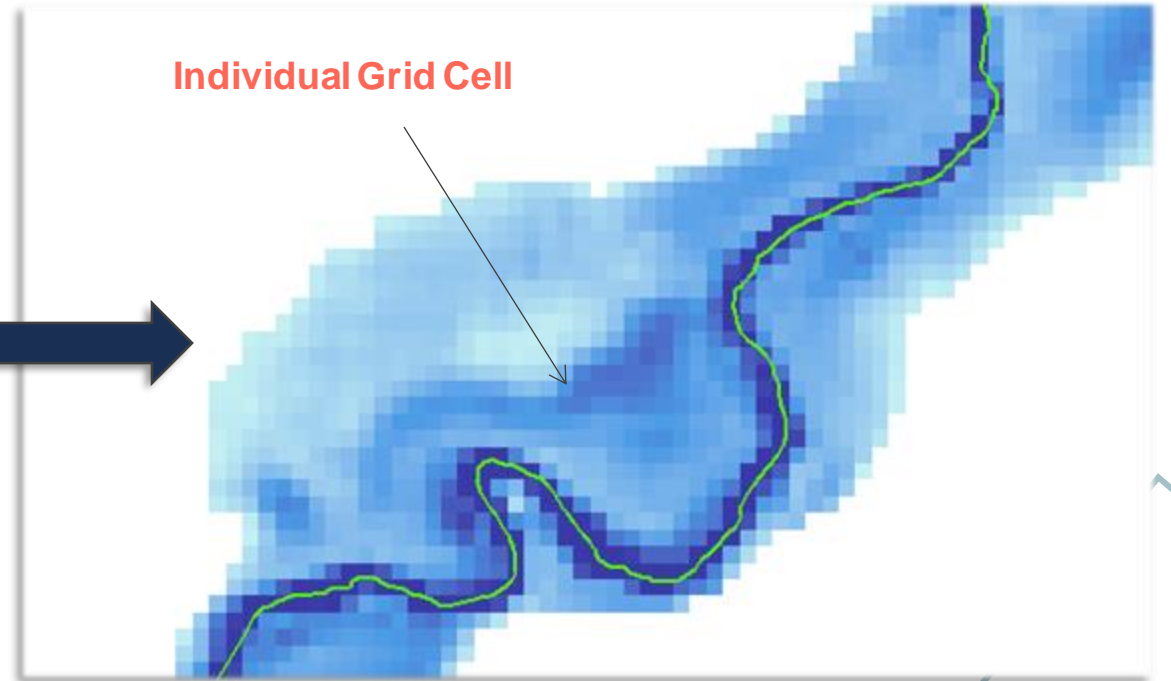
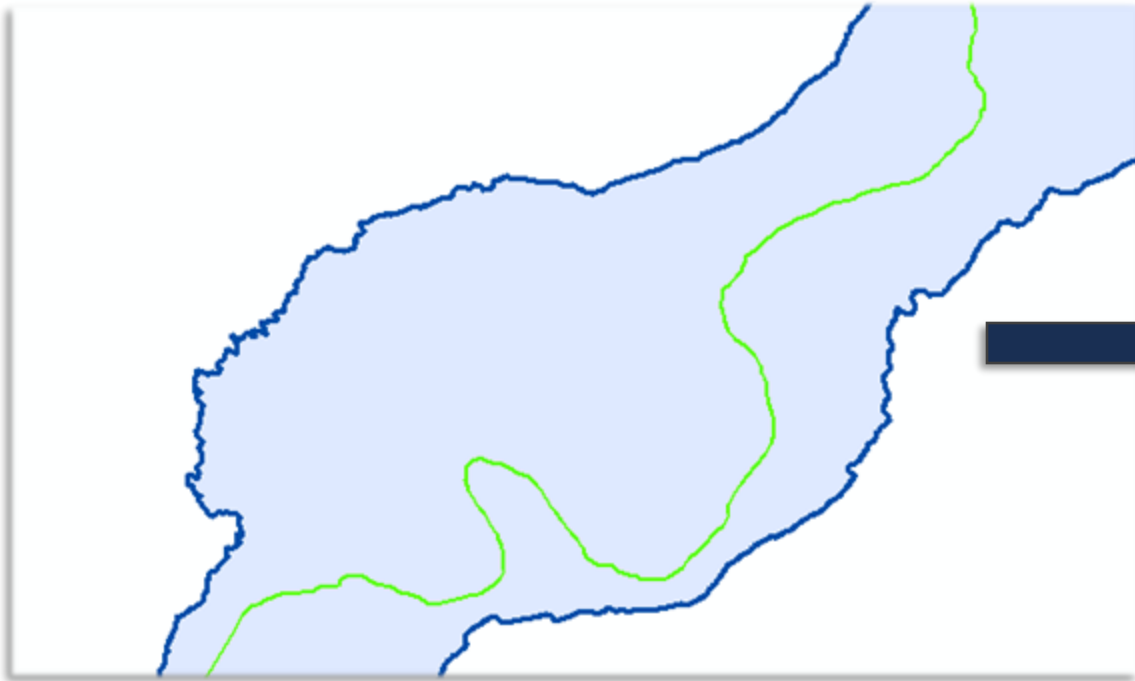
PRESENT AND FUTURE





On a FIRM, the type of flooding in photo A and the type of flooding in photo B may have the same horizontal extent. But is the risk the same?

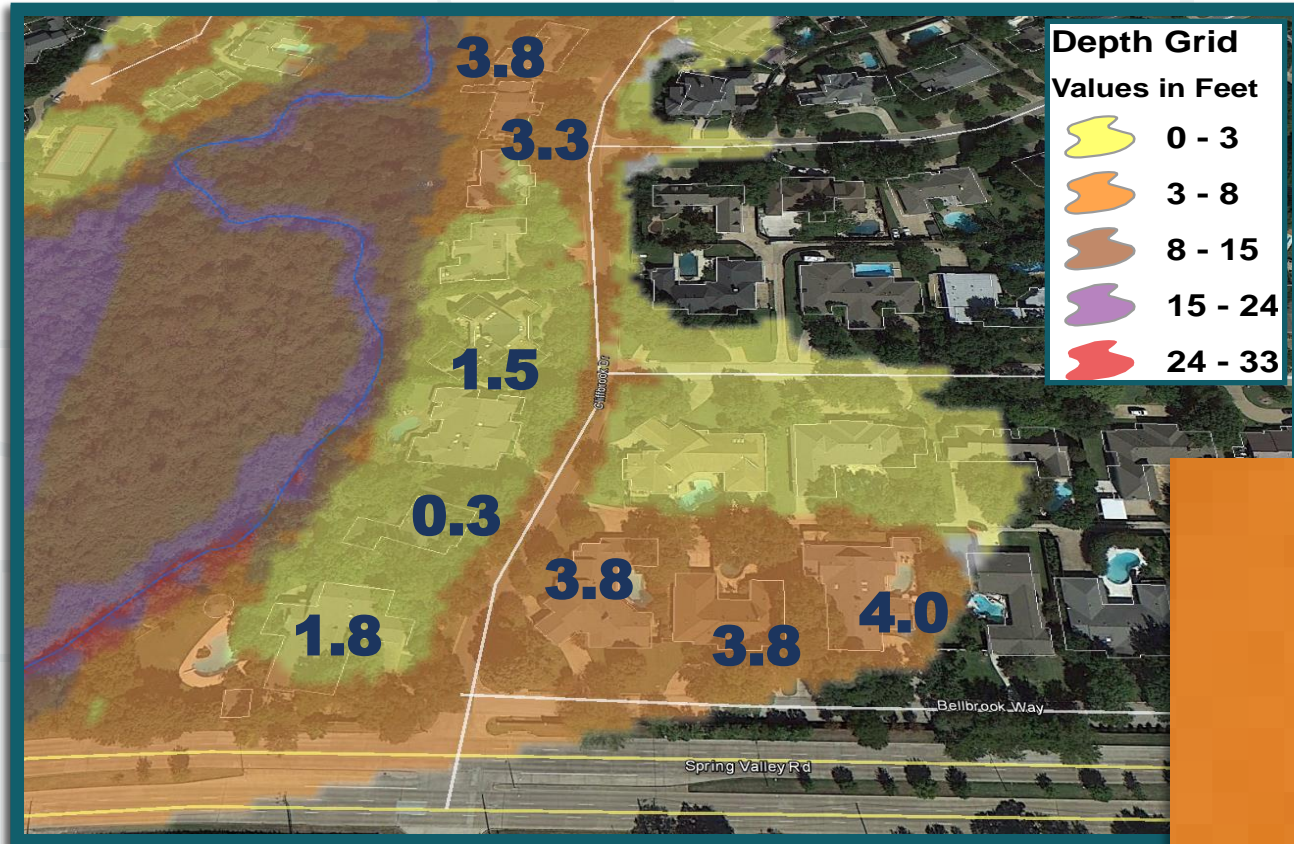
# FLOOD INSURANCE VS. FLOOD RISK



Each Grid Cell has a Unique Value

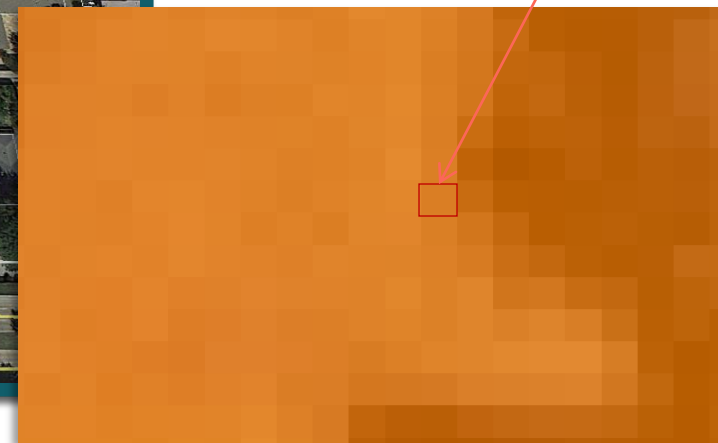


# FOUNDATIONS FOR GRADUATED HAZARD & RISK



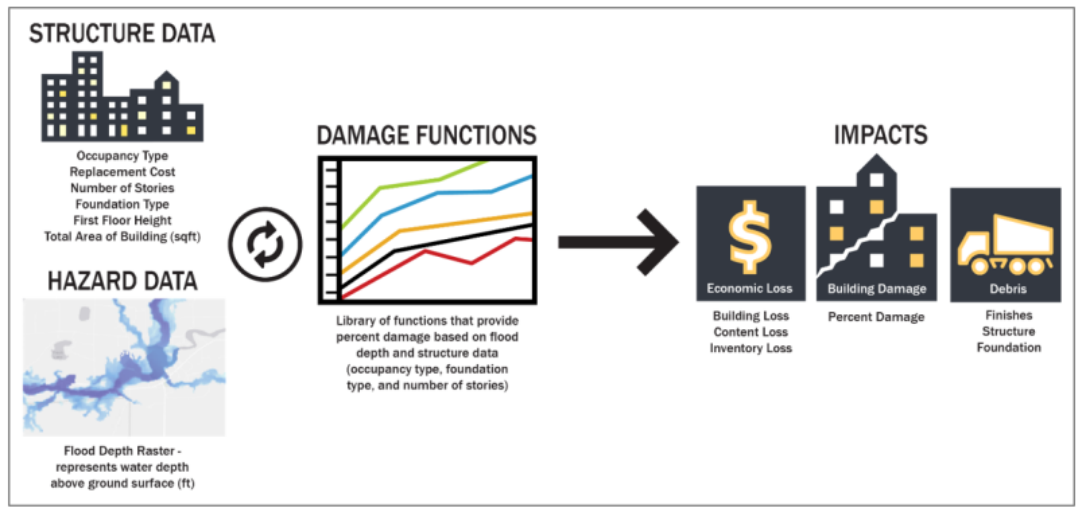
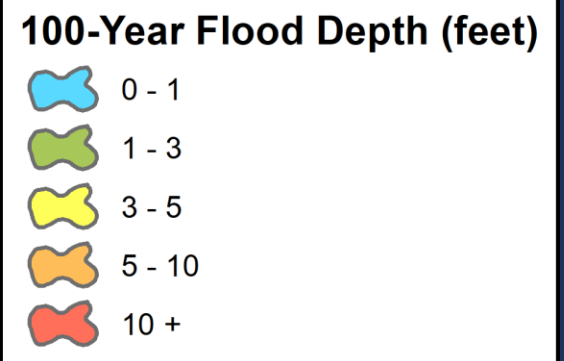
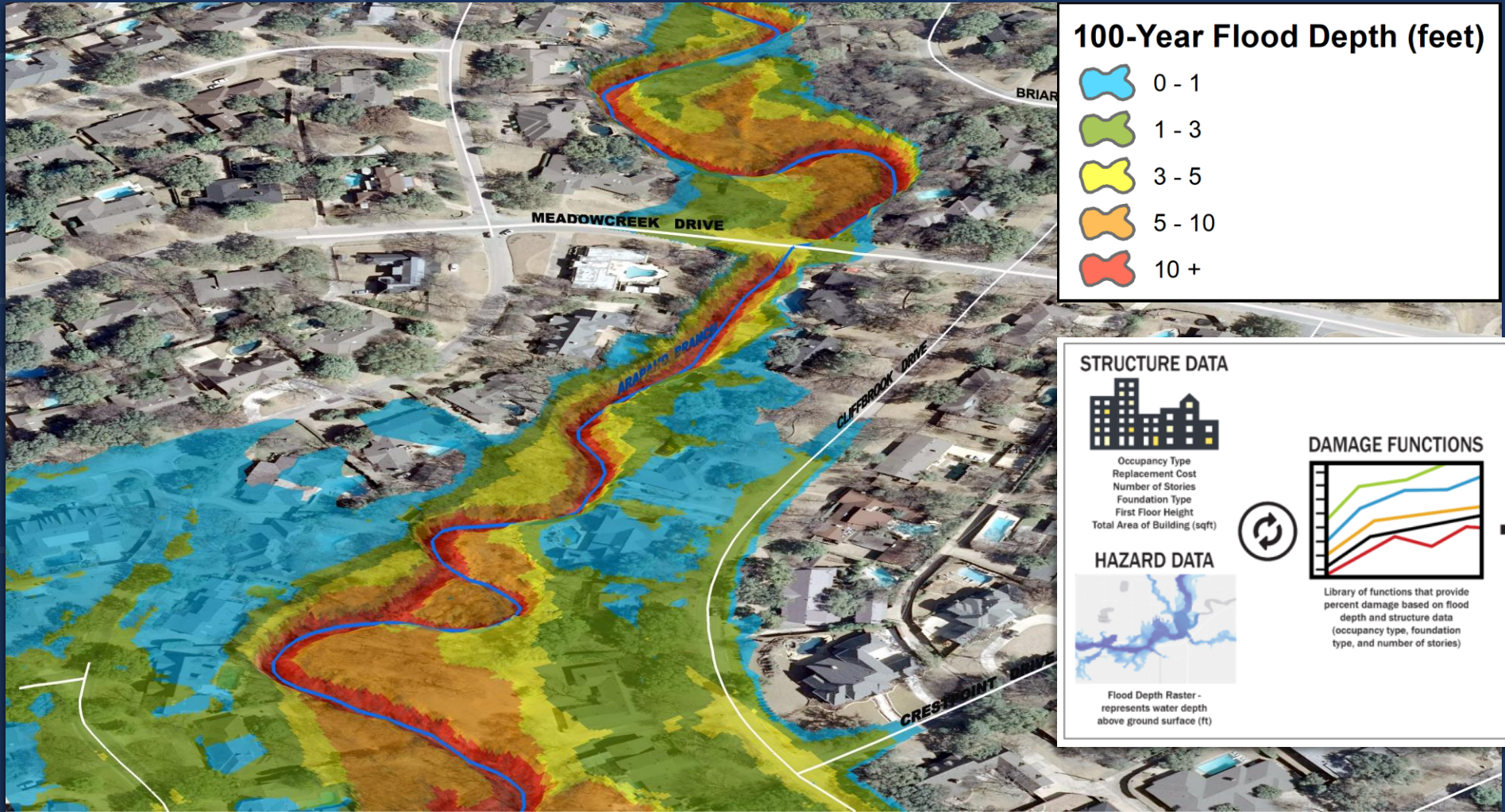
Floodplain Boundary  
**IN or OUT**

Depth Grid  
**Individual Cell**



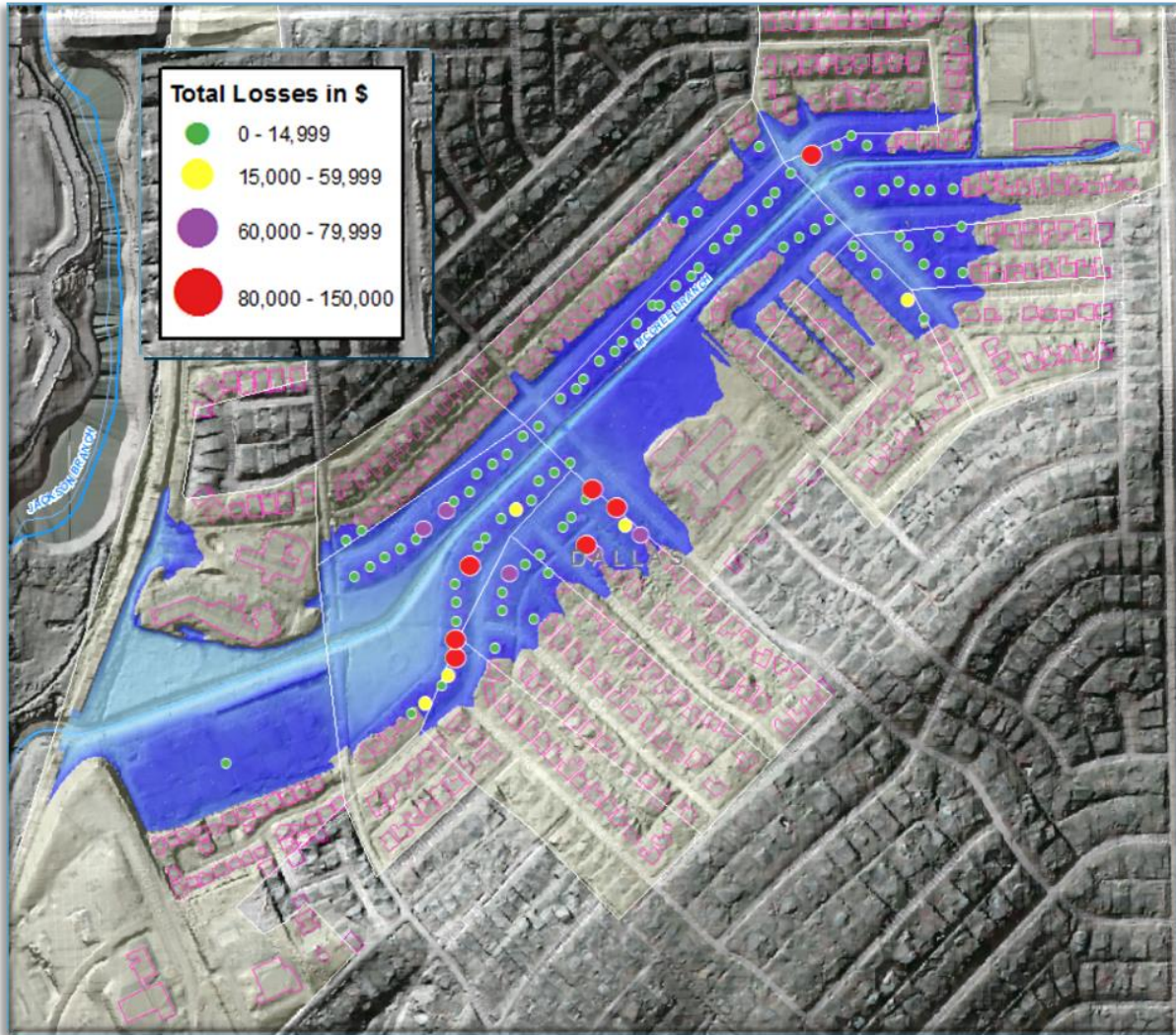


# FLOOD RISK EXPOSURE AND DAMAGES

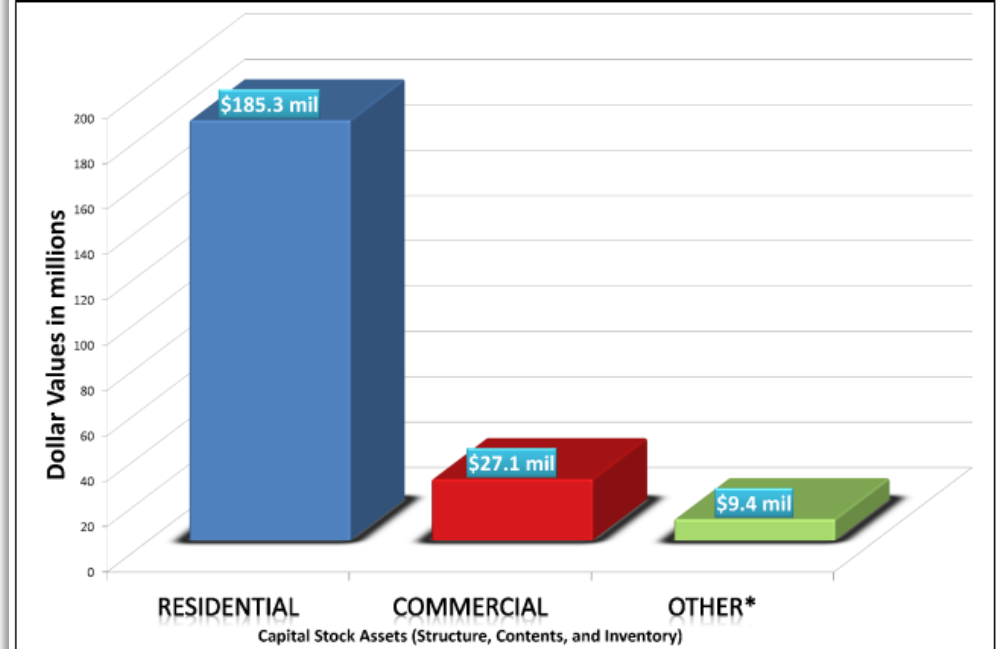




# FLOOD RISK EXPOSURE AND DAMAGES



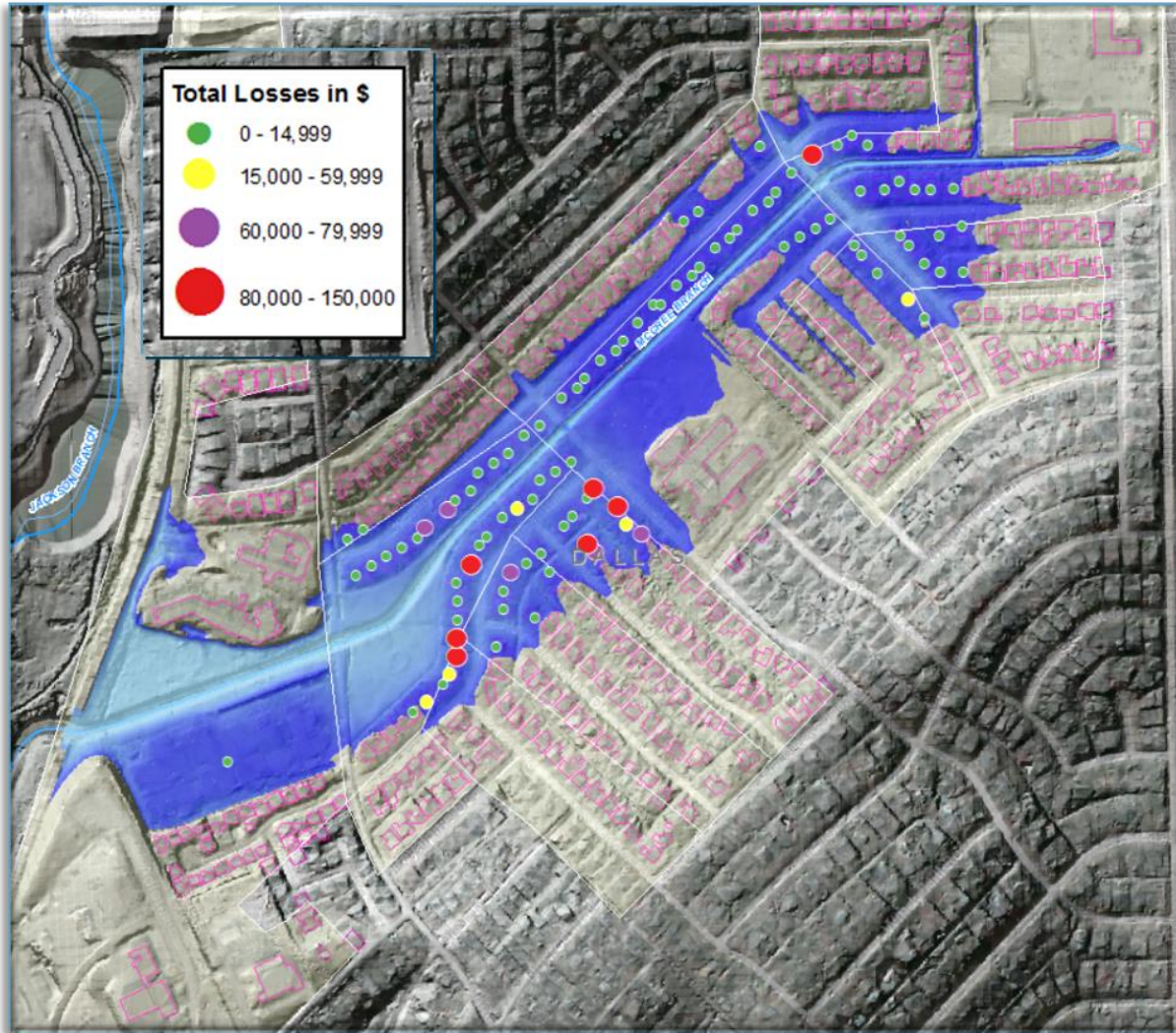
**ASSET INVENTORY VALUES - MCCREE BRANCH**



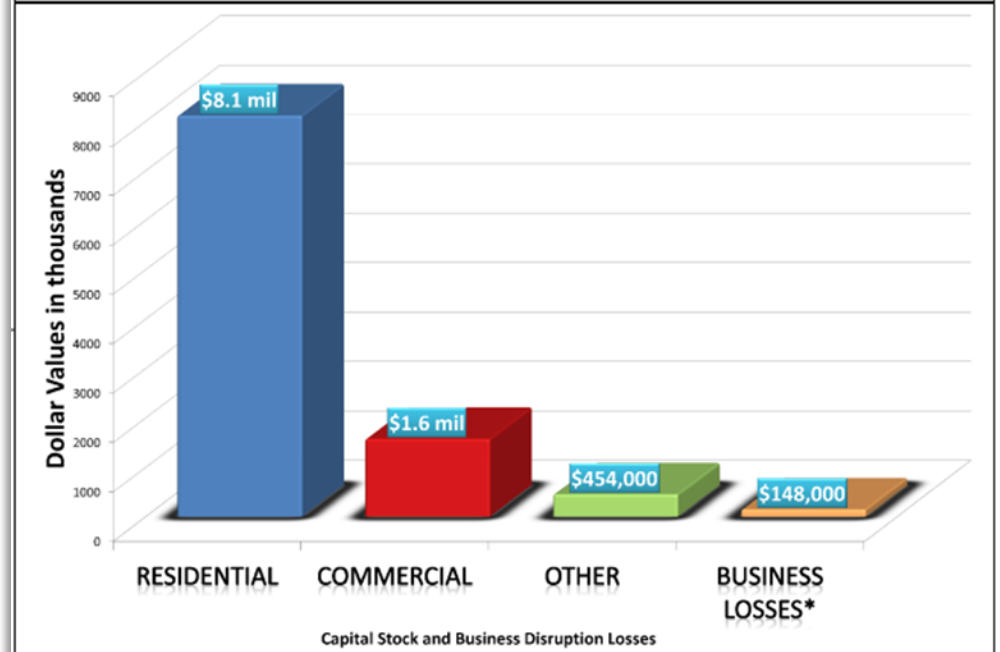
\*Other structure types include Industrial, Agricultural, Education, Religious and Government structures.



# FLOOD RISK EXPOSURE AND DAMAGES



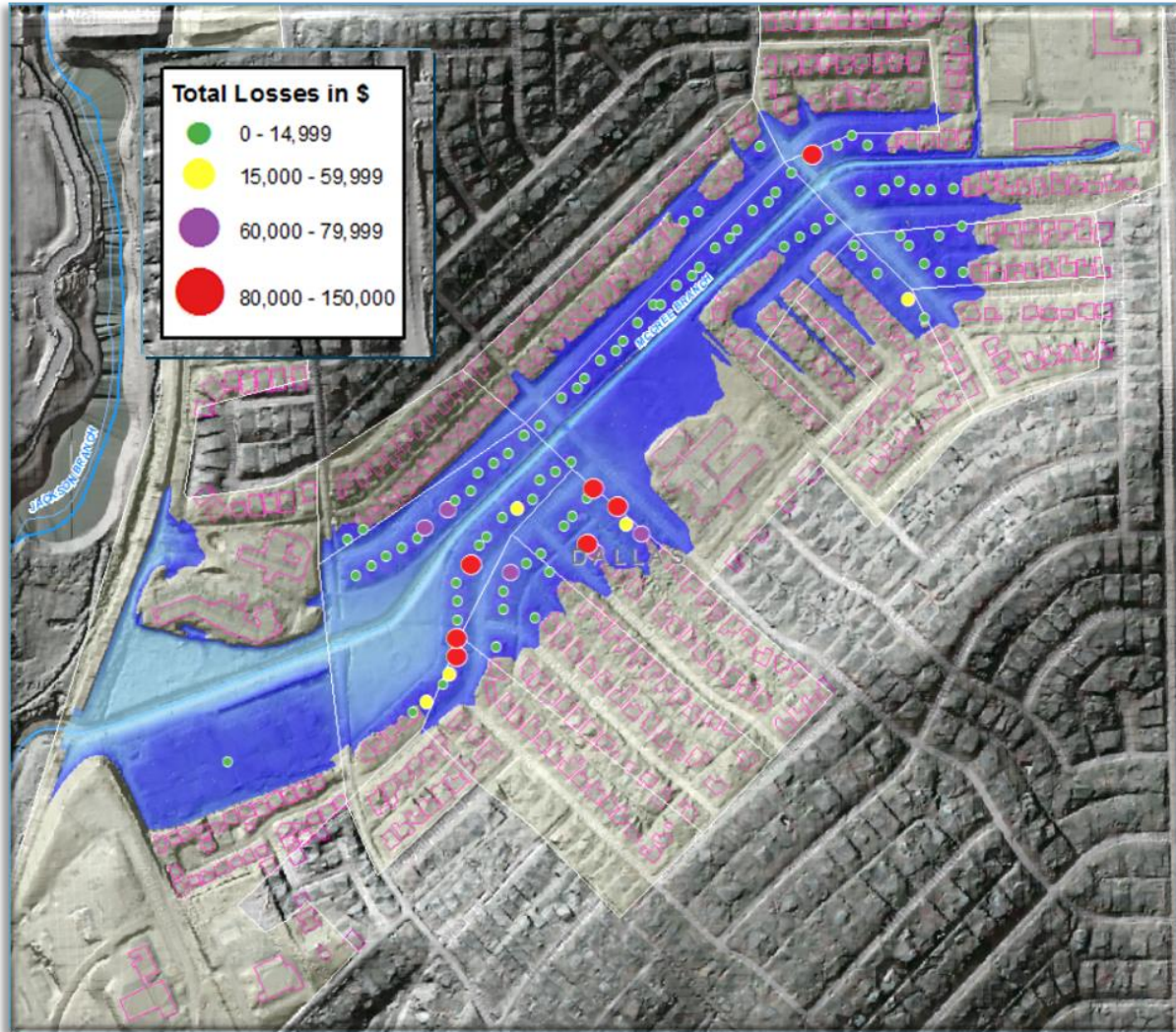
100-YEAR EVENT LOSSES - MCCREE BRANCH



\*Business Losses are the sum of Inventory Loss, Relocation Cost, Income Loss, Rental Income Loss, Wage Loss and Direct Output Loss.



# FLOOD RISK EXPOSURE AND DAMAGES



It is estimated that there are 501 buildings in the area, which have an aggregate total capital stock asset value (structure, contents and inventory) of about \$222 million.

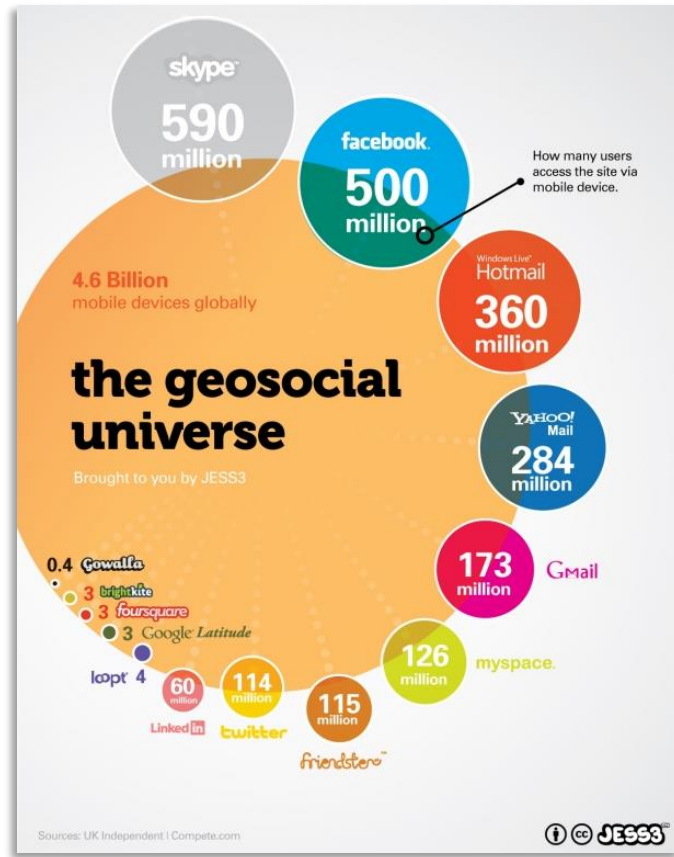
In a 100-year flood event scenario it is estimated that about 47 buildings will be at least moderately damaged. This is over 45% of the total number of buildings in the scenario. The total economic loss estimated for the flood is \$10 million.



# Local Capacity Building

GEO-SOCIAL GOVERNANCE

# GEO-SOCIAL UNIVERSE



## GEOgraphically SOCIAL

**Geo-social Networking** is a type of social networking in which geographic services and capabilities such as **geocoding** and **geotagging** are used to enable additional social dynamics.



By Jess3 - <http://jess3.com/geosocial-universe/>, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=11938516>

# GEO-SOCIAL UNIVERSE

“Obtaining real-time information about a hazard event as it unfolds, such as a flood or earthquake, was until relatively recently largely limited to the professional media. However, social media (e.g. Facebook, Twitter, YouTube, Flickr ,etc.) have been increasingly used in recent years to gain situational awareness. More and more people are looking to social media as additional, more immediate sources of information”



**ACTIONABLE  
GEOSOCIAL  
FLOOD DATA  
FOR  
COMMUNITY  
RESILIENCE**



# GEO-SOCIAL RESPONSIBILITY & GOVERNANCE

1

Leverage Existing Data



2

Community-Centric Engagement



3

Mitigation Planning



6

Disaster Response



5

Local Capacity Building



4

Make GIS Famous!





# GEO-SOCIAL FLOOD DATA - BASE LEVEL ENGINEERING

Welcome to the  
**Estimated Base Flood Elevation Viewer**

Base Level Engineering assessments are produced using high resolution ground data to create technically credible flood hazard information that may be used to expand and modernize FEMA's current flood hazard inventory.

**High Flood Risk**  
This location is in a 1% (100 year) flood zone.  
[View Report](#)

**Property Look Up**  
Where data are available, produce a property-specific report with estimated base flood information.  
[What's My Flood Risk?](#)

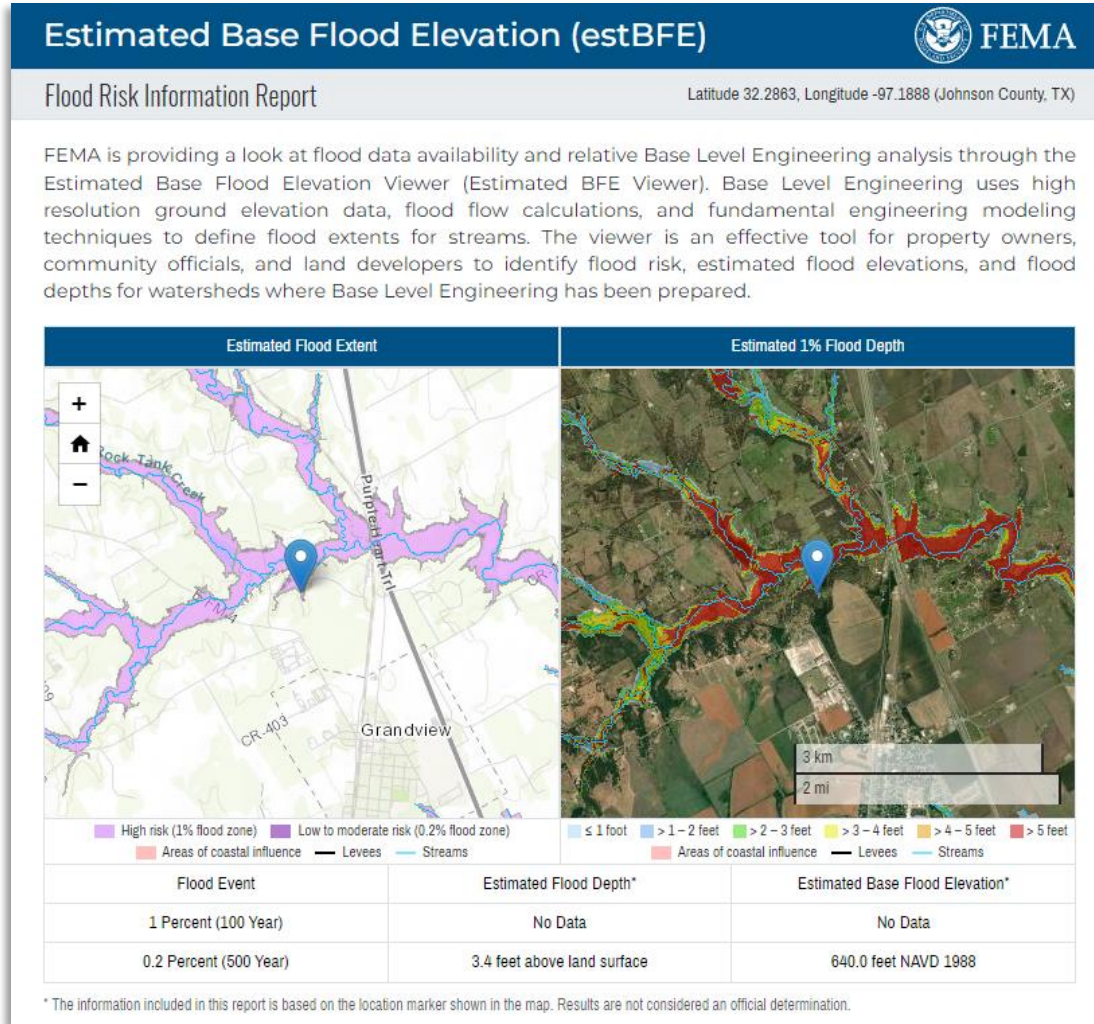
**View Base Level Engineering Data**  
Access all available Base Level Engineering data without GIS software.  
[I Want to Explore](#)

**Download Datasets & Models**  
Download the Base Level Engineering data presented in the viewer.  
[I Want to Download](#)

File Name	Size	Download
12030106_Models.zip	383.9 MB	<a href="#">Download</a>
12030106_Depth01.zip	82.8 MB	<a href="#">Download</a>
12030106_Depth002.zip	91.3 MB	<a href="#">Download</a>
12030106_Elev01.zip	19.5 MB	<a href="#">Download</a>
12030106_Elev002.zip	20.1 MB	<a href="#">Download</a>
12030106_VectorData.zip	263.7 MB	<a href="#">Download</a>

<https://webapps.usgs.gov/infrm/estbfe>

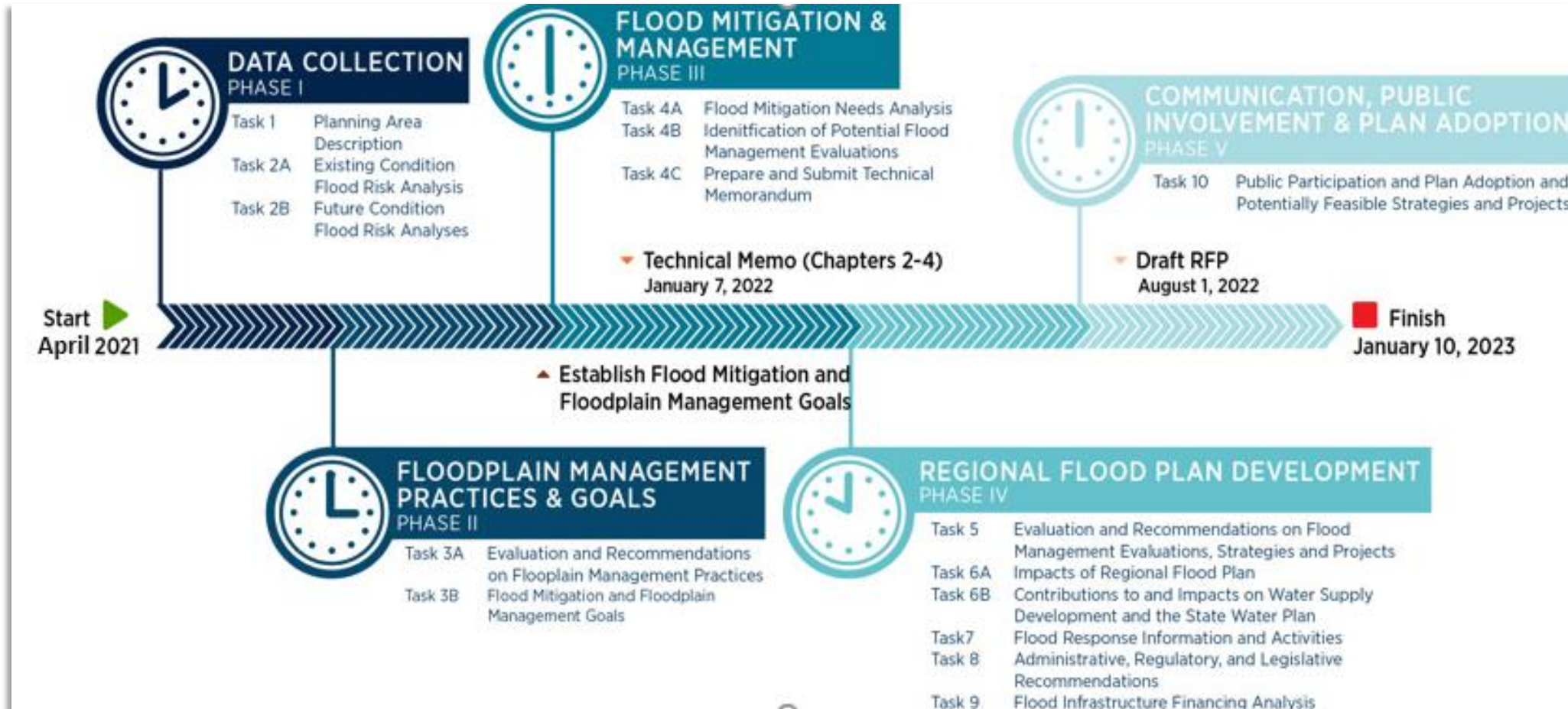
# GEO-SOCIAL FLOOD DATA - BASE LEVEL ENGINEERING



 <https://webapps.usgs.gov/infrm/estbfe>



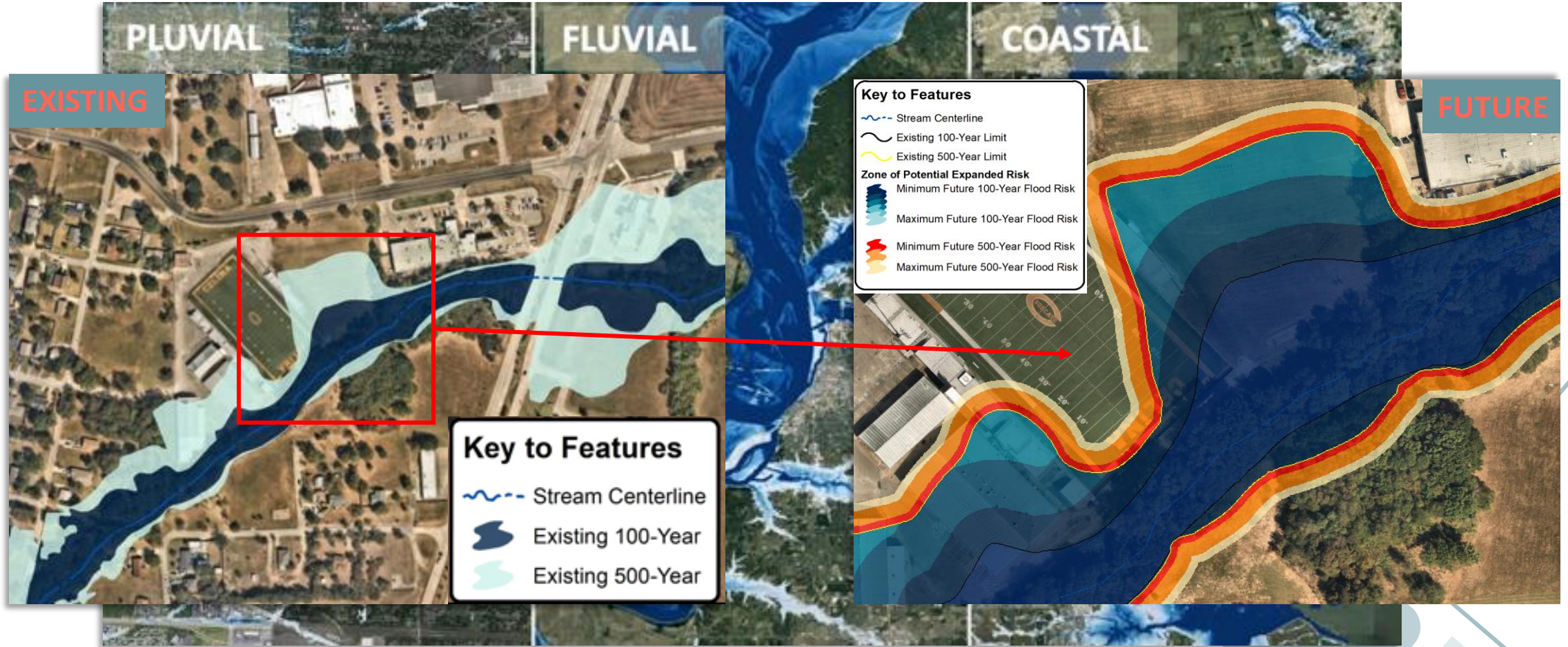
# GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING



<https://www.twdb.texas.gov/flood/planning/regions/index.asp>



# GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING

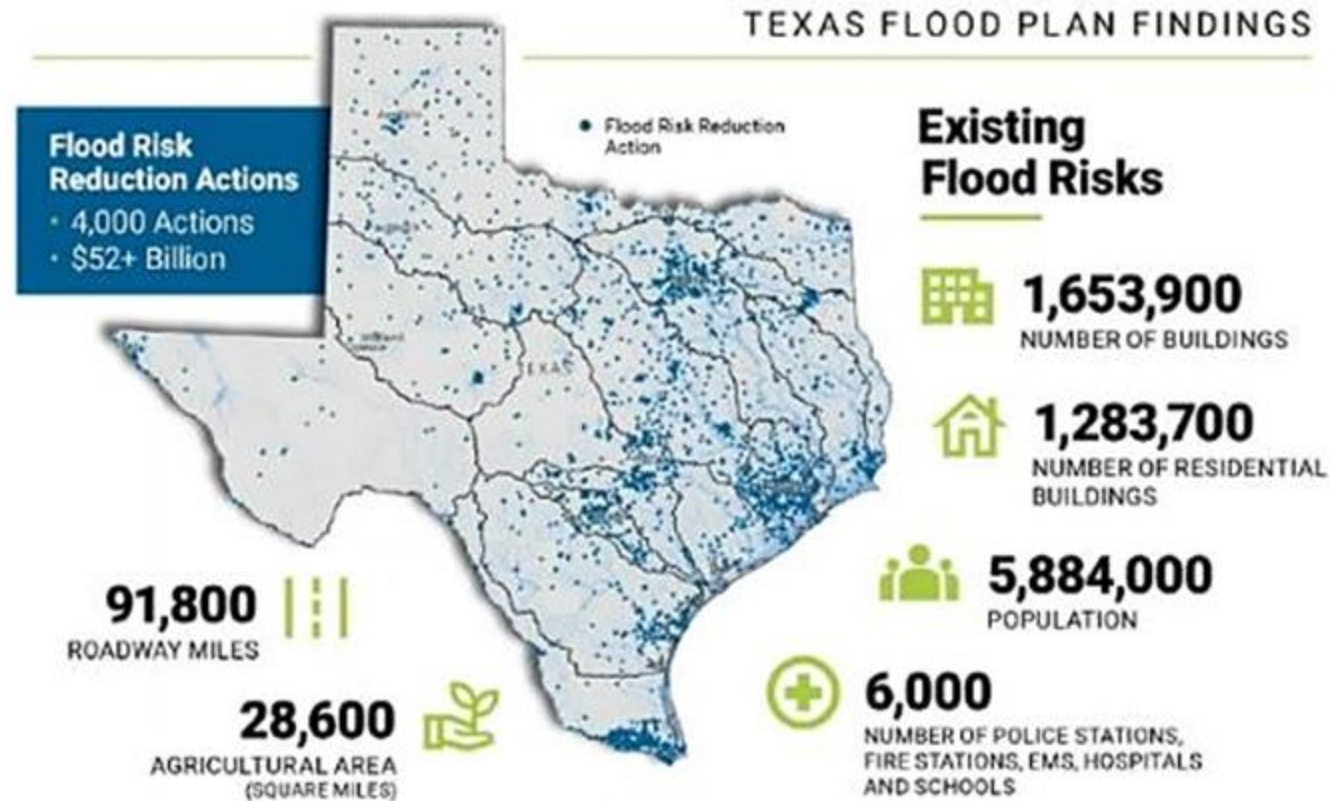


 <https://www.twdb.texas.gov/flood/planning/regions/index.asp>

# GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING

## Texas Regional Flood Plans

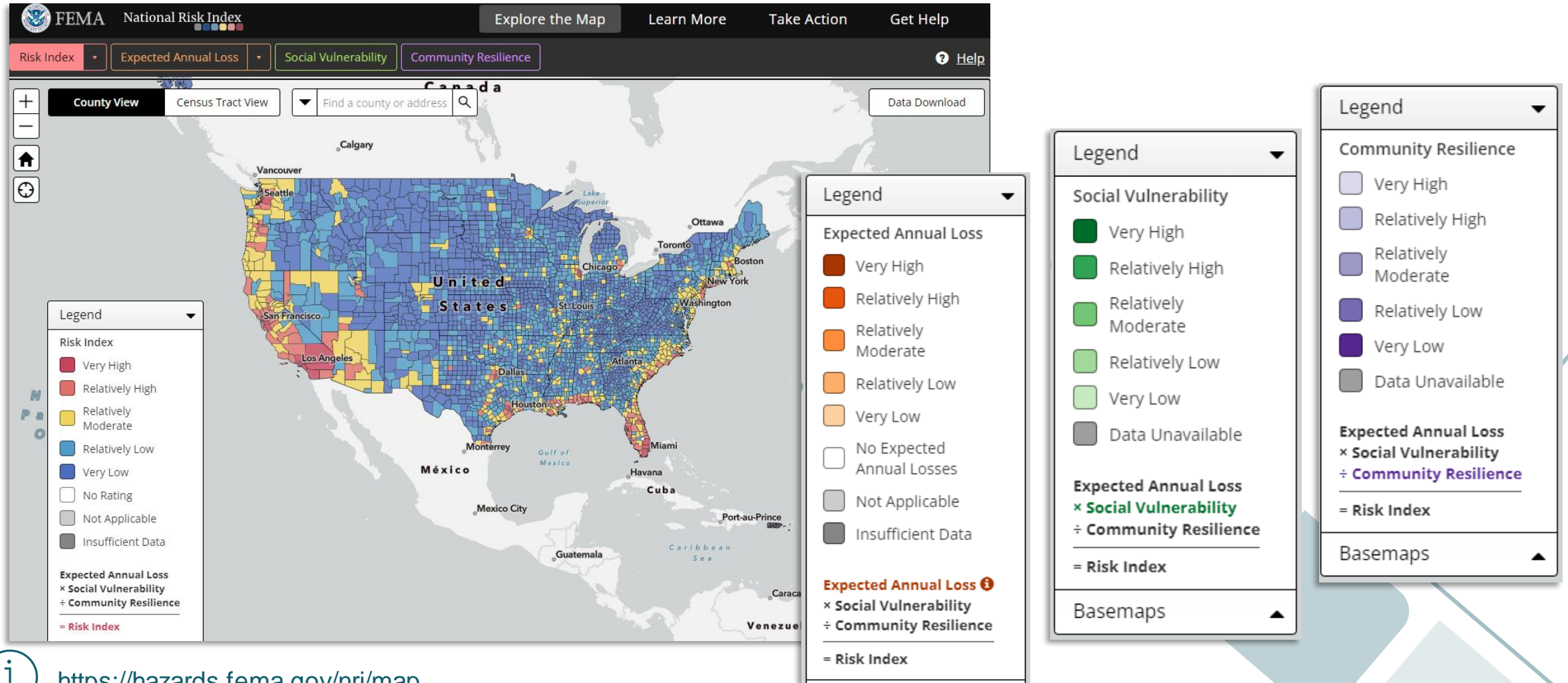
2<sup>nd</sup> PLANNING CYCLE (2024 – 2028)



<https://www.twdb.texas.gov/flood/planning/regions/index.asp>

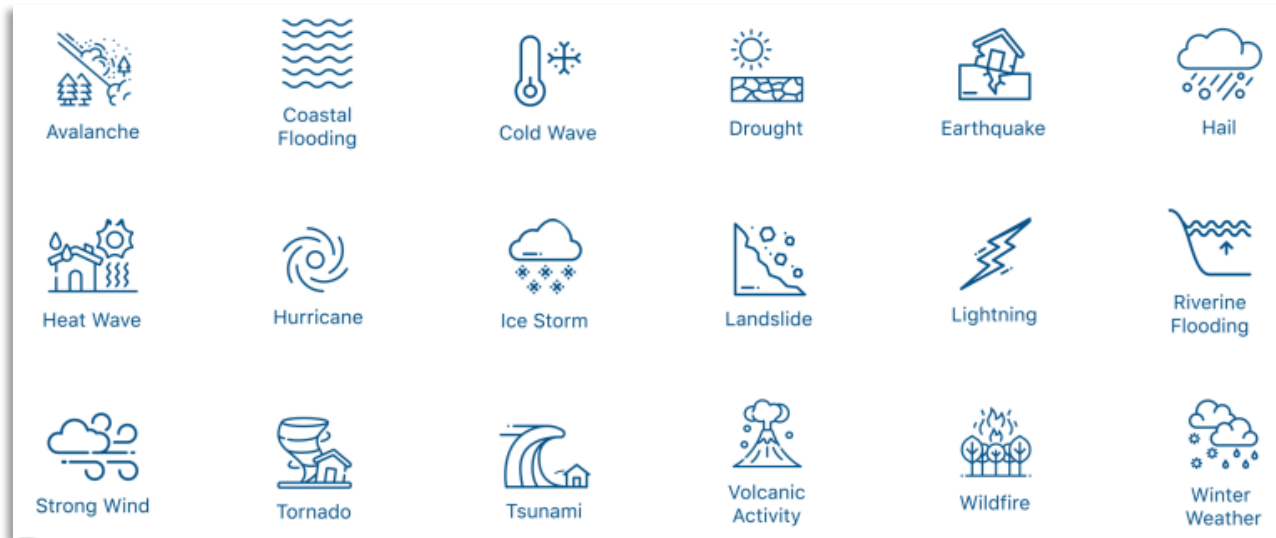


# GEO-SOCIAL FLOOD DATA – NATIONAL RISK INDEX (NRI)



<https://hazards.fema.gov/nri/map>

# GEO-SOCIAL FLOOD DATA – NATIONAL RISK INDEX (NRI)



Not Applicable
Future Enhancements
Orange
Green
Purple

Data unavailable/more research needed
✓ - Done

Available Data	PR	VI	GU	AS	MP
<b>Expected Annual Loss Data</b>	✓	✓	✓	✓	✓
- Avalanche					
- Coastal Flooding	✓	✓	✓	✓	✓
- Cold Wave	✓	✓	✓	✓	✓
- Drought	✓	✓			
- Earthquake	✓	✓	✓	✓	✓
- Hail	✓	✓			
- Heat Wave	✓	✓	✓	✓	✓
- Hurricane	✓	✓			✓
- Ice Storm					
- Landslide	✓				
- Lightning					
- Riverine Flooding	✓	✓	✓	✓	✓
- Strong Wind	✓	✓			
- Tornado	✓	✓			
- Tsunami	✓	✓	✓	✓	
- Volcanic Activity	✓	✓		✓	✓
- Wildfire					
- Winter Weather	✓	✓	✓	✓	✓
<b>Social Vulnerability Data</b>	✓				
<b>Community Resilience Data</b>					

<https://hazards.fema.gov/nri/map>

# GEO-SOCIAL FLOOD DATA – NATIONAL RISK INDEX (NRI)

$$\text{Risk} = \text{Expected Annual Loss} \times f\left(\frac{\text{Social Vulnerability}}{\text{Community Resilience}}\right)$$

where **Expected Annual Loss** =

**Annualized Frequency**



How likely is hazard to occur?

**X**

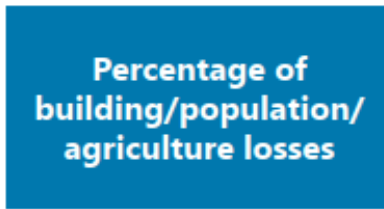
**Exposure**



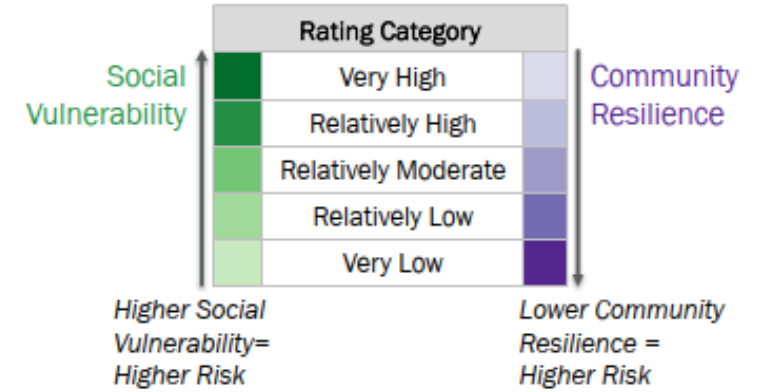
How many people & how much property are potentially at risk?

**X**

**Historic Loss Ratio**



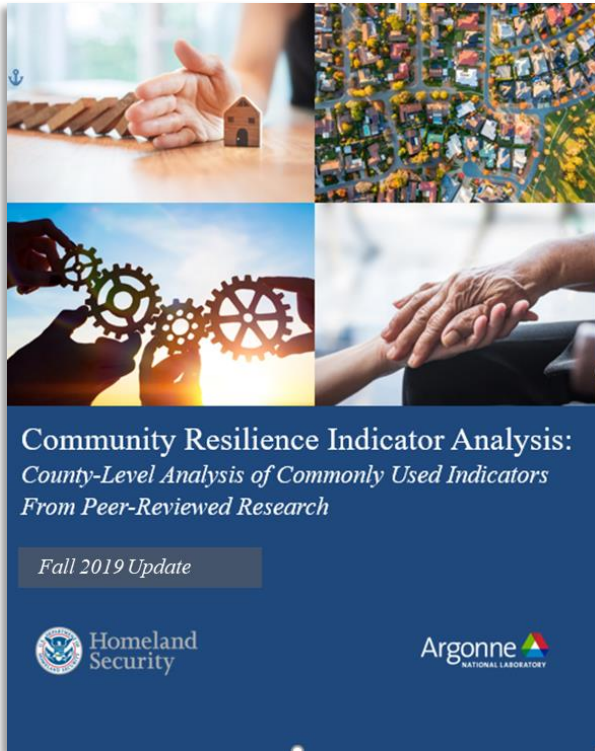
What percent of property/people have historically been lost from a hazard in a given community?



<https://hazards.fema.gov/nri/map>



# RESILIENCE ANALYSIS AND PLANNING TOOL (RAPT)



Community Resilience Indicator Analysis:  
*County-Level Analysis of Commonly Used Indicators  
From Peer-Reviewed Research*

Fall 2019 Update

Homeland Security  
Argonne NATIONAL LABORATORY



FEMA Resilience Analysis and Planning Tool (RAPT)

RAPT gives **everyone** easy access to important community data and analysis tools

[RAPT Resource Center](#)

[RAPT Overview and Quick Start](#)

[RAPT User Guide](#)

[Grant Equity Threshold Tool \(GETT\)](#)

To share how you use RAPT, or to send questions or comments, please contact: [FEMA-TARrequest@fema.dhs.gov](mailto:FEMA-TARrequest@fema.dhs.gov)

To close this window, click on the tab with the left facing arrow [←].

[Climate Risk and Resilience Portal \(ClimRR\)](#) - ClimRR provides GIS data layers of future climate conditions. Adding these layers into RAPT allows users to examine how current community populations and infrastructure may be affected.

[FEMA Content Gallery](#) - FEMA maintains a list of data layers that can be added to RAPT for analysis, including data on lifelines and hazards.

[FEMA Disaster Data](#) - FEMA provides public data on specific incidents, including Geospatial Damage Assessments. Some layers are not public.

I agree to the above terms and conditions

OK

<https://www.fema.gov/rapt>

# RESILIENCE ANALYSIS AND PLANNING TOOL (RAPT)

RAPT Data

Population-Focused Indicators	Community-Focused Indicators	Infrastructure Data	Hazard Data
CRIA Commonly Used Indicators	CRIA Commonly Used Indicators		Historic / Risk
% Population without Health Insurance <sup>a,b</sup>	Connection to Civic/Social Organizations	Nursing Homes	Flood Hazard Zones
% Population Unemployed <sup>a,b</sup>	Hospital Capacity	Hospitals	Tornado Paths
% Population without a High School Education <sup>a,b</sup>	Medical Professional Capacity	Urgent Care Facilities	Tropical Storms
% Population with a Disability <sup>a,b</sup>	Affiliation with a Religion	Public Health Depts.	Seismic Hazards
% Population without Access to a Vehicle <sup>a,b</sup>	Presence of Mobile Homes*	Fire Stations	Wildfire
% Population with Home Ownership <sup>a,b</sup>	Public School Capacity	Emergency Medical Services (EMS) stations	
% Population over 65 <sup>a,b</sup>	Population Change	Local Law Enforcement locations	NOAA Layers
% Population Single-Parent Households <sup>a,b</sup>	Hotel/Motel Capacity	911 Service Area Boundaries	Current Watches/Warnings
% Population with Limited English Proficiency <sup>a,b</sup>	Rental Property Capacity <sup>a,b</sup>	Mobile Home Parks	Hurricane Outlook: Atlantic
Median Household Income <sup>a,b</sup>		Places of Worship	Severe Weather Outlook
Gini Index: Income Inequality <sup>b</sup>		Public Schools	Excessive Rainfall Outlook
		Private Schools	River Flood Outlook
<b>Other Population Indicators</b>		Colleges and Universities	
At-risk electricity-dependent Medicare beneficiaries		Prison Boundaries	
Tribal Populations		Transmission Lines	
		Electric Power Plants	
		Solid Waste Landfills	
		Wastewater Treatment Plants	
		Pharmacies (RX Open)	
		Dialysis Centers	
		High Hazard Dams	

<sup>a</sup> Both U.S. Census Bureau county and census tract data;

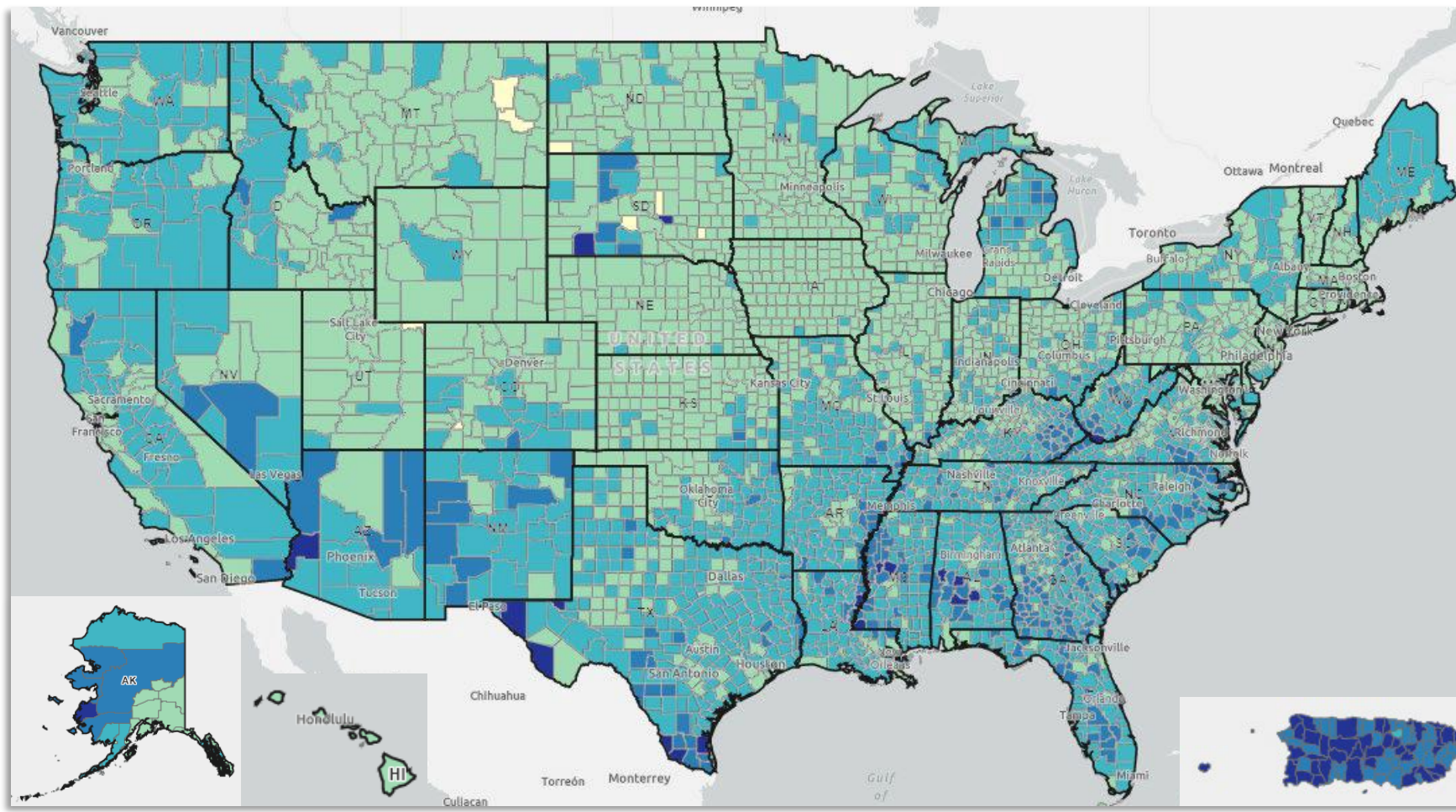
ACS 2014-2018 five-year estimates.

<sup>b</sup> Tribal territory population data available.

 <https://www.fema.gov/rapt>



# RESILIENCE ANALYSIS AND PLANNING TOOL (RAPT)



- 1 standard deviation or more below the average
- Between -0.5 and -1.0 standard deviation below the average
- Below 0, but >-0.5 standard deviation below average
- Above 0 but <+1.0 standard deviation above average
- +1 standard deviation or more above the average

<https://www.fema.gov/rapt>

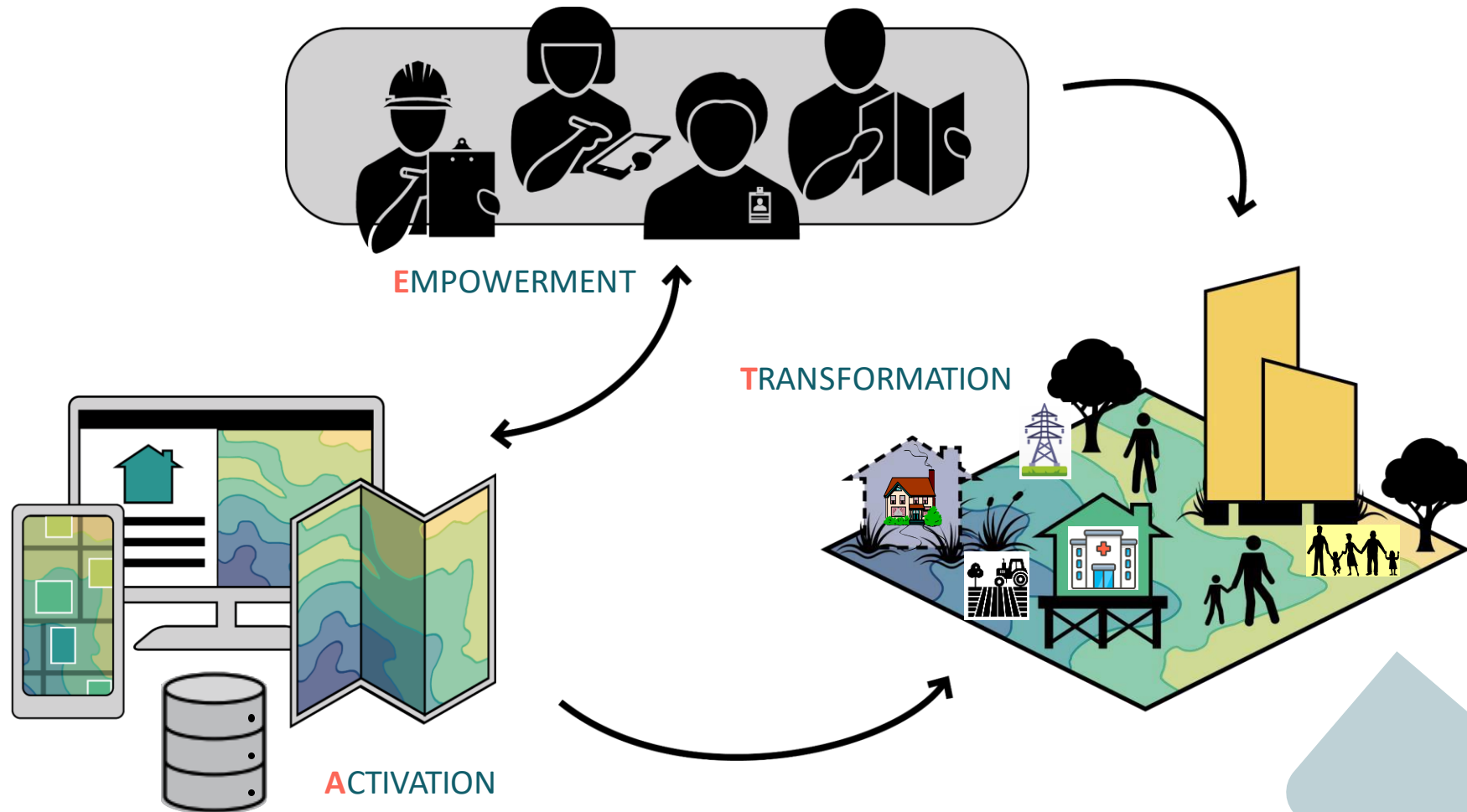


# Wrapping Up

# GEO-SOCIALIZING FLOOD DATA



# GEO-SOCIAL GOVERNANCE & COMMUNITY RESILIENCE





# Q&A

# GET IN TOUCH

Samuel Amoako-Atta, GISP, CFM  
Katy Overbey, GISP, CFM

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[kOverbey@halff.com](mailto:kOverbey@halff.com)



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halff.com

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