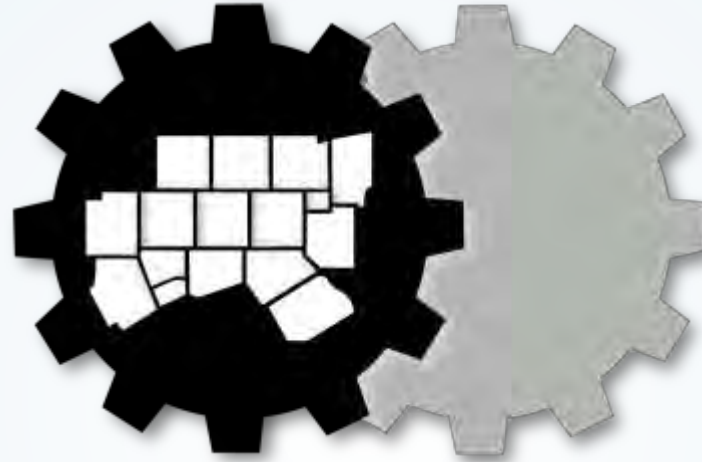


Elected Officials Floodplain Seminar and CRS Users Group

July 18, 2018



North Central Texas
Council of Governments
Environment & Development



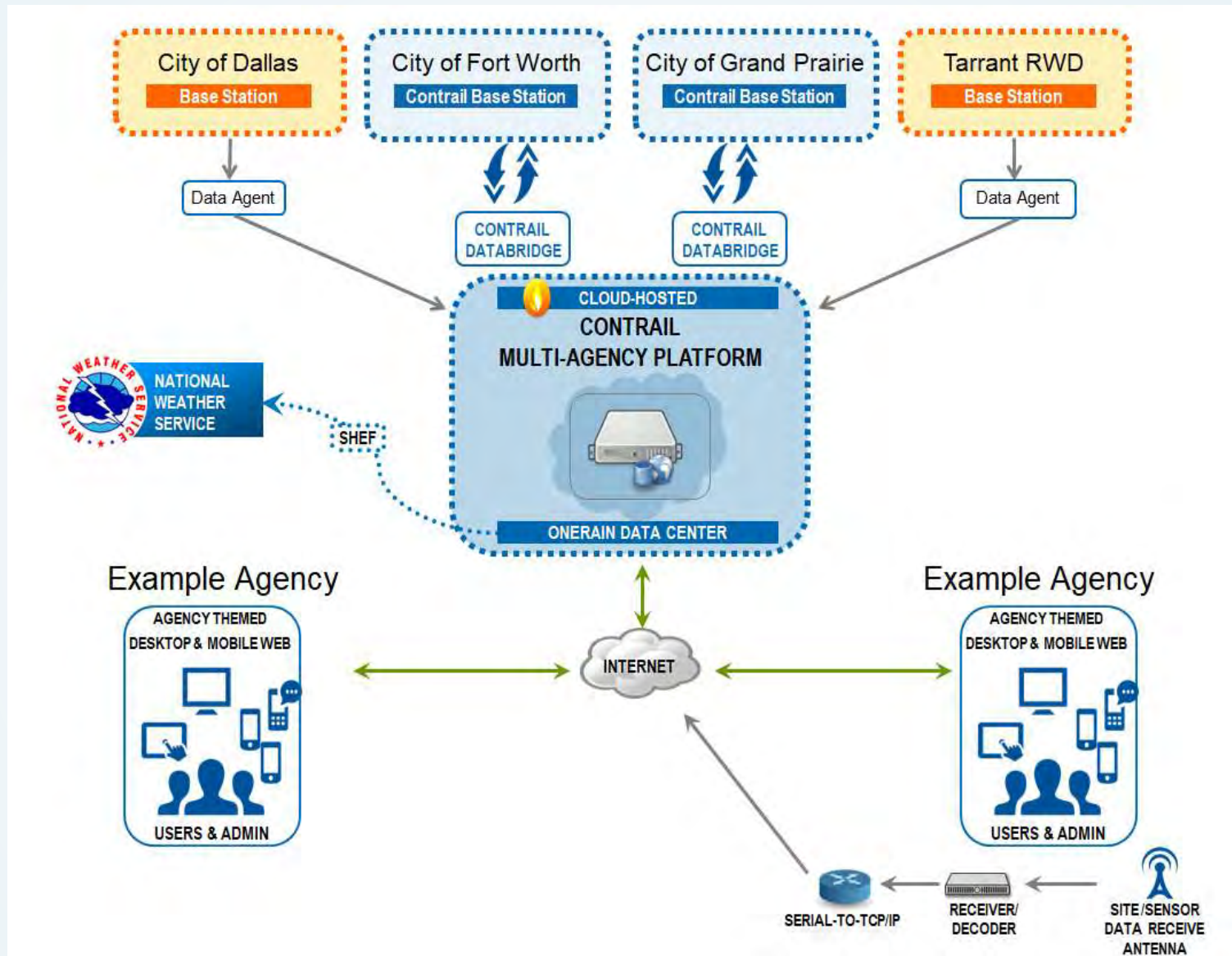
WELCOME & INTRODUCTIONS



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.



How Much Does Joining the Common Flood Software Platform Cost?

Attachment II
SHARE Participant Price List



North Texas
SHARE
OneRain Software Solutions Center

North Texas SHARE
A Regional North Central Texas Council of Governments (NCTCOG)
OneRain Services Agreement

Entity Name ("Entity"):		Signature date below:	
Agreement (Effective Date):		To a purchase order required for this purchase? <input type="checkbox"/> "No," unless box is checked <input type="checkbox"/> Yes: PO#	
Order Start Date:	Order End Date:		

The Service Agreement is made and entered into pursuant to a Master Service Agreement ("Agreement") between NCTCOG and ("Entity") ("Entity"). Entity expressly acknowledges and agrees to abide by the terms and conditions of the Agreement and any End-User Agreement(s) required by vendor as a condition of service delivery.

The hardware, software, goods, services and/or equipment provided hereunder are offered through a coordinated purchasing program in which NCTCOG and Entity are parties. NCTCOG and Entity have entered an Interlocal Cooperation Agreement pursuant to Chapter 761 of the Texas Government Code which satisfies competitive bidding requirements, if any, for these purchases.

A 25% of Early Adopter's Discount will be permanently applied to the first set of communities that enter into contracts under this agreement.

	Quantity	Unit Price	Total Price
SYSTEM	<input type="checkbox"/> Standard Data Service		\$ 4,950.00
EQUIPMENT	<input type="checkbox"/> GEAR (Storage Add, Router Hardware)		Included with Services
SUPPORT	<input type="checkbox"/> Customer Control Admin Support		Included with Services
ANNUAL SUBSCRIPTION FEE TOTAL			
ONE TIME SERVICES	Technical Services Add-Ons (5 or more of these services will be required)		
	<input type="checkbox"/> Implementation Services - Custom Dashboards and Formatted Widgets	\$	1,000.00
	<input type="checkbox"/> Implementation Services - Hardware, Configure Custom Serial to IP Kit	\$	1,500.00
	<input type="checkbox"/> Client Setup and Configuration	\$	1,500.00
	<input type="checkbox"/> Technical Services - Historical Data Load		Quote to quote
	<input type="checkbox"/> Technical Services - Custom Data Load		Quote to quote
	<input type="checkbox"/> Technical Services - Datasight Data Analysis Software License		Quote to quote
	<input type="checkbox"/> Learning Services - Client ALERTS TRAINING		Quote to quote
ONE TIME SERVICES TOTAL			

OPTIONS FOR CUSTOMER SPECIFIC CLIENTS ONLY

The following services are optional available for pre-existing OneRain clients, and are not necessary for communities purchasing the NCTCOG/SHARE OneRain Service.

<input type="checkbox"/> North Central Texas OneRain Services	\$	3,000.00
<input type="checkbox"/> North Central Texas OneRain Services with Basin Averaging	\$	4,200.00

Notes:
The participant has not provided services which identified to the Order shall be removed after the effective date of the Order and shall be removed within 15 days from the invoice date. The participant agrees to provide the participant with the amount of the Order and shall be provided within 15 days from the invoice date for the order in the order below.

Billing	Summary of Subscriptions & Services	Total Billed	Invoice Date
Invoice #	Subscription Fees: Contract Period: _____ 3		Signature Date:
	One-Time Service Fees: 3		Due Date: 10/1/20

Agreed and accepted:

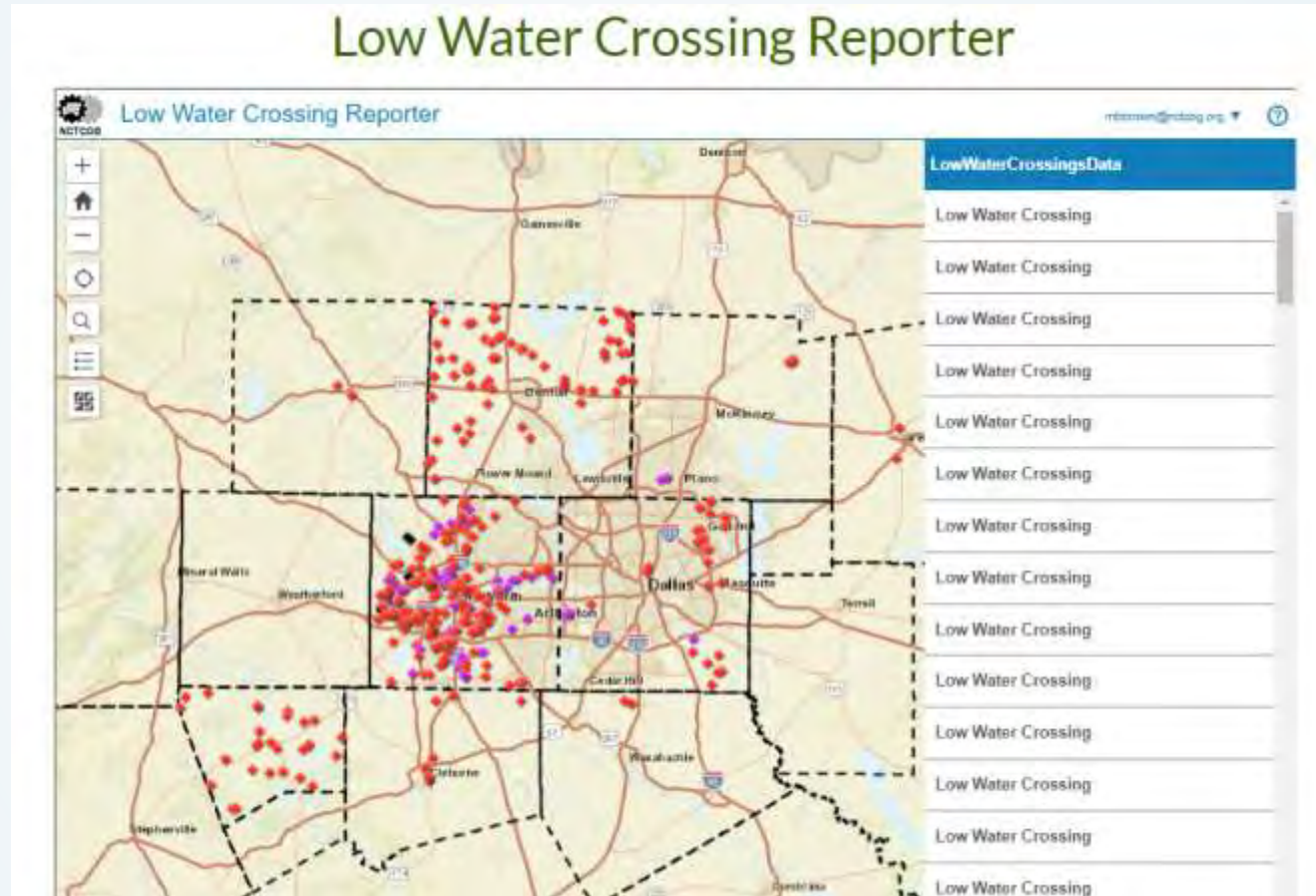
Participating Entity:	North Central Texas Council of Governments
Signature:	
Name:	
Title:	
Date:	

- ▶ 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

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817.695.9227

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nctcog.org/envir

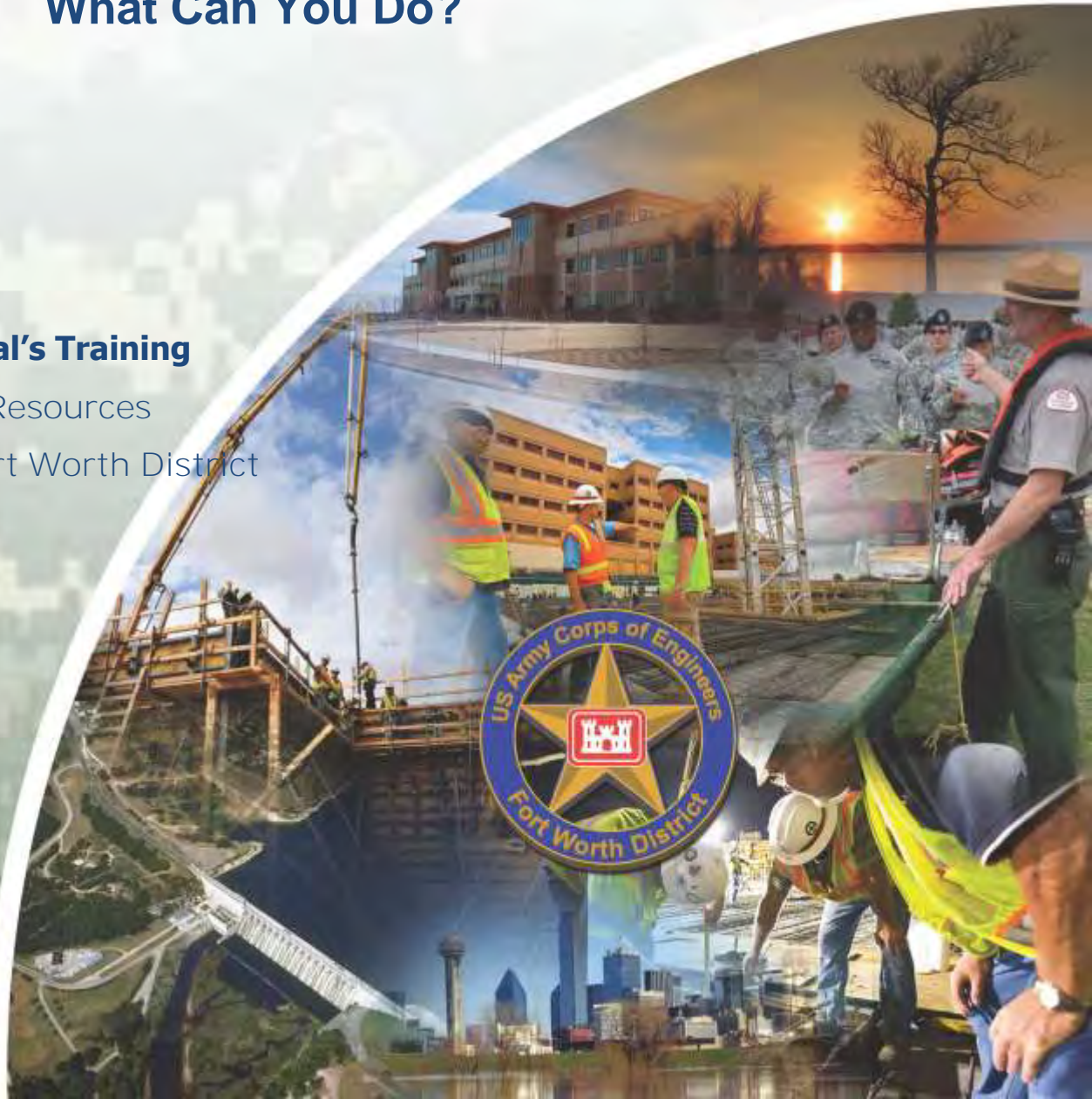
Extreme Precipitation, NOAA Atlas 14, Other InFRM Initiatives What Can You Do?

Date: 18 July 2018

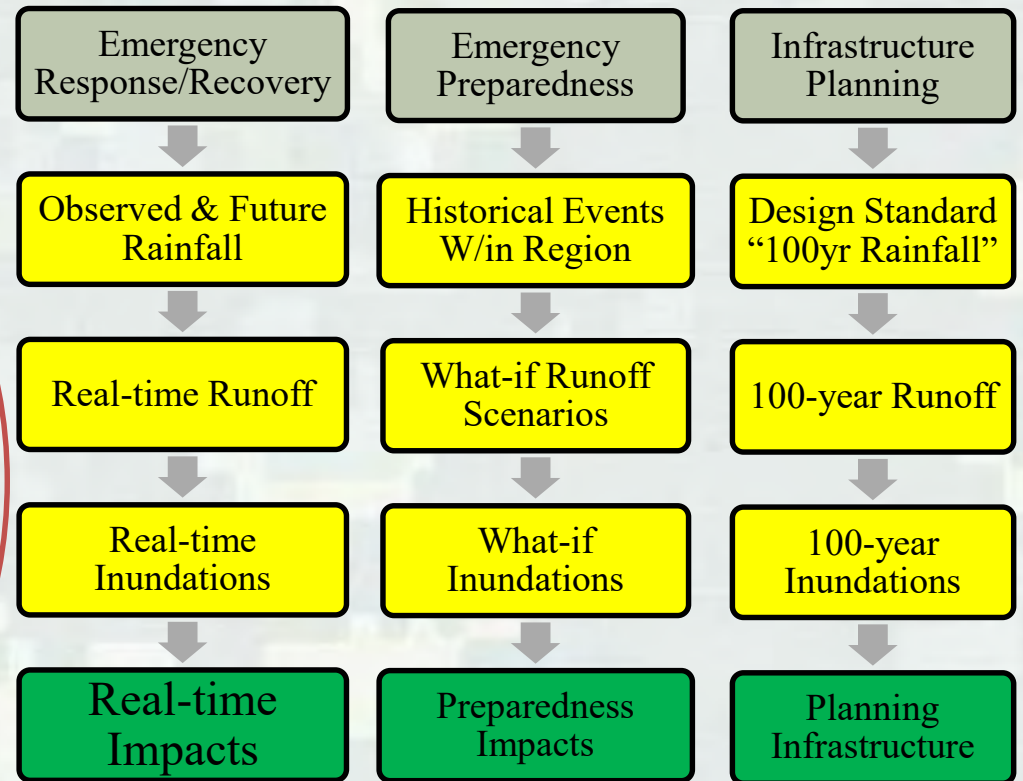
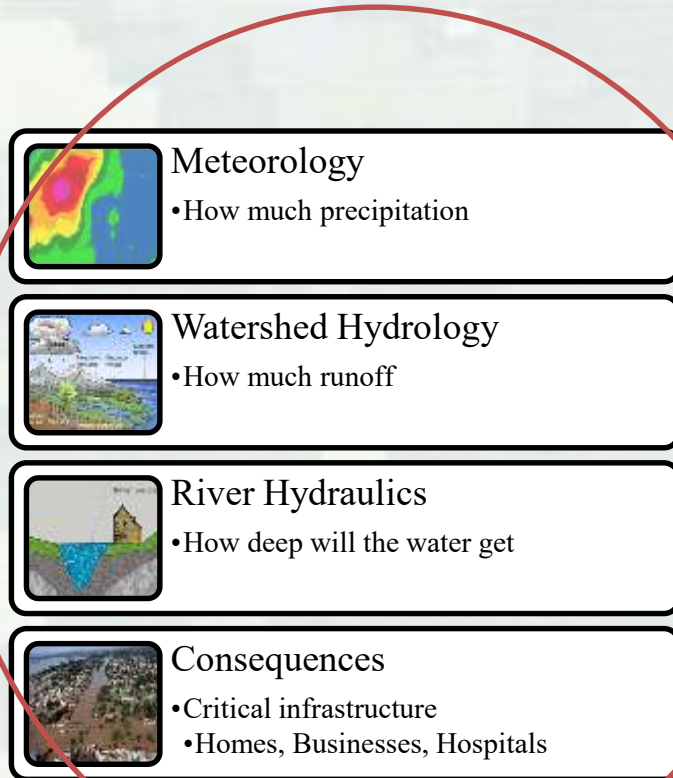
Audience: **NCTCOG Elected Official's Training**

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

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



Components of Flood Impact Determinations



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

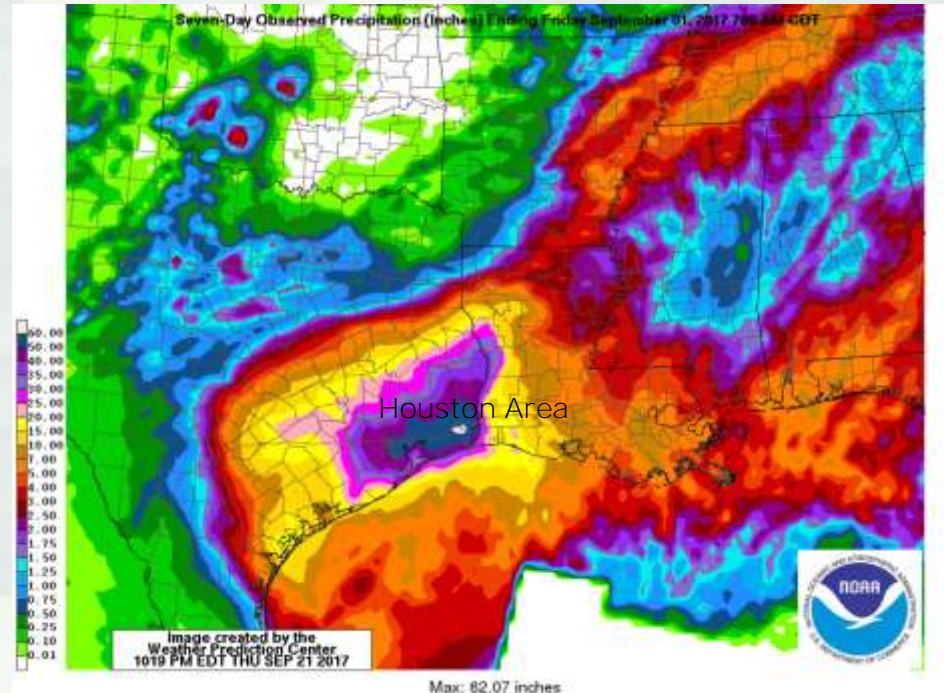
Hurricane Harvey was Unprecedented in the History of the United States!



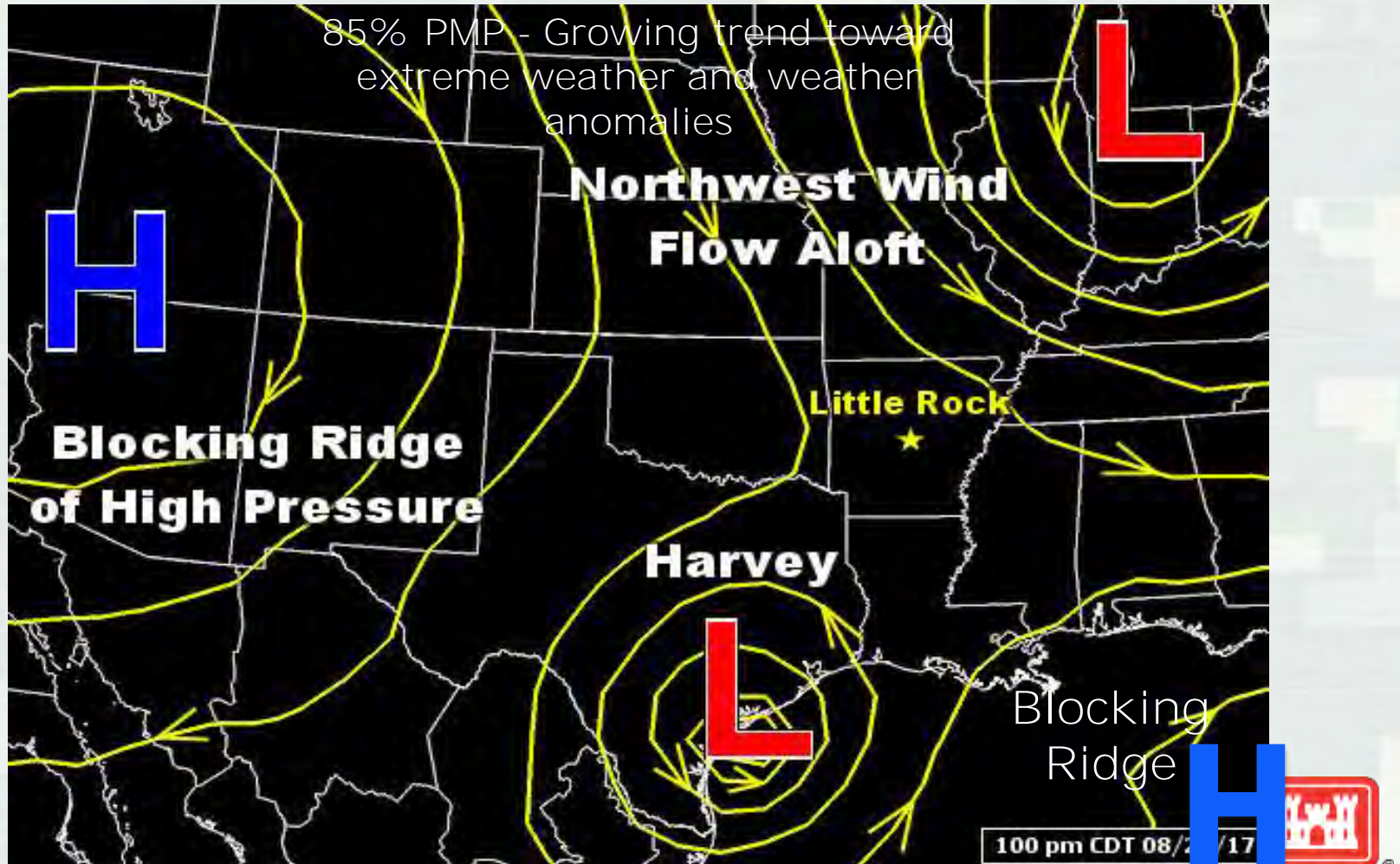
Hurricane Harvey Storm

Could Harvey Happen in DFW?

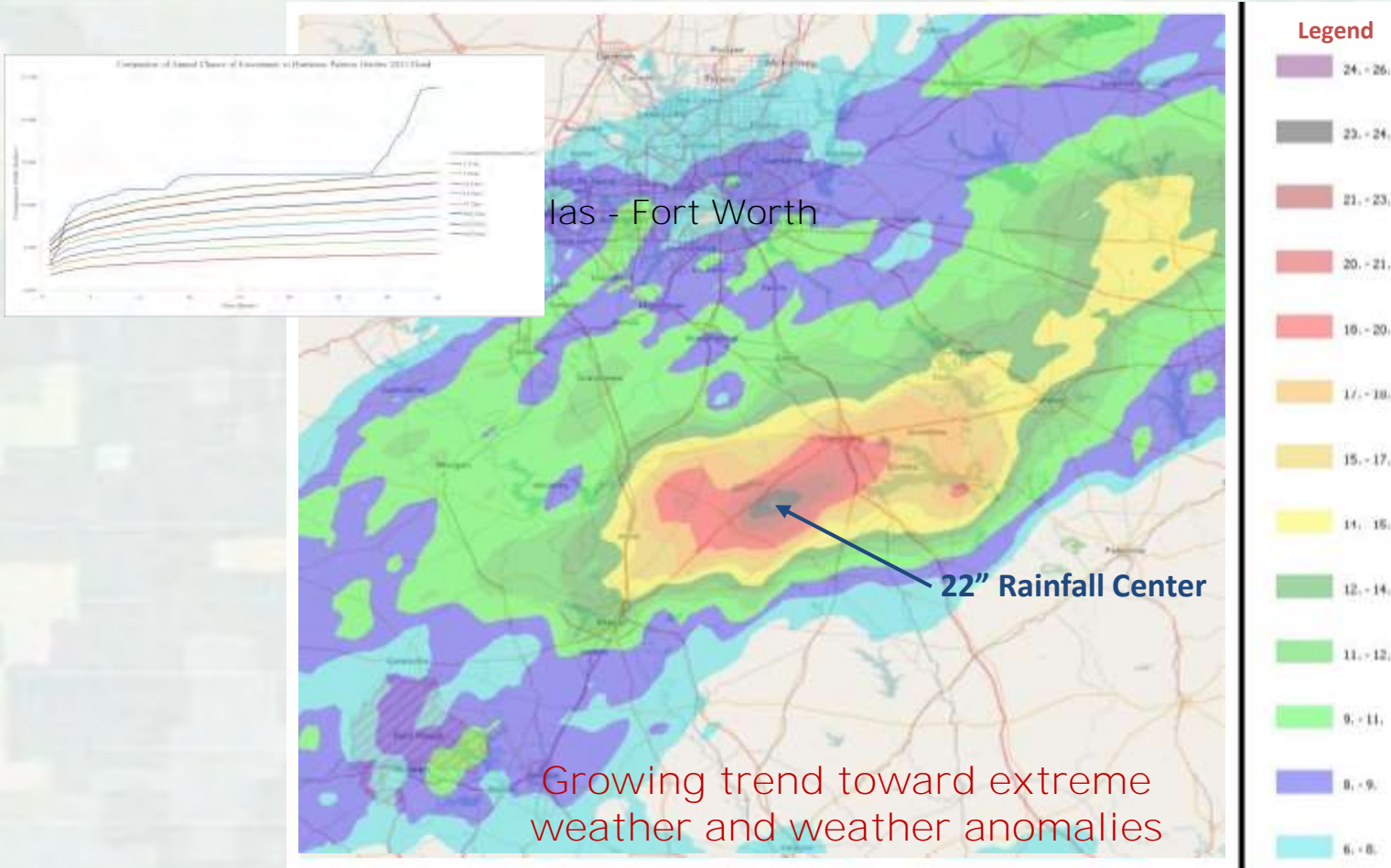
- Rainfall totals up to 60”
- Approaching or exceeding what scientist believed was the maximum amounts of rainfall possible!
- 23,000 + mi²
(CT, RI, DE, NJ)
- Largest storm in continental US history
- OFF THE CHARTS!



Harvey Weather Patterns



Tropical Storm Patricia - Corsican, TX – October 2015



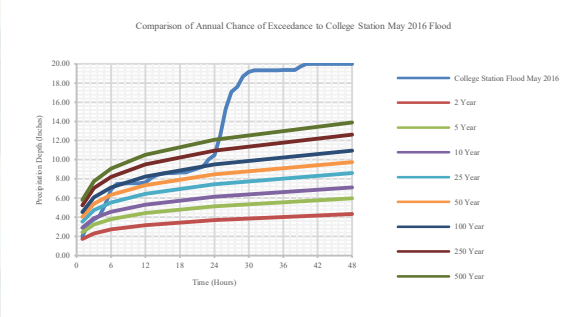
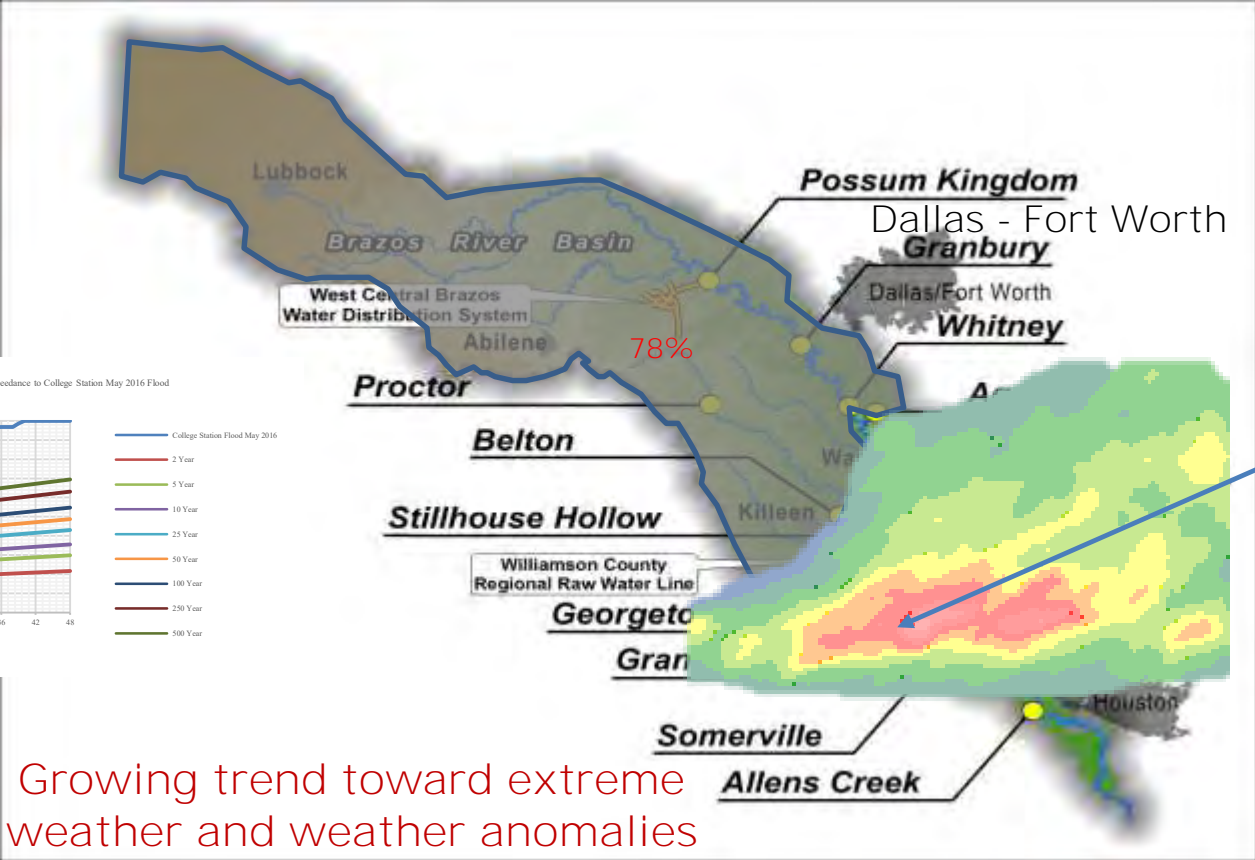
las - Fort Worth

22" Rainfall Center

Growing trend toward extreme weather and weather anomalies



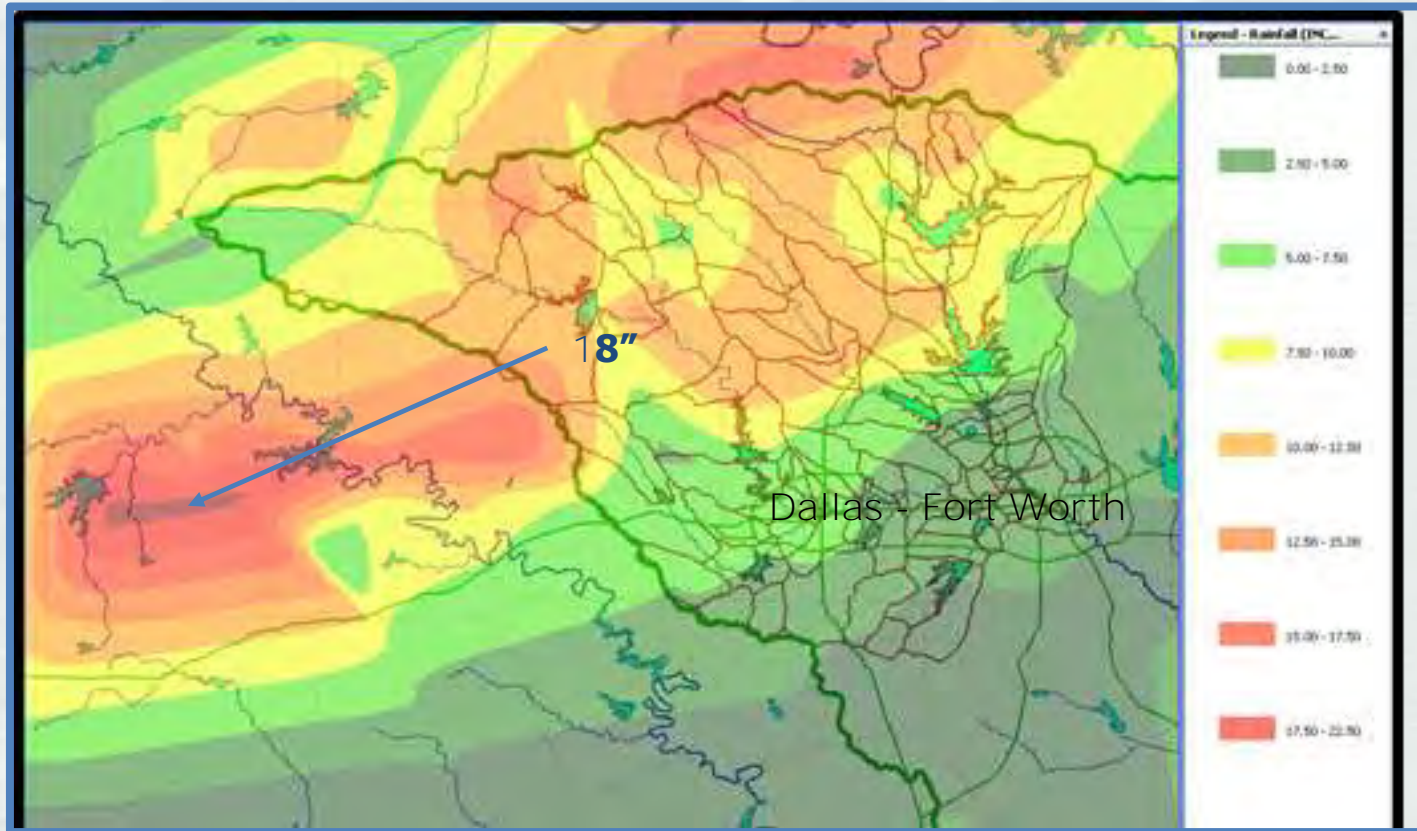
Brenham Storm, May 26-27, 2016 (Not Tropical)



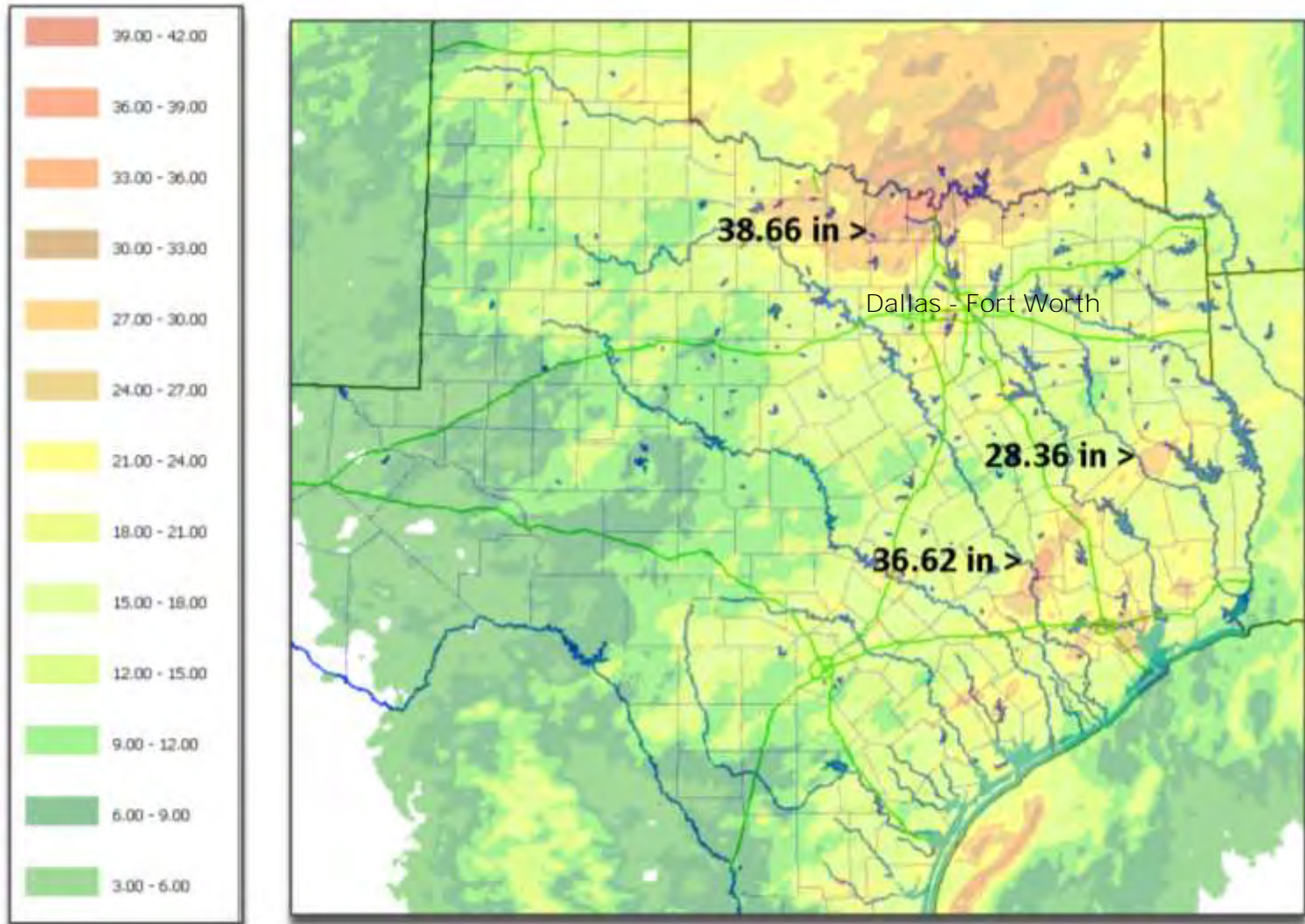
Growing trend toward extreme weather and weather anomalies



Tropical Storm Norma, Clyde, TX – October, 1981

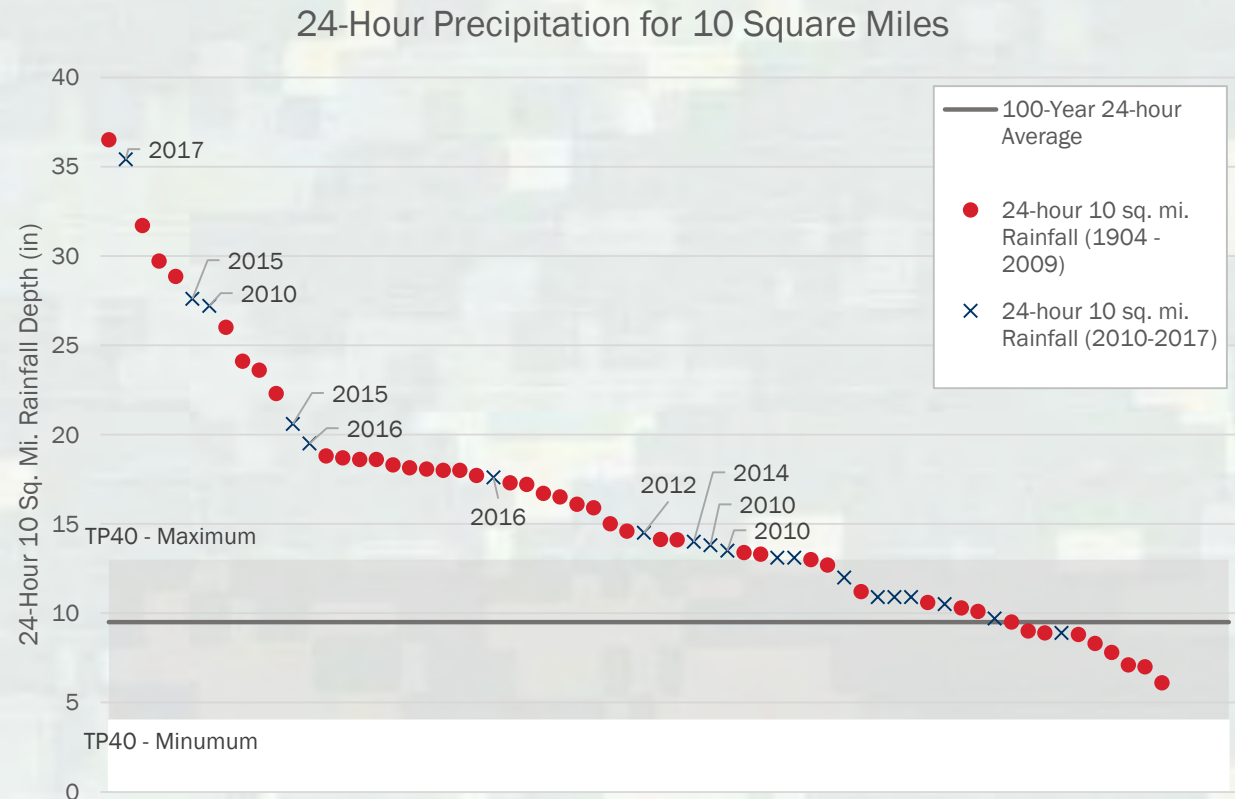


Central and East Texas, May-June 2015

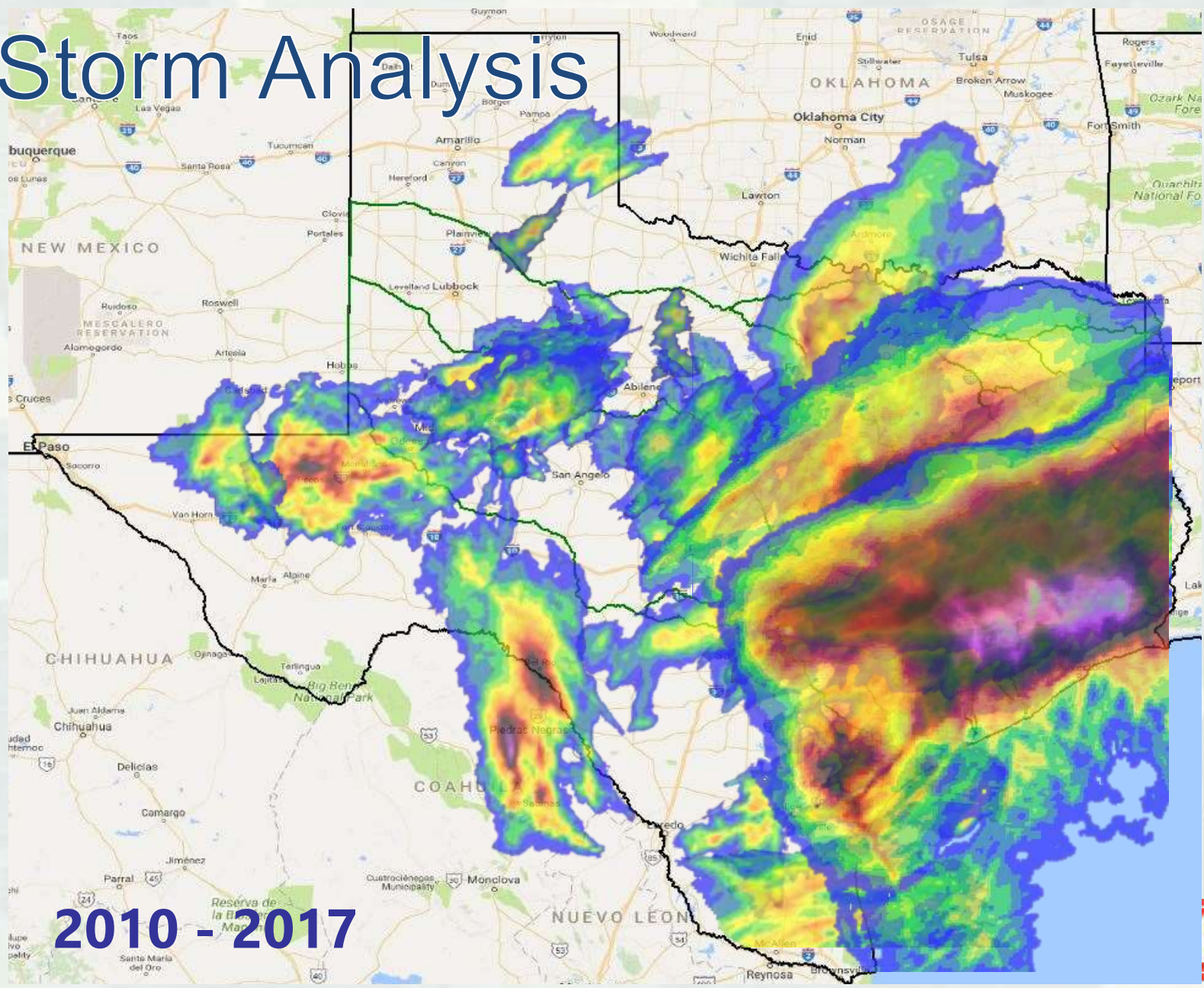


Why InFRM - Storms Exceeding Infrastructure and NFIP Standards

- Regional observed storms
 - ▶ USACE extreme storm database
- 24-hour rainfall for 10 mi²
- 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

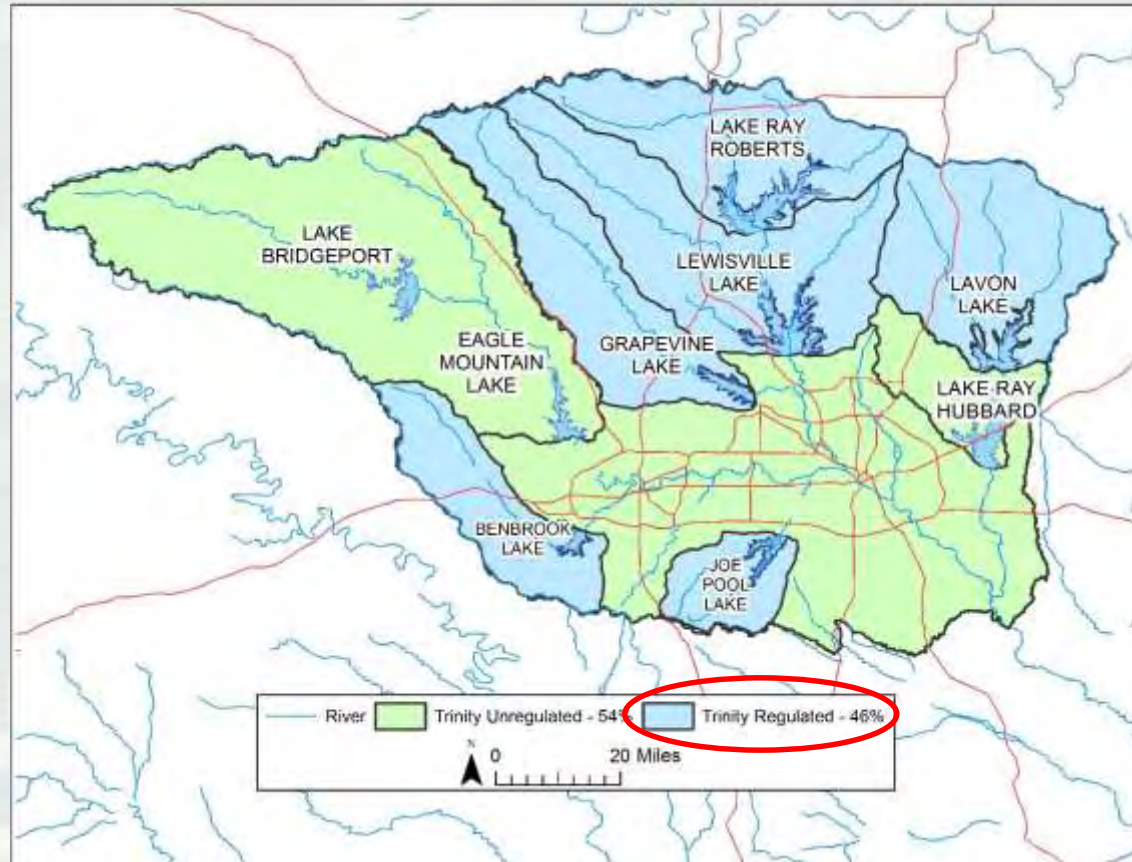


2010 - 2017



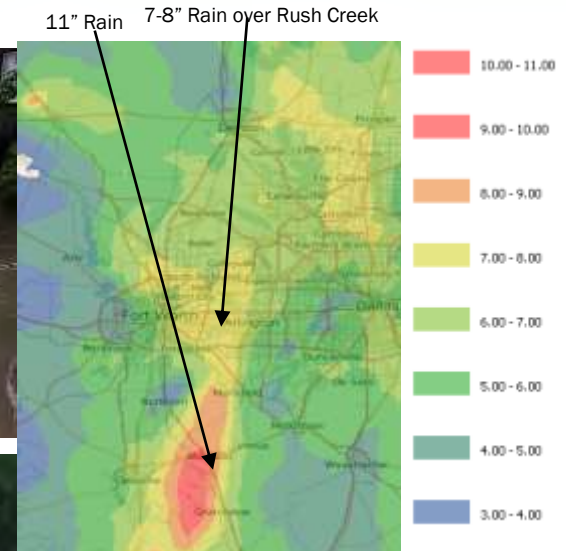
Dallas-Fort Worth - Flood Control and Water Supply System

- 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

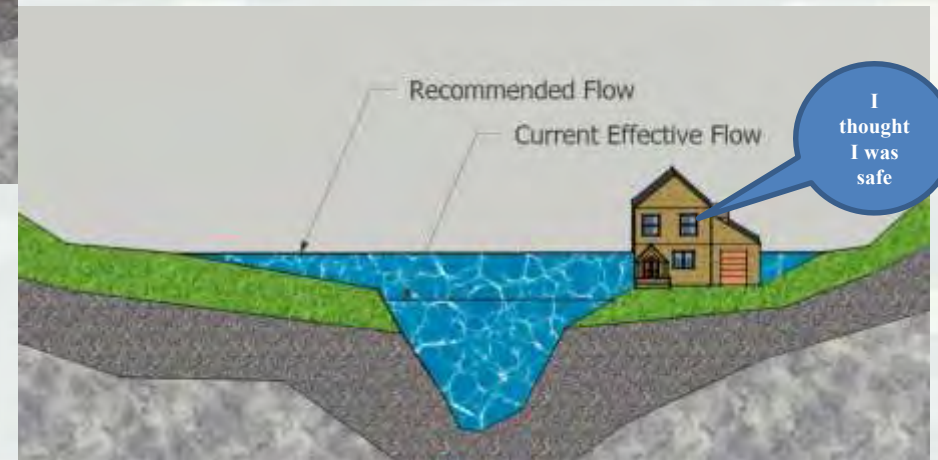
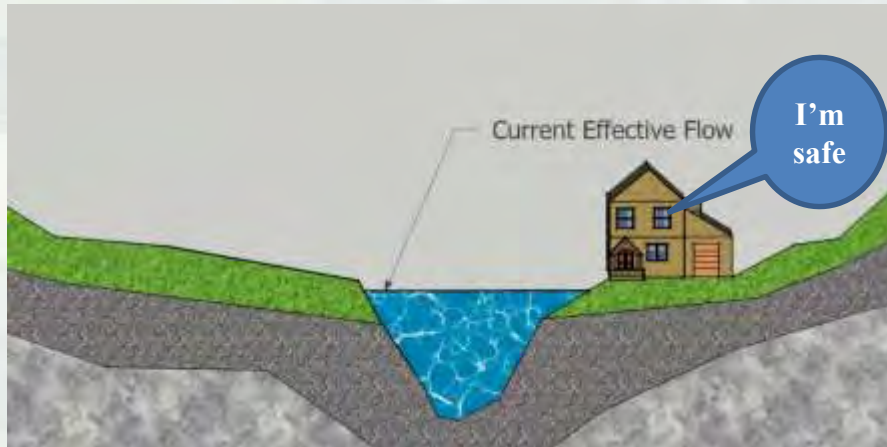


Tropical Storm Hermine – Arlington, Texas September 2010

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



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?

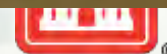


News Clips – Recent Storm Events



BUILDING STRONG®

News Clips – Recent Storm Events



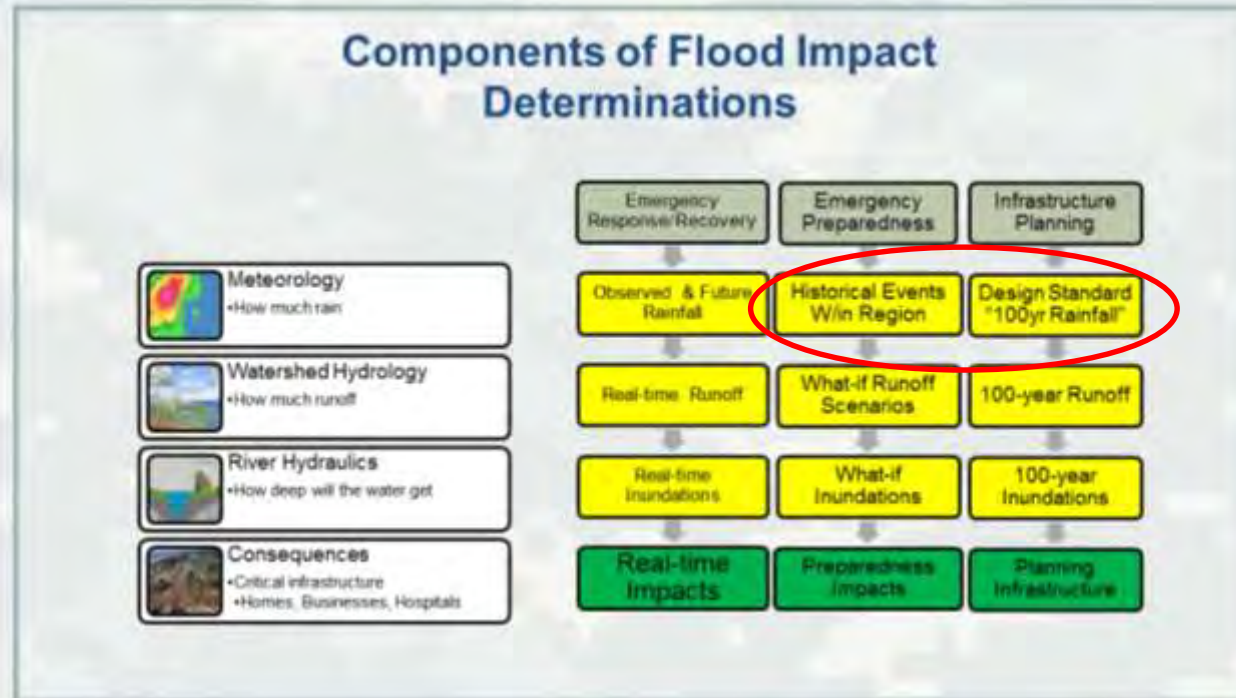
BUILDING STRONG®

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



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



Why does Texas need NOAA Atlas 14?

Why NOAA Atlas 14?

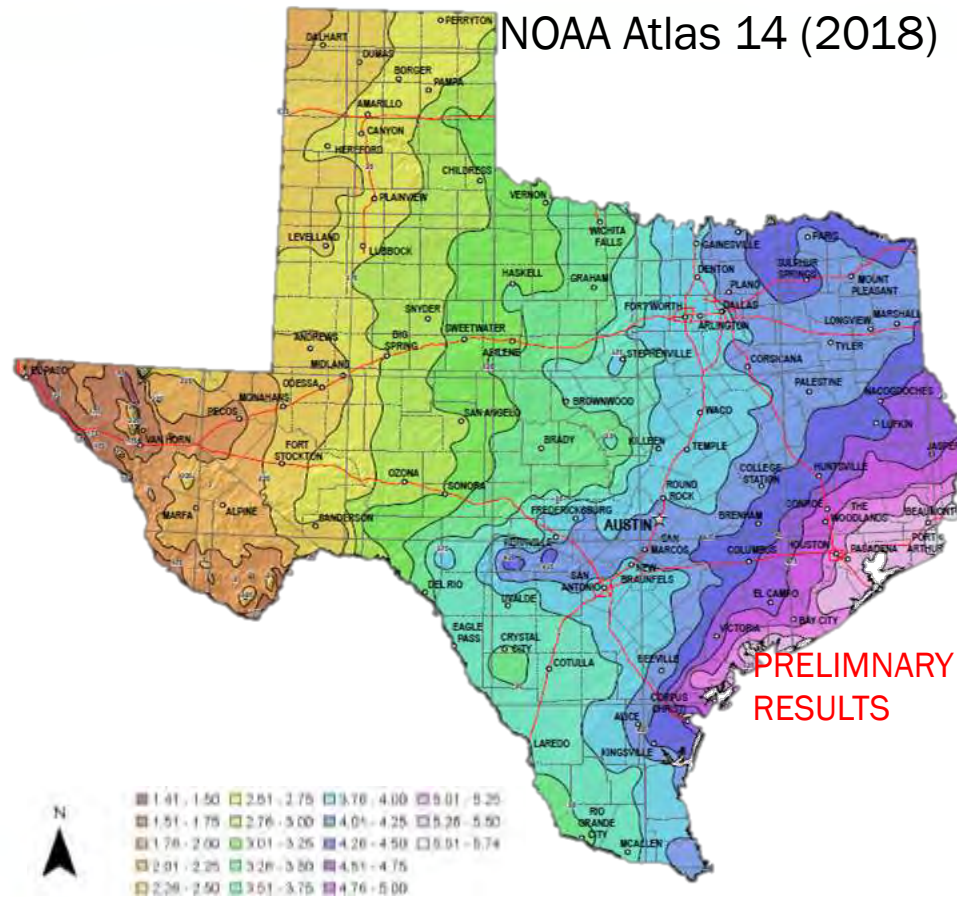
- Today's USA de-facto national standards
- Endorsed by federal water agencies
- Current products are outdated
- Wider range of duration and return intervals
- Modern Web-based data access platform
- More stations – better technology
- More years of observations
- Improved statistical techniques

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

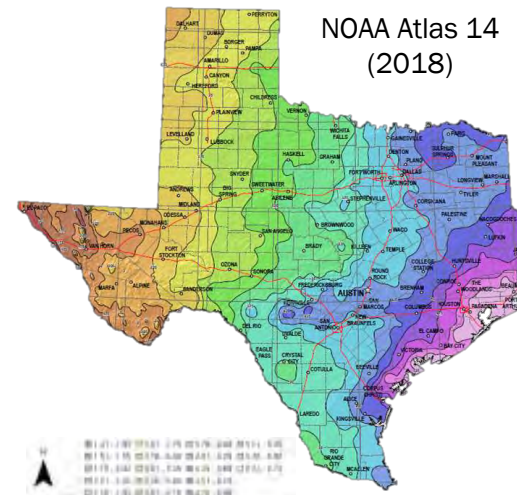


NOAA Atlas 14 - Access

- 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

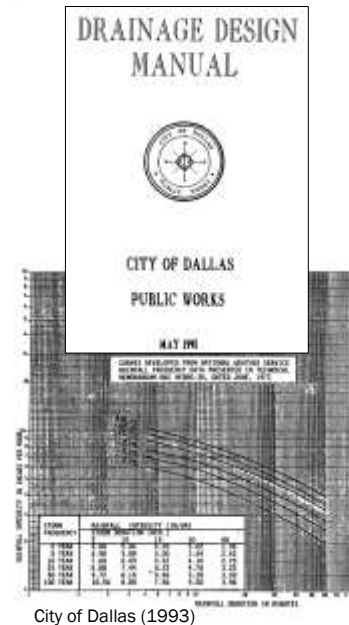
FDI-based precipitation frequency estimates with 50% confidence intervals for inches

Duration	1	2	5	10	25	50	100	200	500
1 Year	0.80	0.98	1.12	1.25	1.38	1.50	1.62	1.75	1.88
2 Year	0.85	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10
5 Year	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
10 Year	1.15	1.45	1.75	2.10	2.40	2.70	3.00	3.30	3.60
25 Year	1.40	1.80	2.20	2.60	3.00	3.40	3.80	4.20	4.60
50 Year	1.65	2.15	2.60	3.10	3.60	4.10	4.60	5.10	5.60
100 Year	1.90	2.50	3.00	3.60	4.20	4.80	5.40	6.00	6.60
200 Year	2.15	2.85	3.40	4.10	4.80	5.50	6.20	6.90	7.60
500 Year	2.60	3.40	4.10	4.90	5.70	6.50	7.30	8.10	8.90
1000 Year	2.97	3.85	4.60	5.50	6.40	7.30	8.20	9.10	10.00



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)

Station	Channel	Flow	Velocity	Depth	Width	Area	Perimeter	Hydraulic Radius	Velocity	Discharge
1+00	100	100	1.00	1.00	100	100	100	1.00	1.00	100
2+00	200	200	2.00	2.00	200	200	200	2.00	2.00	200
3+00	300	300	3.00	3.00	300	300	300	3.00	3.00	300
4+00	400	400	4.00	4.00	400	400	400	4.00	4.00	400
5+00	500	500	5.00	5.00	500	500	500	5.00	5.00	500
6+00	600	600	6.00	6.00	600	600	600	6.00	6.00	600
7+00	700	700	7.00	7.00	700	700	700	7.00	7.00	700
8+00	800	800	8.00	8.00	800	800	800	8.00	8.00	800
9+00	900	900	9.00	9.00	900	900	900	9.00	9.00	900
10+00	1000	1000	10.00	10.00	1000	1000	1000	10.00	10.00	1000

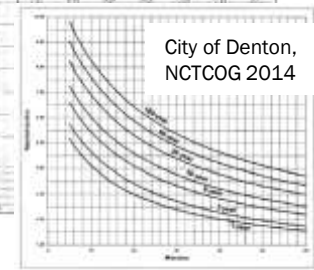
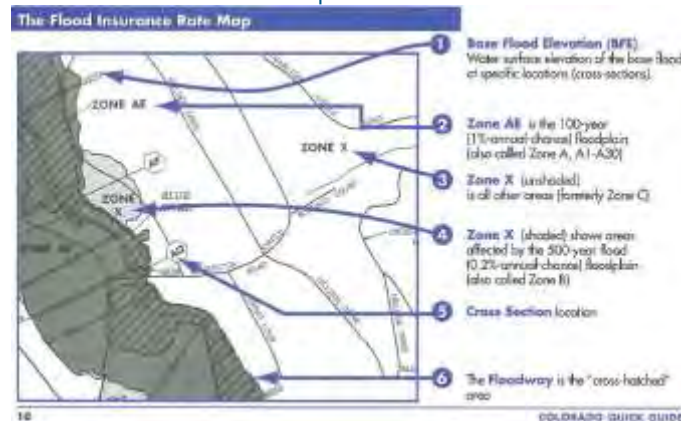
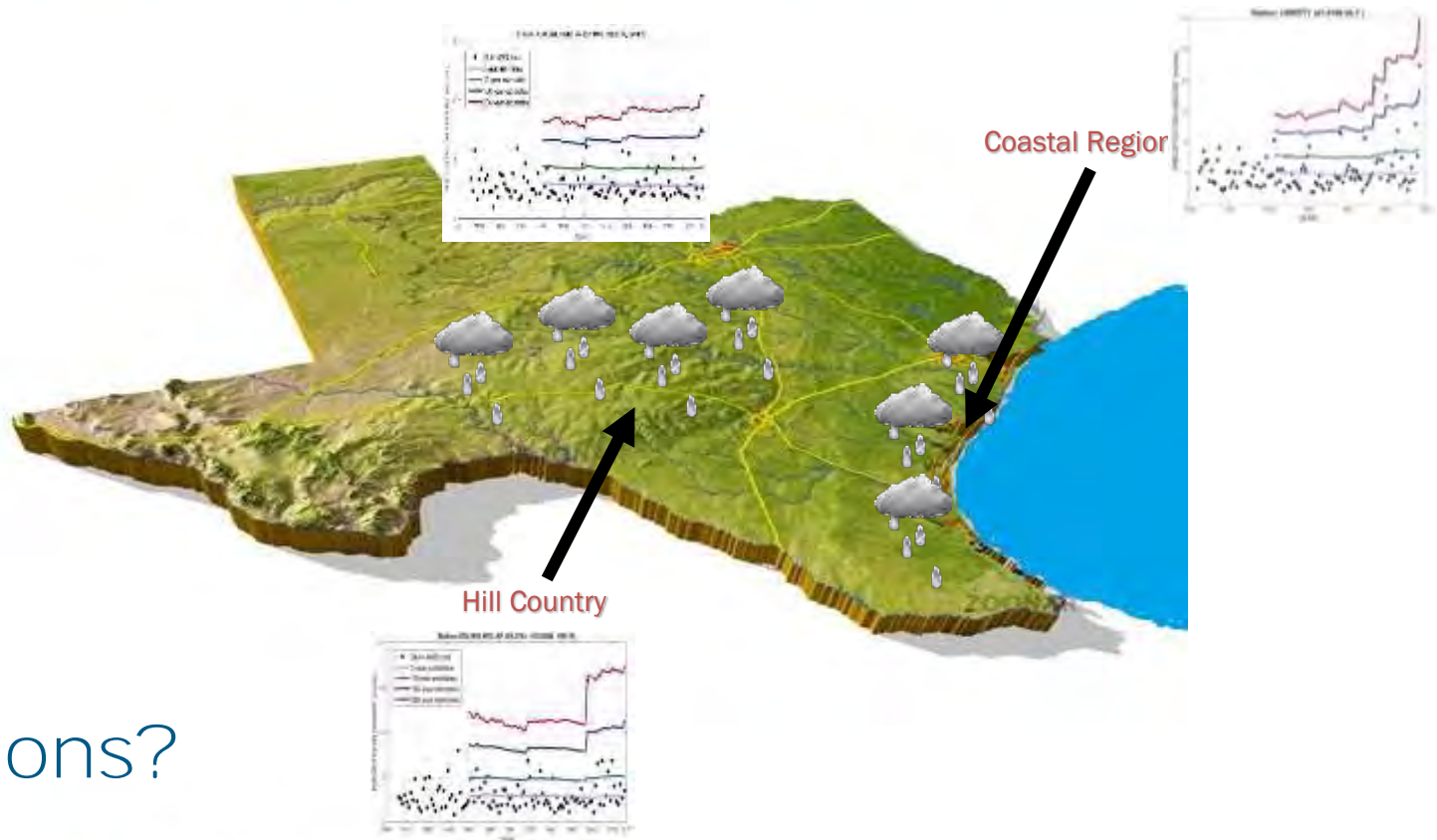


Figure 1.2. Example IDF Curve (Dallas County, Texas)

NFIP Map



NOAA Atlas 14 Precipitation Changes



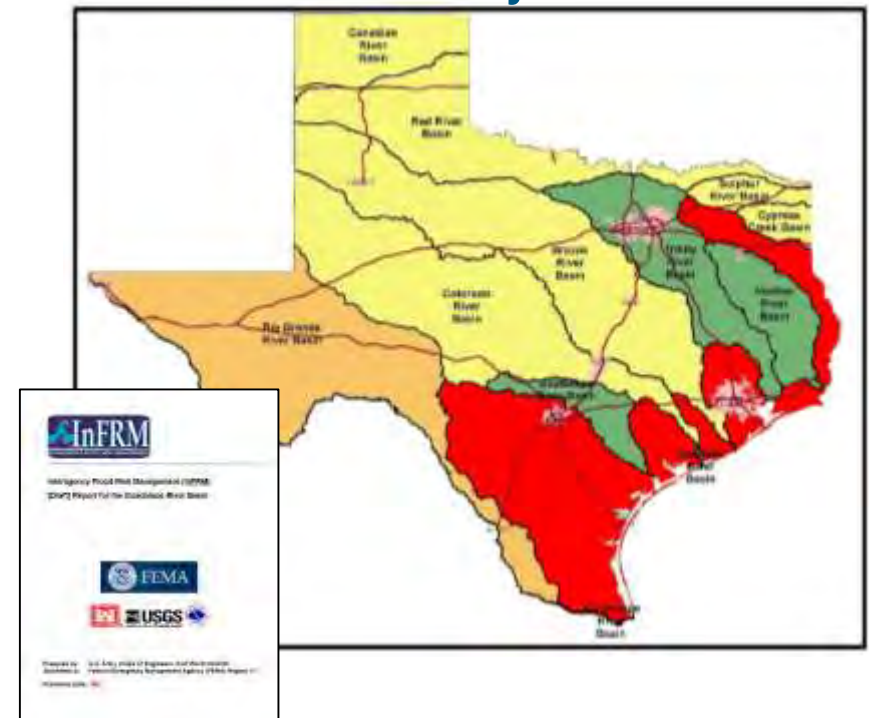
Questions?

InFRM Watershed Hydrology Assessments

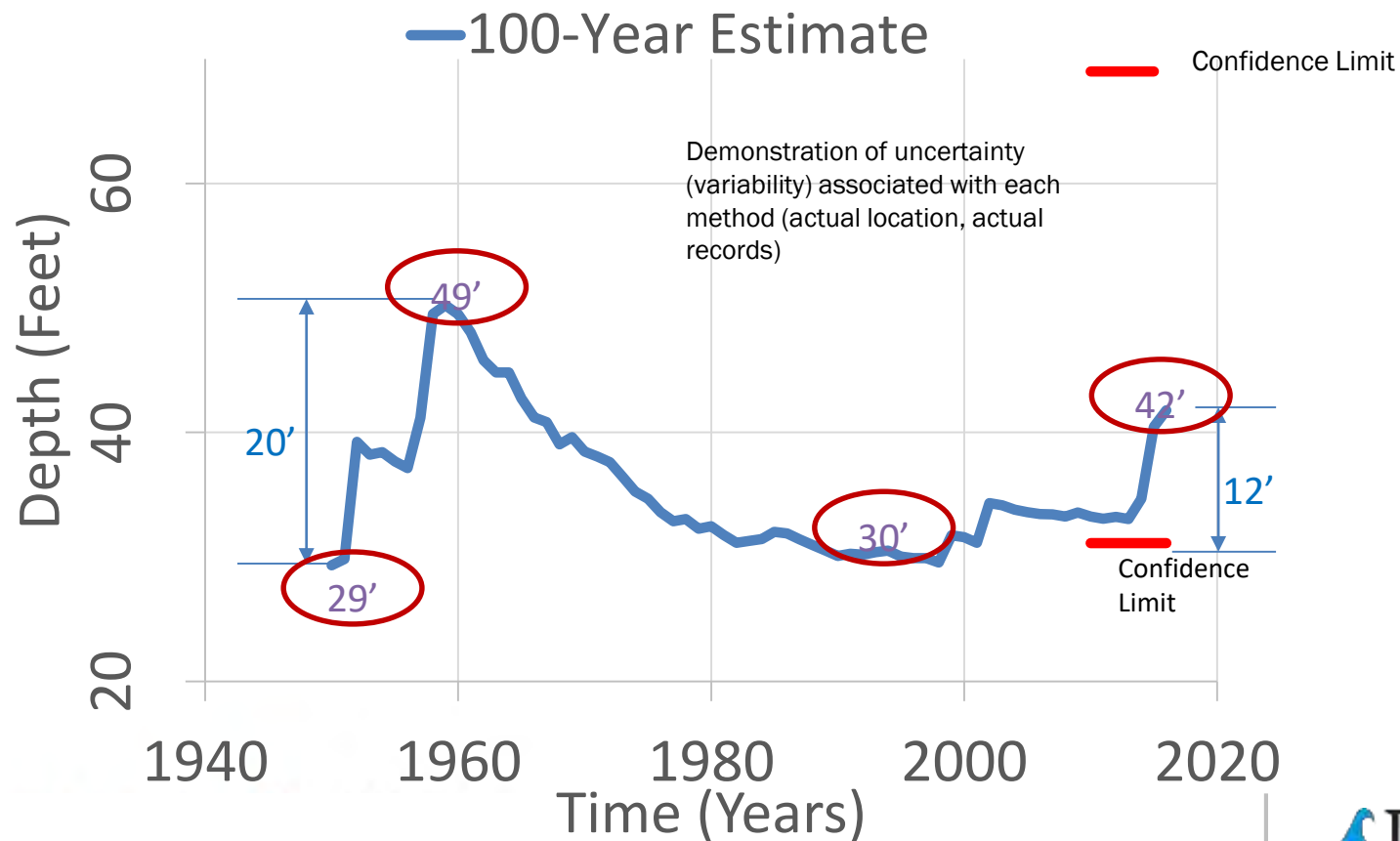
sponsored by FEMA Region 6

- **Watershed level vs. community level**
- **Current Basins**
 - Guadalupe
 - Trinity
 - Neches
 - Colorado
- **Provides**
 - Frequency Flows for Design & NFIP 2-yr, 5-yr, 10-yr, 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**

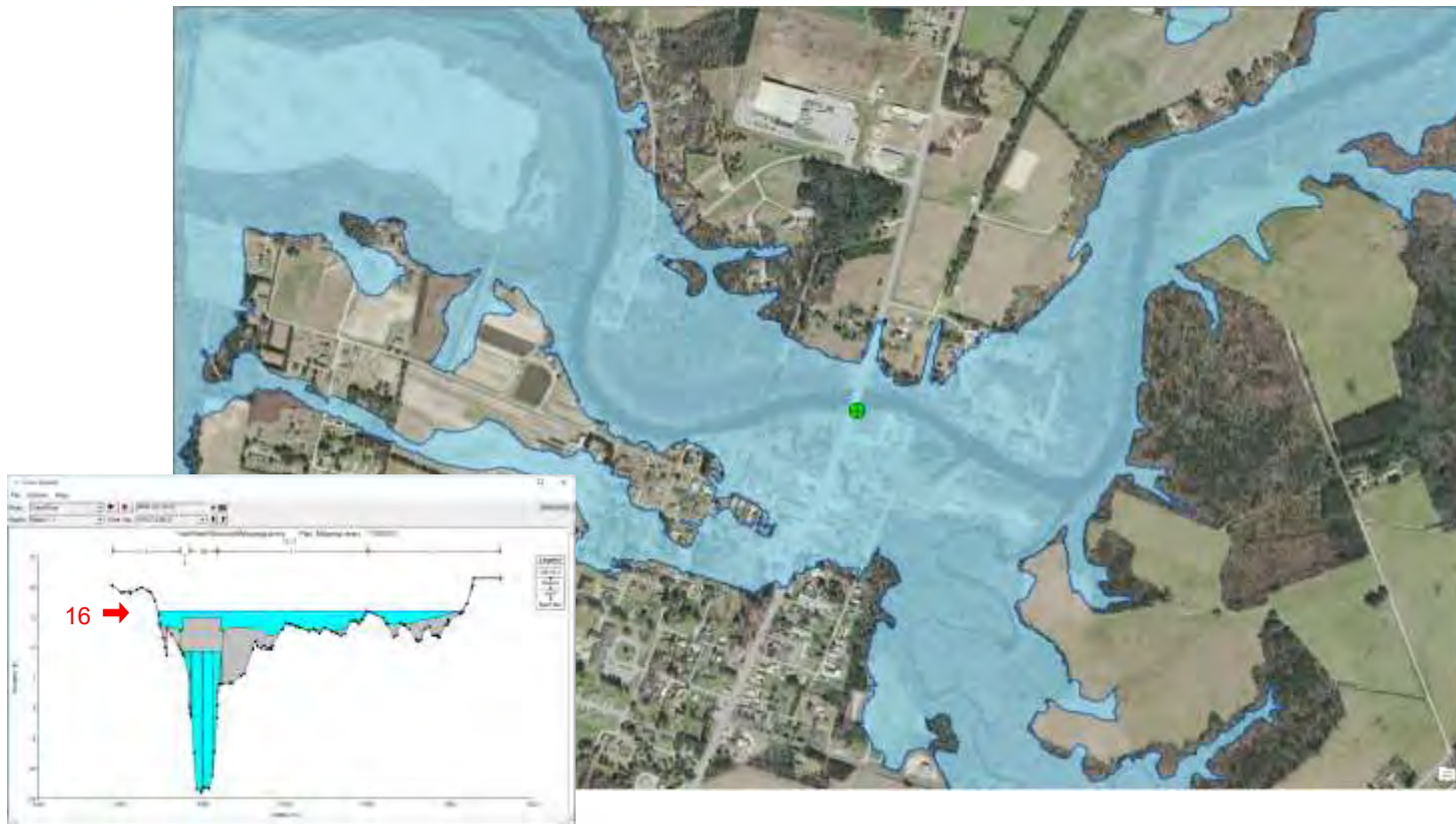
What is the 100-year flood?



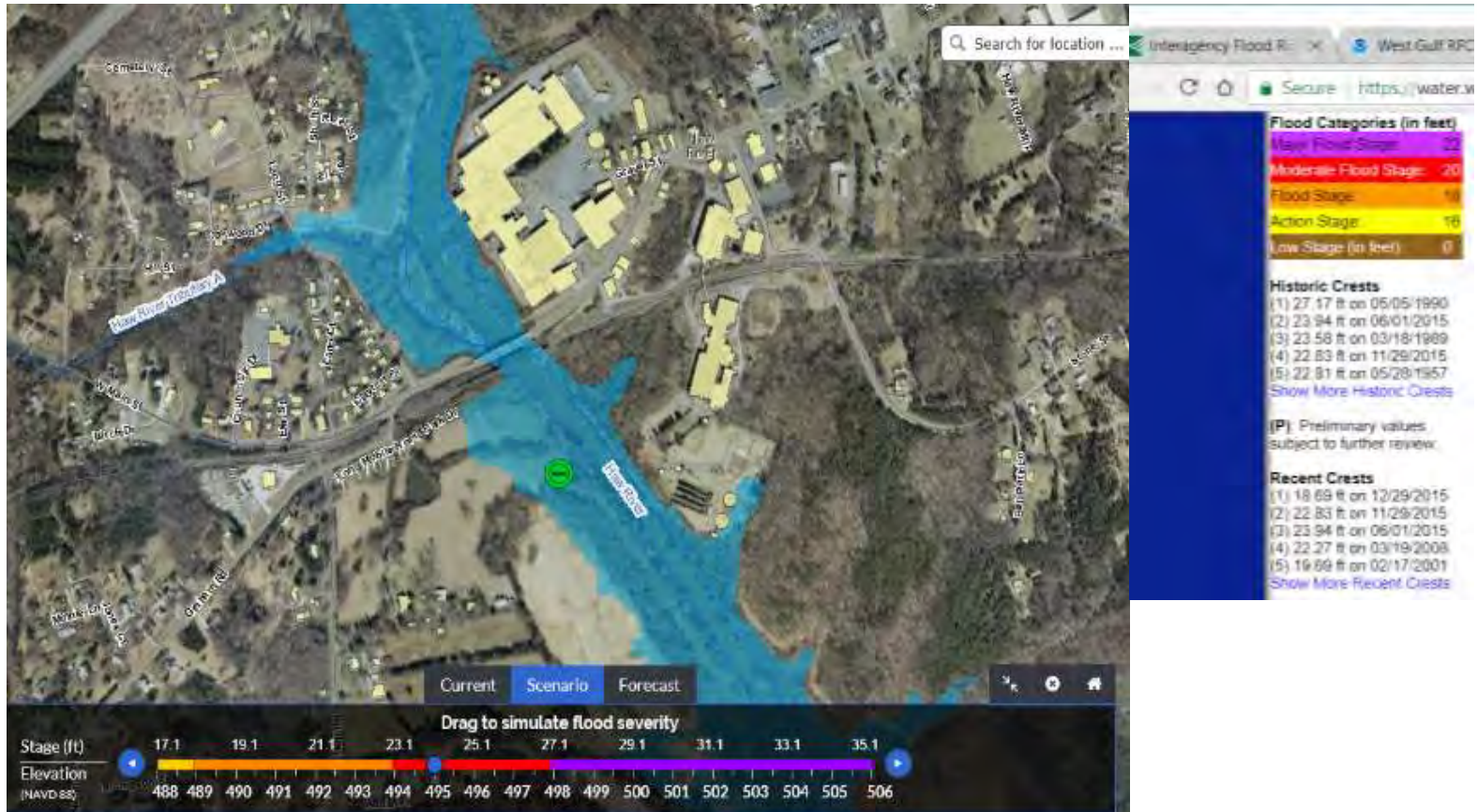
Why WHA's - Uncertainty Associated with Single Method Approach



InFRM – Inundation Map Server (What You Will See)

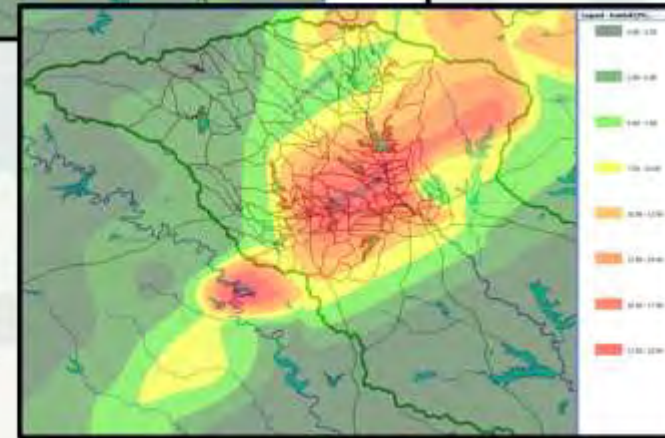
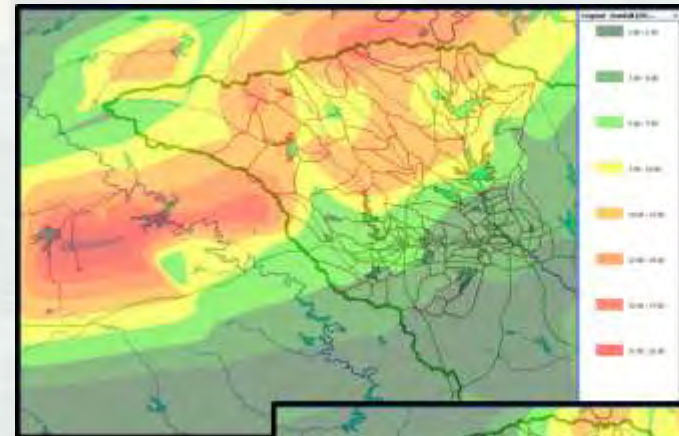


InFRM – Web Based Mitigation Planning



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?

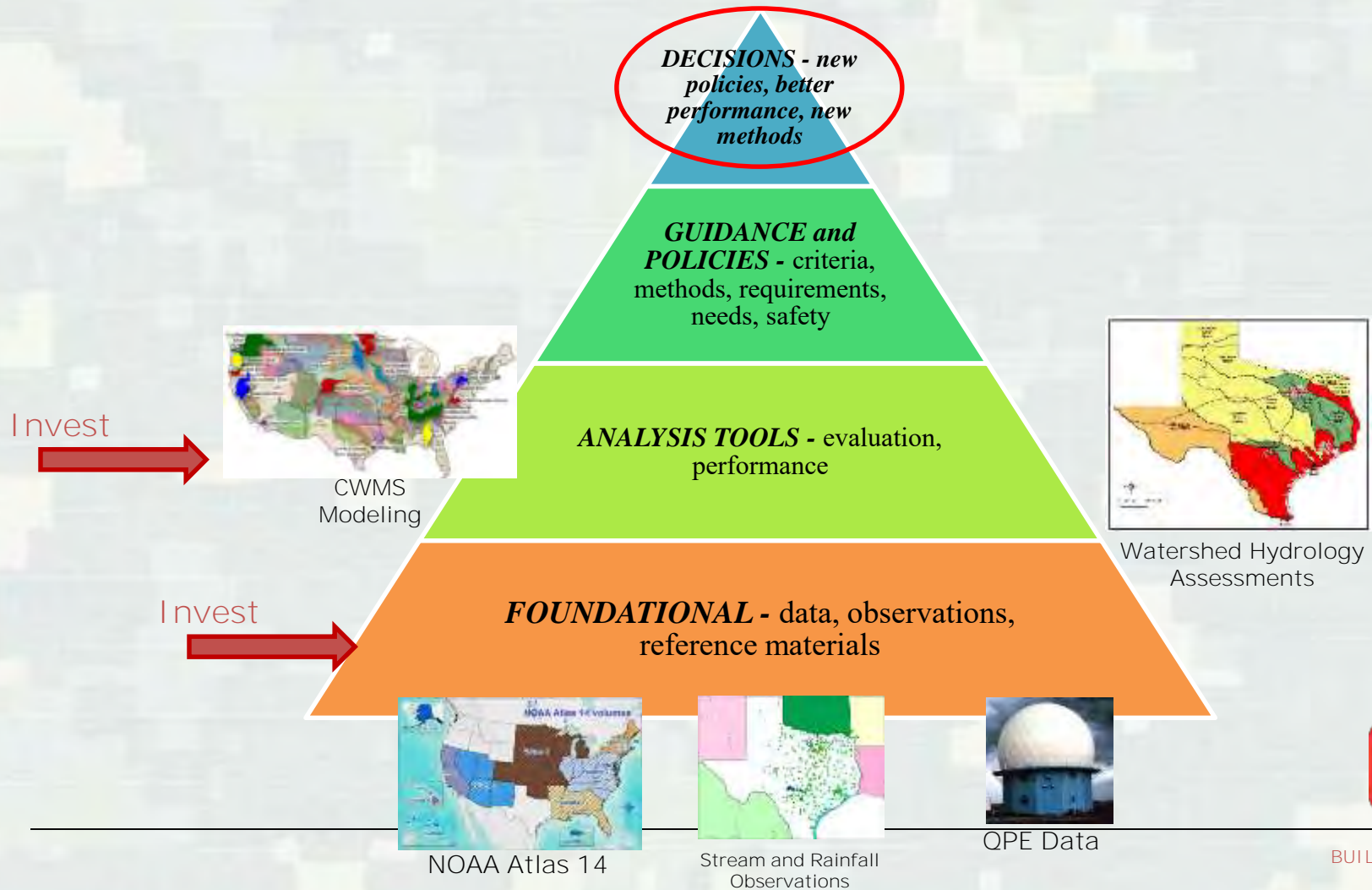
- Consider adoption of higher standards - Freeboard
 - ▶ 2', 3', 4' or more above the 1% exceedance or 100-year level
- Adopt stormwater management policies (decrease risk)
- COG, TFMA and USACE
 - ▶ Promoting higher standards
 - ▶ Promoting stormwater management policies
- Why
 - ▶ Decrease risk and 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



BUILDING STRONG®

RiskMAP
Increasing Resilience Together

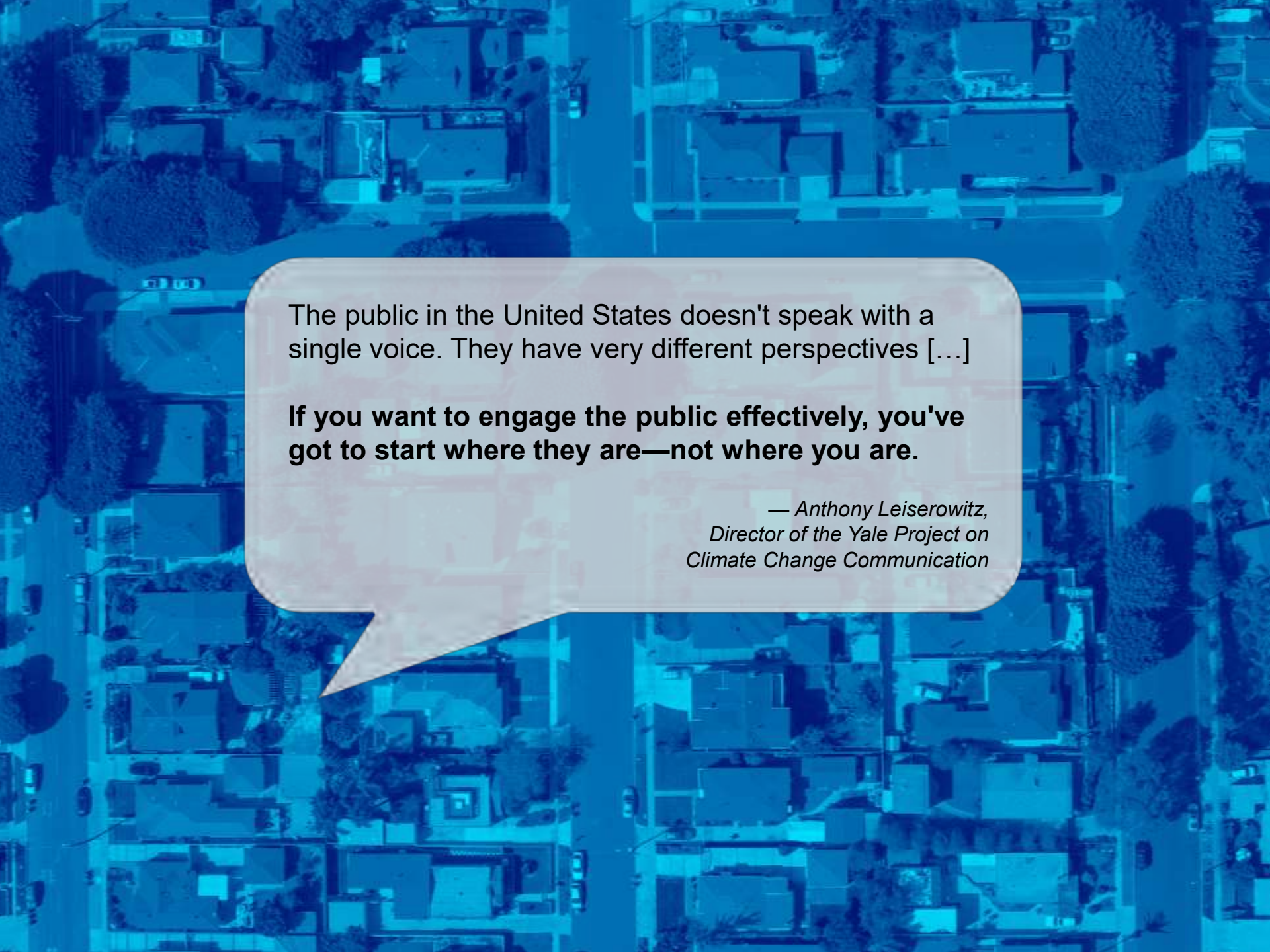


Visualizing Risk & Resilience

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

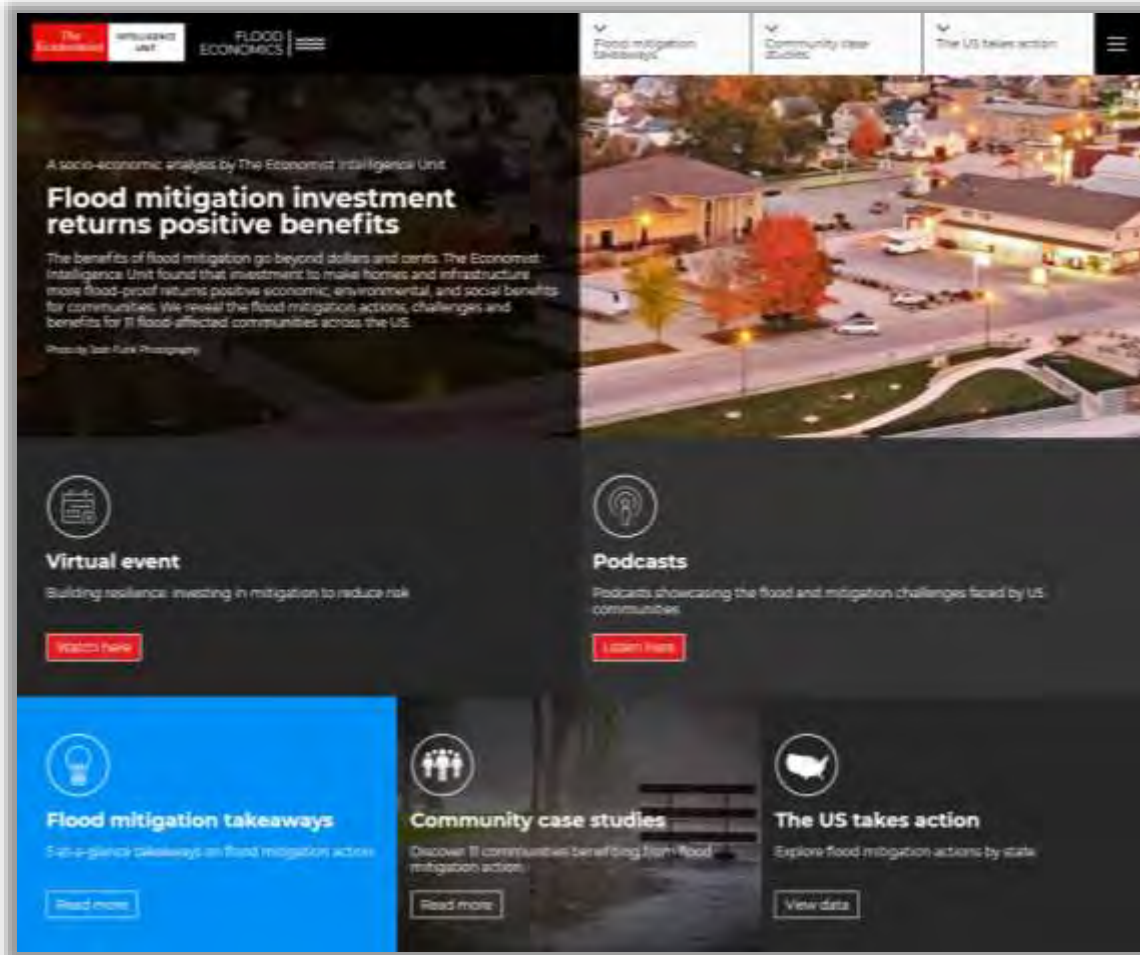


Resilience Requires Behavior Change



FEMA

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.



FEMA

Audiences

▶ Nontechnical Decision-makers

- Mayors
- Local council members

▶ Community Leaders

- Association presidents
- Community advocates

▶ Technical Experts

- Floodplain Administrators
- Planners
- Hazard Mitigation Staff
- Advisors



FEMA

Case Studies



SHARE

Profiles of 21 communities across the US that mitigated flood risk

All communities

Filter



SHARE

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.



FEMA

Flood Economics Tools



Flood mitigation goes beyond dollars and cents

The benefits of mitigation cannot be overstated. Community leaders are driven to take action in order to revitalize neighborhoods, improve public spaces, enhance public safety and boost the community's competitiveness.



Avoided property losses
 Avoided business & education interruption
 Ecosystem benefits
 Avoided loss of critical infrastructure

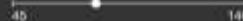


Revitalized neighborhoods
 Improved public spaces
 Enhanced public safety
 Increased competitiveness for the community

State summary for Texas

Average return on investment ⓘ

81%

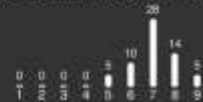


Average benefit-cost ratio ⓘ

1.81



CRS communities by class ⓘ



Number of projects ⓘ

753

1996-2016

Total investment ⓘ

\$1.4b

1996-2016

Total benefits ⓘ

\$2.0b

1996-2016

Source: FEMA Hazard Mitigation Assistance Grants database

Flood mitigation projects, 1996-2016

Total investment and number of projects by type of project

Cumulative

Individual year

1996 - 2016

1996



2016

Planning and Education

Mitigation planning	163 projects	\$23,761,169 invested
Public awareness and education	23 projects	\$6,389,612 invested
Hazard identification and risk assessment		

Building-related

Buyback (acquisitions and relocations)	177 projects	\$109,536,809 invested
Elevations	9 projects	\$47,022,611 invested
Floodproofing (wet or dry)	15 projects	\$12,905,338 invested

Experiential Learning and Behavior Change



IMMERSED

A VR EXPERIENCE ABOUT FLOOD & RESILIENCE

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



FEMA

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



FEMA

Telling it in Their Own Words



FEMA

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
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Increasing Resilience Together



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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

- 
- A dimly lit room, possibly a meeting or conference room, with several people seated at tables. The view is from behind the audience, looking towards a screen or presentation area. The room has a drop ceiling with recessed lighting and air vents. The overall atmosphere is professional and focused.
- Discovery Meetings
 - Resilience Meetings
 - Hazard Mitigation Planning Meetings



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From the Provider

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.

▲	NAME	TIME	RELEASED	DESCRIPTION		POPULARITY	PRICE
1	Making "Cents" of Disasters	21 min	May 15, 2018	Did you know more than 60% of Am... <i>i</i>			Get ▾
2	Immersed in Mitigation	12 min	May 8, 2018	Immersed is a Virtual Reality experie... <i>i</i>			Get ▾
3	FEMA Administrator's Strategic Plan	29 min	Apr 13, 2018	A conversation with Administrator B... <i>i</i>			Get ▾
4	1997 Floods: East Grand Forks Minnesota, From Tragedy ...	16 min	Apr 13, 2018	For many Minnesotans, the spring o... <i>i</i>			Get ▾
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6	Earthquake Preparedness Podcast	17 min	Feb 22, 2018	Cheikh Koma of FEMA and Jeff Bri... <i>i</i>			Get ▾

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