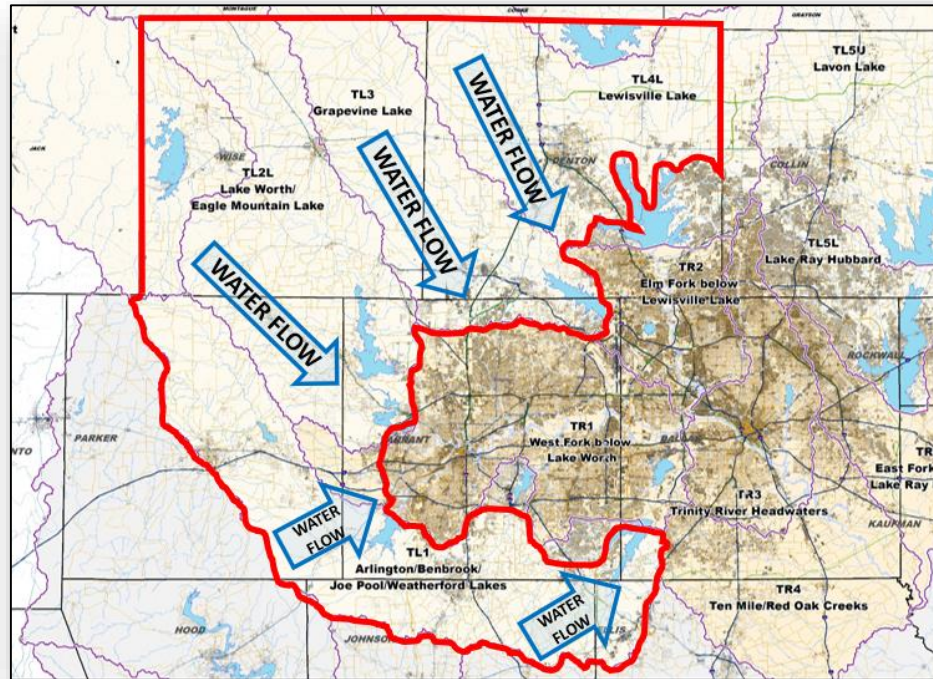


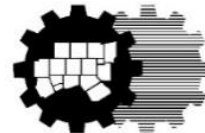
INTEGRATED TRANSPORTATION AND STORMWATER MANAGEMENT PROJECT

PARTNER DISCUSSION



Edith Marvin, P.E., Director of Environment & Development, NCTCOG
Jerry Cotter P.E., Chief Water Resources, USACE, Fort Worth District
Michael Morris, P.E., Director of Transportation, NCTCOG

March 18, 2019



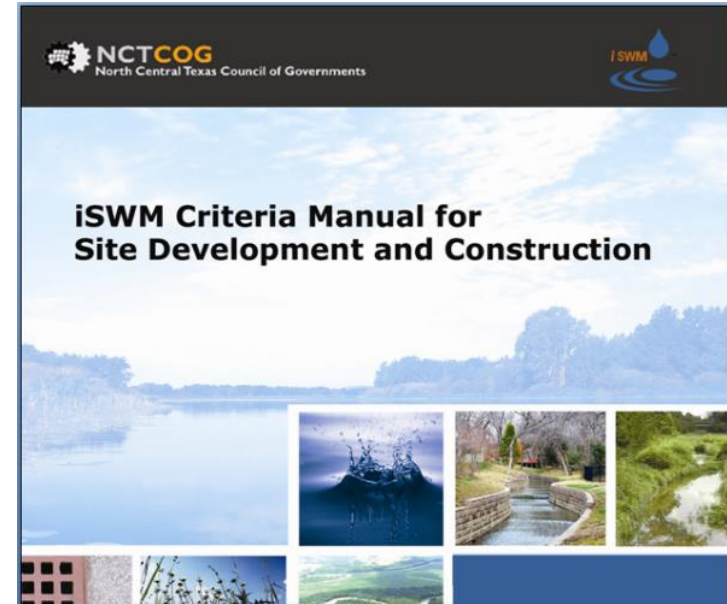
North Central Texas
Council of Governments

EXISTING NORTH CENTRAL TEXAS WATERSHED MANAGEMENT TOOL



iSWM Resources

- Technical Manual - Criteria Manual



iSWM Criteria Manual
(For Adoption)

iSWM Technical Manual
(For Reference)

iSWM Program

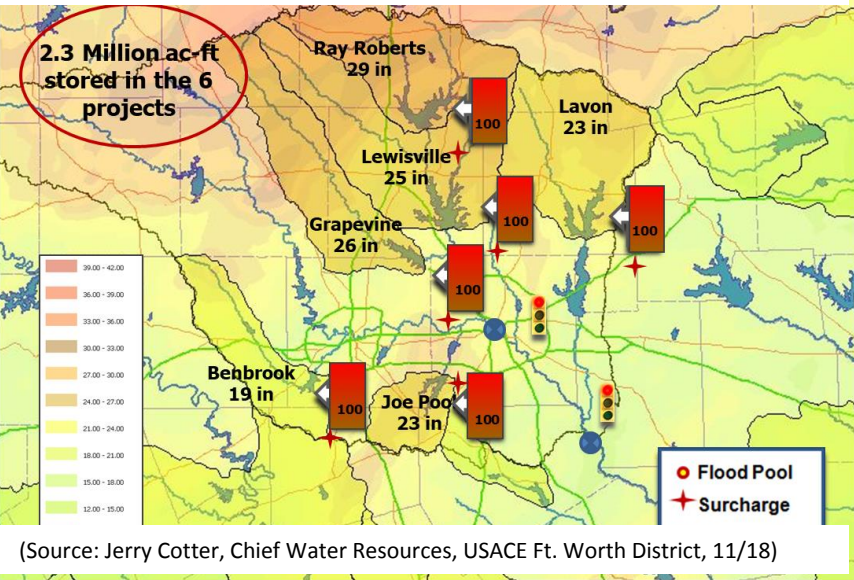
iSWM Tools
(For Reference)

iSWM Program Guidance
(For Reference)

EXISTING TRINITY RIVER CORRIDOR PROGRAM

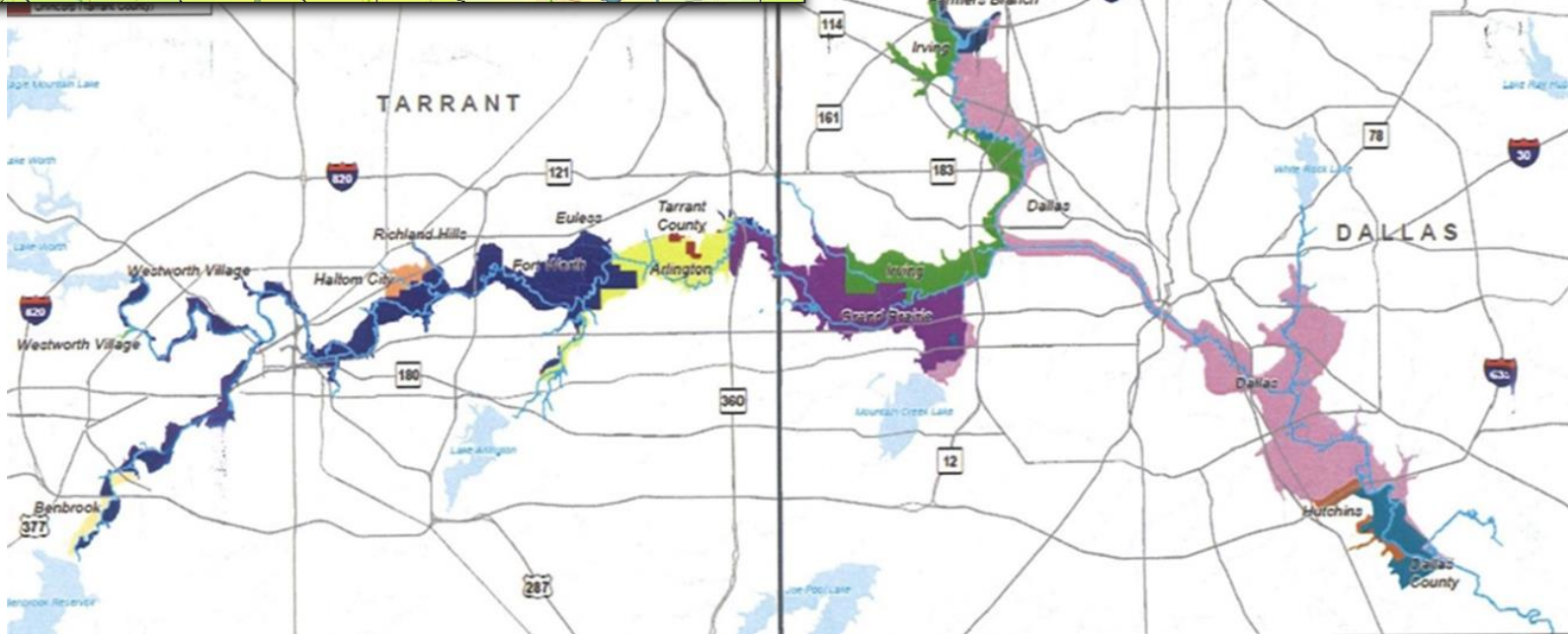
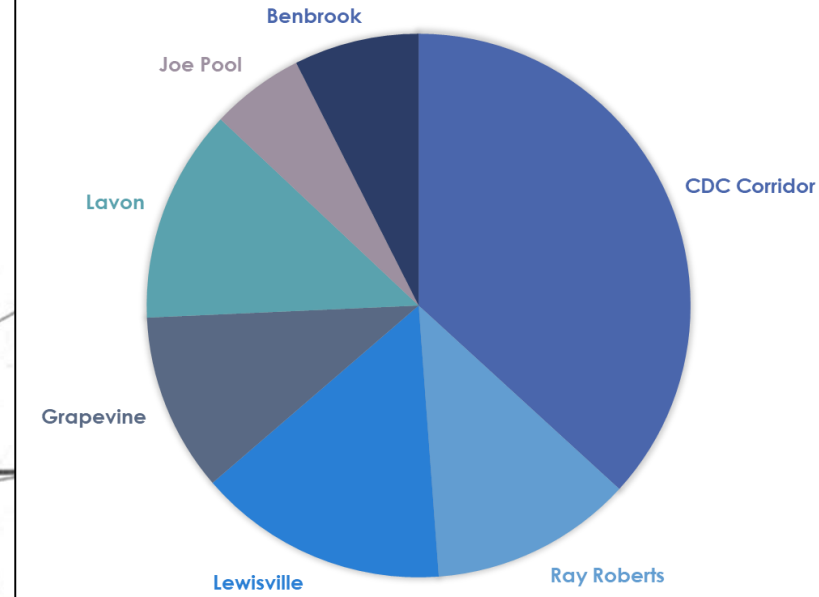
May – June 2015 Flooding

2.3 Million ac-ft stored in the 6 projects



(Source: Jerry Cotter, Chief Water Resources, USACE Ft. Worth District, 11/18)

ACTIVE FLOOD STORAGE



Flooding continues to be a challenge in North Texas

Threats: Increased flooding and safety risks; cost of infrastructure, stormwater, environmental restoration

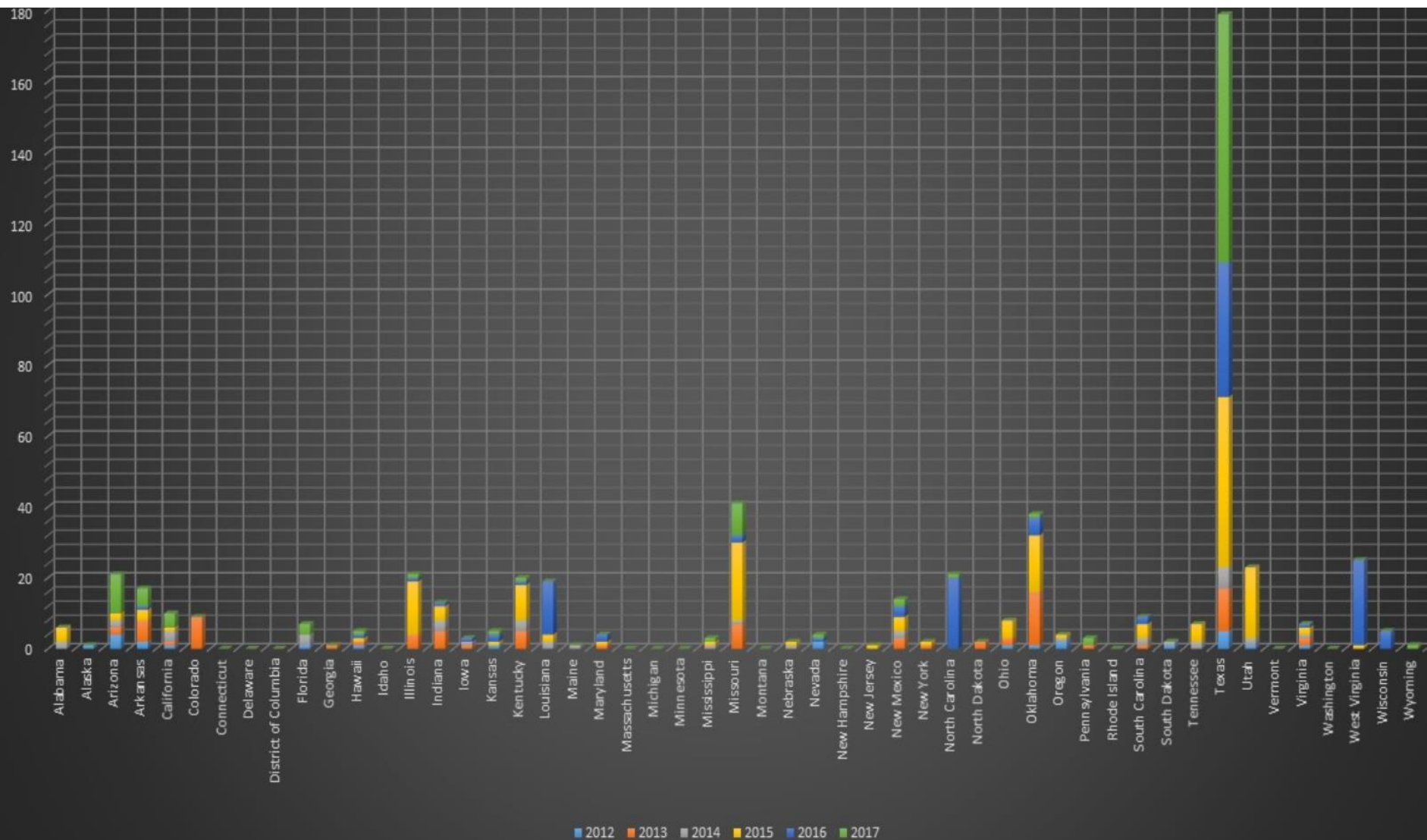
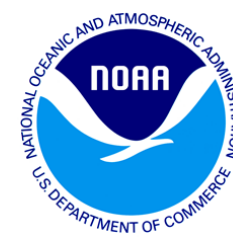


DeSoto Fire Rescue

Solution: Innovative partnerships and integrated infrastructure

Perspective: 5 year tally of flood fatalities

Texas far outpaces all of the states in flood related fatalities



(Photo by Jason Cooley, Jason@texasstormchasers.com),
November 2018 TFMA presentation



INVESTIGATES

119 million gallons of sewage overflow in DFW, by the numbers

A closer look at sewage overflows here and across Texas.

Author: Ryan Osborne, Charlotte Huffman
Published: 7:00 PM CST February 21, 2019
Updated: 10:13 PM CST February 22, 2019

In 2018, more than 119 million gallons of sewage overflowed onto the streets and lakes of Dallas-Fort Worth. That's 119,090,756 gallons, to be exact, over more than 1,700 overflow incidents.

<https://www.wfaa.com/article/news/local/investigates/119-million-gallons-of-sewage-overflow-in-dfw-by-the-numbers/287-f4de9146-1f77641e1-af03-0b48ab3311f2>

Heavy Rains Lead to Sewage Spills in Multiple North Texas Cities

Published Oct 16, 2018 at 9:10 AM – NBC5 DFW
<https://www.nbcdfw.com/weather/stories/Heavy-Rains-Lead-to-Sewage-Spills-in-Multiple-North-Texas-Cities-497679751.html>



By Steve Pickett February 23, 2018 at 7:10 pm Filed Under: flooding, Lake Estates, Lake Rockwall, Local TV, Rockwall



Parts of North Texas see flooding overnight



By FOX4News.com Staff



POSTED FEB 28 2018 10:23PM CST
UPDATED MAR 01 2018 07:35AM CST

CARROLLTON, Texas - Heavy rain flooded parts of Collin, Dallas, Denton and Tarrant counties Wednesday night.

There was a flash flood warning for those parts of the Metroplex until just after midnight. Those living in low-lying areas were encouraged to move to higher [ground](#).

Several cars got stuck in high [water](#) in the Dallas suburb of Carrollton. Firefighters were called out to rescue people in the heavily-flooded intersections near North Denton Drive and Jeanette Way as well as Countryside and North Josey Lane.

The service road on Central Expressway in Allen in Collin County was closed by flooding south of Bethany Drive. High water and debris covered the road. Highway officials had to set up barricades to keep people away.

Rain flooded an apartment complex in suburban Coppell. Viewers submitted pictures of standing water in the parking lot of the Wellington Place [Apartments](#) on MacArthur Boulevard near Sandy Lake Road. The complex has flooded before, including twice in 2015.

Homes in a new development just off Highway 380 in Princeton, east of McKinney, also flooded. Video posted on Facebook showed one family sweeping fast-moving water out of their [house](#). A creek behind the house filled with water and flooded at least five homes.

"Look at this. It's like a river right here in my brother's side of the house. The landscaping is ruined. The sprinkler system is going to have to be redone. They have brand new furniture in this house. It's ruined," said Monica Moncier, whose brother's [home](#) flooded.

The family just moved into the house in November. They're upset with the [builder](#) and the city of Princeton.



Seagoville Flooding News Story - Fox4

<http://www.fox4news.com/news/continued-north-texas-rain-causing-problems-for-some>

North Texas neighborhoods are flooding more than ever before. Why?

BY BILL HANNA AND LUKE RANKER

OCTOBER 12, 2018 06:00 AM, UPDATED OCTOBER 12, 2018 04:07 PM



REGIONALLY RECOMMENDED STANDARDS IN WATERSHED MANAGEMENT*

For New Development Within County Regulated Areas

- 1** Design infrastructure to fully developed conditions with approved land-use maps if data is available
- 2** Begin protection at the most upstream end of the watershed above Federal Emergency Management Agency Limit of Detail Study
- 3** Maintain unfilled valley storage areas
- 4** Protect against and reduce erosive velocities
- 5** Match pre-developed site runoffs
- 6** Verify/require adequate downstream conveyance
- 7** Require freeboard from fully developed (if data is available) and changing watershed conditions
- 8** Define written operation and maintenance responsibilities
- 9** Size conveyance of street and storm systems adequately to safely convey traffic
- 10** Create stream buffers and preserve open space; limit clearing and grading
- 11** Consider regional (on or off stream) detention incentives
- 12** Implement Conservation and/or Cluster Development incentives
- 13** Encouraging low impact development techniques and/or green infrastructure

EXISTING CHALLENGES WITH FLOOD REDUCTION EFFORTS

Local Government Flood Reduction Challenges

Limited Resources

Limited Staff Expertise

Competing Priorities

Piecemeal Modeling
and Reviews



Local Government Flood Reduction Needed Resources

Development of Tools that Define Waterways

Stormwater Features (e.g. detention storage)



Benefits to Local Government

Development Community Avoids Costs

Communities Don't Lose Revenues



State Recommendation:

The January 2019 Interim Report to the 86th Texas Legislature from the House Committee on County Affairs contains a recommendation that the Texas Legislature should explore a regional approach to floodplain regulation, allowing counties that share watersheds to adopt similar regulations, as allowed by the Texas State Water Code.

HOUSE COMMITTEE ON COUNTY AFFAIRS

January 2019

CHARGE II - Evaluate whether counties have the necessary ordinance-making and enforcement authority to deal with flood risk in unincorporated rural and suburban areas of Texas. Additionally, examine whether counties have adequate resources and authority to ensure that new development in unincorporated areas is not susceptible to flooding.

- 3. The Texas Legislature should explore a regional approach to flood plain regulation, allowing counties that share watersheds to adopt similar regulations.**

The Water Code also allows counties to restrict certain development and to regulate construction in the flood plain. Counties use this authority to mandate certain designs to mitigate flooding, to prevent flooding on neighboring properties, and to minimize erosion. However, although a county may adopt these standards for flood management, the impact of these regulations may be muted when surrounding counties do not adopt similar regulations.

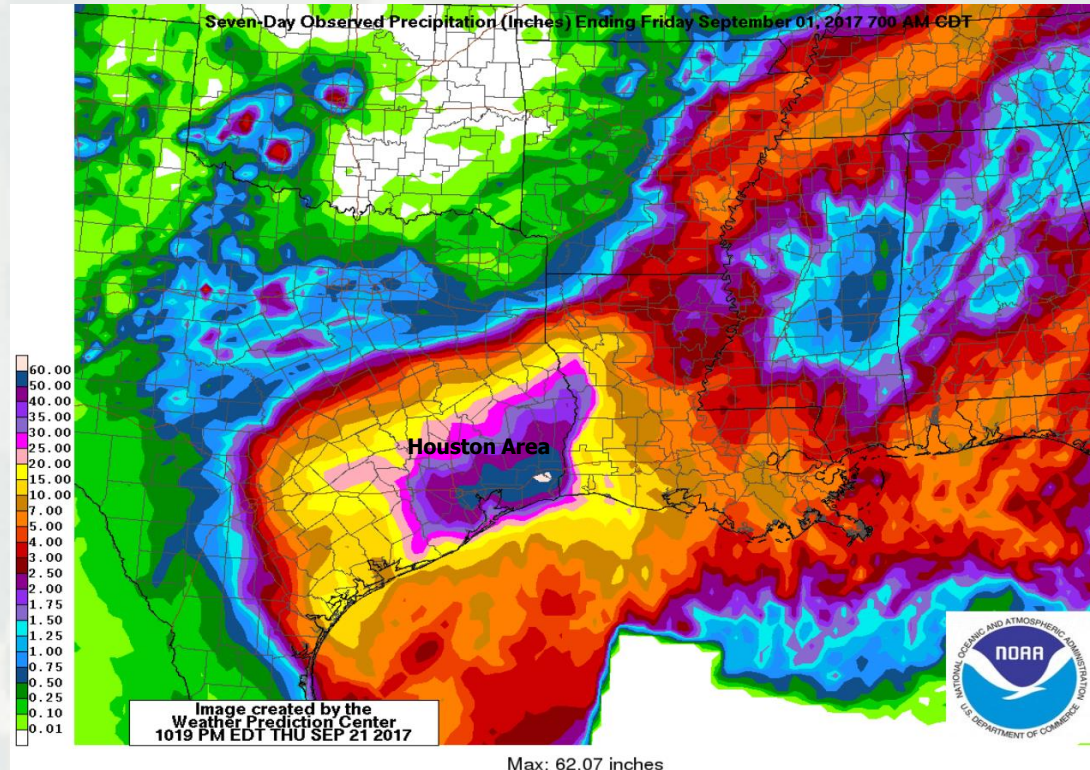
Extreme Weather and Weather Anomalies



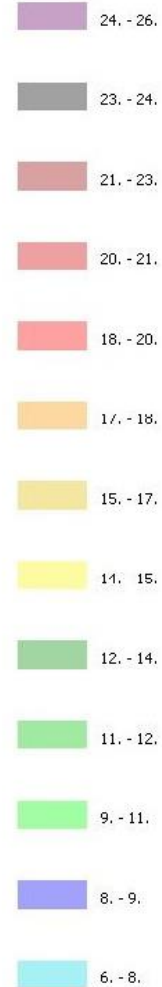
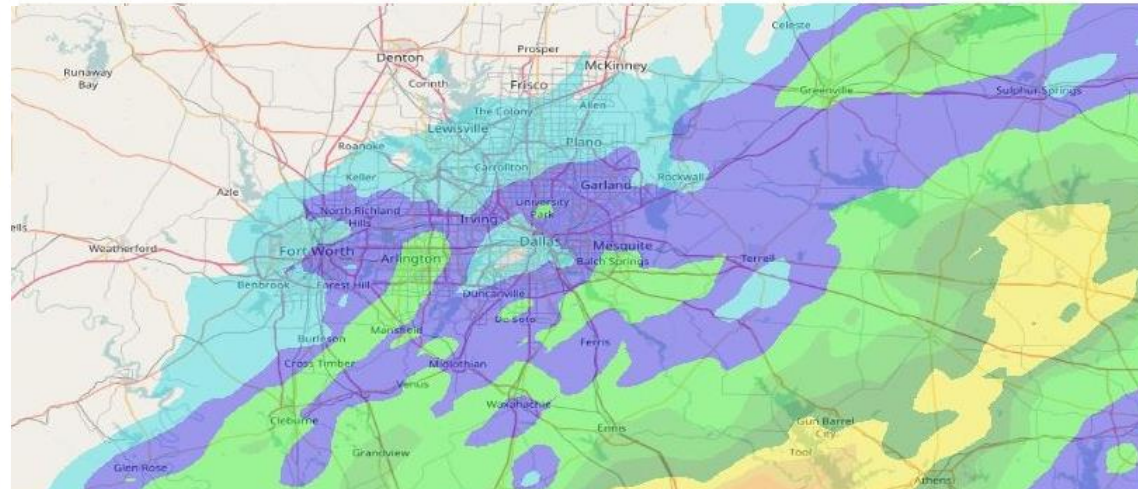
BUILDING STRONG®

Hurricane Harvey Storm

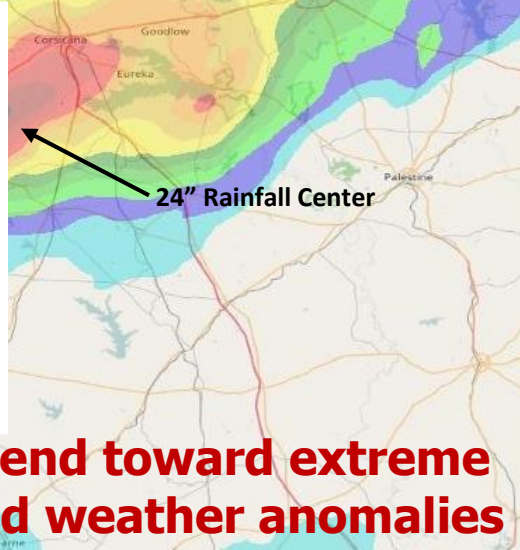
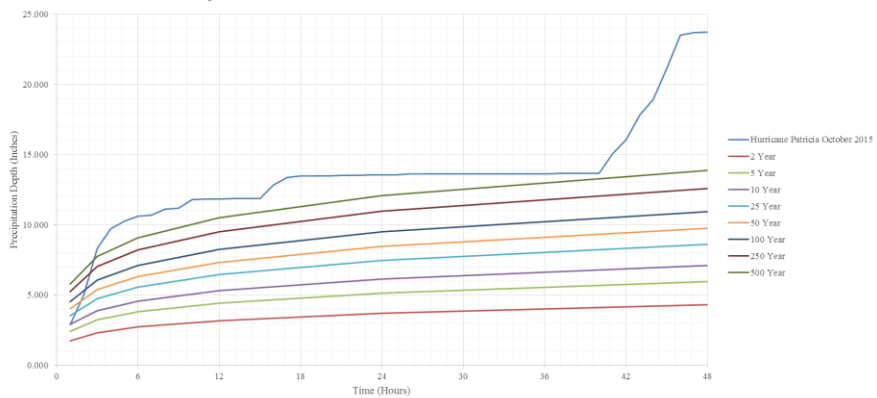
- Rainfall totals up to 60”
- Approaching or exceeding maximum rainfall possible
- 23,000 + mi²
(CT, RI, DE, NJ)
- One of the largest storms in continental US history
- Blocking factors
- OFF THE CHARTS!



Corsicana, TX – October 2015



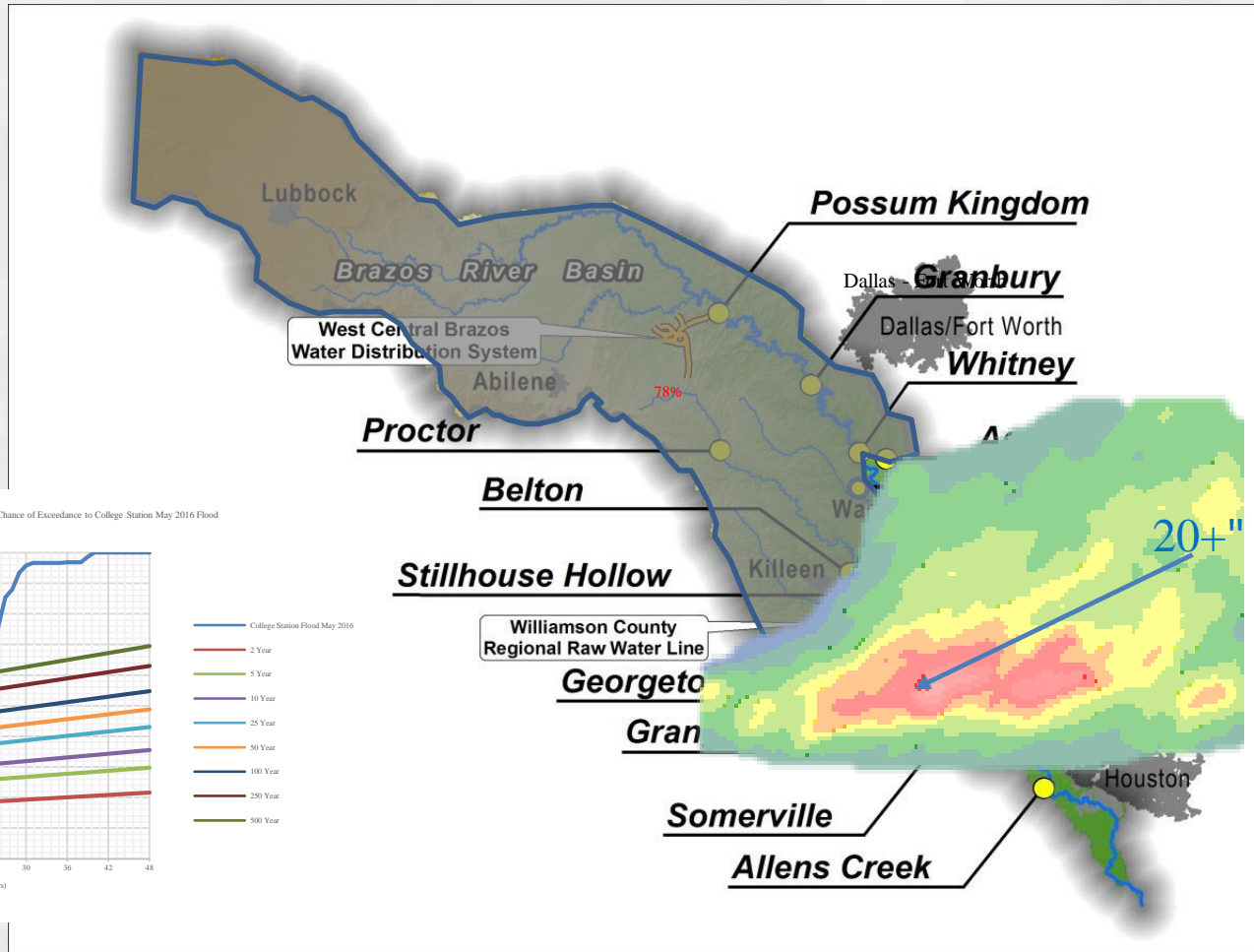
Comparison of Annual Chance of Exceedance to Hurricane Patricia October 2015 Flood



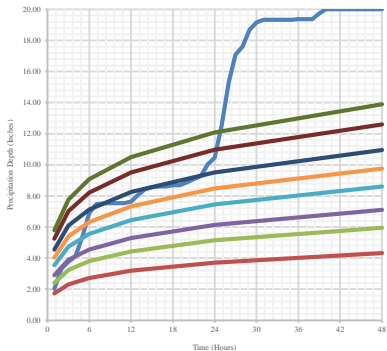
Growing trend toward extreme weather and weather anomalies



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



Comparison of Annual Chance of Exceedance to College Station May 2016 Flood



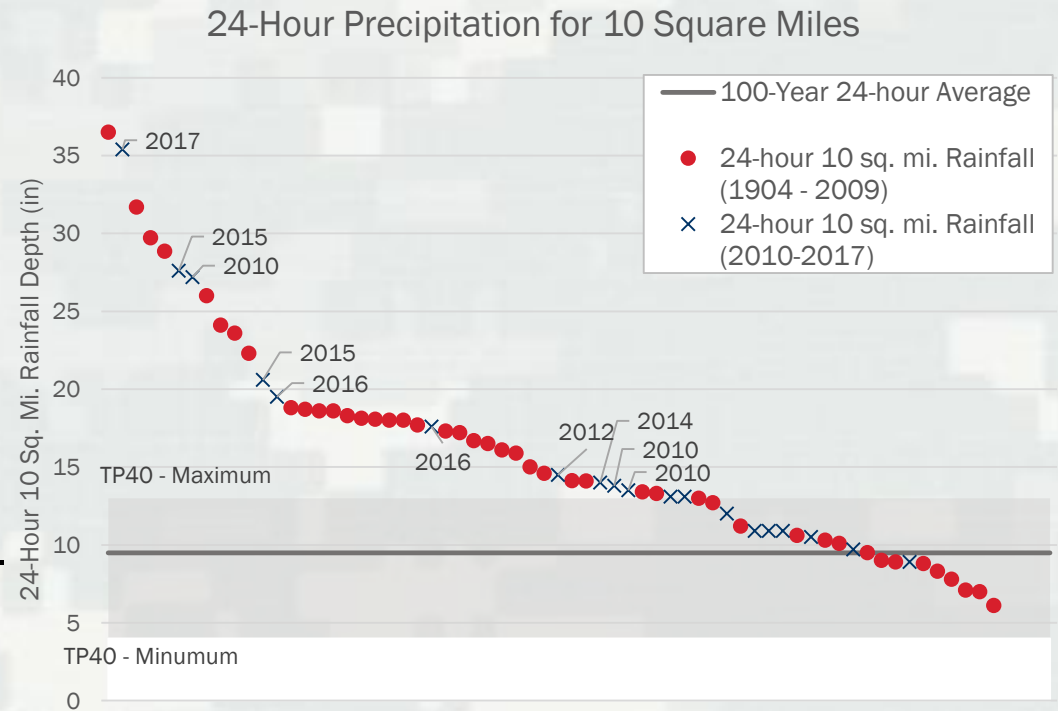
@ Brenham, TX

Blocking Phenomena

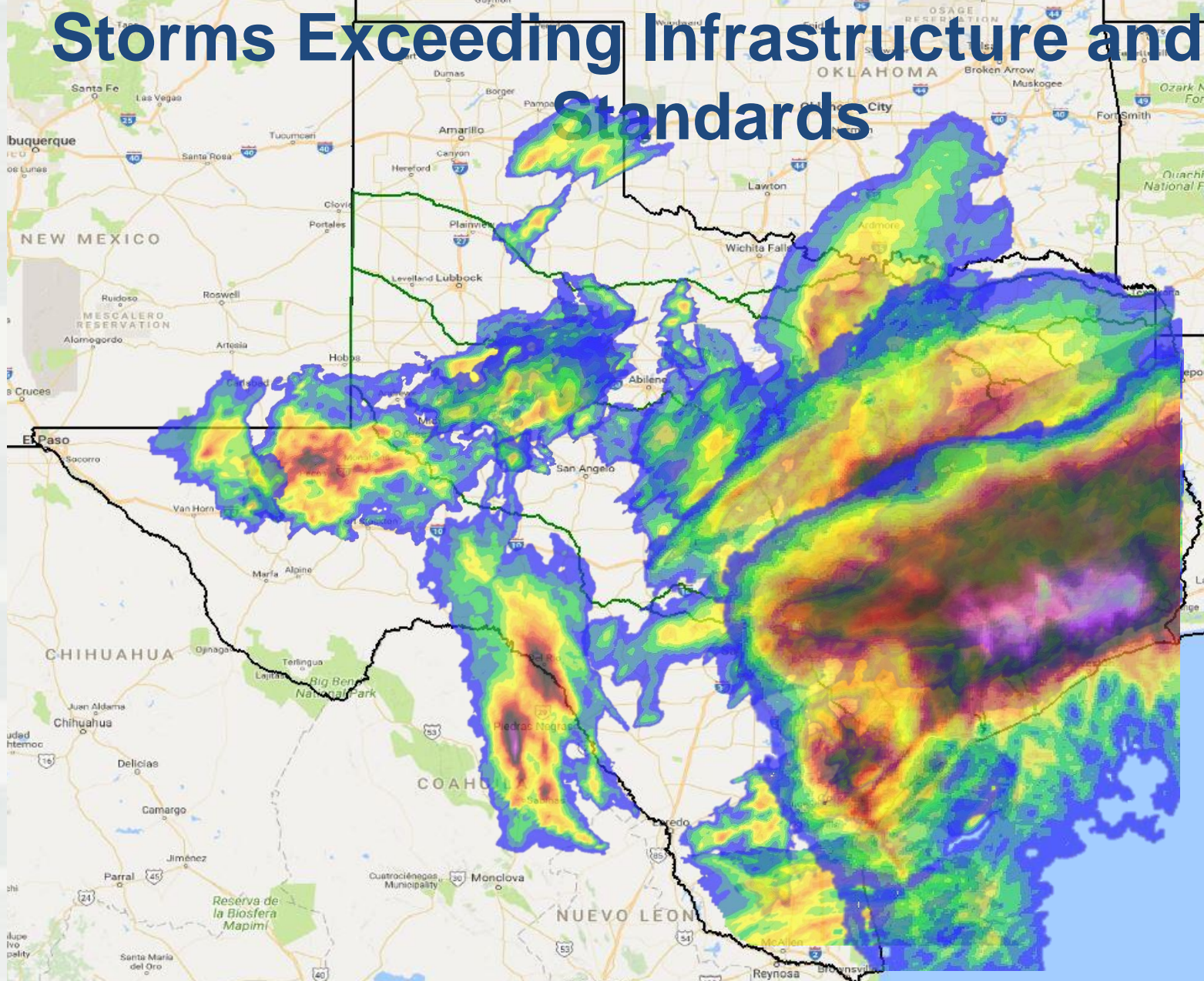


Storms Exceeding Infrastructure and NFIP Standards

- 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

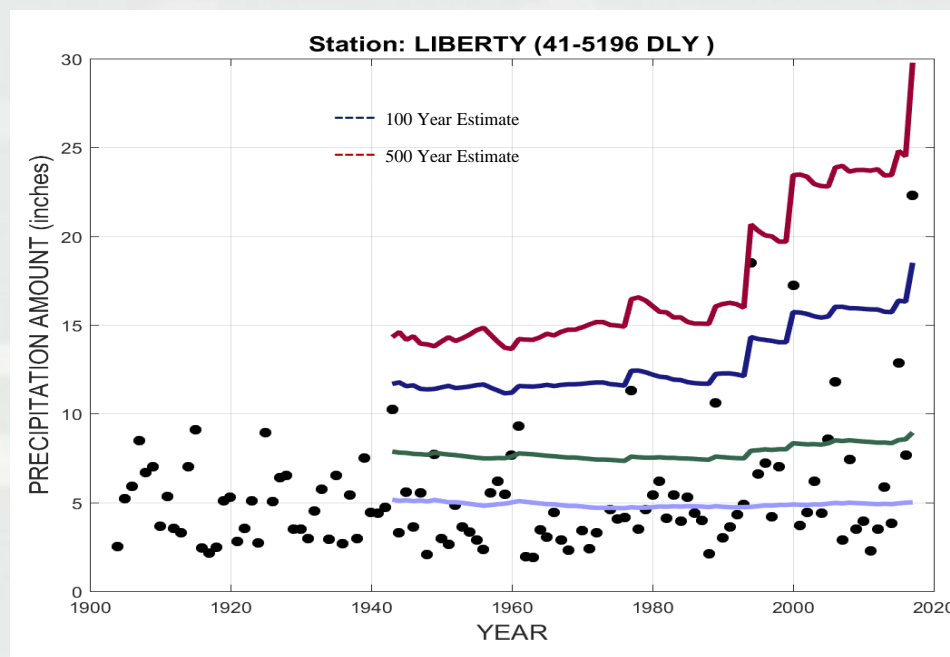
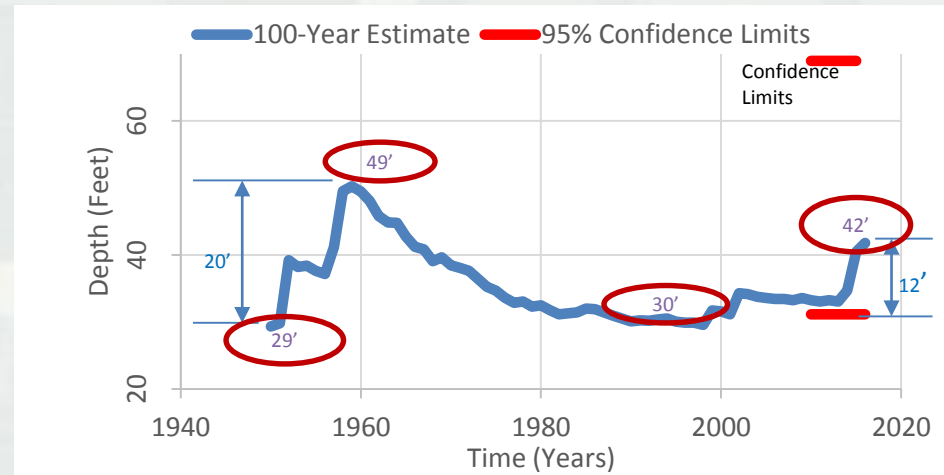


Storms Exceeding Infrastructure and NFIP Standards



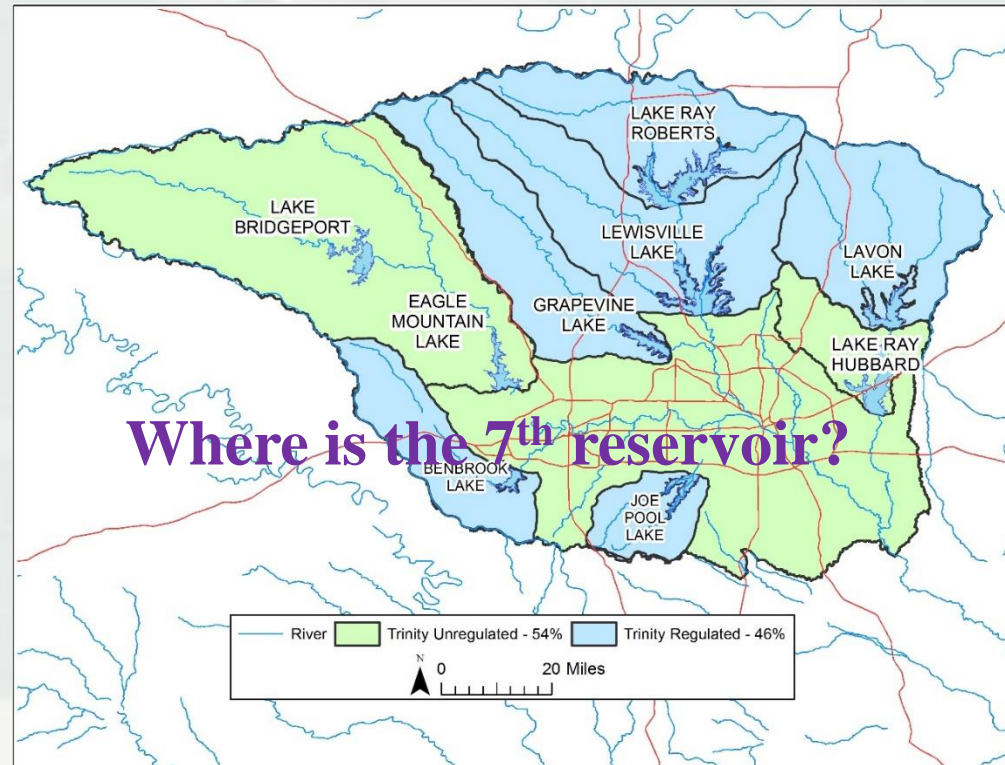
Uncertainty

- Many techniques to estimate flood and rainfall frequencies rely on observations
- Need record length 3-4 times estimated return interval
- Short Observation Periods - On average TX has 50 years of stream record and 70 years of precipitation records
- Significant non-stationarity observed in flood flow and rainfall frequency estimates



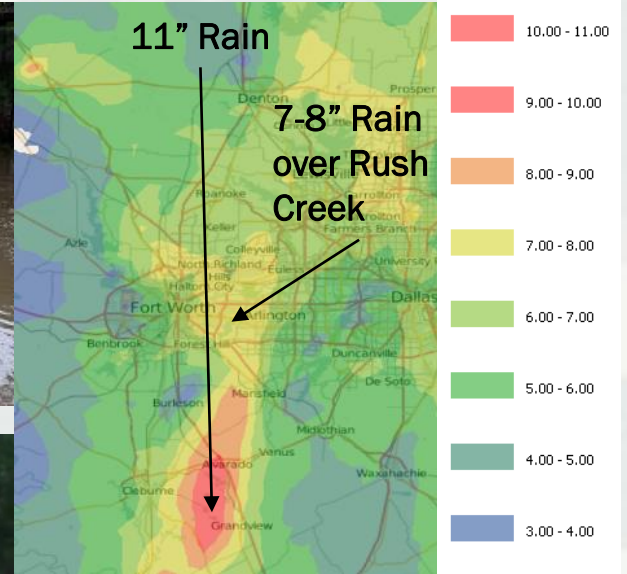
USACE Dallas-Fort Worth - Flood Reduction and Water Supply System

- Devastating floods, 1908, 1942, 1949
- 6 multi-purpose reservoirs (1952-1987)
- 2 federal levee systems
- DFW Flood Control System
 - 7.4 million people
 - \$100+ billion in damages prevented
 - \$2 - \$3 billion annually
- Water supply system
- Total cost \$2.5 billion
- ***Must be operated as a system***



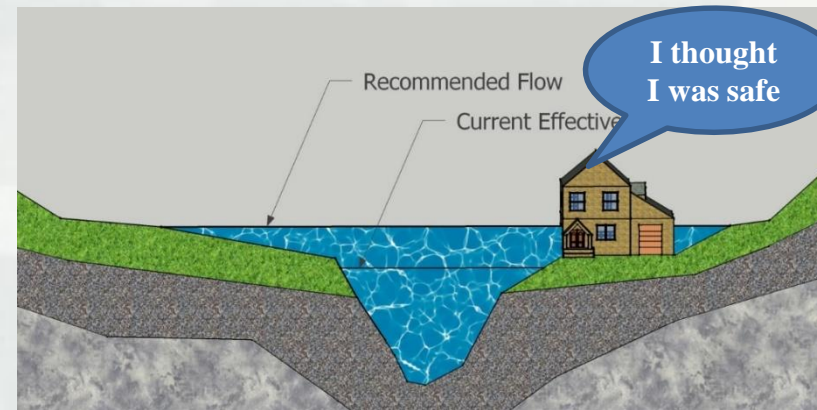
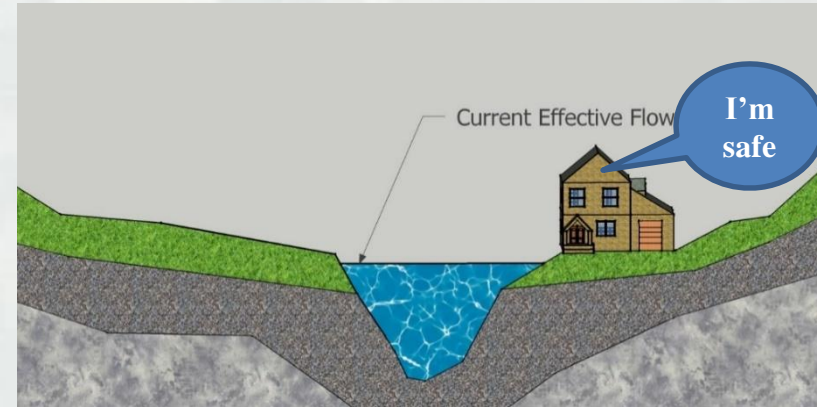
Tropical Storm Hermine – Arlington, Texas September 2010

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

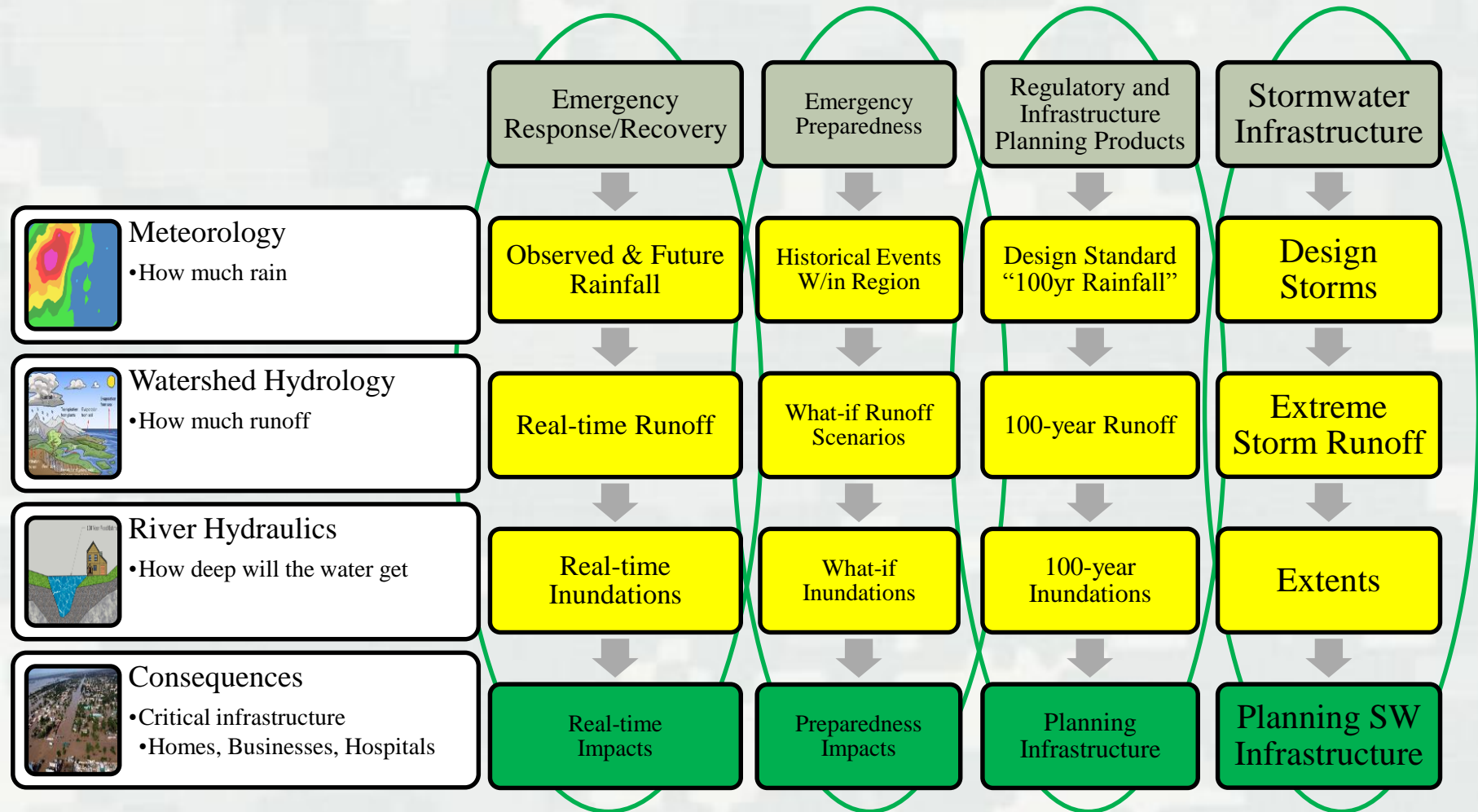


What Flooding Disasters Do

- Destroy property (homes, automobiles, belongings)
- Take lives
- Destroy Infrastructure, transportation, waste water, water, human services
- Disconnect people - friends, schools, work, and familiar places
- Ruin family photos and heirlooms
- Alter relationships
- Permanent harm to culture and way of life
- Impact the most socially and financially marginal people
- Long-term consequences to the health (mental) and collective well-being of those effected
- Loss of pets
- Destroy natural ecosystems that are integral parts of communities
- Disrupt populations in ways that are difficult to articulate, let alone assign monetary worth



Matrix of Flood Risk Related Products



Flood Risk Products and Uses

- Numerical models
 - Existing conditions
 - Future land use conditions
 - Climate change
- Regulatory
 - Update technical basis for NFIP mapping (100-yr flood)
- Stormwater infrastructure planning
- Emergency preparedness
 - What-if scenarios
- Emergency response
 - Basis for real-time inundation mapping



PROPOSAL FOR INTEGRATED PLANNING OF REGIONAL TRANSPORTATION AND STORMWATER MANAGEMENT TOGETHER AS A SYSTEM OF IMPROVEMENTS: PREVENTION VS. RESPONSE

POTENTIAL PARTNERS:

United States Federal Agencies

State Agencies

Regional Planning Agencies

Water Districts

Local Governments

Michael Morris, P.E.

Director of Transportation

North Central Texas Council of Governments



North Central Texas
Council of Governments

RETURN ON INVESTMENT

2017 “Natural Hazard Mitigation Saves” report by: National Institute of Building Sciences Institute, Multi-hazard Mitigation Council (MMC), at the direction of the U.S. Congress

Riverine flooding – for \$1 invested in mitigation strategies and higher standards (versus recovery from flooding actions), communities save \$5-7

Source: http://www.wbdg.org/files/pdfs/MS2_2017Interim%20Report.pdf



National Benefit-Cost Ratio Per Peril <small>*BCR numbers in this study have been rounded</small>	Federally Funded	Beyond Code Requirements
Overall Hazard Benefit-Cost Ratio	6:1	4:1

Hazard	Federally Funded	Beyond Code Requirements
Riverine Flood	7:1	5:1
Hurricane Surge	Too few grants	7:1
Wind	5:1	5:1
Earthquake	3:1	4:1
Wildland-Urban Interface Fire	3:1	4:1

Table 1. Benefit-Cost Ratio by Hazard and Mitigation Measure.

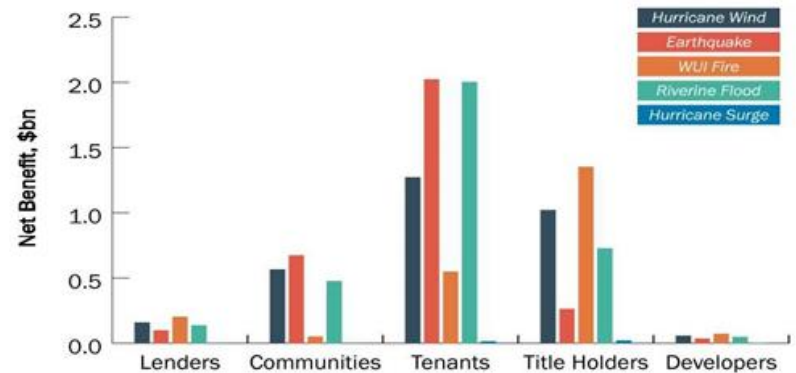
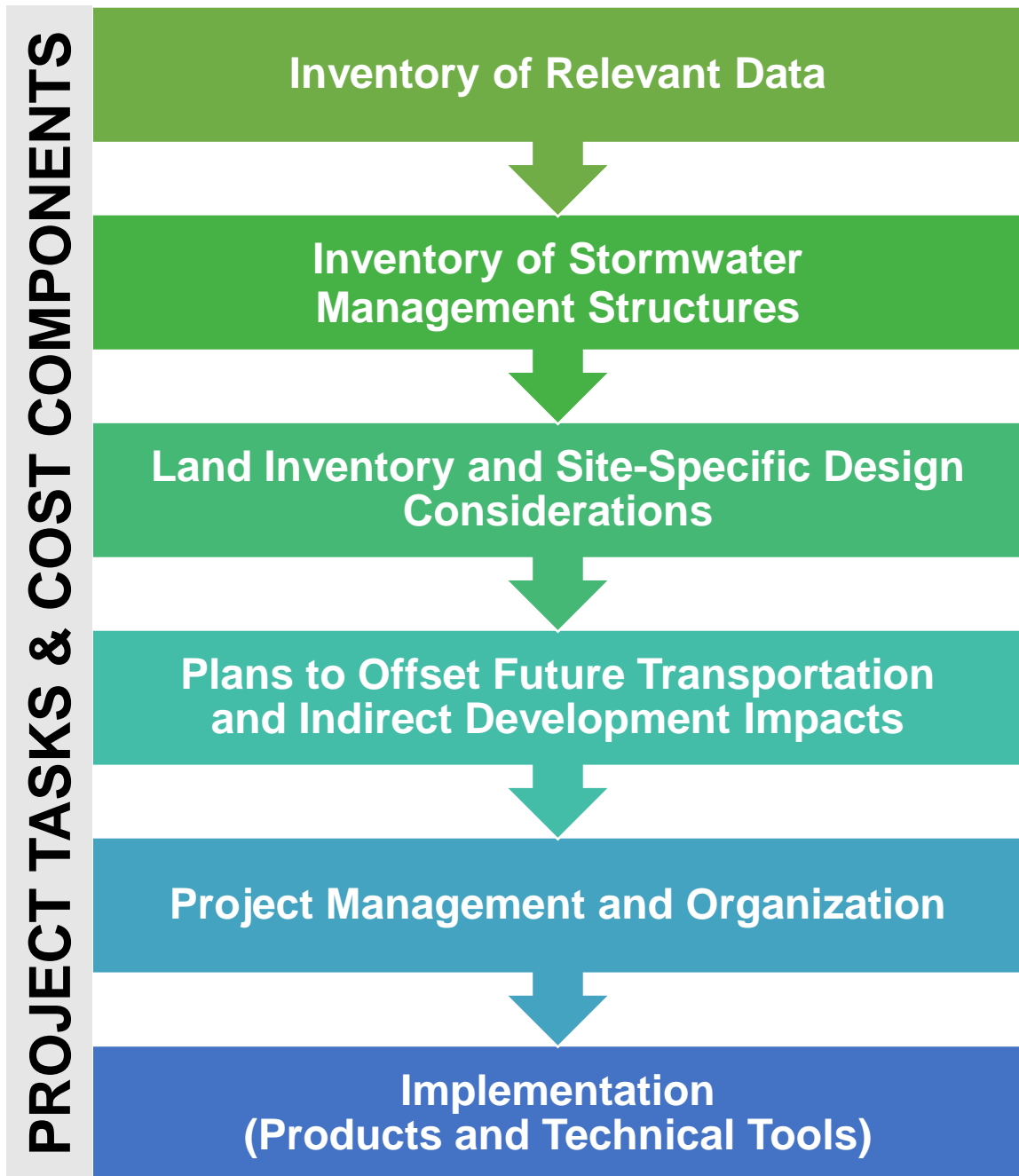


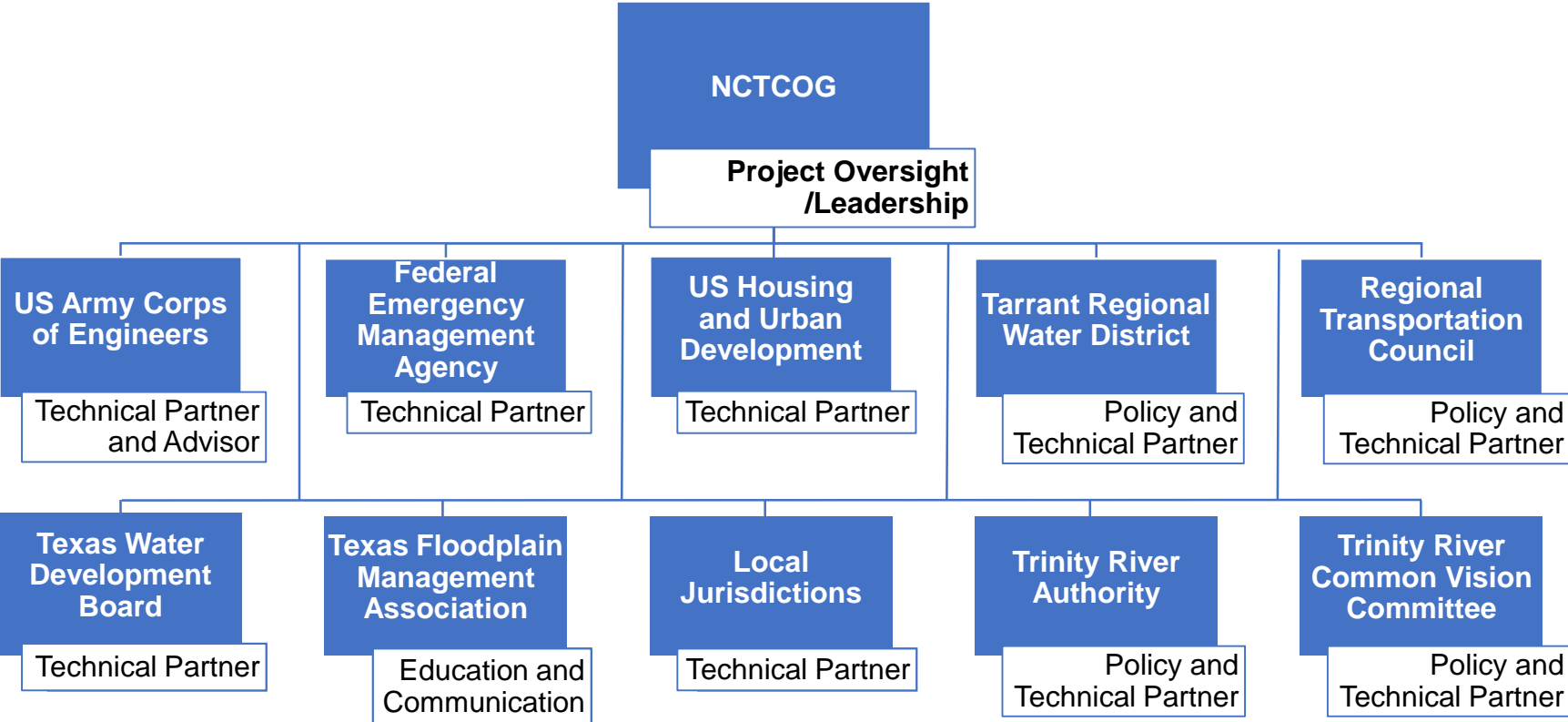
Figure 8. Stakeholder net benefits resulting from one year of constructing all new buildings to exceed select 2015 IBC and IRC requirements or to comply with 2015 IWUIC.

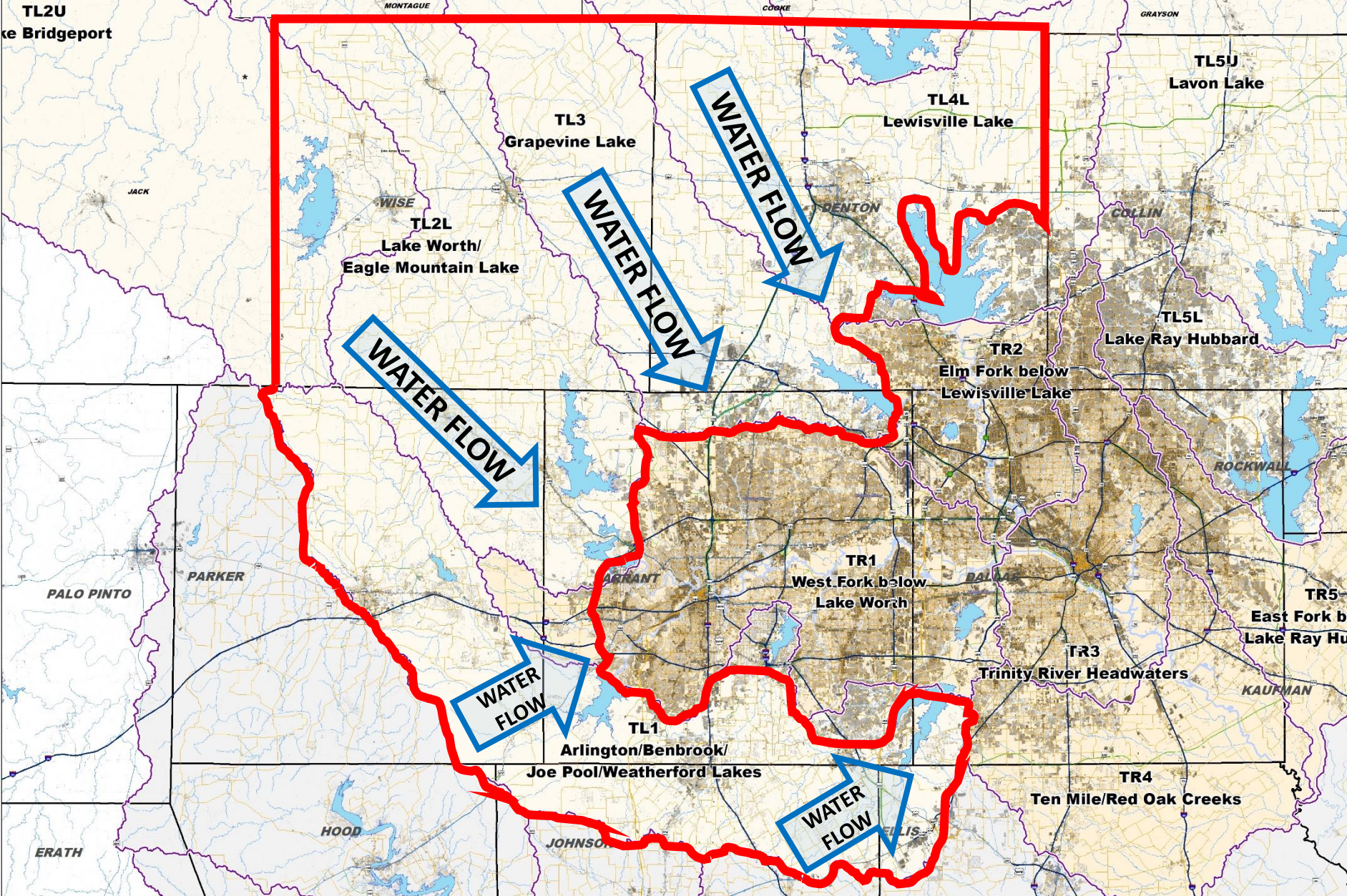
HOW: Integrate regional transportation planning, regional stormwater management planning, and environmental planning to develop consolidated, adaptive infrastructure



WHO: Project Team Members

A working group of partners and stakeholders to carry out a comprehensive planning effort in Wise County and portions of Dallas, Denton, Ellis, Johnson, Parker, and Tarrant counties



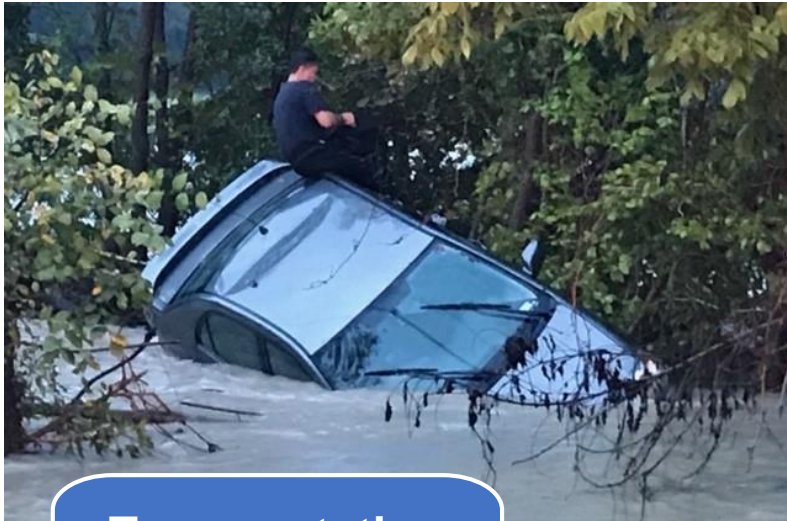


WHERE: Proposed Study Area



THUC - Hydrologic Unit Code
 Data Source : Watershed Boundary Dataset (WBD) by USDA - Natural Resources Conservation Service
 Stream Data by National Hydrography Dataset (NHD)
 This map/data was created by the North Central Texas Council of Governments (NCTCOG) for use "as is" and as an aerial graphic representation only. This data is not verified by a Registered Land Surveyor for the State of Texas, and is not intended to be used as such. NCTCOG, its officials, and its employees do not accept liability for any discrepancies, errors, or omissions that may exist.

WHY: Comprehensive, collaborative planning will dissolve silos and improve delivery of consolidated, adaptive infrastructure *before* expected population growth makes addressing these issues more difficult and costly



DeSoto Fire Rescue



City of Waxahachie

Transportation Infrastructure and Safety

Stormwater Runoff



Teague Nail and Perkins, Inc.

Environmental Features and Tools

PREVENTION VS. RESPONSE

Transportation Infrastructure

Structure Elevation / Culverts / Model Growth

Mechanical Culverts?

Transportation “LEED” Certified (Ray Roberts / Lewisville)

Green Parkway Widths / Detention

Safety

Technology / Routing

Prioritization / Low Lying Facilities

Stormwater

Minimize / Reduce Downstream

Detention

Tools, Data, Experts

PREVENTION VS. RESPONSE CON'T.

Environmental Features

Tree Farms / Intentional Saturation
Filtration / Recharge

Wetland and Stream Bed Mitigation Banking

Environmental Stewardship as a Revenue Element

Mitigation Banking
Horse Farms
Eco-Tourism

CONTRIBUTIONS:

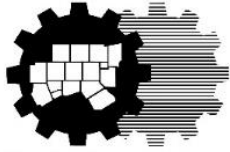
Partners are critical to making this possible

US Congress	US Housing and Urban Development (HUD)	US Army Corps of Engineers (USACE)	Federal Emergency Management Agency (FEMA)	Texas Department of Transportation (TxDOT)	Texas Water Development Board (TWDB)	Regional Transportation Council (RTC)
\$	\$	\$	\$	\$	\$	\$

Project Funding Goal: \$10 Million

Project Has Begun With Getting the Money

CONTACTS



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