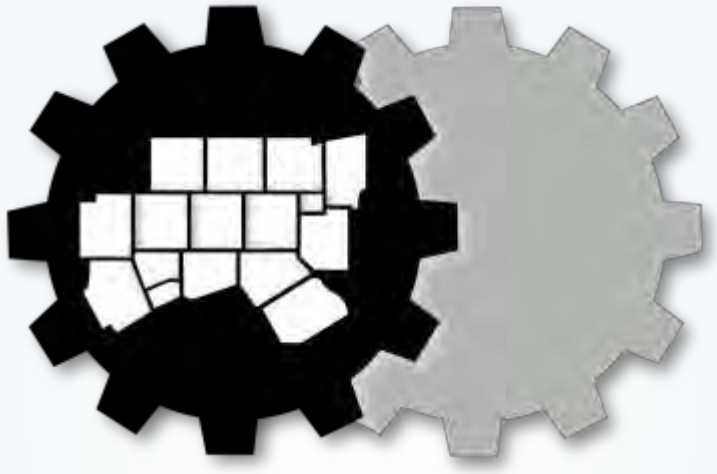
# Elected Officials Floodplain Seminar and CRS Users Group

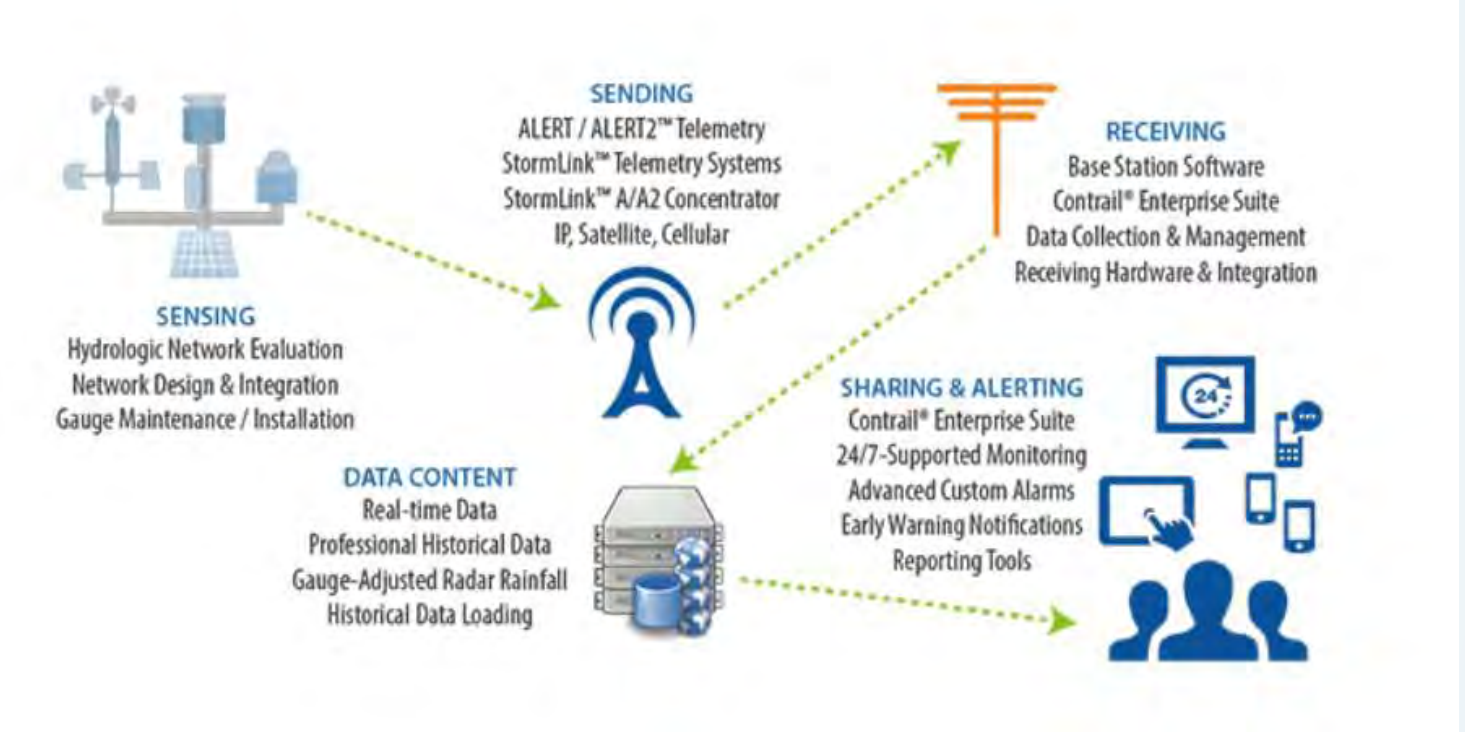
July 18, 2018

North Central Texas Council of Governments
Environment & Development

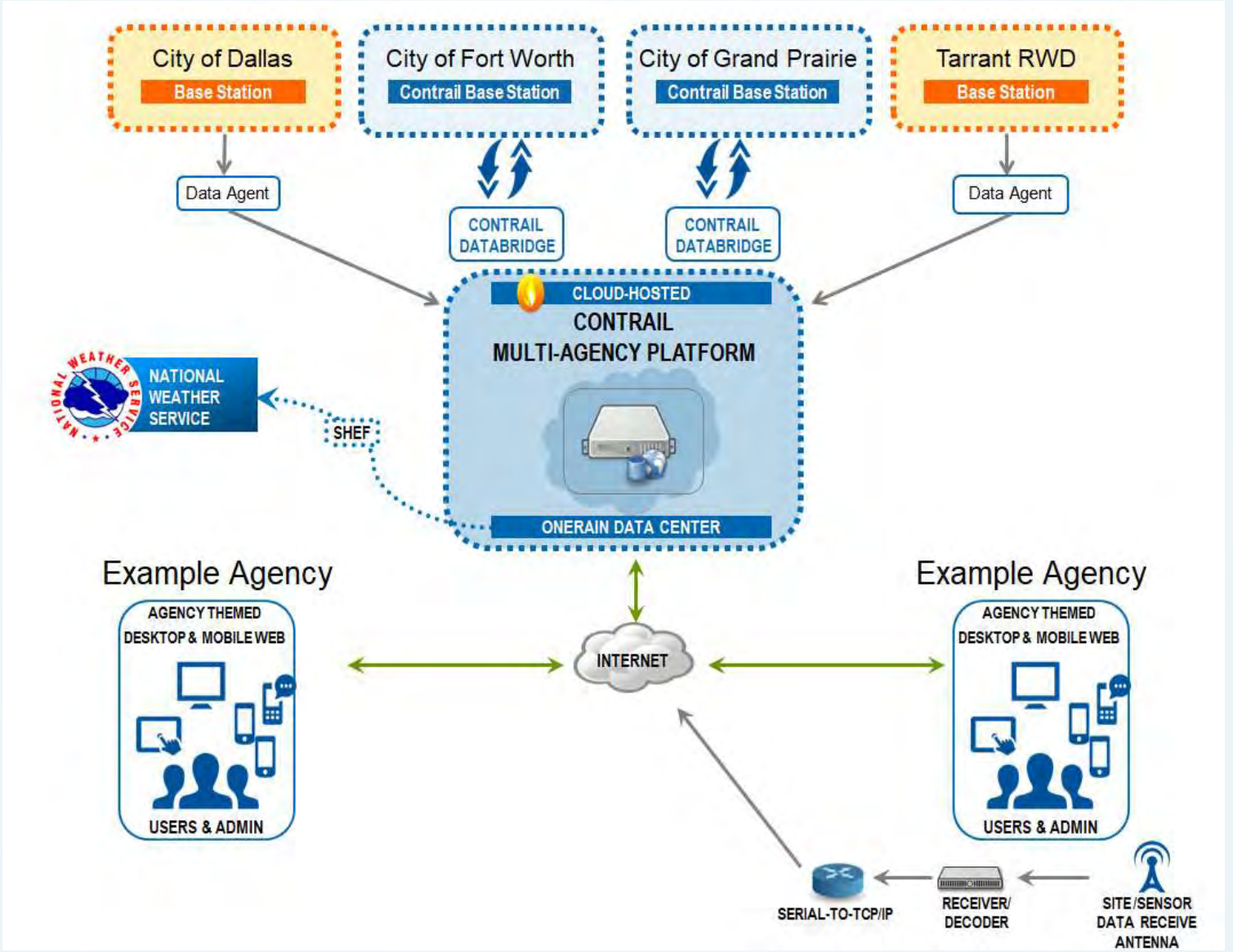


# WELCOME & INTRODUCTIONS

# Regional Flood Warning Software Platform




OneRain, Inc. was awarded a contract to provide a regional flood software platform for North Central Texas. This platform allows cities who already have flood gauge/low water crossing hardware in the field to share their data with other cities in the region and track storms across NCT, making coordination during storms easier. It also provides a subscription to OneRain's services at a significantly lower cost than obtaining it alone.


City of Dallas
Base Station
City of Fort Worth
Contrail Base Station
City of Grand Prairie
Contrail Base Station
Tarrant RWD
Base Station
Data Agent
CONTRAIL DATABRIDGE
CONTRAIL DATABRIDGE
Data Agent
CLOUD-HOSTED
CONTRAIL
MULTI-AGENCY PLATFORM
ONERAIN DATA CENTER
NATIONAL WEATHER SERVICE
SHEF
Example Agency
AGENCY THEMED
DESKTOP & MOBILE WEB
USERS & ADMIN
INTERNET
Example Agency
AGENCY THEMED
DESKTOP & MOBILE WEB
USERS & ADMIN
SERIAL-TO-TCP/IP
RECEIVER/
DECODER
SITE/SENSOR
DATA RECEIVE
ANTENNA

# How Much Does Joining the Common Flood Software Platform Cost?

Attachment II
SHARE Participant Price List

North Texas SHARE

North Texas SHARE

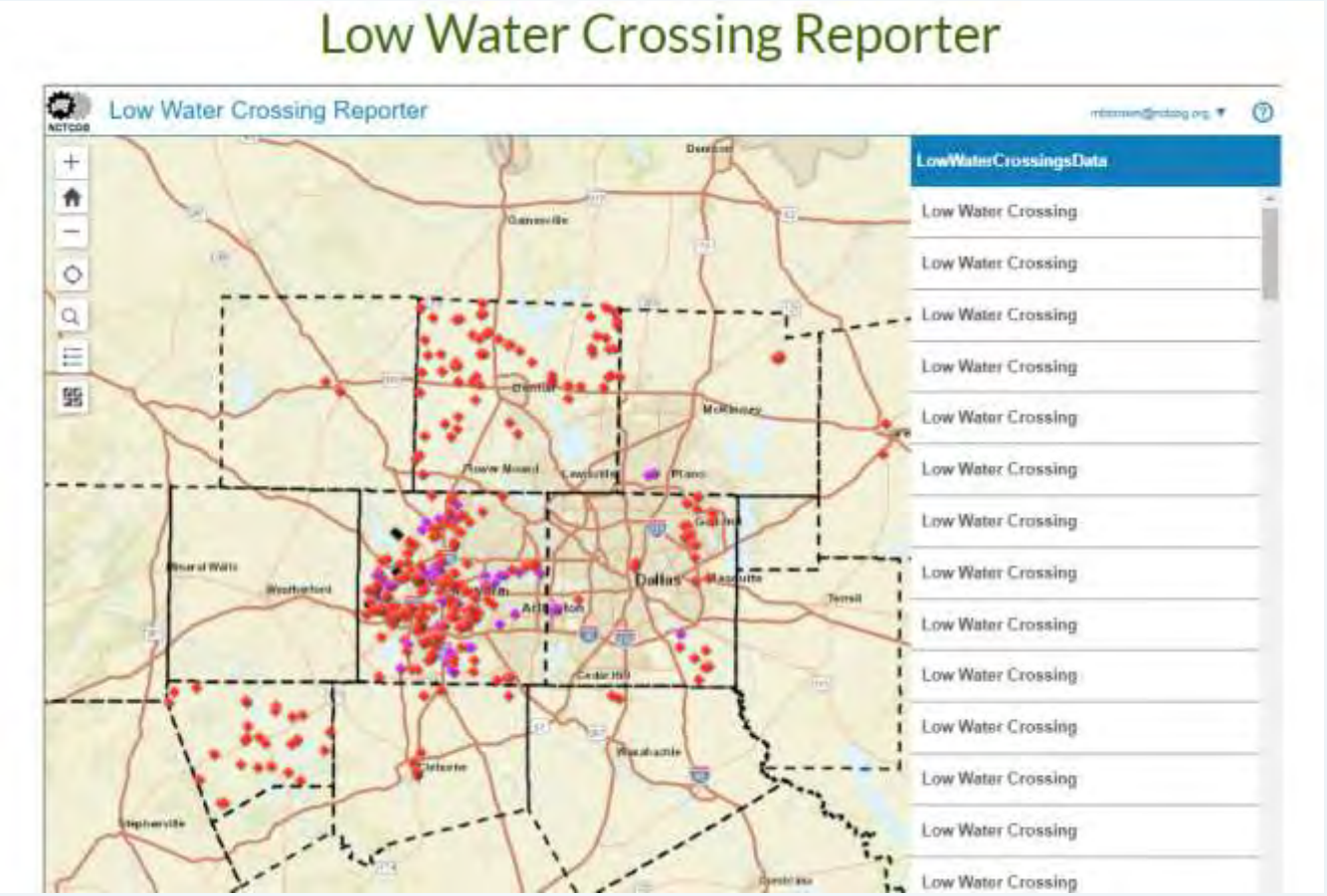
OneRain Services Agreement

- Yearly Subscription Fee: $4950
  - $500 permanent yearly discount for the first 10 communities
- One-time Services (some optional)
  - Custom Dashboards: $1000
  - Custom Serial to IP Kit: $1500
  - Client Setup and Configuration: $1500
  - Quotes from OneRain:
    - Historical Data Load
    - Custom Data Feed
    - Optional Datasight Software License

# How Does a Community Sign Up for this Service?

- Communities must be a member of North Texas Share
  - Joining North Texas Share is free.
- Order form will be available in August at https://www.northtexasshare.org/
  - Completed order forms can be sent to Craigan Johnson, Purchasing Supervisor, at NCTCOG. cjohnson@nctcog.org.
- The first 10 communities to send in a signed form will receive a permanent $500 yearly discount off of the subscription fee.

# Regional Low Water Crossing Map




www.nctcog.org/envir/watershed-management/low-water-crossing-reporter

# Contact

Mia Brown, CFM
Planner, Environment and Development
mbbrown@nctcog.org
817.695.9227

Edith Marvin, PE
Director, Environment and Development
emarvin@nctcog.org
817.695.9211

# Connect

Facebook.com/nctcogenv

@nctcogenv

nctcogenv

youtube.com/user/nctcoged

EandD@nctcog.org

nctcog.org/envir

North Central Texas Council of Governments
Environment & Development

# Extreme Precipitation, NOAA Atlas 14, Other InFRM Initiatives What Can You Do?

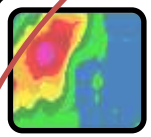
Date: 18 July 2018

Audience**: NCTCOG Elected Official's Training**

Jerry L. Cotter P.E., Chief Water Resources

U.S. Army Corps of Engineers, Fort Worth District

# Components of Flood Impact Determinations



**Meteorology**
- How much precipitation

**Watershed Hydrology**
- How much runoff

**River Hydraulics**
- How deep will the water get

**Consequences**
- Critical infrastructure
  - Homes, Businesses, Hospitals

| Emergency Response/Recovery | Emergency Preparedness | Infrastructure Planning |
|---|---|---|
| Observed & Future Rainfall | Historical Events W/in Region | Design Standard "100yr Rainfall" |
| Real-time Runoff | What-if Runoff Scenarios | 100-year Runoff |
| Real-time Inundations | What-if Inundations | 100-year Inundations |
| **Real-time Impacts** | **Preparedness Impacts** | **Planning Infrastructure** |

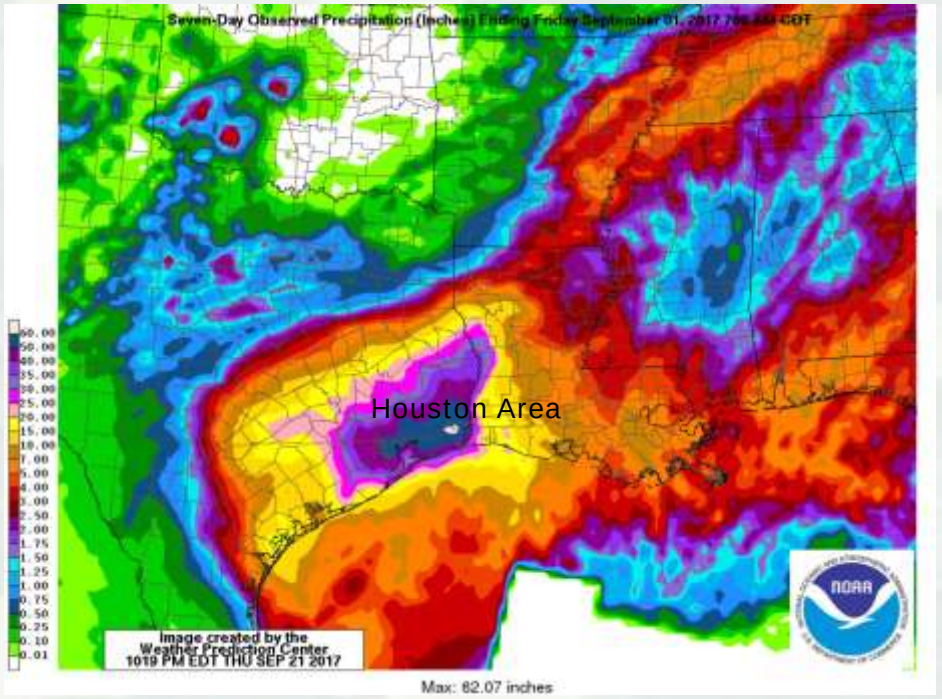
# Beginning in 2015,Texas Has Experienced a Growing Trend Toward Extreme Weather and Weather Anomalies

# Hurricane Harvey was Unprecedented in the History of the United States!

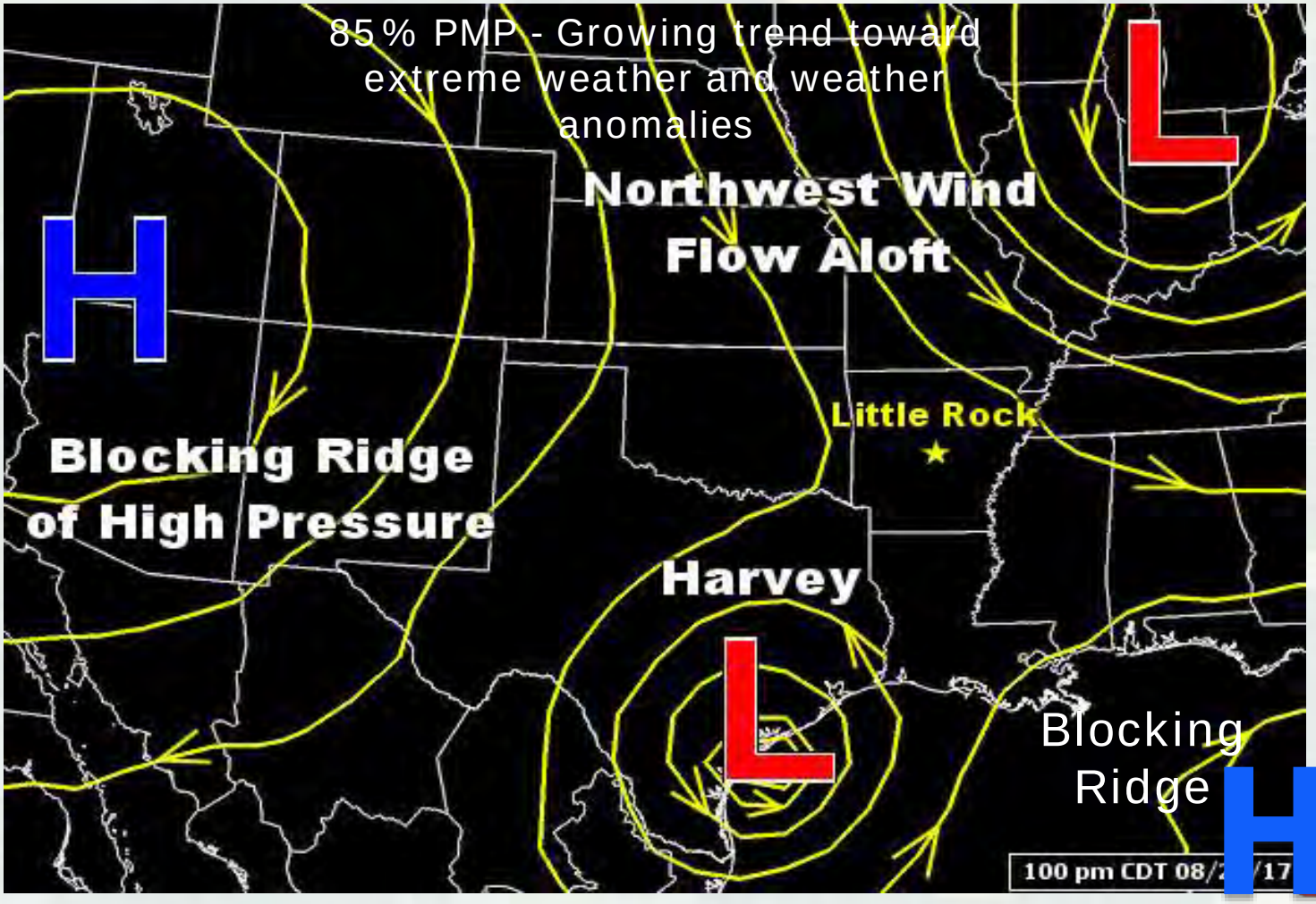
# Hurricane Harvey Storm

## Could Harvey Happen in DFW?

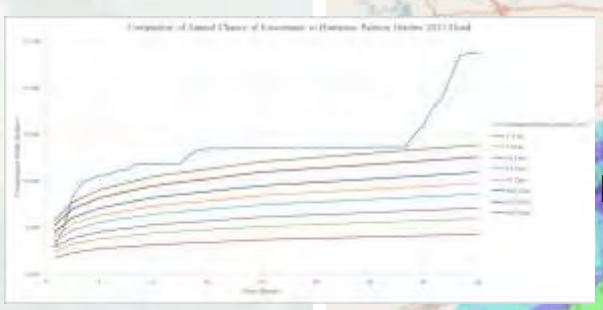
- Rainfall totals up to 60”
- Approaching or exceeding what scientist believed was the maximum amounts of rainfall possible!
- 23,000 + $mi^2$ (CT, RI, DE, NJ)
- Largest storm in continental US history
- OFF THE CHARTS!

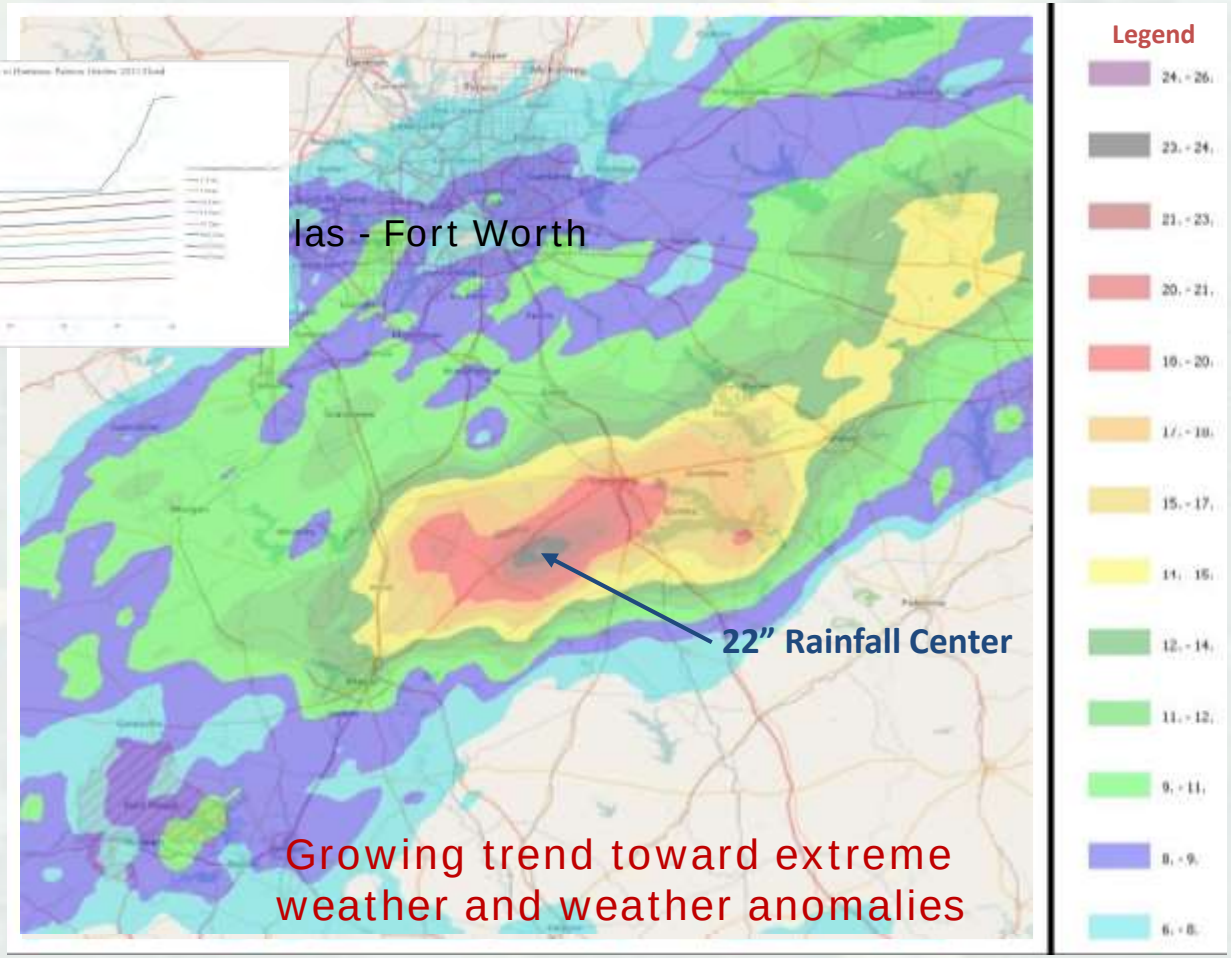


# Harvey Weather Patterns

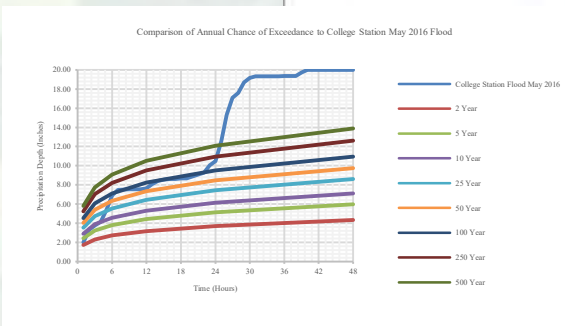


# Tropical Storm Patricia - Corsican, TX – October 2015





# Brenham Storm, May 26-27, 2016 (Not Tropical)

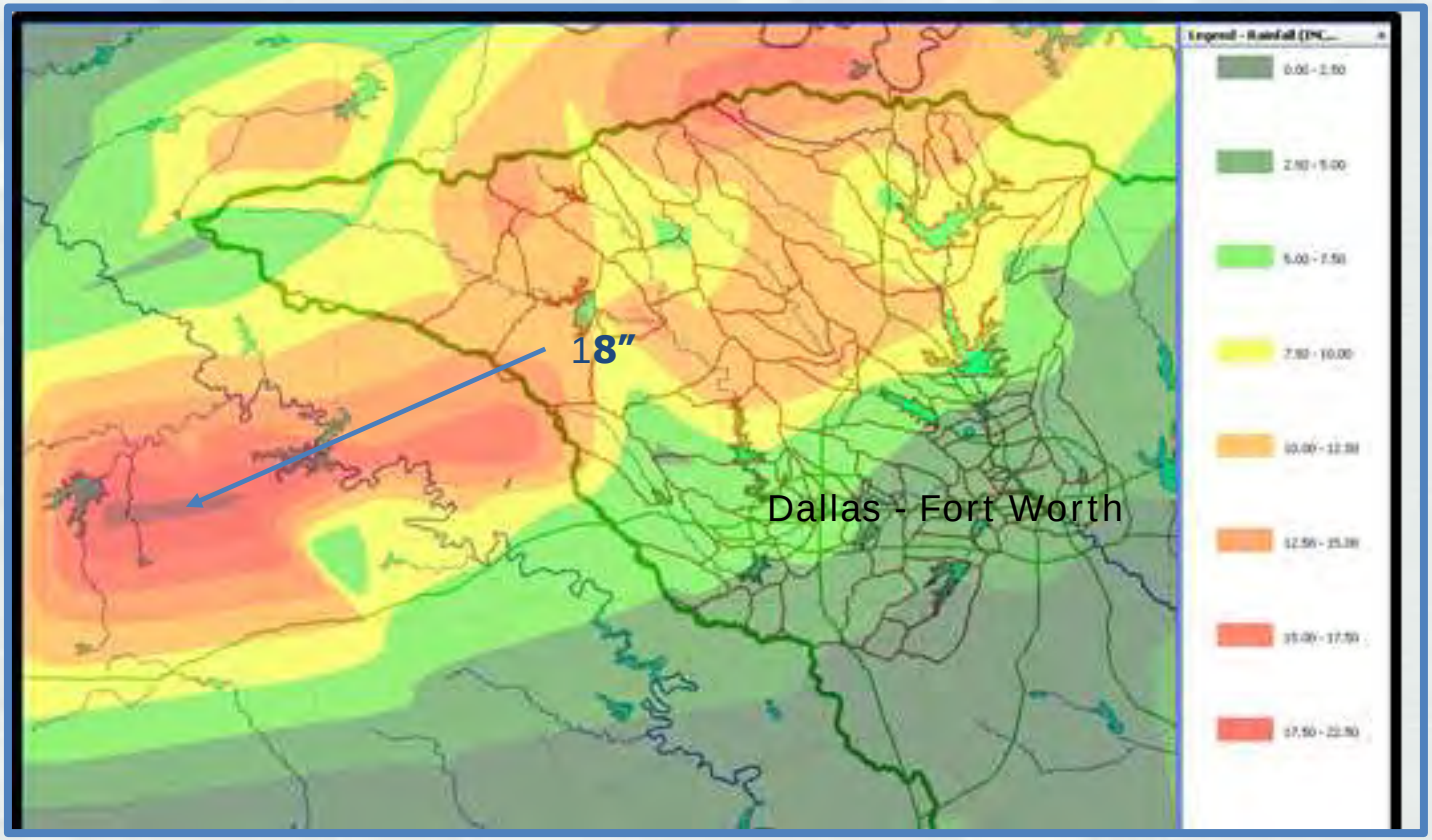




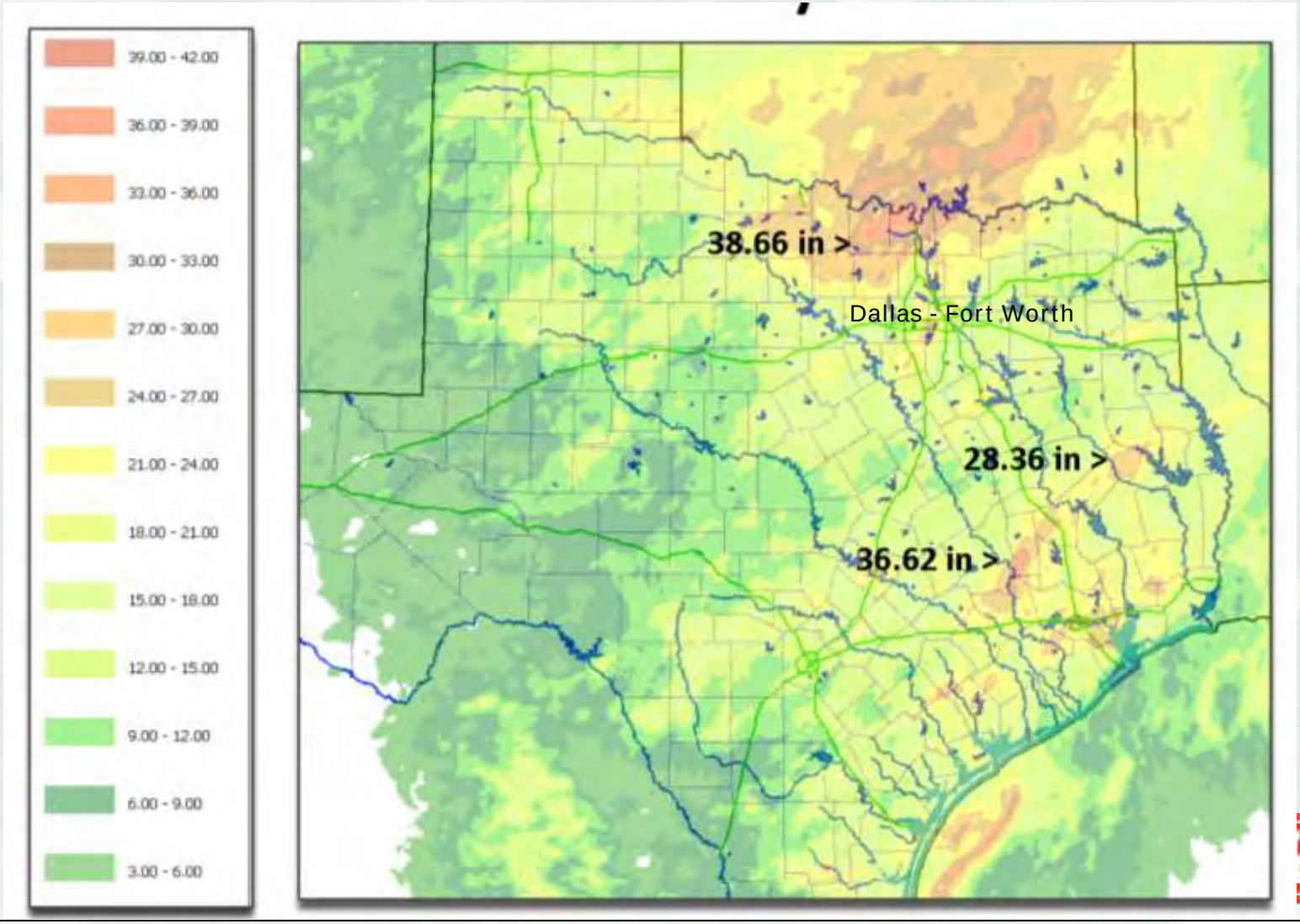


Growing trend toward extreme weather and weather anomalies

# Tropical Storm Norma, Clyde, TX – October, 1981

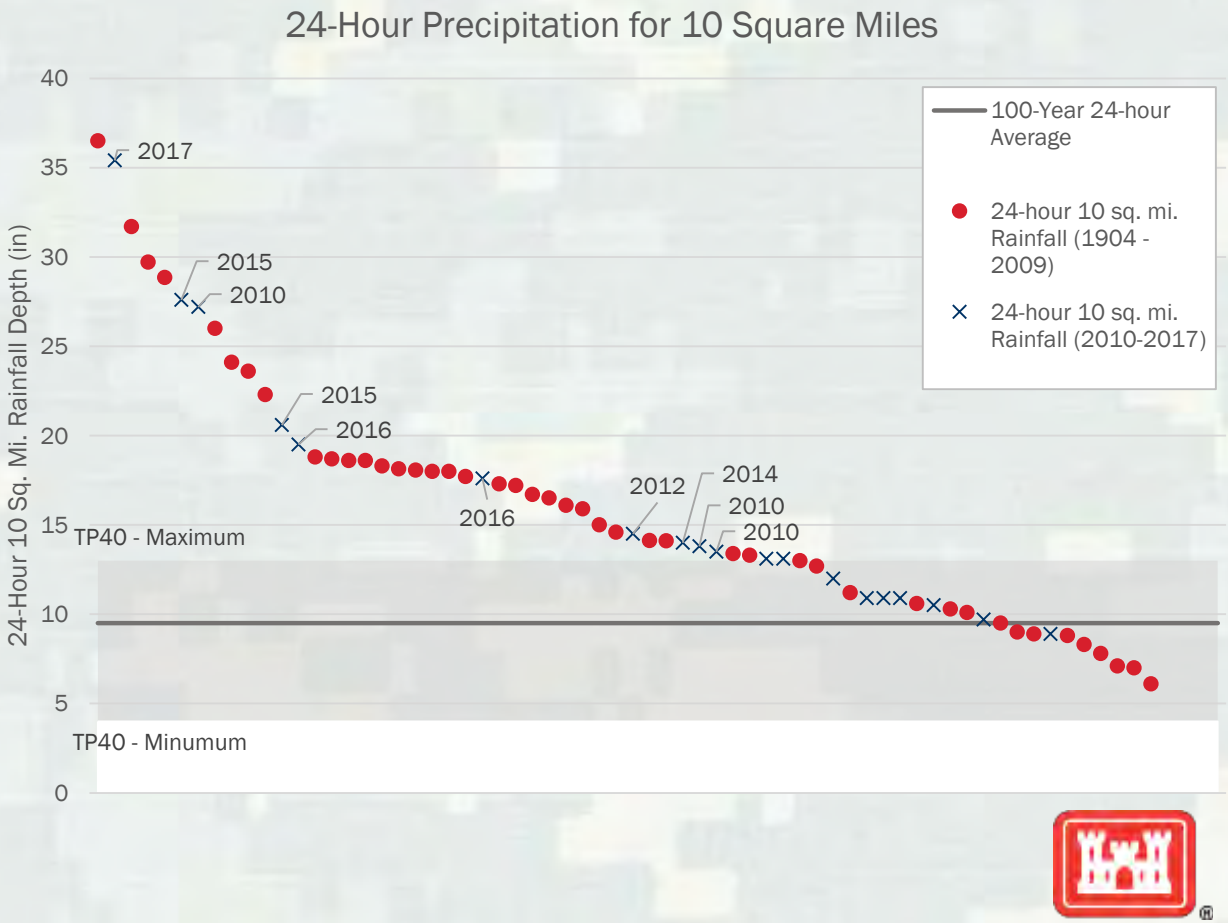


# Central and East Texas, May-June 2015

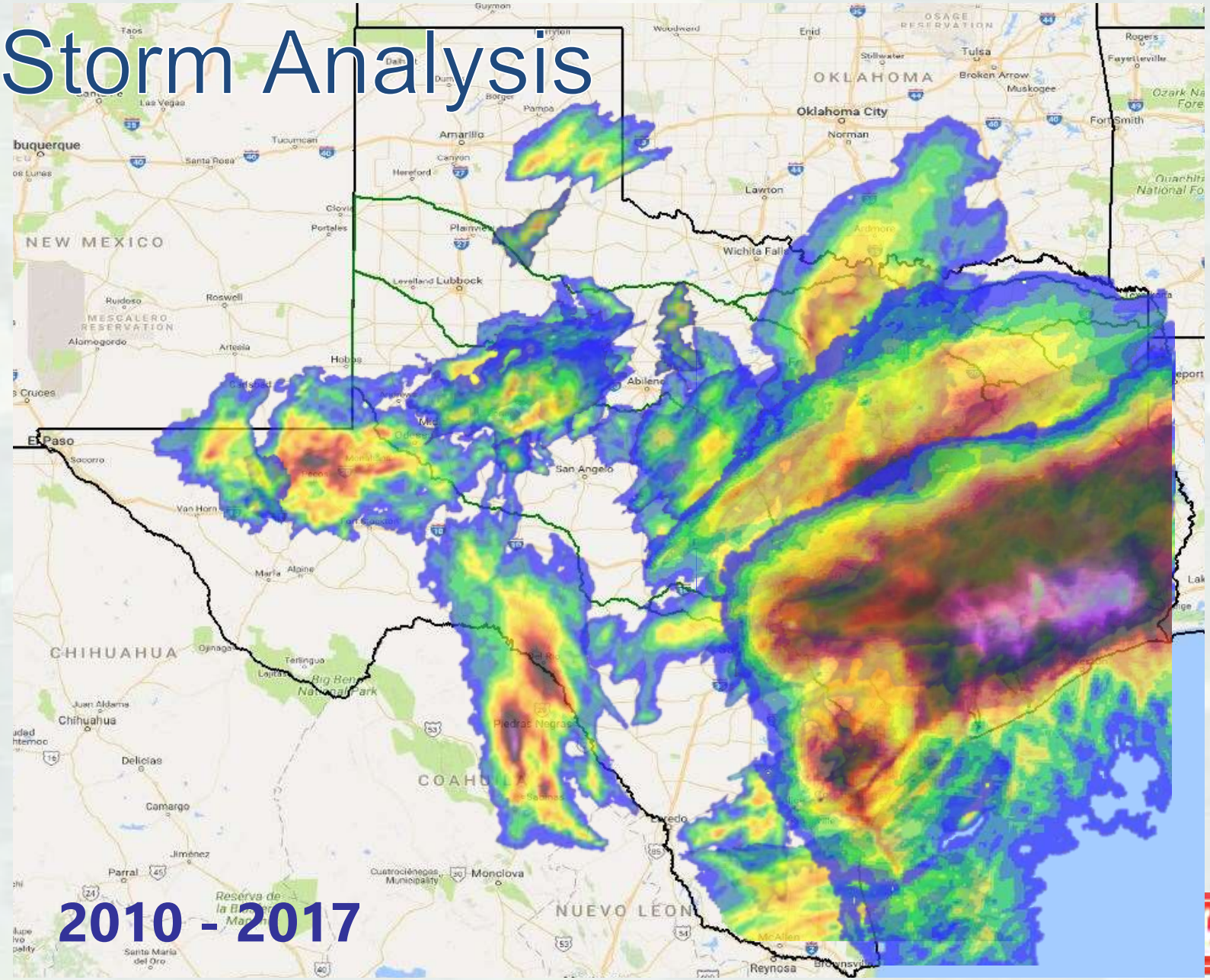


# Why InFRM - Storms Exceeding Infrastructure and NFIP Standards

- Regional observed storms
  - USACE extreme storm database
- 24-hour rainfall for 10 $mi^2$
- Plotted in descending order
- Grey band is current design standard (100-year) for all of TX
- Blue X's points are 2010-2017 storms that exceed 100-year
- 18 events exceeded the 100-yr design standard



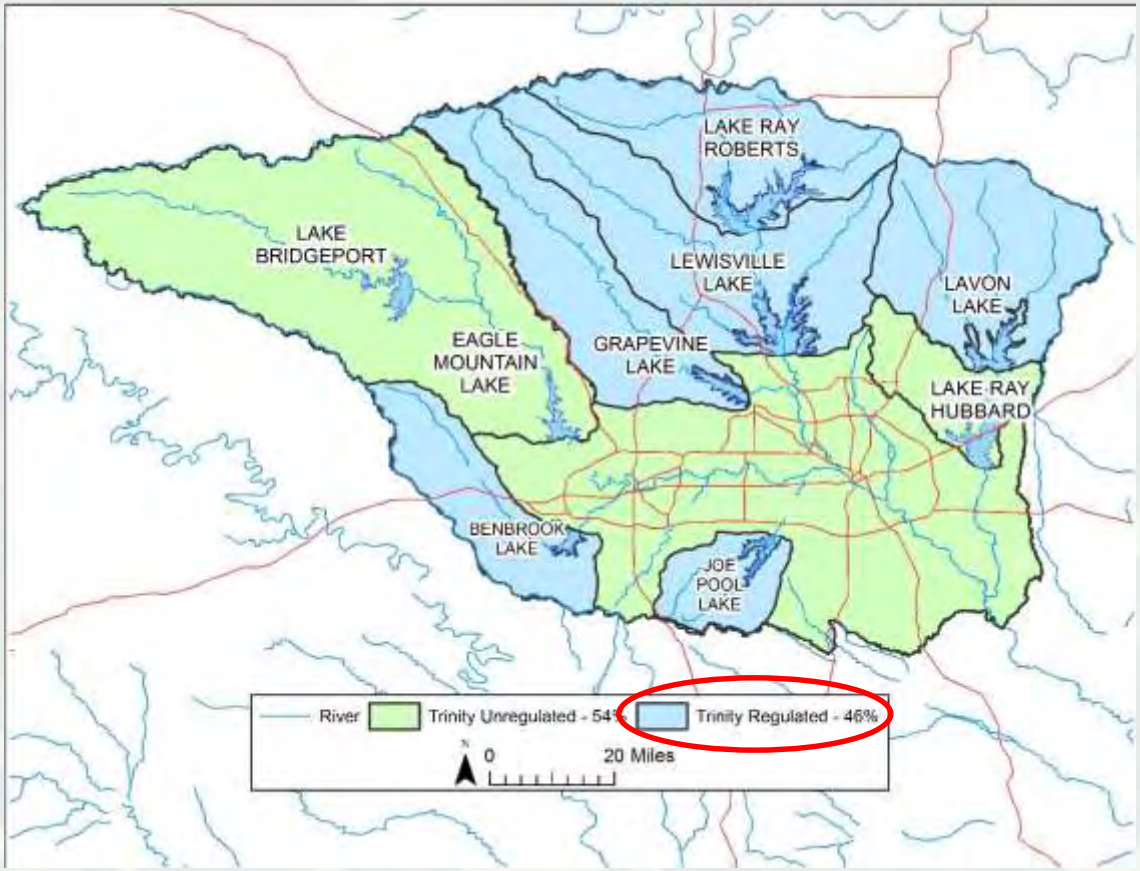
# Storm Analysis




**2010 - 2017**

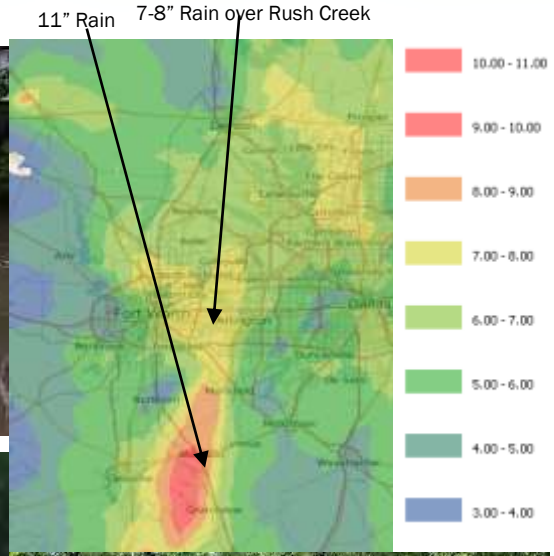
# Dallas-Fort Worth - Flood Control and Water Supply System

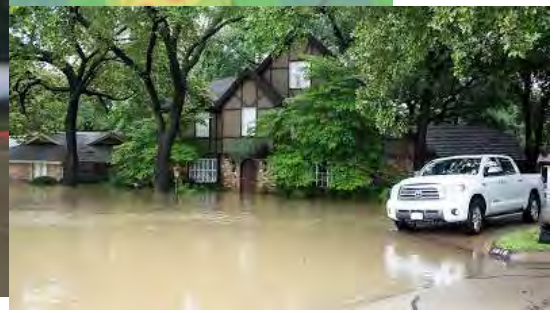
- Devastating floods, 1908, 1942, 1949
- 6 multi-purpose reservoirs
- 2 federal levee systems
- DFW Flood Control System
  - ► $100 billion in damages prevented
  - ► $2 - $3 billion annually
- Water supply system
  - ► 7 million served
- Total cost $2.5 billion



# Tropical Storm Hermine – Arlington, Texas September 2010

- 2010 Tropical Storm Hermine
- Extensive flooding
- No fatalities
- Buy-outs for 150 residences
- $17+ M



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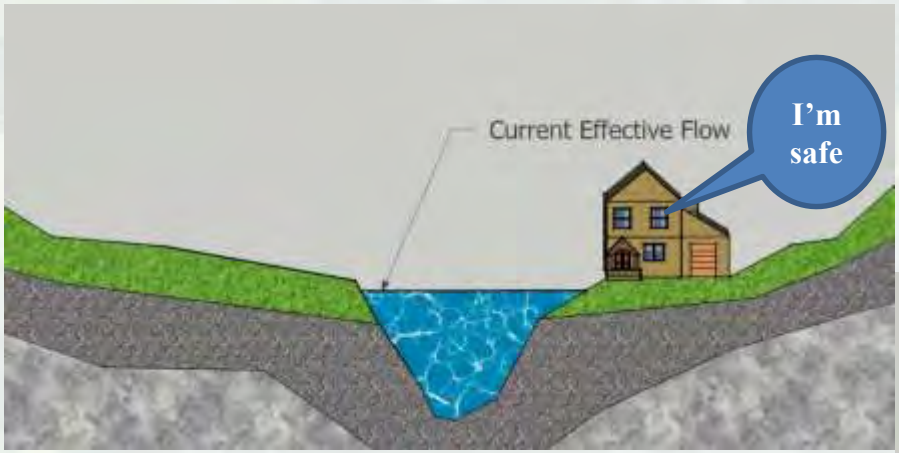
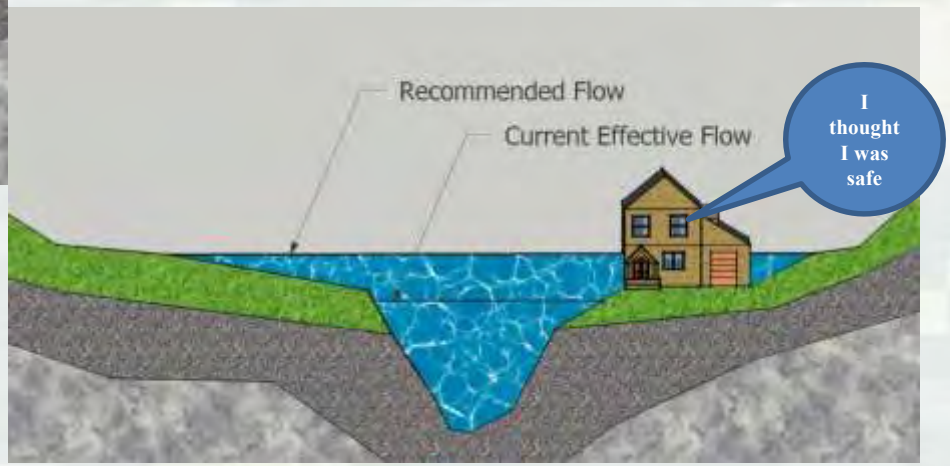
# Need to Manage and Understand Uncertainty Better




- Why have we had 3 100-year events in the last 10 years?
- Who is at risk during an extreme storm event?

# News Clips – Recent Storm Events

# News Clips – Recent Storm Events

# Interagency Flood Risk Management (InFRM)

- Established 2014
- Integrated Water Resources Science and Services (IWRSS) program
- Regional (FEMA Region 6)/Statewide/Basin-wide approaches & support
- Supports common missions
- Collaboration
- Leveraging resources and information
- Limit duplication of effort
- www.InFRM.US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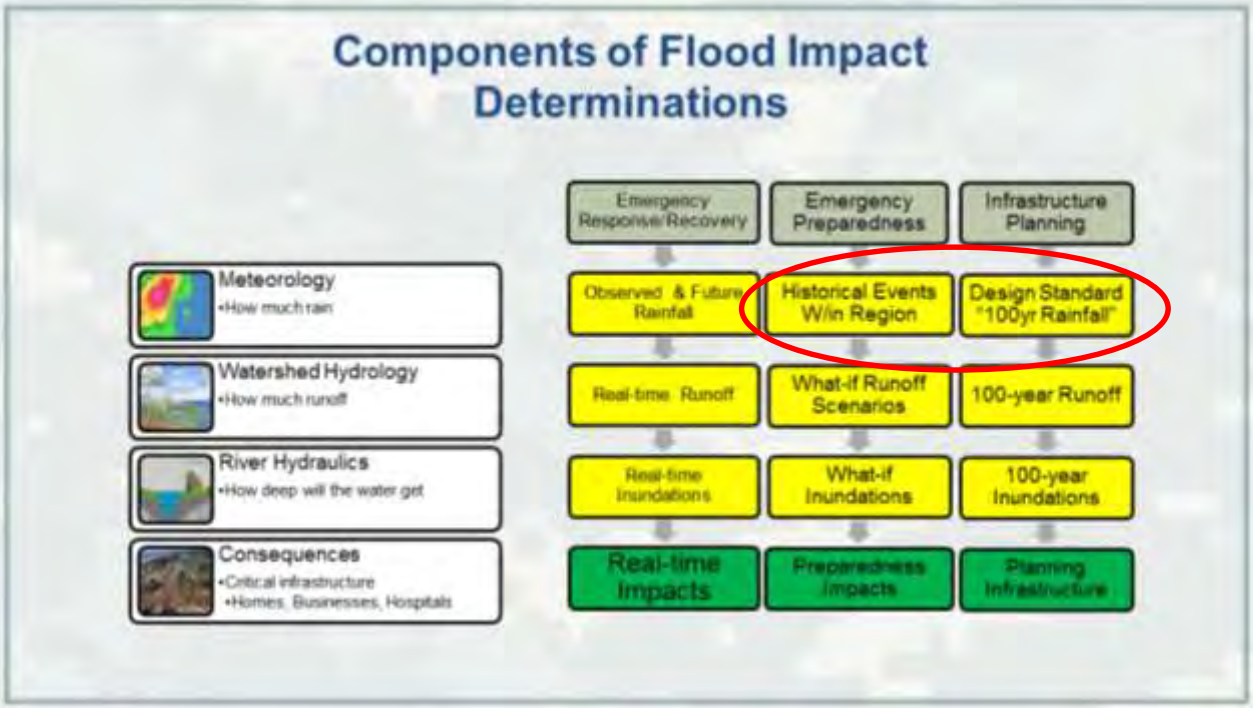
INTERAGENCY FLOOD RISK MANAGEMENT

# InFRM Initiatives




- NOAA Atlas 14
- Watershed Hydrology Assessments (WHA)
- Inundation Mapping/Mitigation Planning Tool

# InFRM – Meteorology Research Initiatives

- **What is it:**
  - Precipitation frequency estimates
  - Informs us of how much rain to expect in a 100-yr storm event
  - Non-regulatory product
- **Benefits**
  - Better understanding of the risk from extreme precipitation events
  - Infrastructure design, bridges, culverts, wastewater, water supply
  - Floodplain mapping (NFIP), where can we safely construct new neighborhoods
  - Preparedness or mitigation planning
- **Ongoing studies**
  - NOAA Atlas 14 (September 2018)
  - Extreme storm HHT & Extreme storm DB
- **Studies still needed ($3 - $4 M)**
  - Other methods to estimate precipitation frequency (check)
  - Trend analysis
  - Storm studies

NOAA Atlas 14

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# Why does Texas need NOAA Atlas 14?

## Why NOAA Atlas 14?

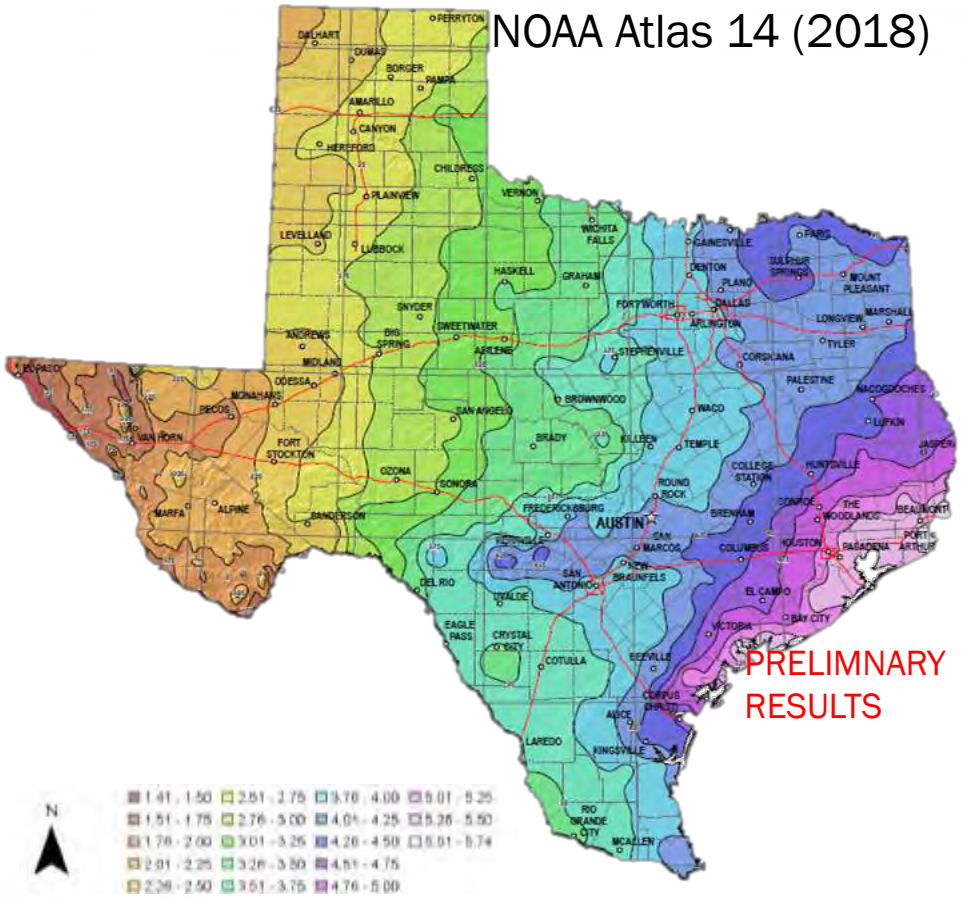
- Today's USA de-facto national standards
- Endorsed by federal water agencies
- Current products are outdated
- Wider range of duration and return intervals
- Modern Web-based data access platform
- More stations – better technology
- More years of observations
- Improved statistical techniques

## Limitations

- Texas is falling behind surrounding states
- Not in the NOAA/NWS federal budget
- Developed at request of end users
- Funded by end users
- Basic technology is dated
- Granularity of data
- Need additional verification studies

# 2-year 24-hour Precipitation Estimates

NOAA Atlas 14 (2018)




PRELIMNARY RESULTS

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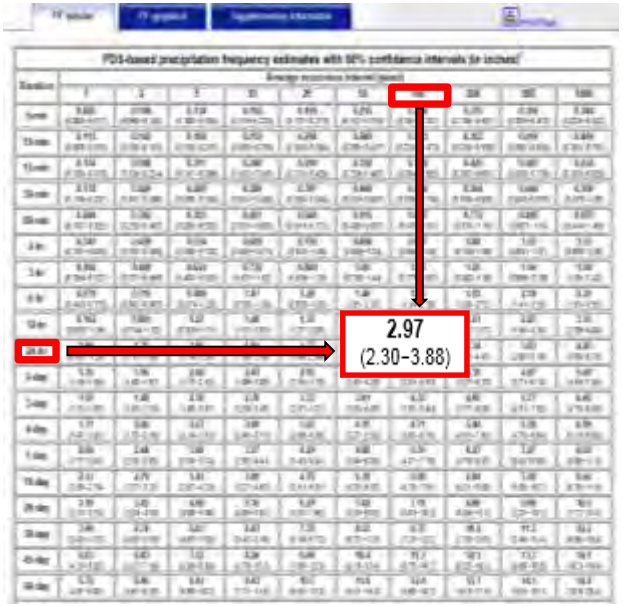
# NOAA Atlas 14 - Access

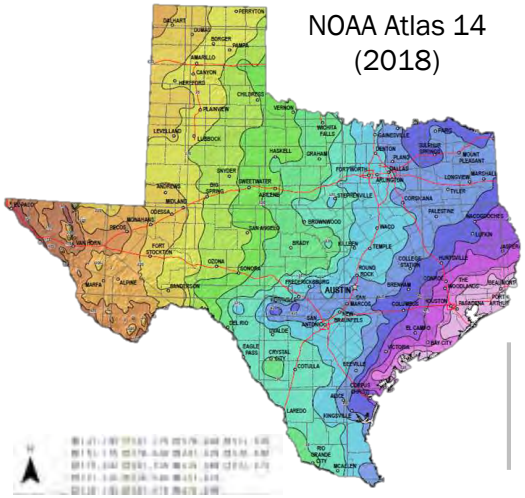
- **To access NOAA Atlas 14 data**
  - Navigate to:

  http://hdsc.nws.noaa.gov/hdsc/pfds/

  Or thru

  www.InFRM.US
  - Click on a study location
  - Access tables, and other forms of data in electronic format
- **Utilize USACE applications that incorporate NOAA Atlas 14 data**
- **Use an updated NFIP map**



NOAA Atlas 14
(2018)

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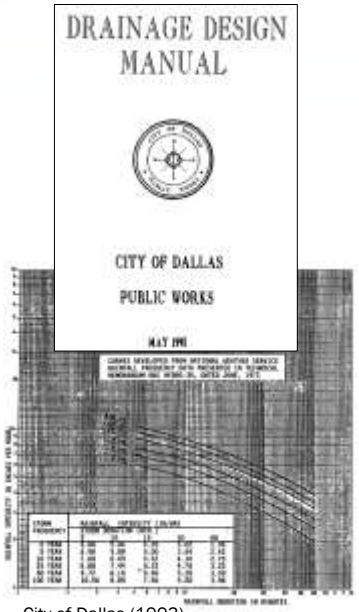
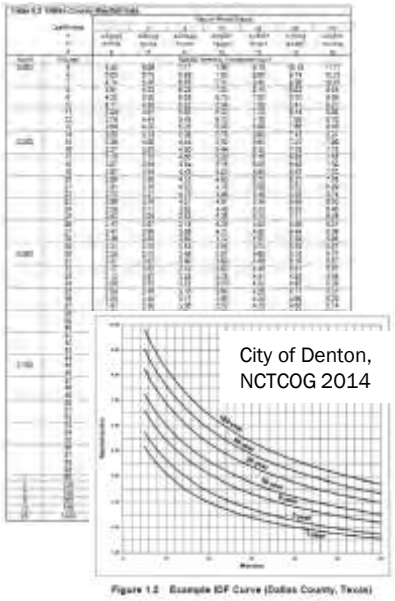
# NOAA Atlas 14 – How Does It Become Regulatory

- Communities update design manuals, incorporating NOAA Atlas 14 data
- TXDOT updates design manuals, incorporating NOAA Atlas 14 data
- New NFIP maps produced which incorporate NOAA Atlas 14 data

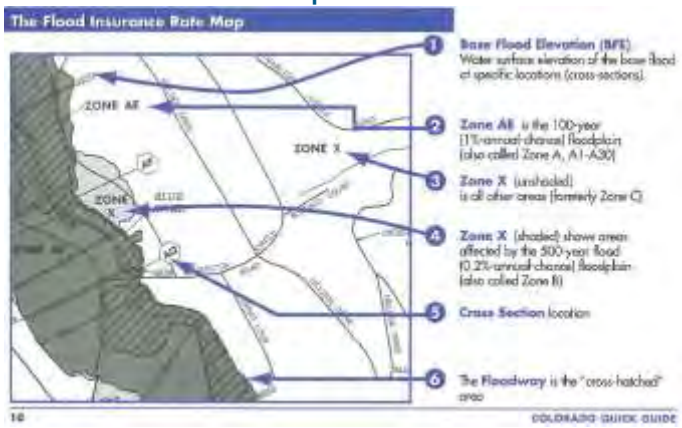



City of Dallas (1993)



City of Denton, NCTCOG 2014

NFIP Map

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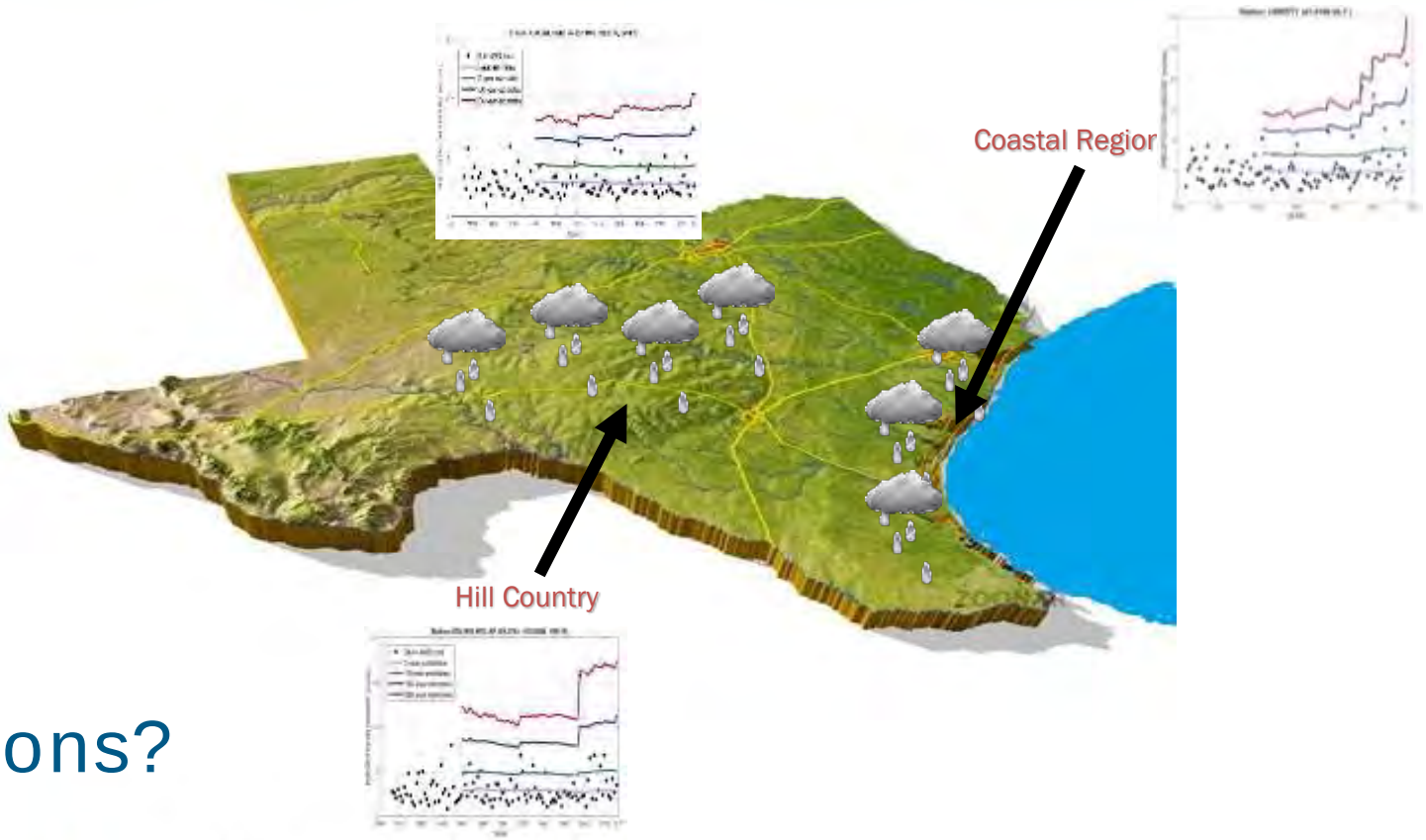
# NOAA Atlas 14 Precipitation Changes




Questions?

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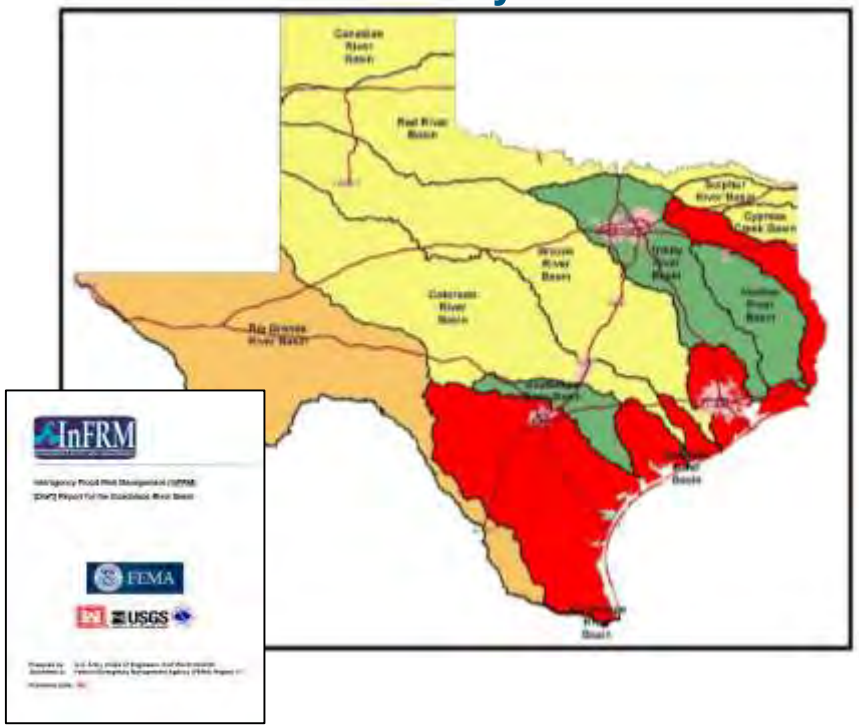
INTERAGENCY FLOOD RISK MANAGEMENT

# InFRM Watershed Hydrology Assessments

sponsored by FEMA Region 6

- **Watershed level vs. community level**
- **Current Basins**
  - Guadalupe
  - Trinity
  - Neches
  - Colorado
- **Provides**
  - Frequency Flows for Design & NFIP 2-yr, 5-yr, 10-r, 25-yr, 50-yr, 100-yr, 250-yr, 500-yr
  - Existing, future and climate change conditions
- **Benefits**
  - FEMA NFIP
  - Supports all infrastructure groups
  - Independent non-political science based result using multiple methods
- **Follow-up -> Increased resolution in urban areas**

## What is the 100-year flood?

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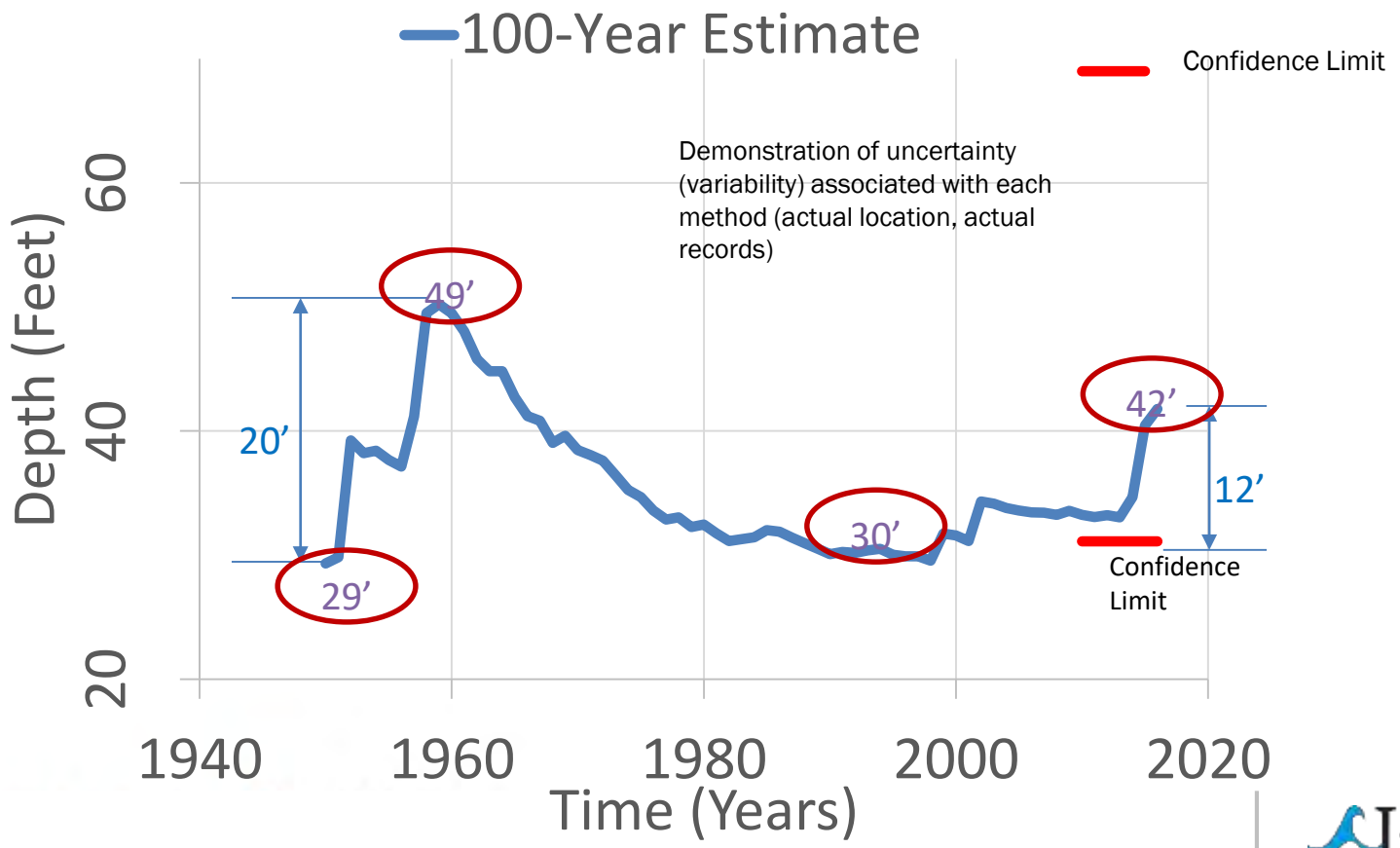
# Why WHA's - Uncertainty Associated with Single Method Approach

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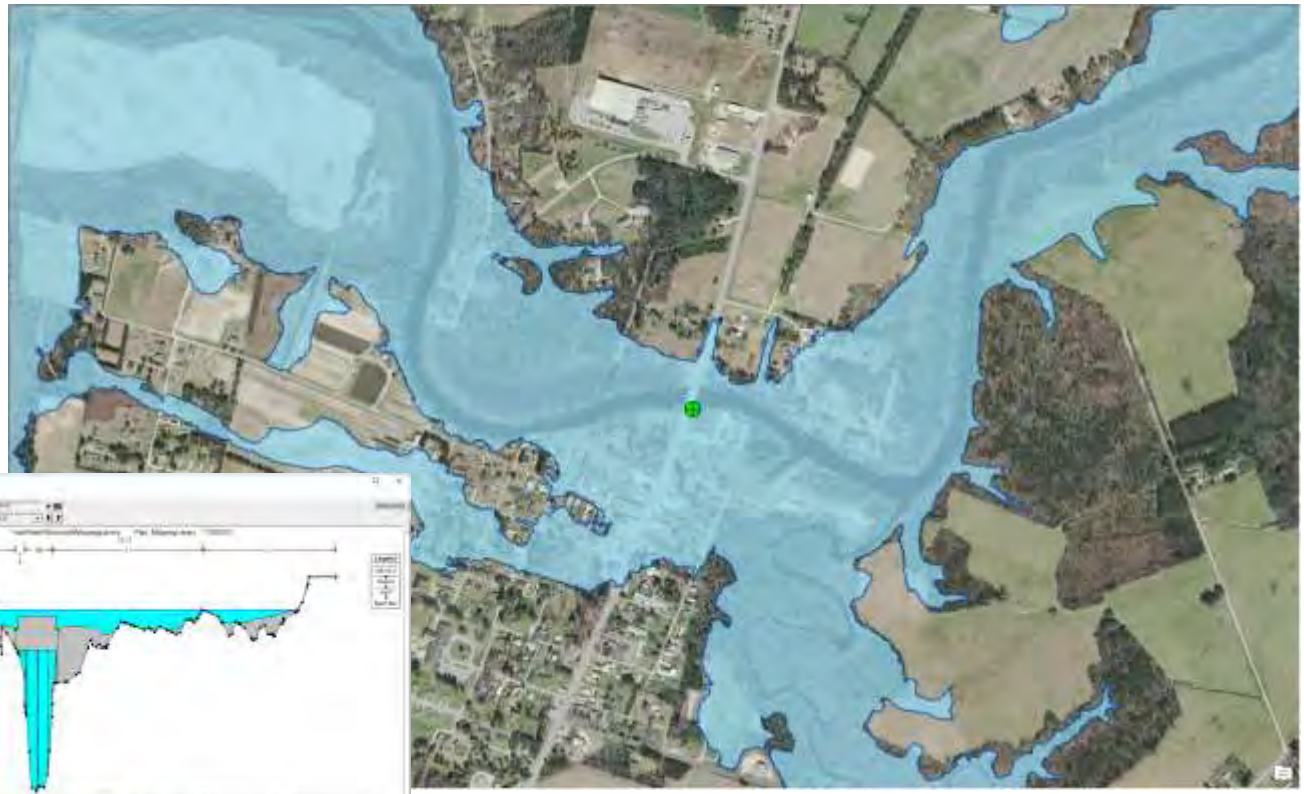
# InFRM – Inundation Map Server (What You Will See)

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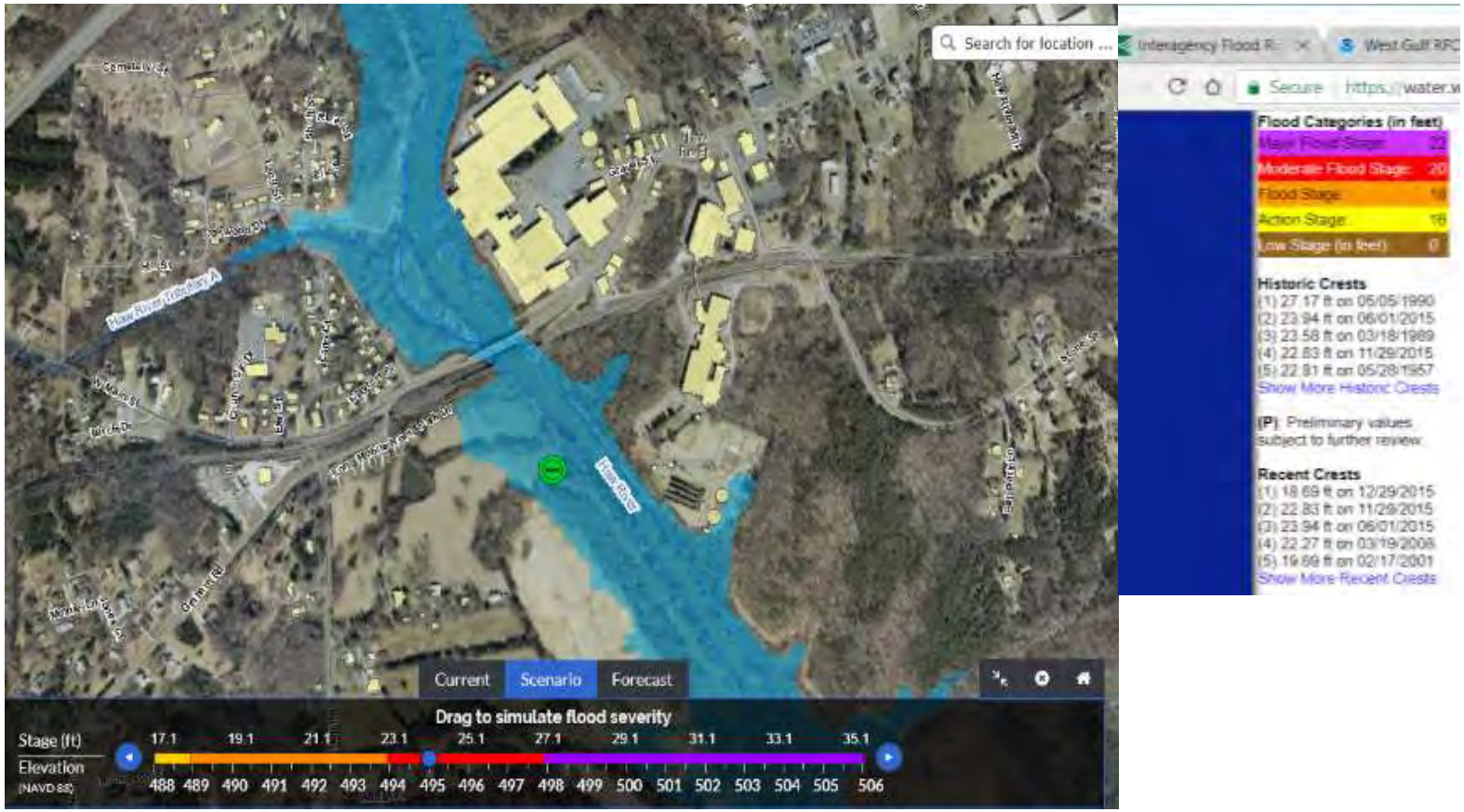
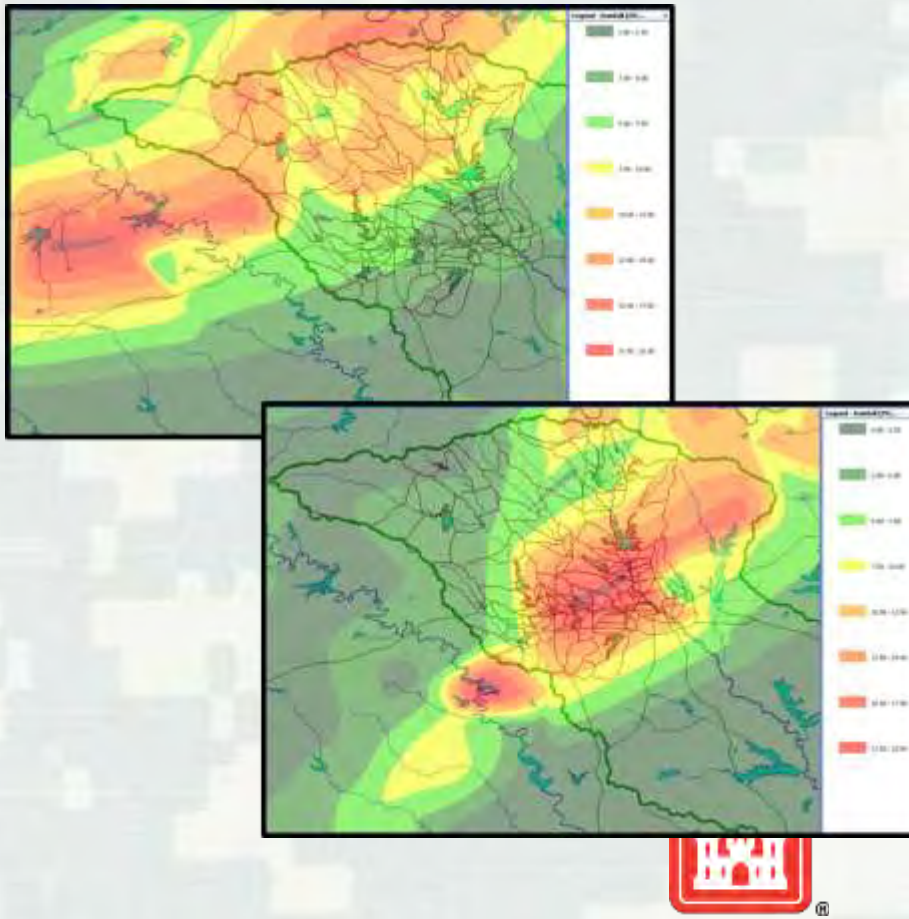
# InFRM – Web Based Mitigation Planning




InFRM
INTERAGENCY FLOOD RISK MANAGEMENT

# Your Strategy to Decrease Risk and Manage Uncertainty

- Participate with the NCTCOG
- Better manage and understand potential for and impacts of extreme storms
- Pool funds and budget funds for the 3 areas
  - ►Meteorology (how much rain?)
  - ►Hydrology (watershed response?)
  - ►Hydraulics (how deep?)
- Planning - develop NFIP mapping (100-year)
- Emergency mitigation and preparedness
  - ►Inundation map libraries
  - ►Apply regional storms (storm transpositions)
  - ►What is the potential for flooding



# What Can You Do?

- Consider adoption of higher standards - Freeboard
  - ►2', 3', 4' or more above the 1% exceedance or 100-year level
- Adopt stormwater management policies (decrease risk)
- COG, TFMA and USACE
  - ►Promoting higher standards
  - ►Promoting stormwater management policies
- Why
  - ►Decrease risk and manage uncertainty
  - ►Decrease future losses and costs
  - ►Lower insurance premiums

# Embracing Technology Changes





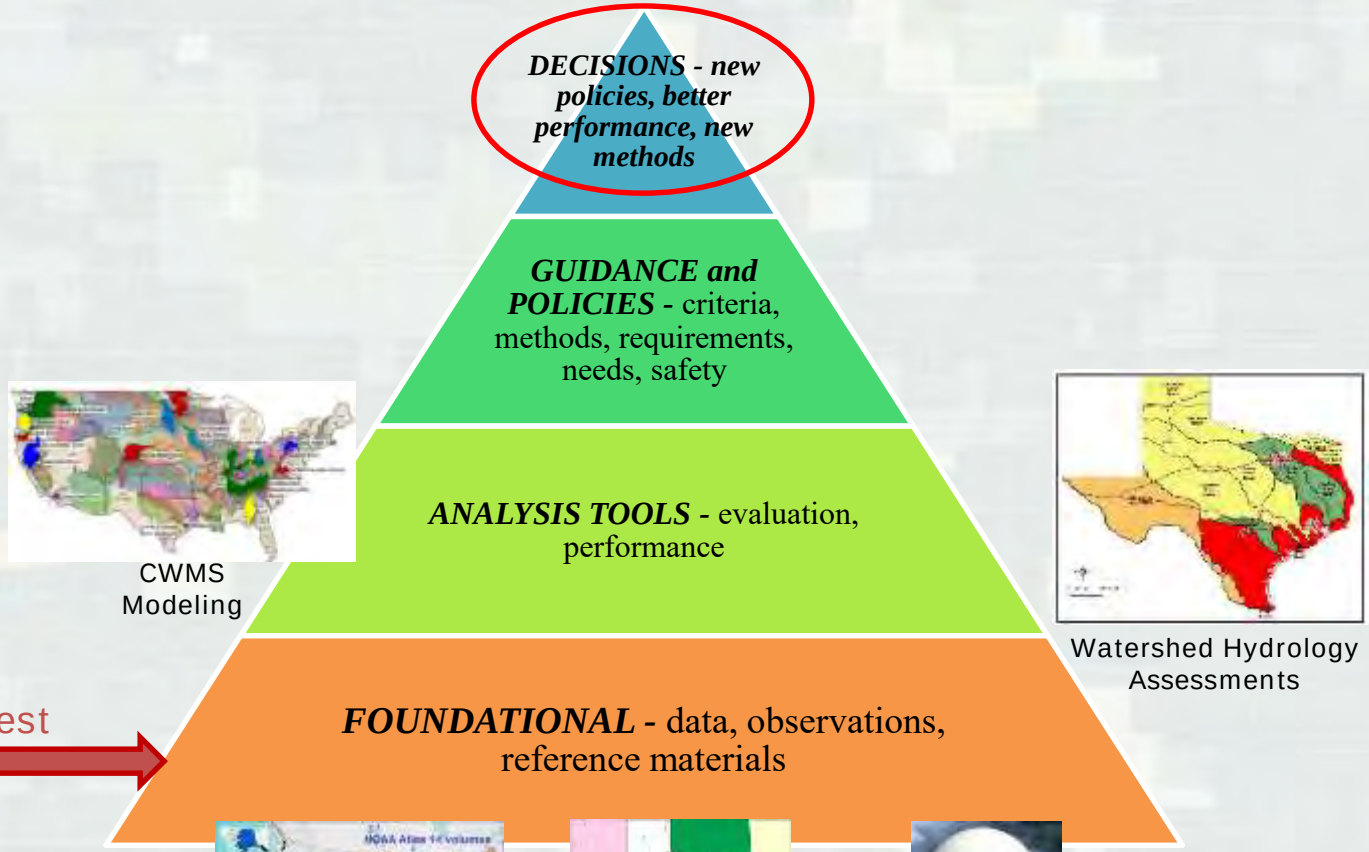








# Infrastructure Decision Pyramid



# Questions?

US Army Corps of Engineers

Jerry L. Cotter, P.E.

Chief Water Resources

U.S. Army Corps of Engineers
Fort Worth District (SWF)
819 Taylor Street
Fort Worth, TX 76102

(817) 886-1549 TEL
(817) 454-1290 CEL

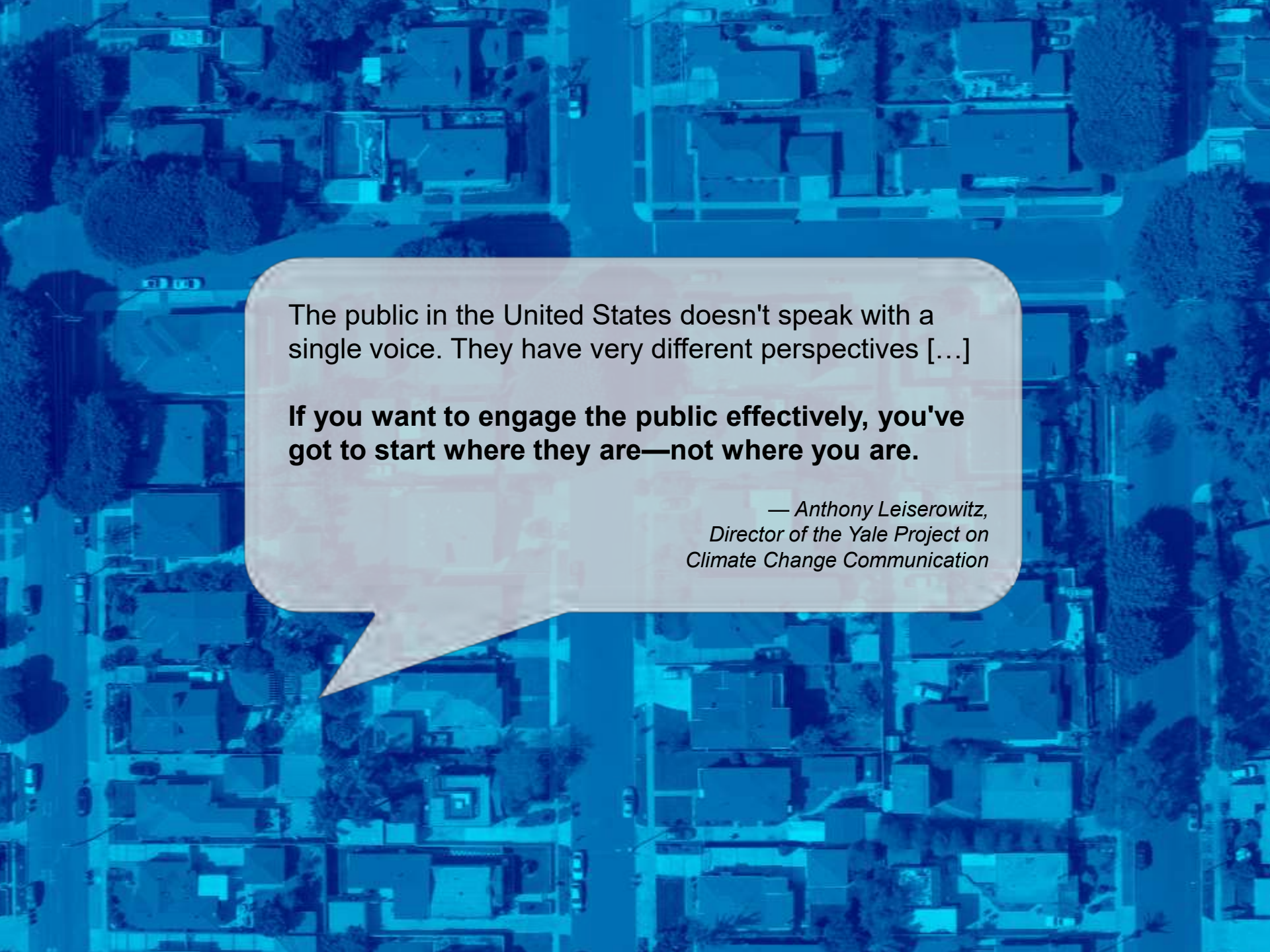
Jerry.L.Cotter@usace.army.mil

RiskMAP
Increasing Resilience Together

# Visualizing Risk & Resilience

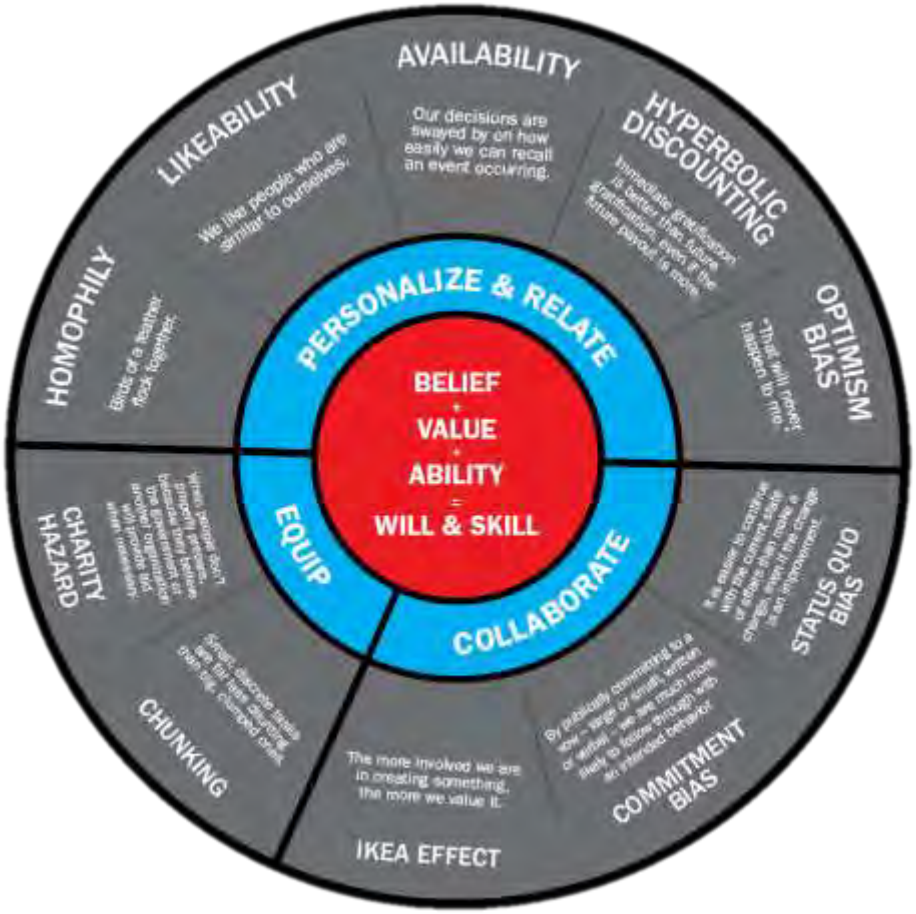
Flood Economics and behavioral science: Case Studies in Community Mitigation
July 2018; NCTCOG Elected Officials Floodplain Seminar

FEMA


The public in the United States doesn't speak with a single voice. They have very different perspectives […]
If you want to engage the public effectively, you've got to start where they are—not where you are.
— Anthony Leiserowitz,
Director of the Yale Project on
Climate Change Communication

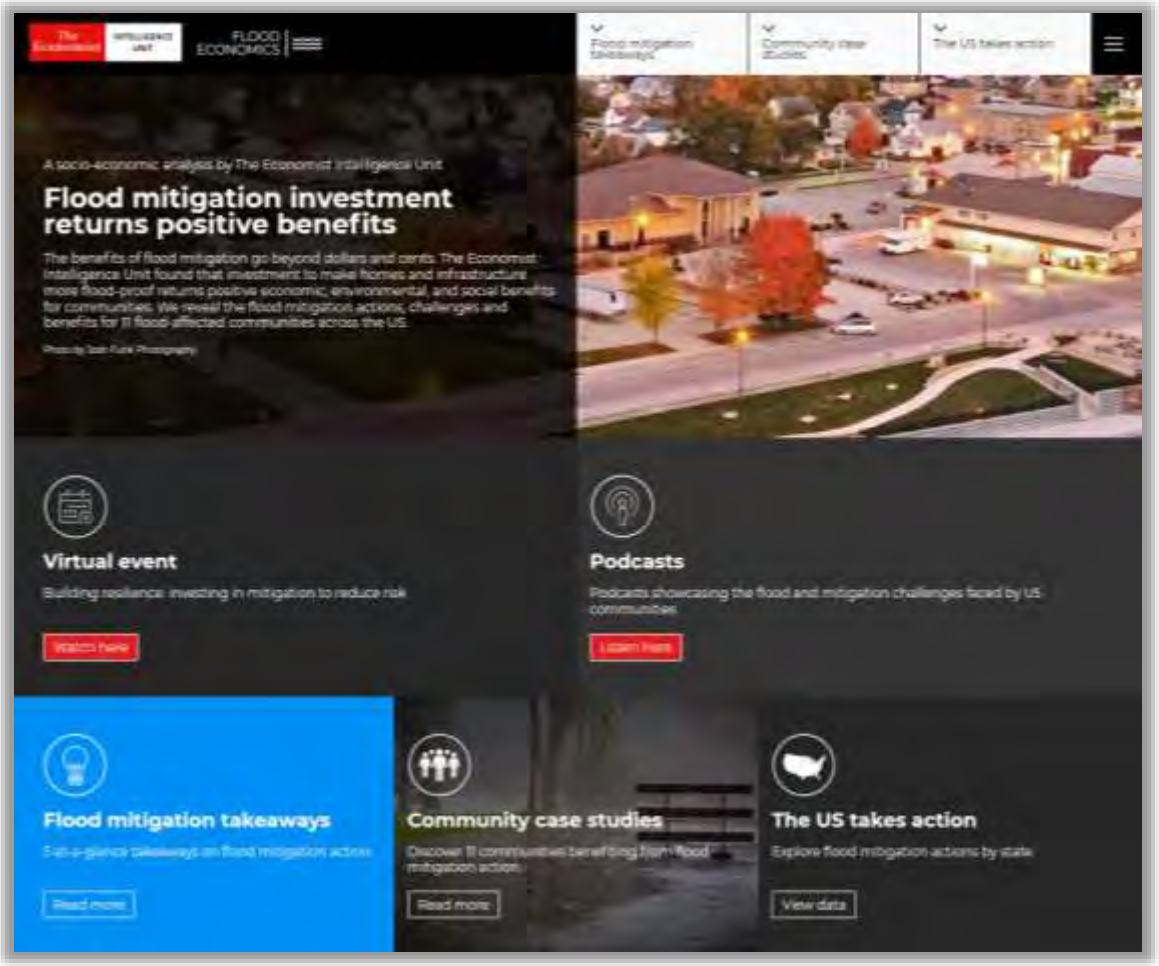
# Data, Templates, Plans, & Maps Aren't Enough

- Our brains are complicated
- Understanding how our brains receive and process information helps us understand people's motivations and how they may think about and receive information about their risks
- We need to be aware of the cognitive biases and heuristics that will affect how each community member thinks about flood risk



# Resilience Requires Behavior Change

# Changing the Conversation: Floodeconomics.com




- Increase decision-makers' awareness of flood risk and its relevance to their communities;
- Increase their knowledge of how to mitigate a community's flood risk; and
- Encourage people to share this knowledge with key industry experts and affected stakeholders, creating a ripple effect.

# Audiences

- Nontechnical Decision-makers
  - Mayors
  - Local council members
- Community Leaders
  - Association presidents
  - Community advocates
- Technical Experts
  - Floodplain Administrators
  - Planners
  - Hazard Mitigation Staff
  - Advisors

# Case Studies

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**Profiles of 21 communities across the US that mitigated flood risk**

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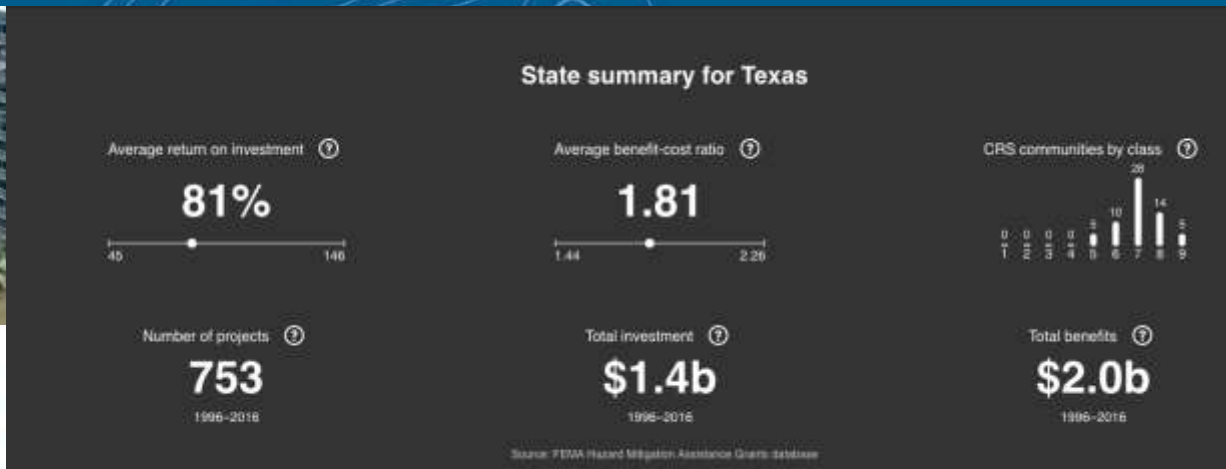
Houston, Texas

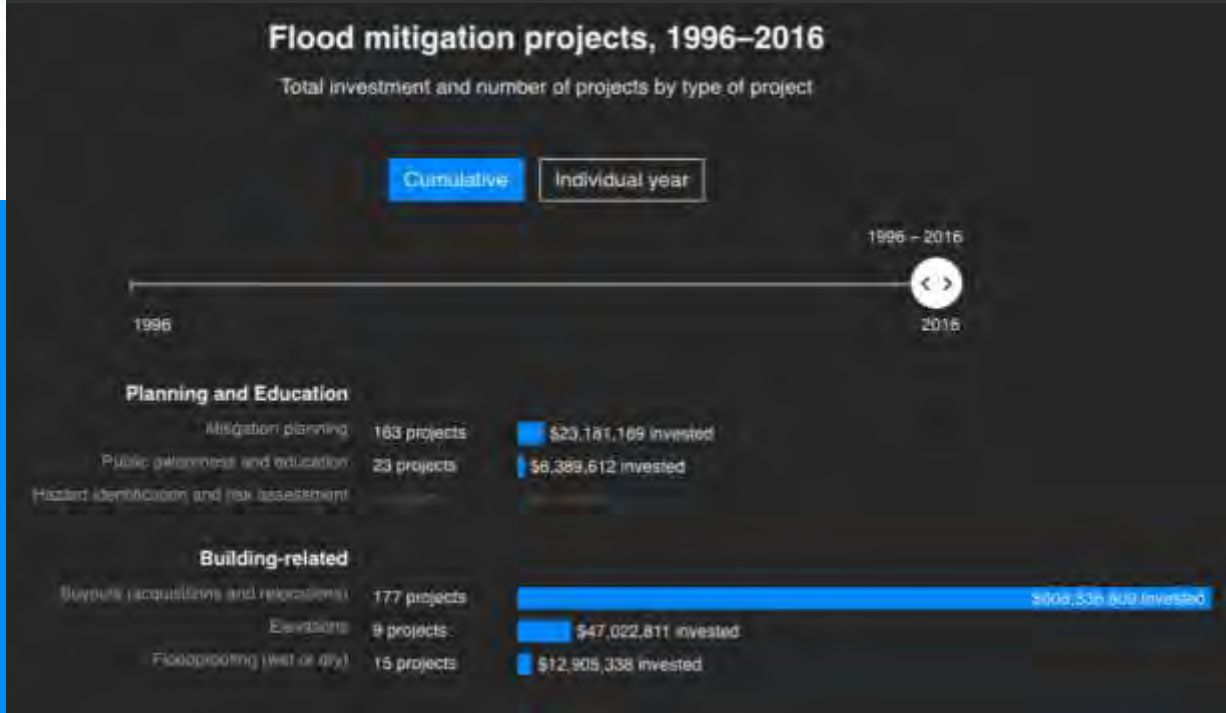
## Acquisitions and elevations help to reduce Hurricane Harvey's impact

Because many communities in Houston were built before flood regulations were enacted, thousands of homes are at risk of flood damage. Since 1989, Houston and Harris County officials have worked with FEMA on grants to acquire or elevate more than 1,600 of the hardest-hit homes in the area.

# Flood Economics Tools





# Experiential Learning and Behavior Change

# Why Storytelling?

**Because storytelling is better than fact-sharing.**

**Because there are powerful stories to tell about how communities can drive mitigation action.**

**Stories that are**

**More memorable  More powerful  More persuasive  More effective**

# Storytelling

*"Risk is not a static thing. Risk is dynamic. It moves, and we have to constantly stay alert and understand that you have to be prepared for that change."*
Luis Valdez, Fire Chief, Leon Valley, TX

*"All communities have to have tremendous respect for Mother Nature. You've got to learn and embrace changes. Nobody expected the issue of Sea Level Rise. It happens."*
Bruce Mowry, City Engineer, Miami Beach, FL

*"We are keenly aware that we've got a huge responsibility to our community in keeping good floodplain management practices, with hundreds of millions of dollars in property at stake if something were to fail."*
Stan Polivick, Assistant Public Works Director, Cape Girardeau, MO

# Telling it in Their Own Words

# How can we help?

- Peter Herrick, FEMA Risk Management Directorate
  - Peter.herrickjr@fema.dhs.gov
- Meg Bartow, Resilience Action Partners
  - Meg.bartow@ogilvy.com
- Fontaine Bland, Resilience Action Partners
  - Fontaine.bland@ogilvy.com

Increasing Resilience Together

FEMA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A VR EXPERIENCE ABOUT FLOOD & RESILIENCE


The best way to prepare for a disaster is to **learn from experience**.

Plan

Find Solutions

Reduce Damage


Every $1 spent preparing
for a flood right now
will save an average
of $6 later on


· Discovery Meetings
· Resilience Meetings
· Hazard Mitigation Planning Meetings

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Telling the story of what FEMA does and how we do it, and providing a call to action for the nation to prepare for potential disasters.

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