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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?

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Why are we here?

FLOODING IN NORTH TX

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FORT WORTH

DALLAS

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

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GEOSPATIAL FLOOD DATA

FEDERAL

STATE

REGIONAL

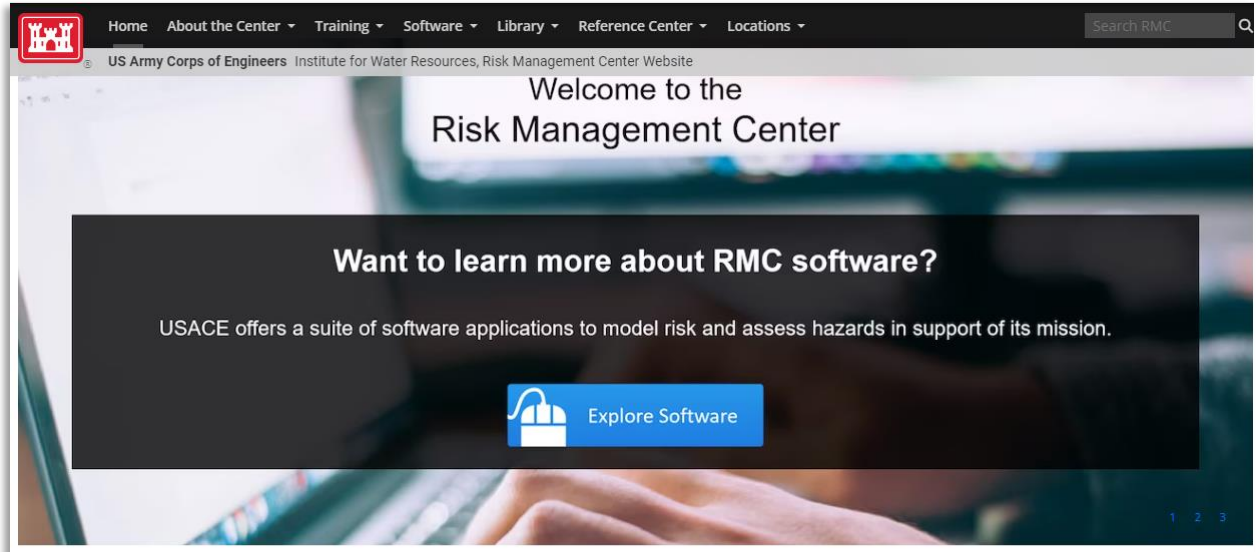
FEMA

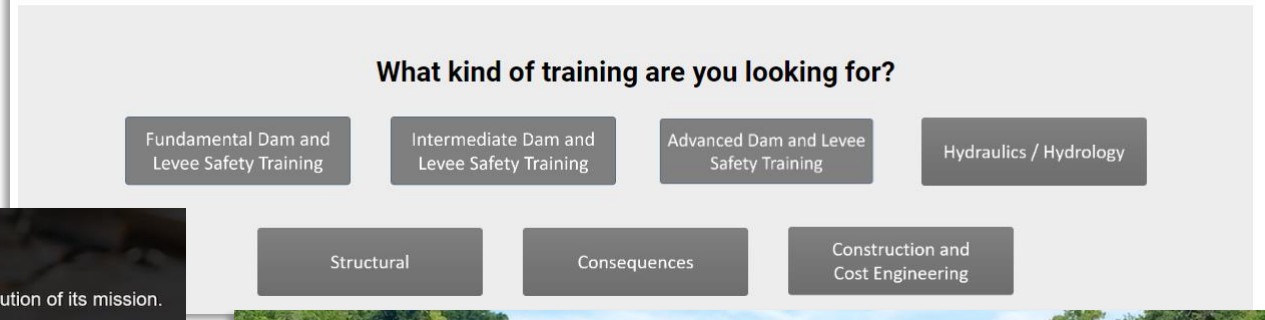
FEDERAL EMERGENCY MANAGEMENT AGENCY

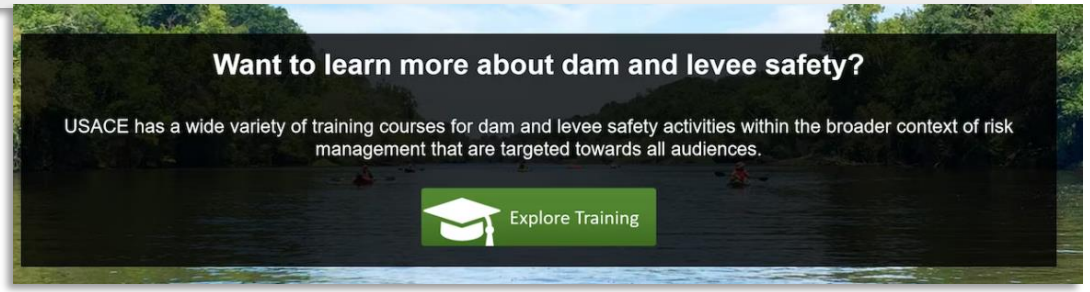
FEMA

USACE

UNITED STATES ARMY CORPS OF ENGINEERS







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USGS

UNITED STATES GEOLOGICAL SURVEY

InFRM
INTERAGENCY FLOOD RISK MANAGEMENT

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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 (**OWRD**)

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)

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Flood Risk Communication

PRESENT AND FUTURE

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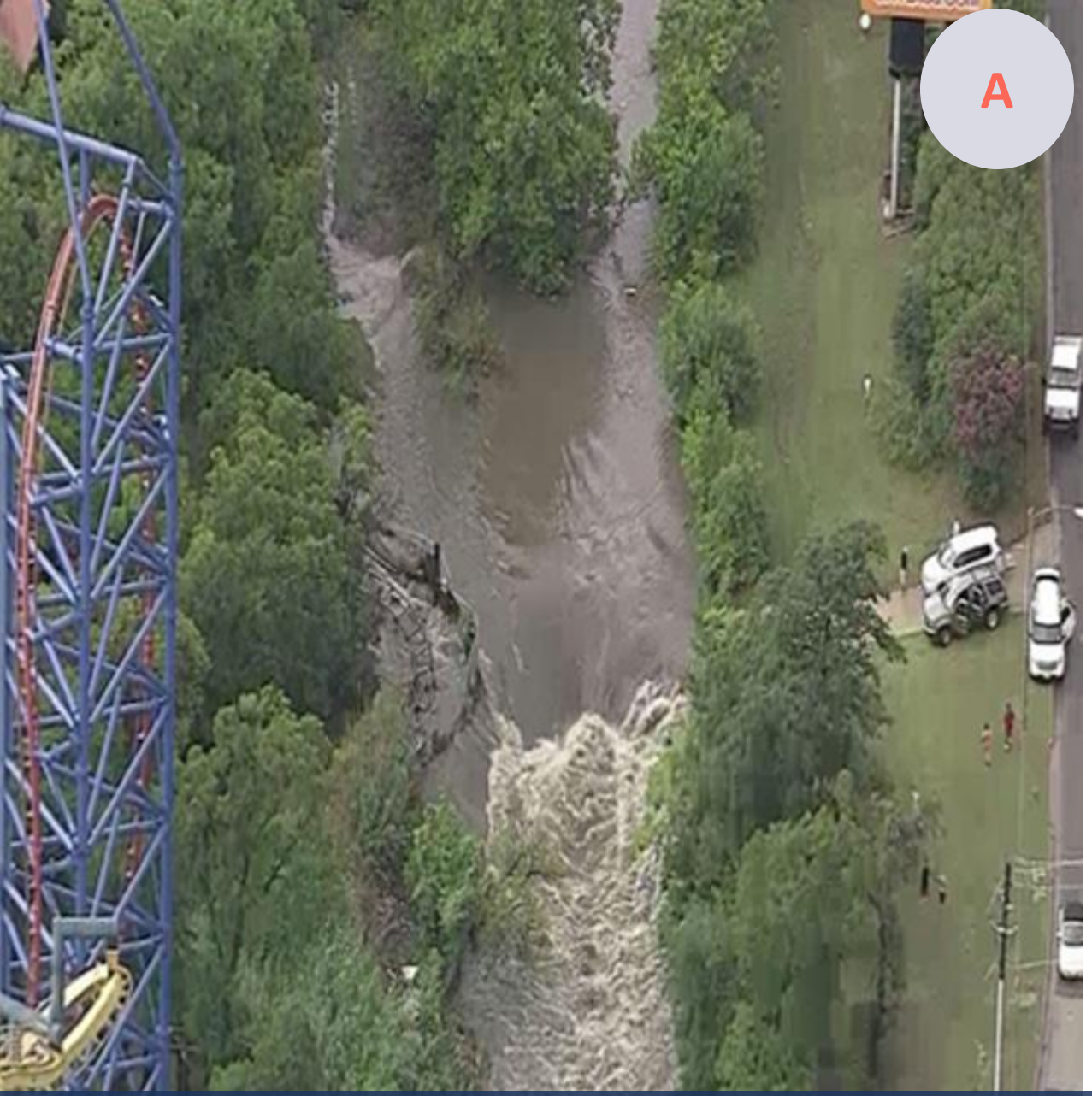
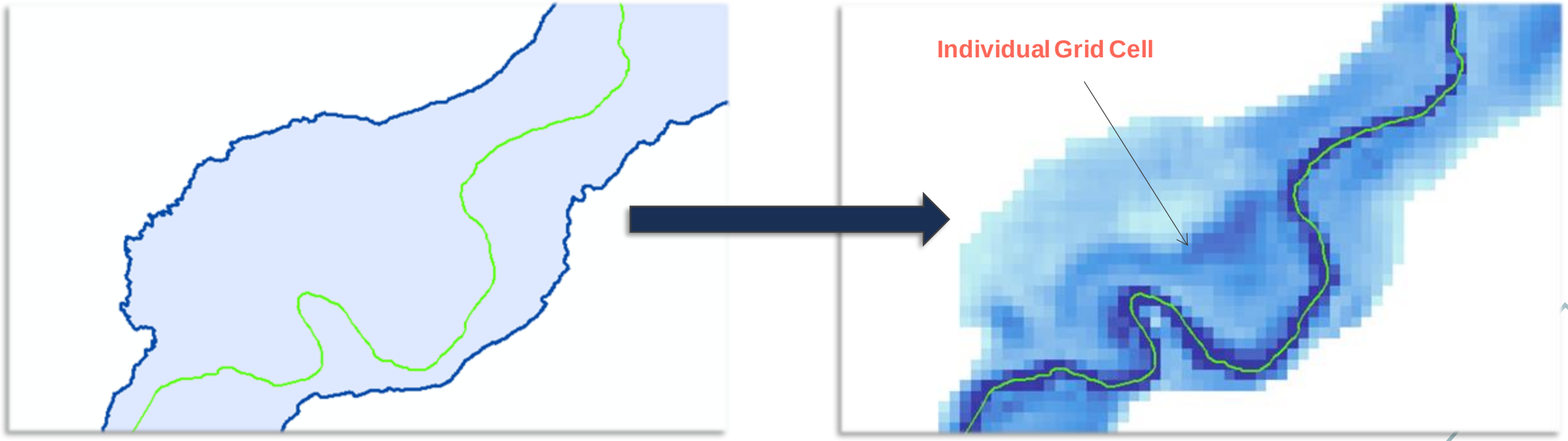


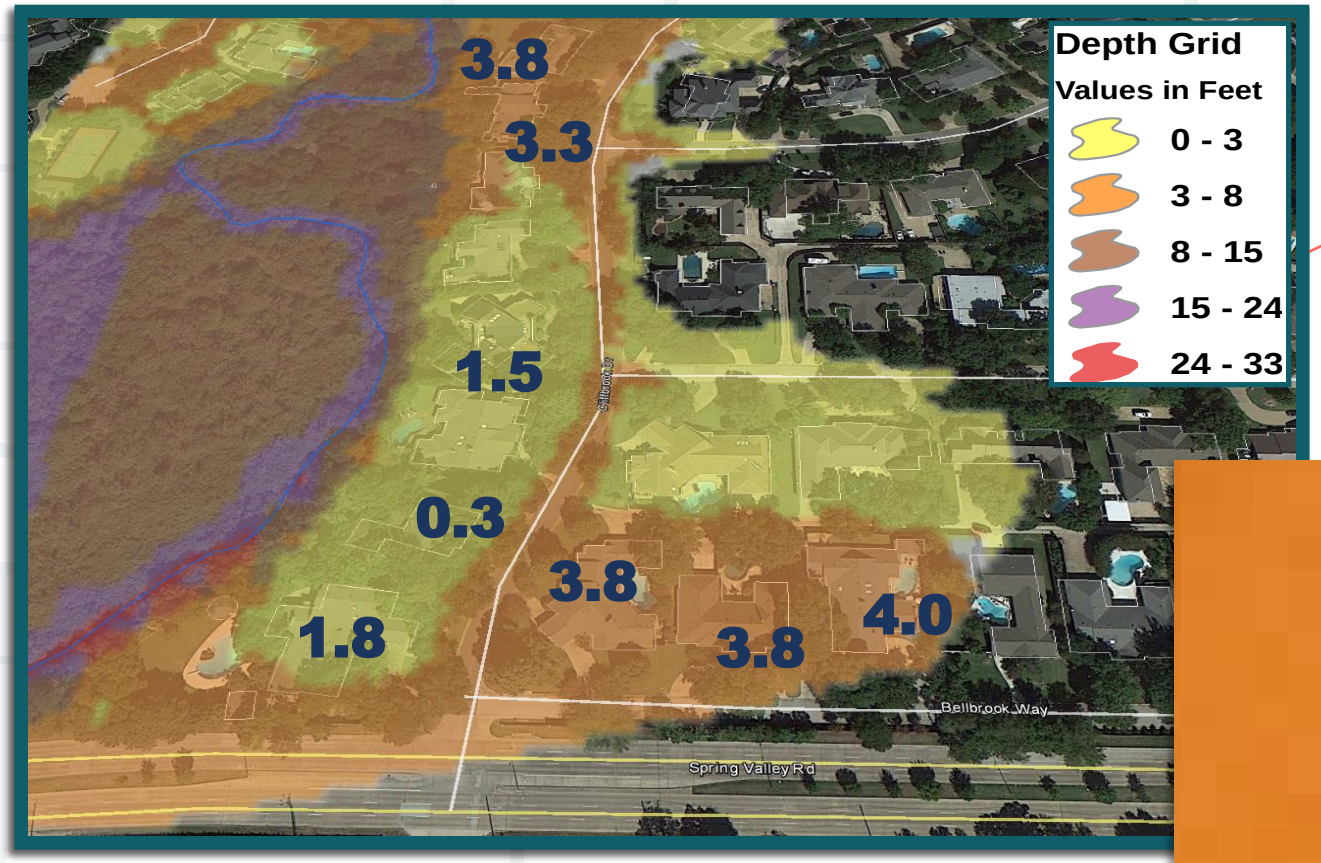
On a FIRM, the type of flooding in photo A and the type of flooding in photo B may have the same horizontal extent. But is the risk the same?

FLOOD INSURANCE VS. FLOOD RISK



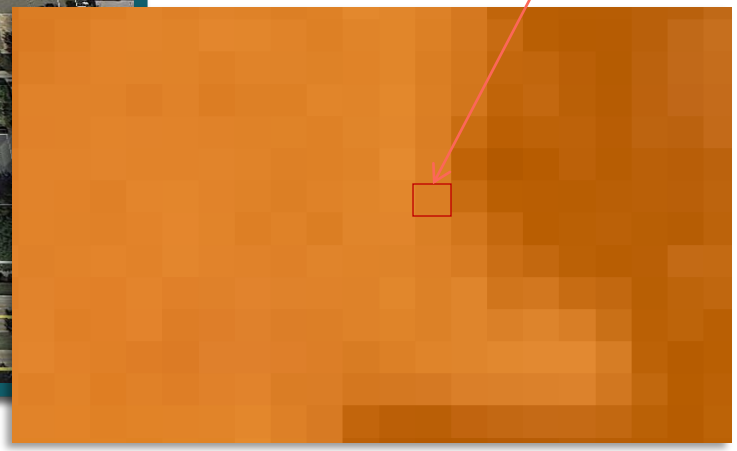
Each Grid Cell has a Unique Value

FOUNDATIONS FOR GRADUATED HAZARD & RISK

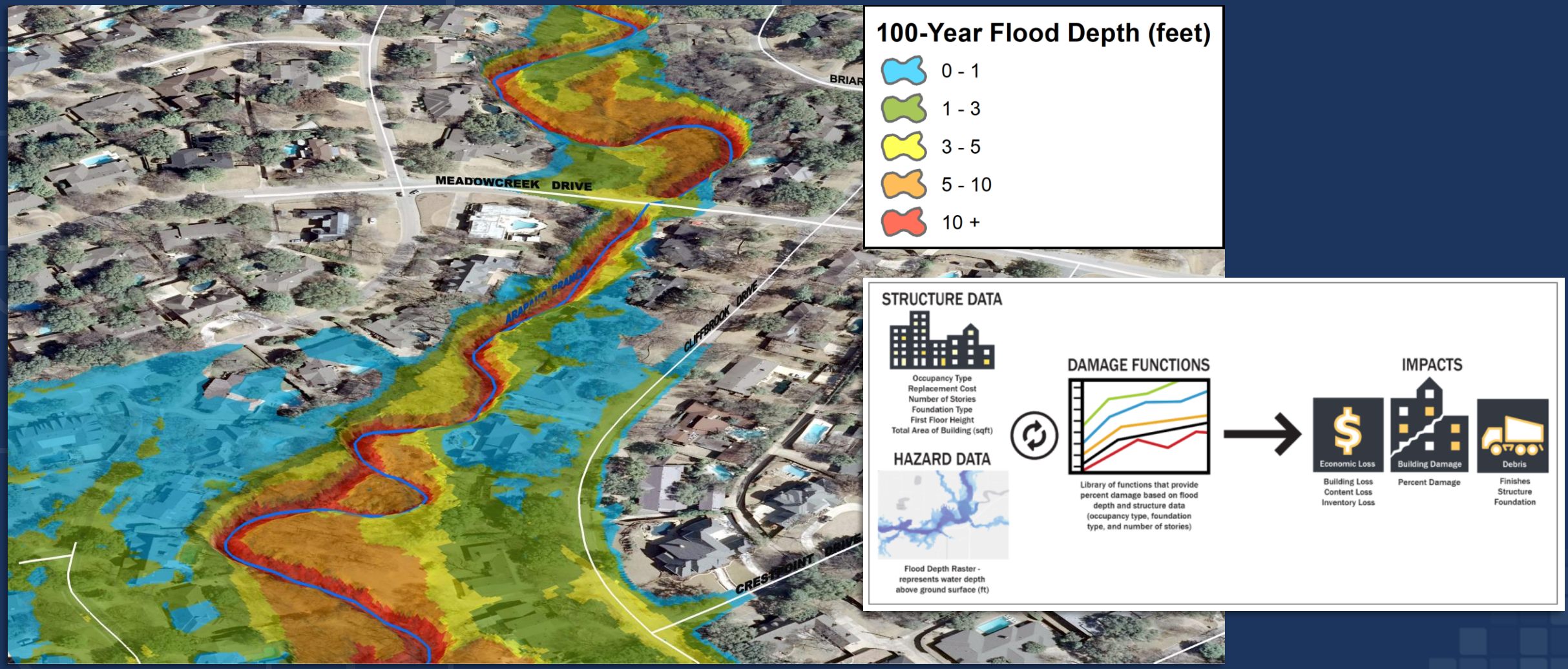


Floodplain Boundary
IN or OUT

Depth Grid
Individual Cell



FLOOD RISK EXPOSURE AND DAMAGES



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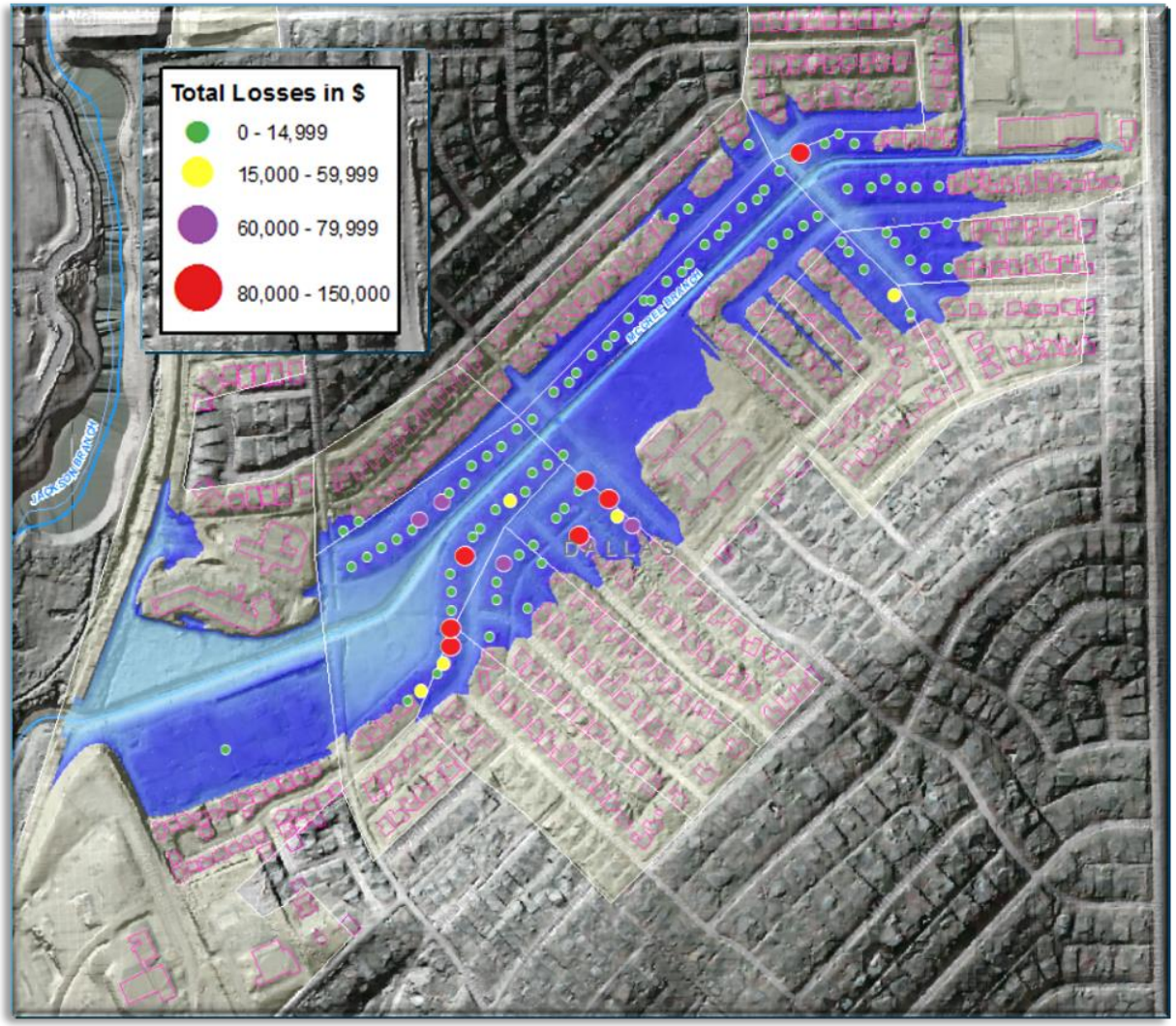
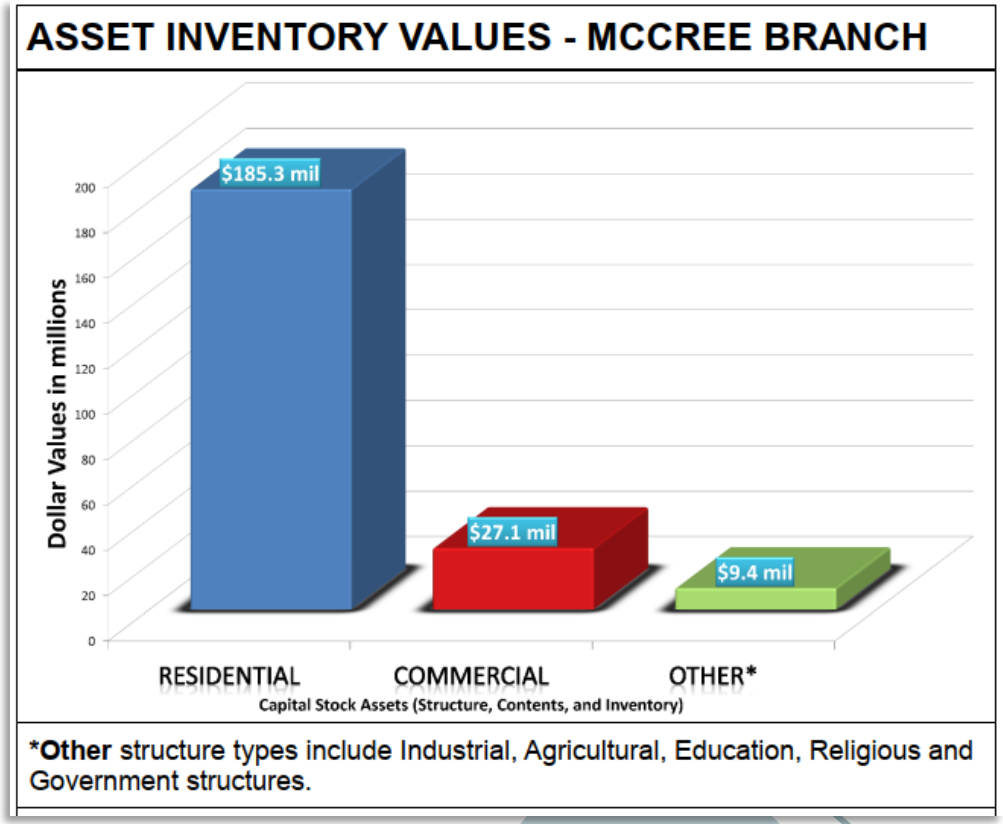
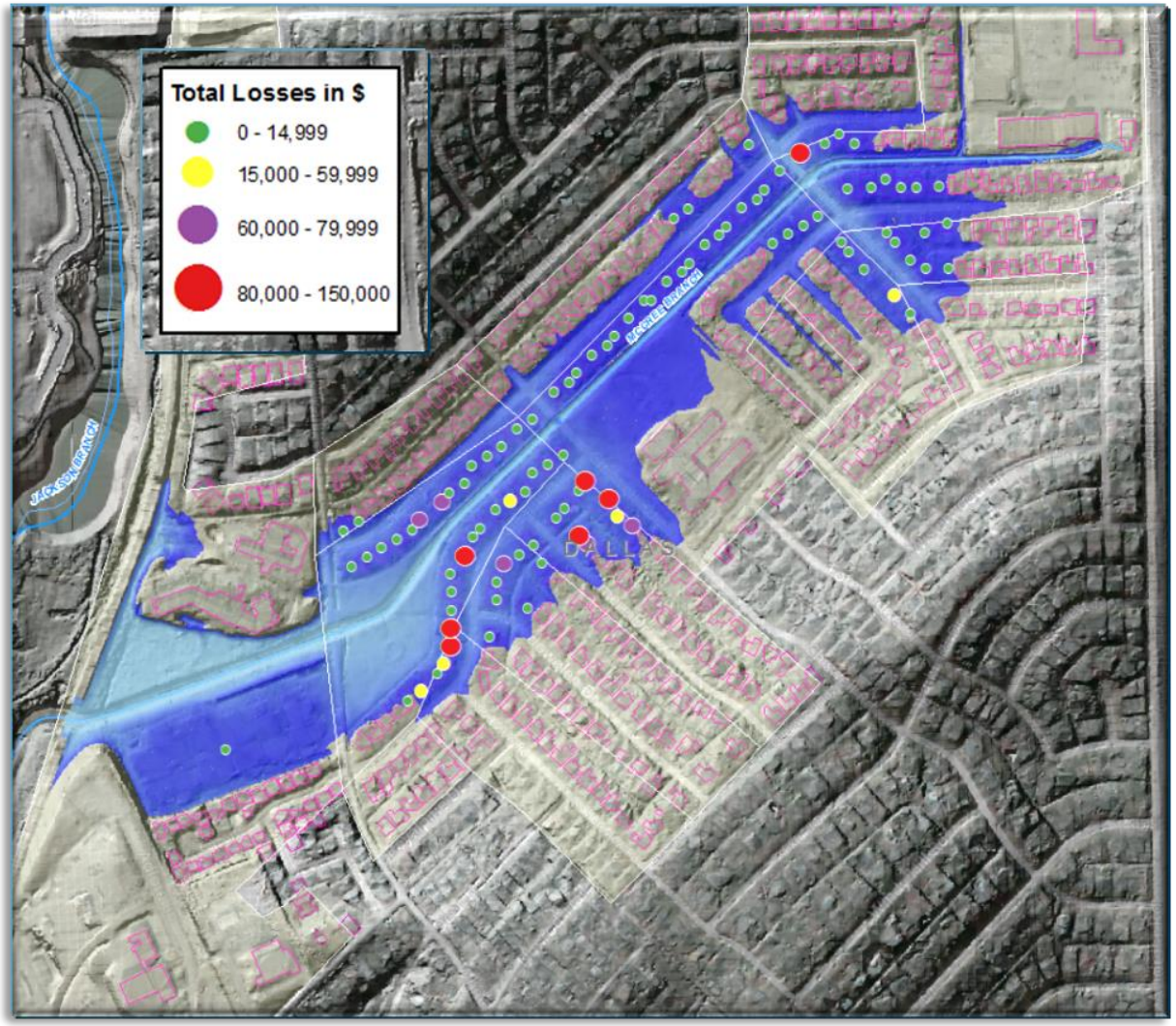
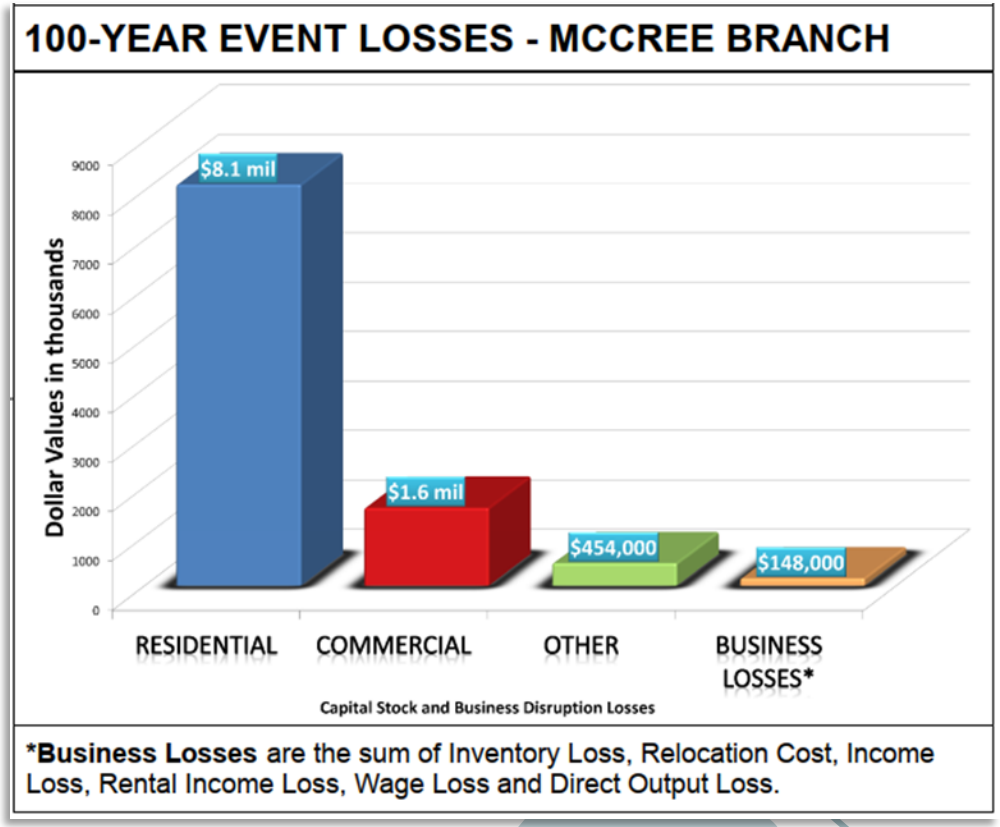




FLOOD RISK EXPOSURE AND DAMAGES





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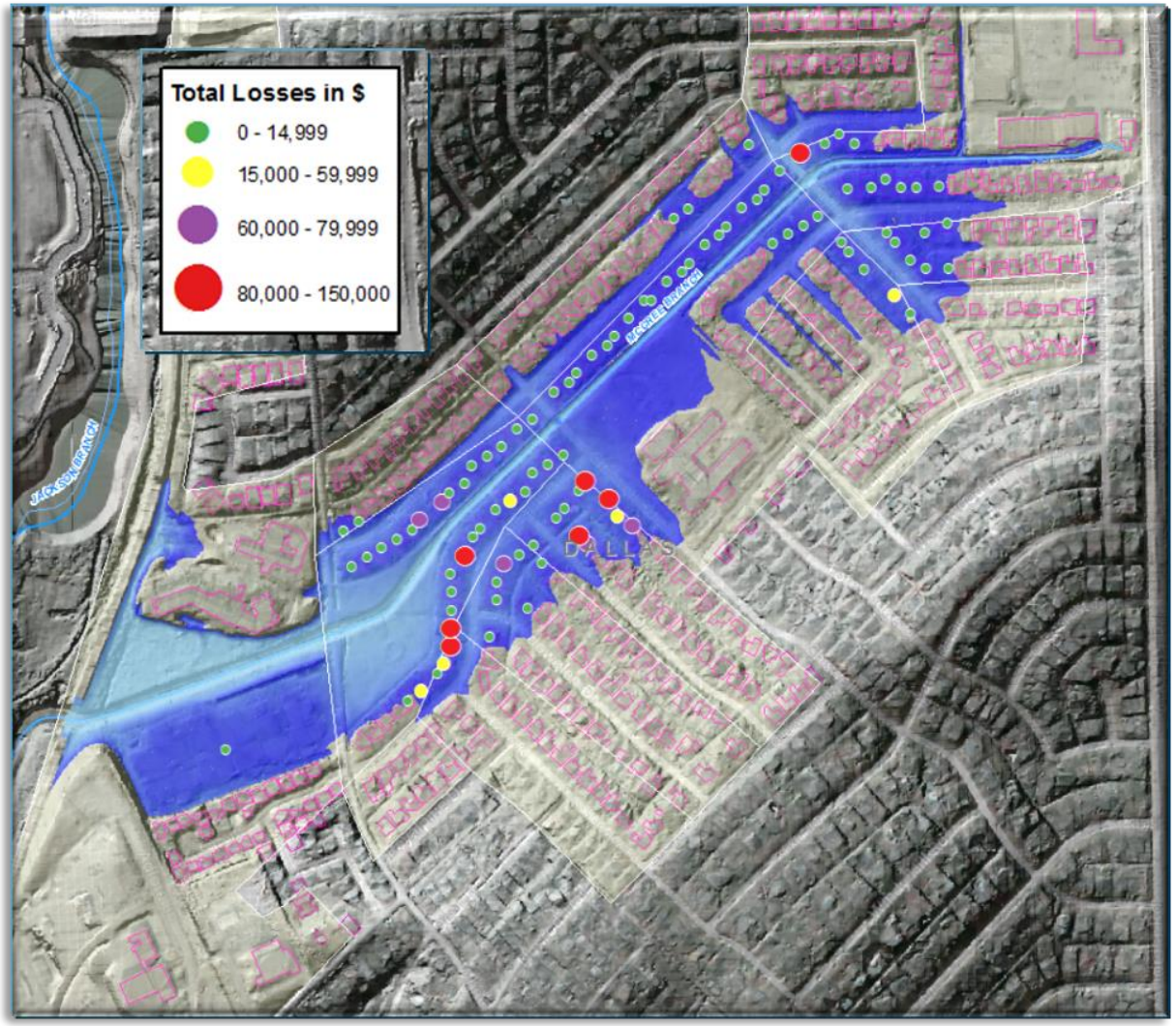

It is estimated that there are 501 buildings in the area, which have an aggregate total capital stock asset value (structure, contents and inventory) of about $222 million.

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

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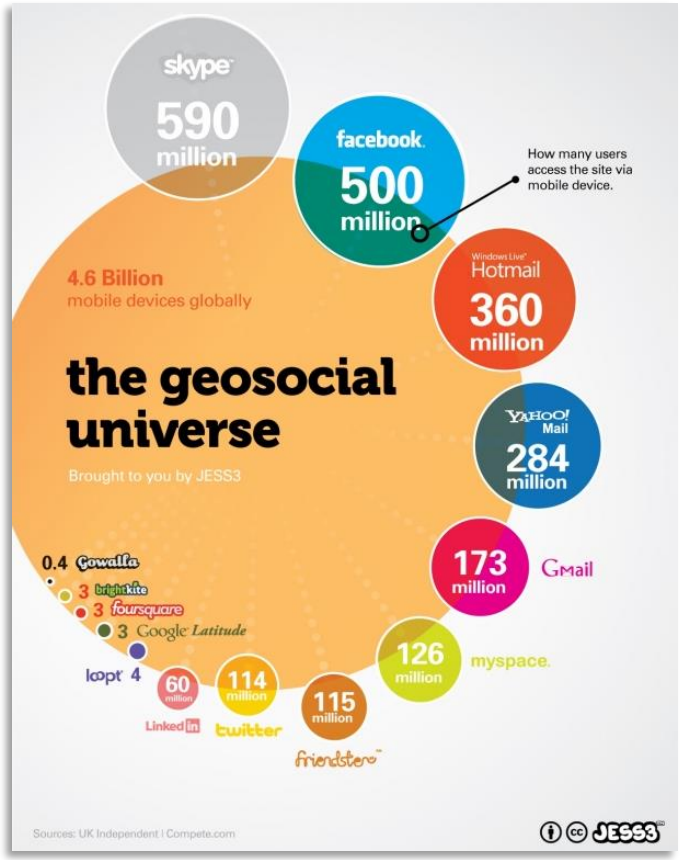
GEO-SOCIAL UNIVERSE



GEOgraphically SOCIAL

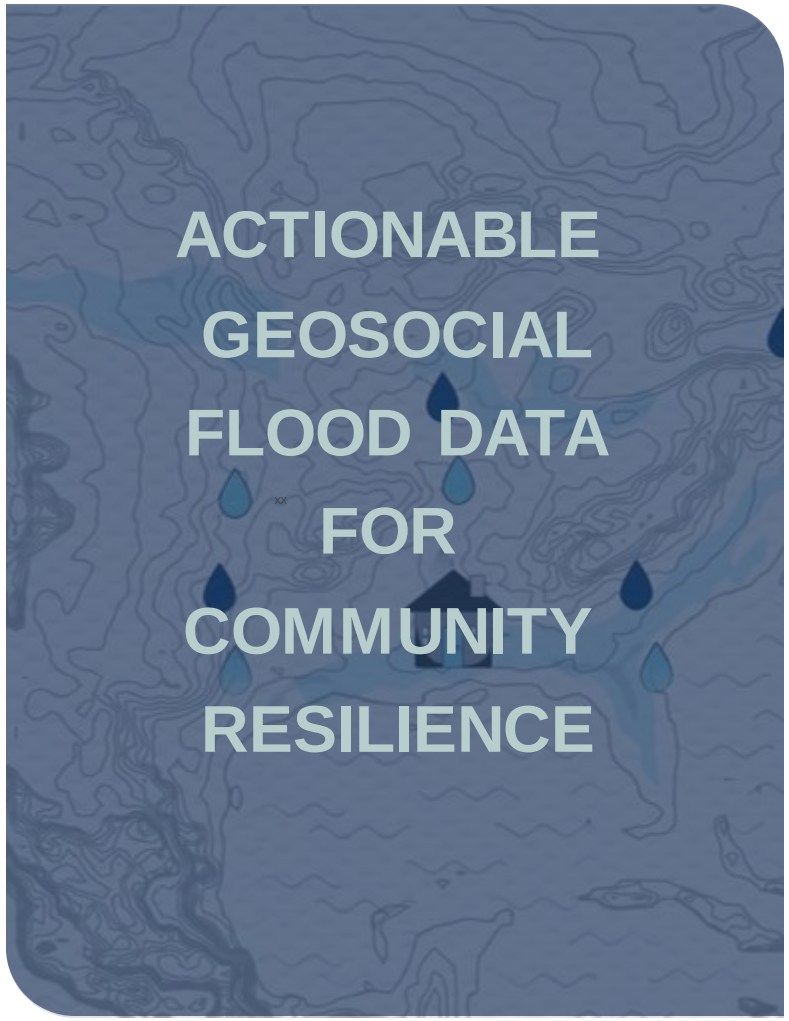
Geo-social Networking is a type of **social networking** in which **geographic services** and capabilities such as **geocoding** and **geotagging** are used to enable additional social dynamics.

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"

British Geological Survey



GEO-SOCIAL RESPONSIBILITY & GOVERNANCE

1 Leverage Existing Data

2 Community-Centric Engagement

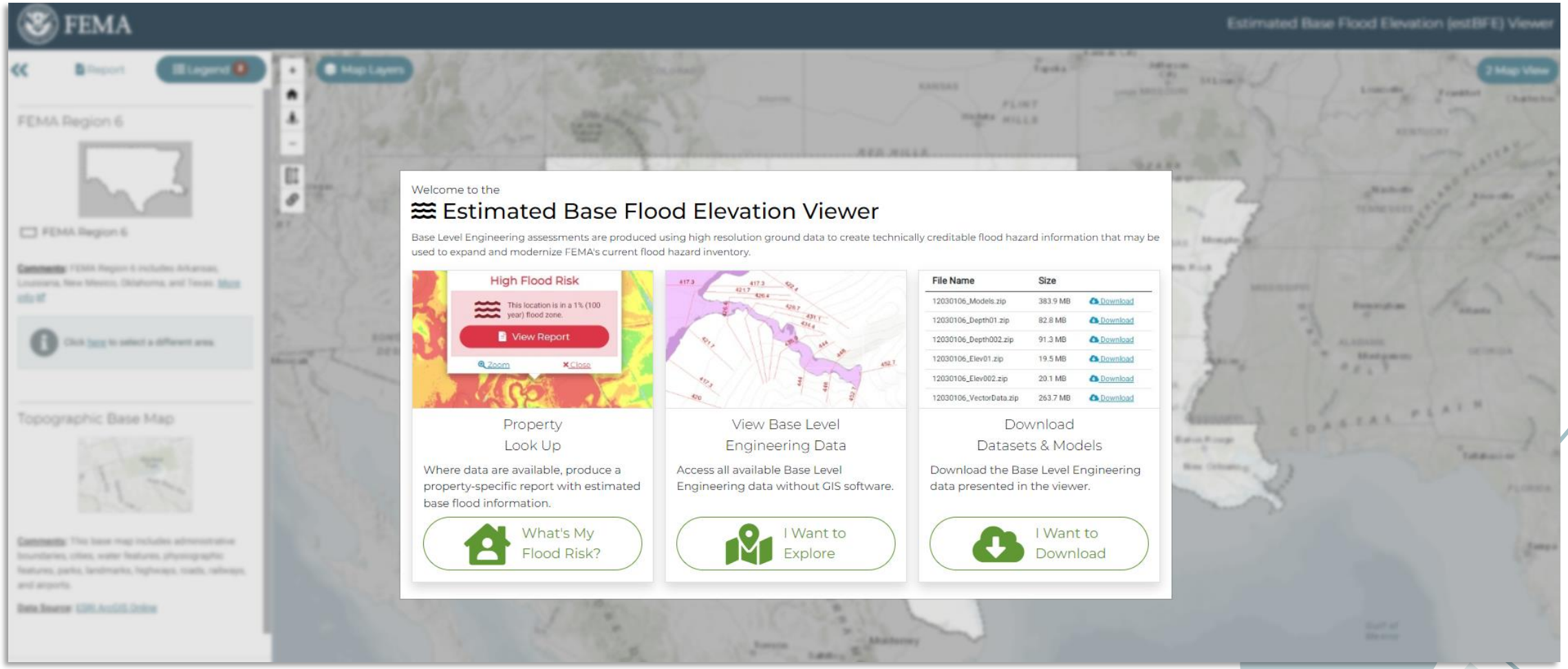
3 Mitigation Planning

4 Make GIS Famous!

5 Local Capacity Building

6 Disaster Response

GEO-SOCIAL FLOOD DATA - BASE LEVEL ENGINEERING



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

GEO-SOCIAL FLOOD DATA - BASE LEVEL ENGINEERING

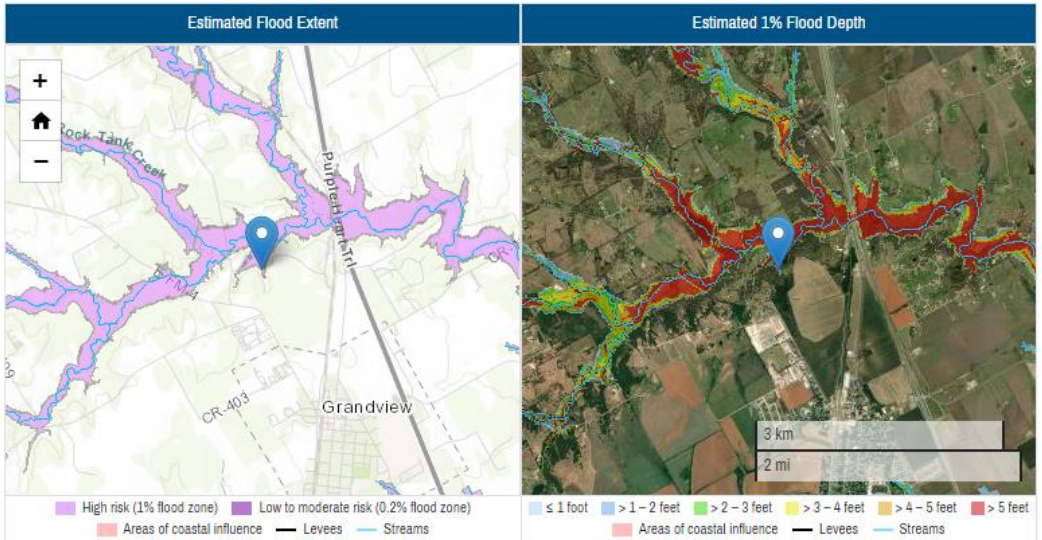
Estimated Base Flood Elevation (estBFE)

FEMA

Flood Risk Information Report

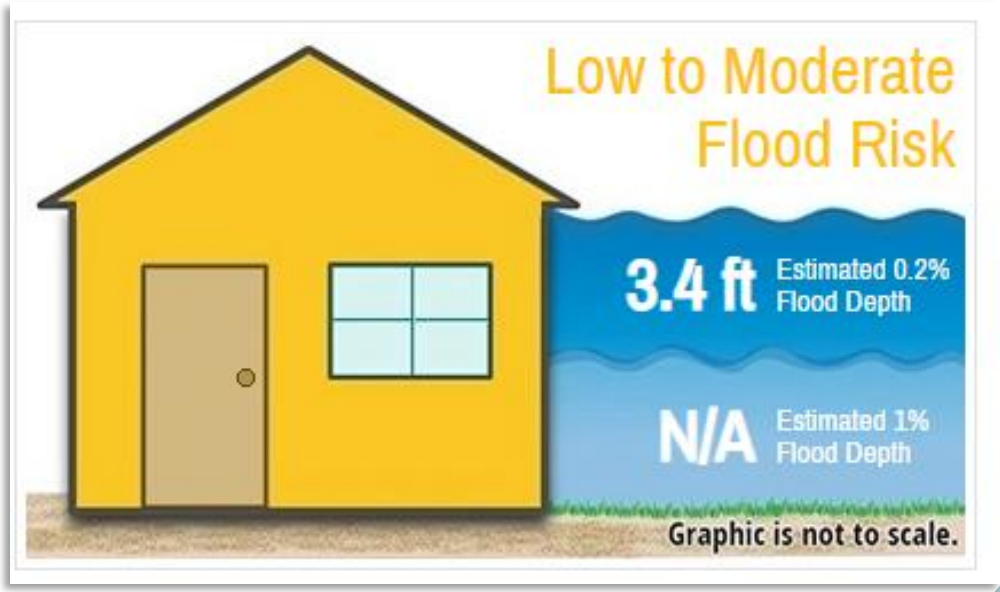
Latitude 32.2863, Longitude -97.1888 (Johnson County, TX)

FEMA is providing a look at flood data availability and relative Base Level Engineering analysis through the Estimated Base Flood Elevation Viewer (Estimated BFE Viewer). Base Level Engineering uses high resolution ground elevation data, flood flow calculations, and fundamental engineering modeling techniques to define flood extents for streams. The viewer is an effective tool for property owners, community officials, and land developers to identify flood risk, estimated flood elevations, and flood depths for watersheds where Base Level Engineering has been prepared.



Flood Event	Estimated Flood Depth*	Estimated Base Flood Elevation*
1 Percent (100 Year)	No Data	No Data
0.2 Percent (500 Year)	3.4 feet above land surface	640.0 feet NAVD 1988

* The information included in this report is based on the location marker shown in the map. Results are not considered an official determination.



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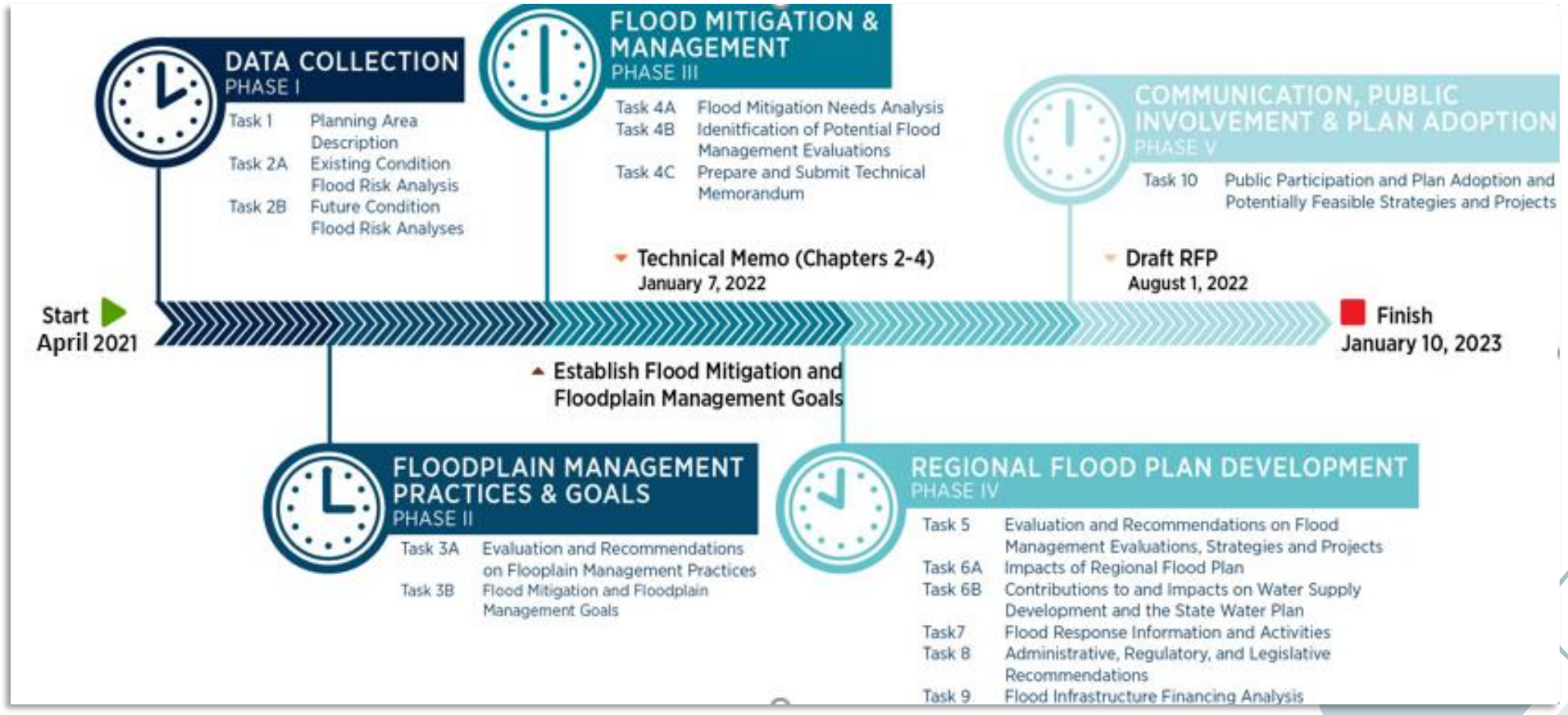
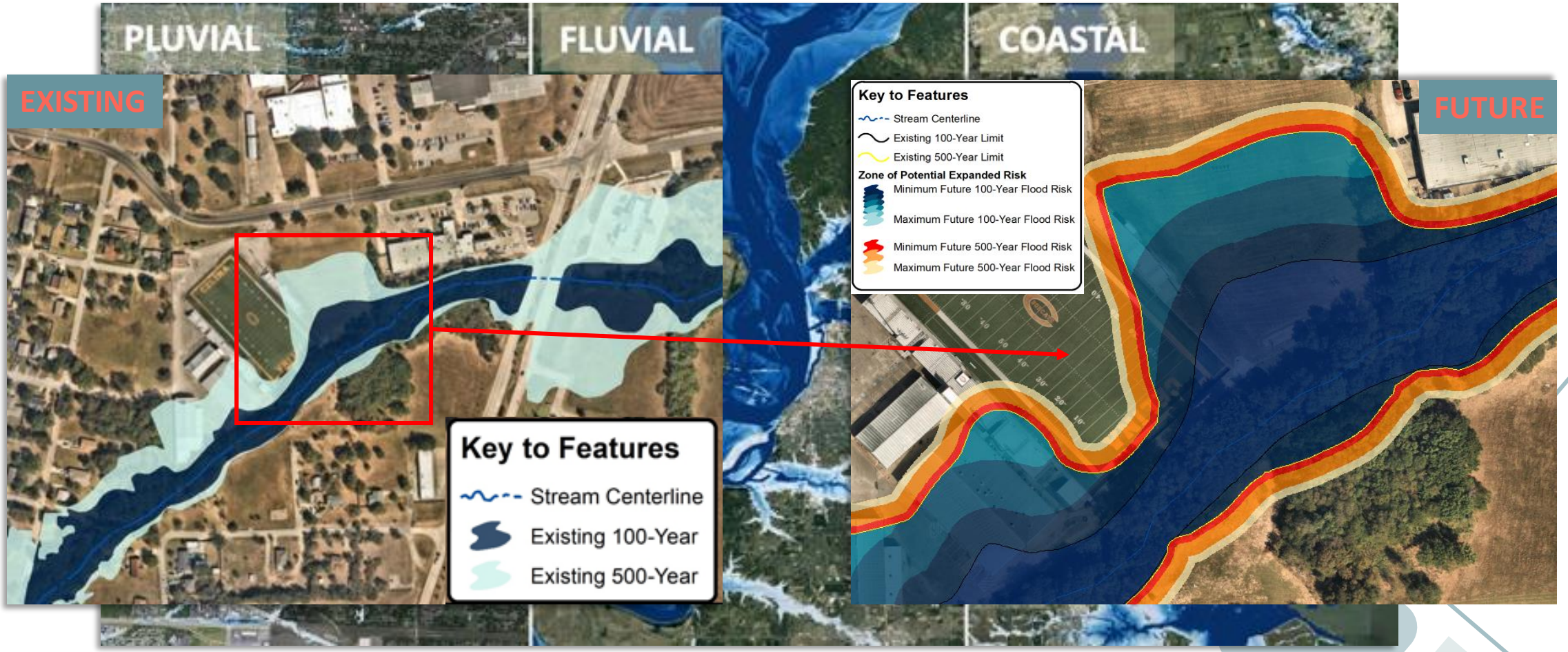
GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING



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

GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING



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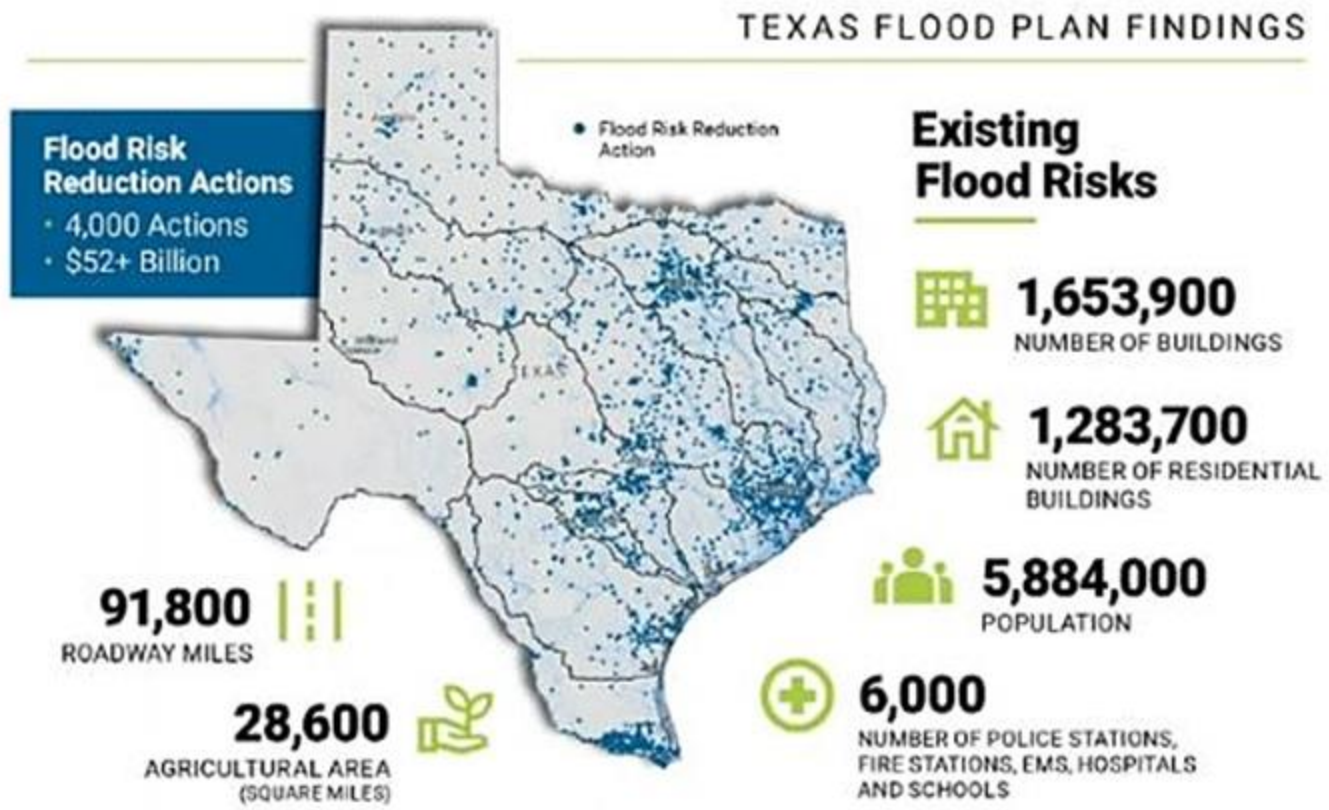
GEO-SOCIAL FLOOD DATA – REGIONAL FLOOD PLANNING

2nd PLANNING CYCLE (2024 – 2028)

Texas Regional Flood Plans



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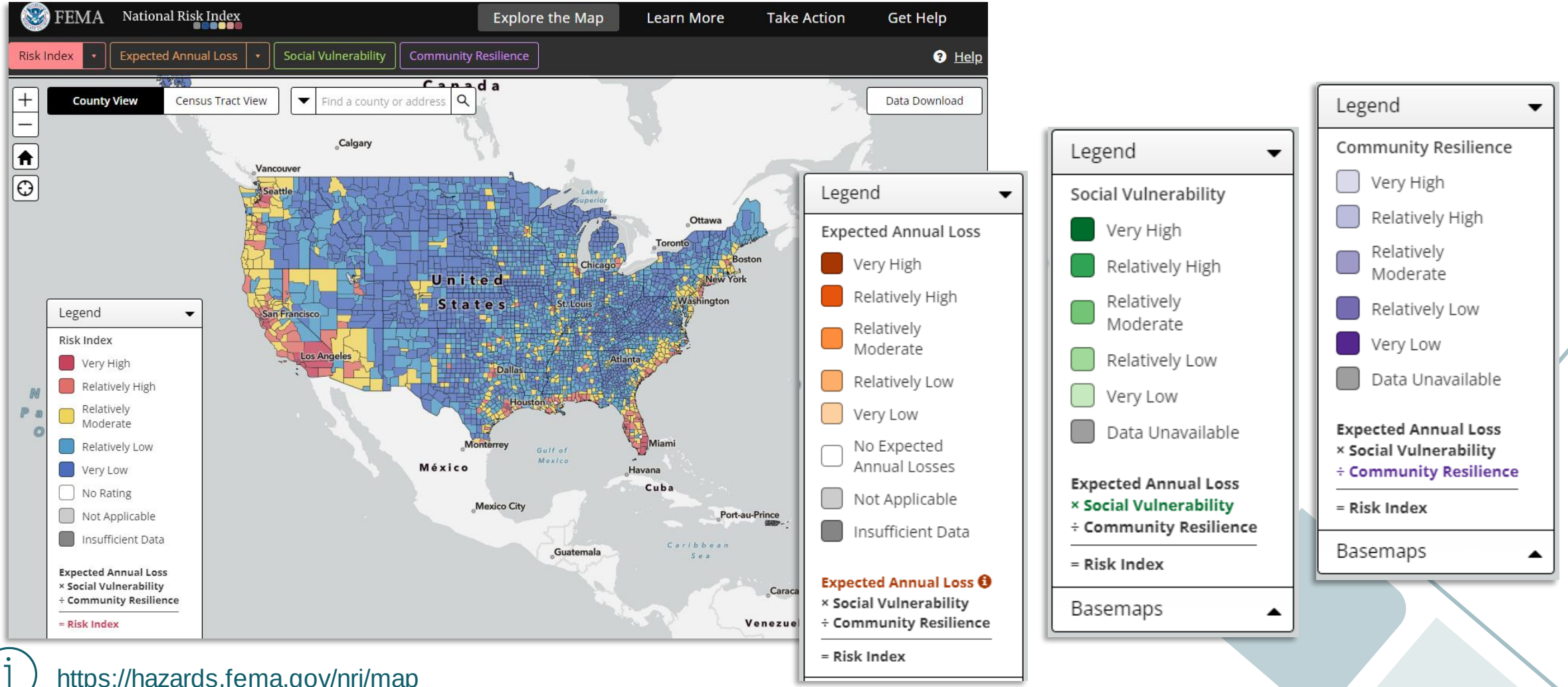
GEO-SOCIAL FLOOD DATA – NATIONAL RISK INDEX (NRI)



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

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

Available Data	PR	VI	GU	AS	MP
Expected Annual Loss Data	✓	✓	✓	✓	✓
- 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	✓	✓	✓	✓	✓
Social Vulnerability Data	✓				
Community Resilience Data					

Not Applicable	Future Enhancements
Data unavailable/more research needed	✓ - Done

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

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

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

where Expected Annual Loss =

Annualized Frequency

Rate of occurrence

How likely is hazard to occur?

X

Exposure

- **Building Value**
- **Population**
- **Agriculture**

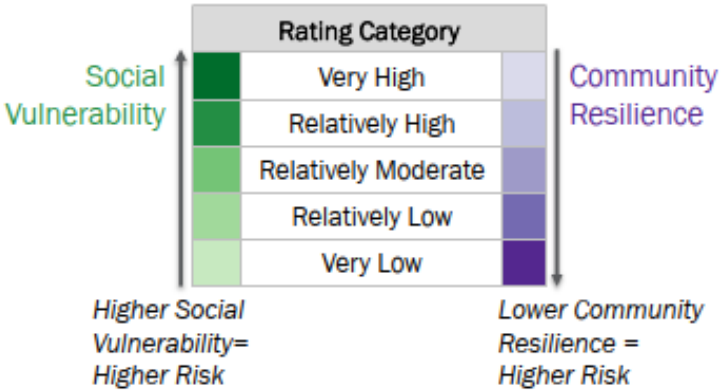
How many people & how much property are potentially at risk?

X

Historic Loss Ratio

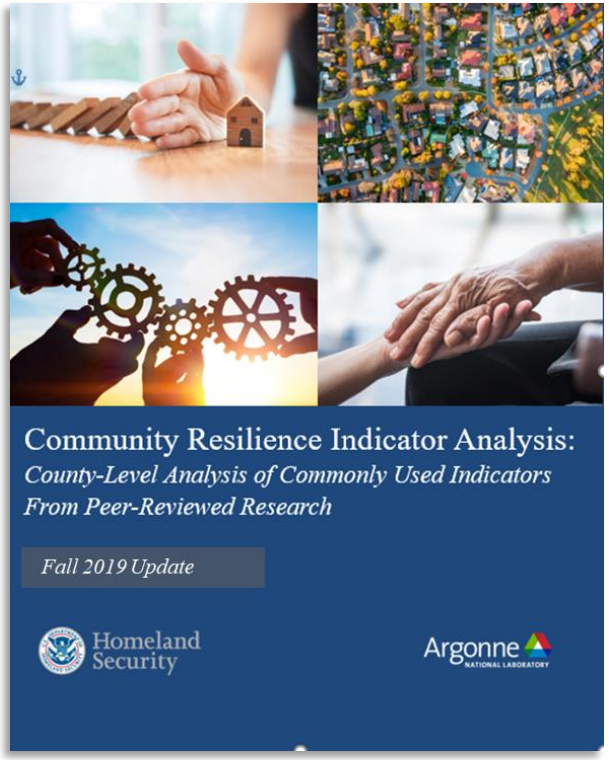
Percentage of building/population/ agriculture losses

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)



https://www.fema.gov/rapt

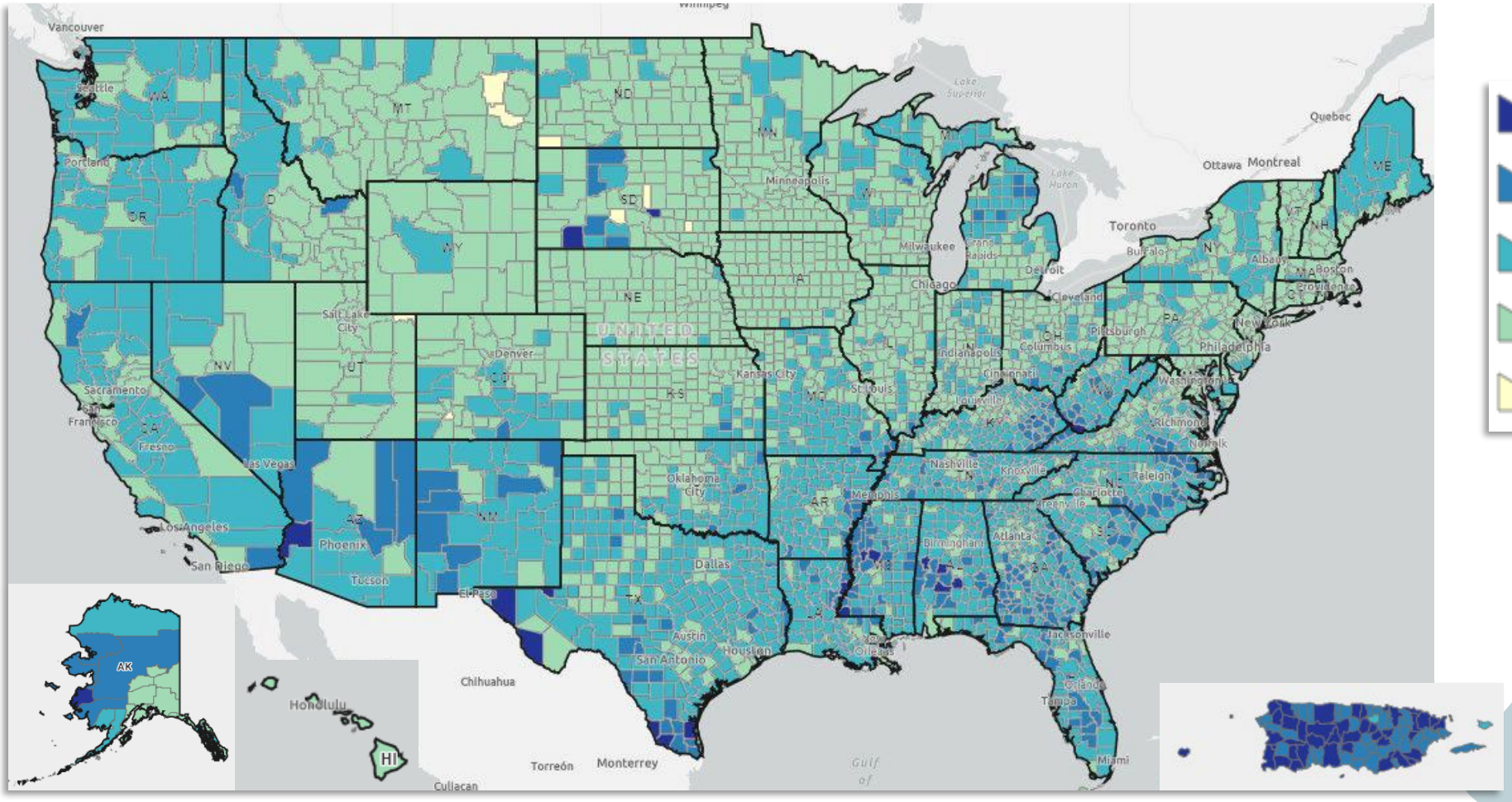
RESILIENCE ANALYSIS AND PLANNING TOOL (RAPT)

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[a,b]	Connection to Civic/ Social Organizations	Nursing Homes	Flood Hazard Zones
% Population Unemployed[a,b]	Hospital Capacity	Hospitals	Tornado Paths
% Population without a High School Education[a,b]	Medical Professional Capacity	Urgent Care Facilities	Tropical Storms
% Population with a Disability[a,b]	Affiliation with a Religion	Public Health Depts.	Seismic Hazards
% Population without Access to a Vehicle[a,b]	Presence of Mobile Homes*	Fire Stations	Wildfire
% Population with Home Ownership[a,b]	Public School Capacity	Emergency Medical Services (EMS) stations	
% Population over 65[a,b]	Population Change	Local Law Enforcement locations	NOAA Layers
% Population Single-Parent Households[a,b]	Hotel/Motel Capacity	911 Service Area Boundaries	Current Watches/ Warnings
% Population with Limited English Proficiency[a,b]	Rental Property Capacity[a,b]	Mobile Home Parks	Hurricane Outlook: Atlantic
Median Household Income[a,b]		Places of Worship	Severe Weather Outlook
Gini Index: Income Inequality[b]		Public Schools	Excessive Rainfall Outlook
		Private Schools	River Flood Outlook
Other Population Indicators		Colleges and Universities	
At-risk electricity-dependent Medicare beneficiaries		Prison Boundaries	
Tribal Populations		Transmission Lines	
		Electric Power Plants	
		Solid Waste Landfills	
a Both U.S. Census Bureau county and census tract data;		Wastewater Treatment Plants	
ACS 2014-2018 five-year estimates.		Pharmacies (RX Open)	
b Tribal territory population data available.		Dialysis Centers	
		High Hazard Dams	

https://www.fema.gov/rapt

RESILIENCE ANALYSIS AND PLANNING TOOL (RAPT)



https://www.fema.gov/rapt

Wrapping Up

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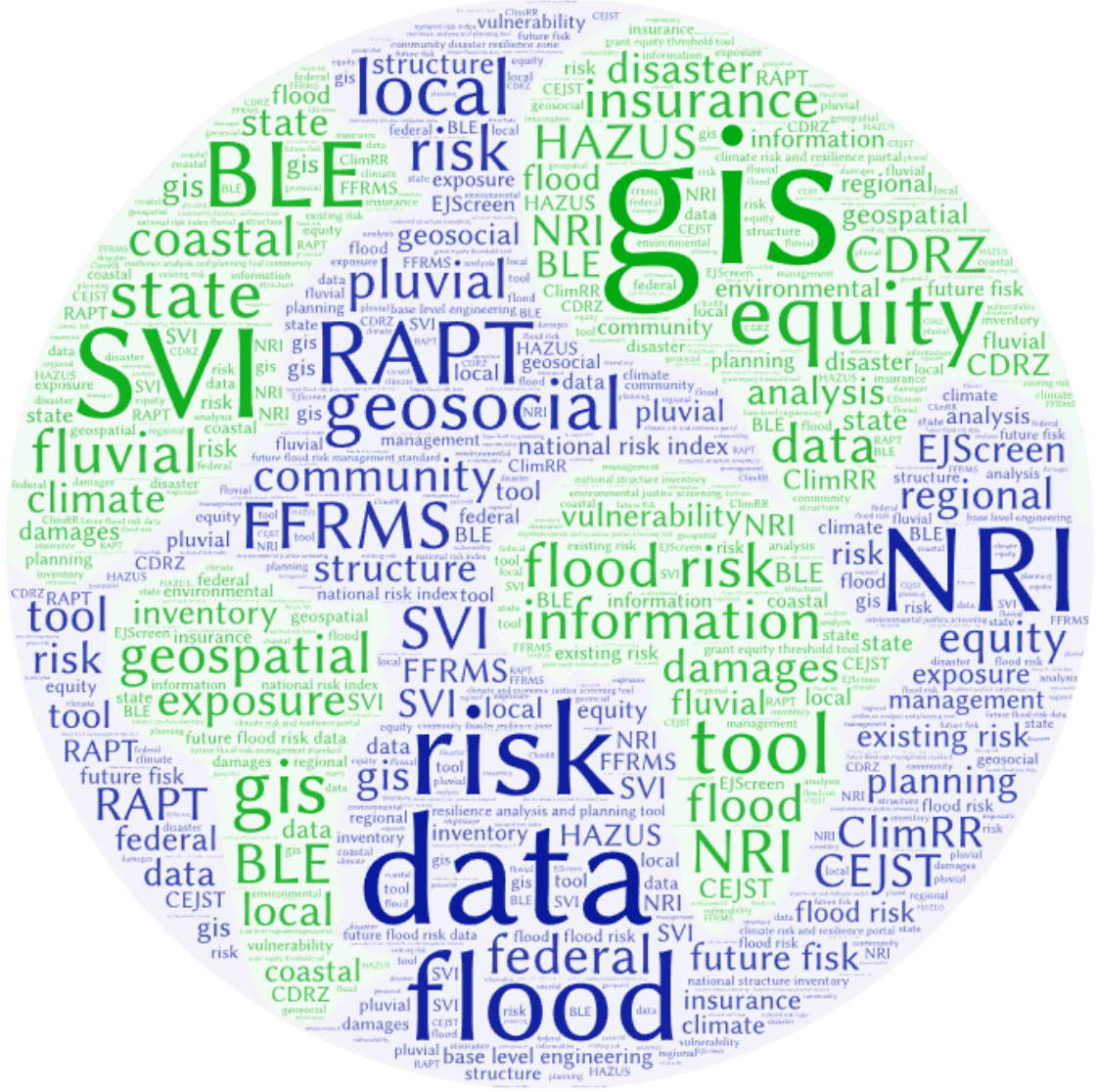
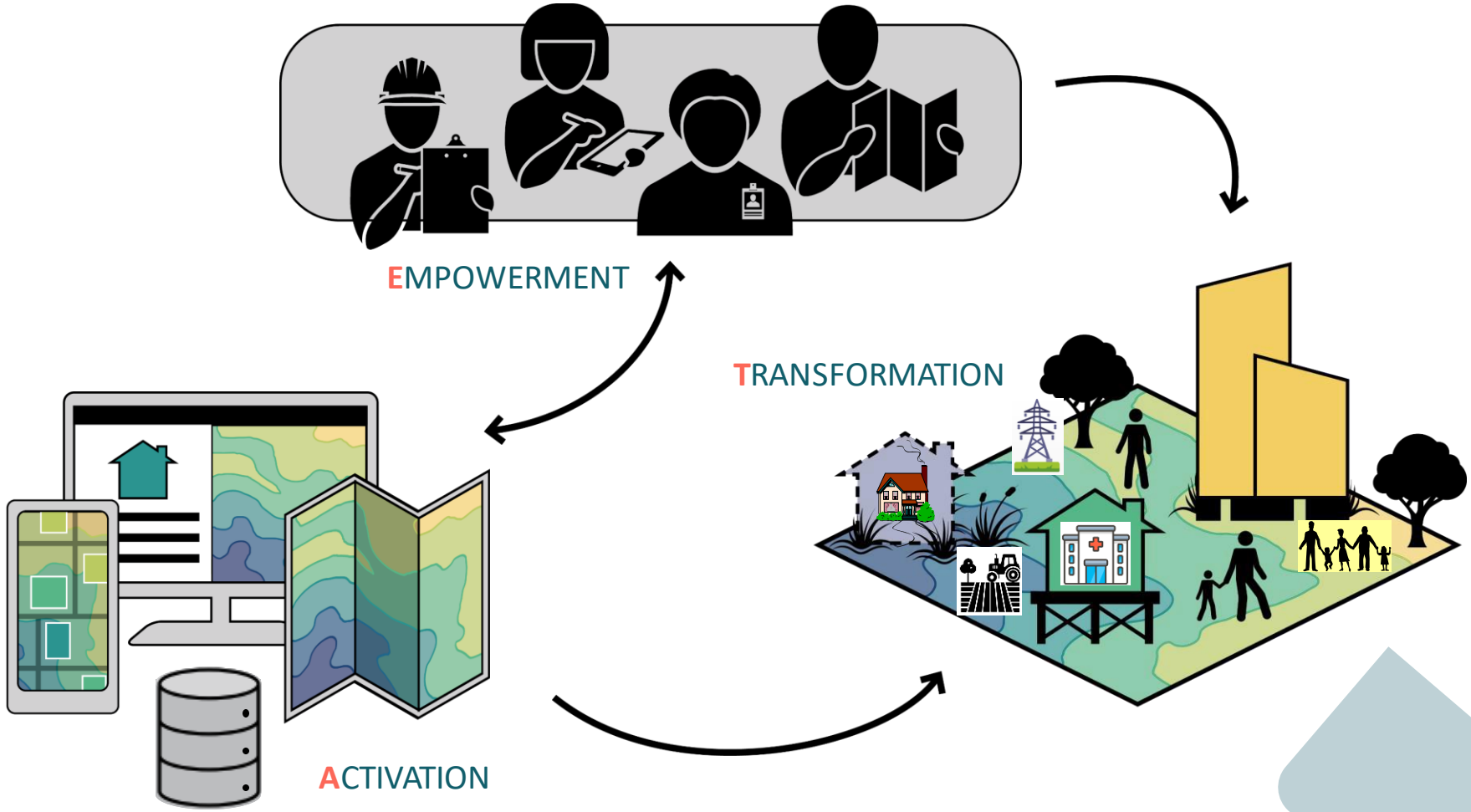
GEO-SOCIALIZING FLOOD DATA



GEO-SOCIAL GOVERNANCE & COMMUNITY RESILIENCE



Q&A

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GET IN TOUCH

Samuel Amoako-Atta, GISP, CFM samoak-atta@halff.com

Katy Overbey, GISP, CFM kOverbey@halff.com

844-230-6136

halff.com

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