



# Stormwater Outreach

NCTCOG Elected Officials Luncheon

August 31, 2016

Stephanie Griffin, P.E., CFM



Who does the public call?

**YOU**



# What does the public tell you?

- House/yard
- Street flooded
- Standing water (mosquitos)
- Creek issues
- Flood insurance increased



# What questions does the public ask?

- Why did my house/yard flood?
- Why did the street flood?
- Why doesn't the City keep the creek from flooding my property?



# When does the public contact you?

- After storm events
- After neighbor starts/completes a project
- During the hottest, driest months of summer

# Where is the flooding problem?

- Streets
- Storm drains
- Ditches
- Creeks
- Culverts
- Outfalls
- Neighbor's property

# Why does the public call you?

- Don't know who else to call
- Plumber/irrigation specialist/other professional/neighbor told them it was the City's responsibility to fix it
- Claims the City fixed the problem in the past
- False impression that the City is responsible for everything
- Don't like the neighbor's "improvement"



# Favorite lines from the public

- “I’ve lived here \_\_\_ years, and this has never happened before.”
- “I don’t want to get my neighbor in trouble, but \_\_\_\_.”
- “Someone else’s water is flooding my property.” (neighbor, City, HOA, etc.)
- “All the City has to do is \_\_\_ to fix the problem.”
- “The City’s lot next door \_\_\_\_.” (not actually a City-owned lot)

# Favorite lines from the public

- “So and so (or generic someone) at the City told me that this was really the City’s responsibility to fix.”
- “The City built me a \_\_\_\_ and needs to maintain or repair it.”
- “I know the Mayor personally and have his number on speed dial.”



# Favorite lines from the public

- “We flooded last year, so we won’t flood for another 100 years. Right?”
- “I don’t need flood insurance because I don’t plan to live another 100 years.”
- “Why do I have to keep paying a stormwater fee during a drought?”



# How does the public contact you?

- Phone call
- Email
- Website
- Mail
- Start with the Mayor, City Manager or City Council member

The screenshot shows the City of Grand Prairie website interface. At the top, there is a search bar and navigation links for HOME, ABOUT US, CITY GOVERNMENT, RESIDENTS, BUSINESSES, VISITORS, and I WANT TO. The main content area is titled "Drainage/Erosion and EPA Pollution Complaints" and includes a sidebar with links to various documents like "Drainage Design Manual" and "Construction General Permit & BMP FAQ". The main text provides instructions on how to file a complaint, including contact information for the Engineering Department. A contact info box on the right lists the address, phone number, and email addresses for reporting complaints and checking their status. Below the text, there are input fields for Name, Email, and Street Address, along with a dropdown menu for selecting the location of the complaint.

City of Grand Prairie  
T E X A S

HOME ABOUT US CITY GOVERNMENT RESIDENTS BUSINESSES VISITORS I WANT TO

Drainage and Design Requirements  
Drainage/Erosion Complaints  
Drainage Design Manual  
Construction General Permit & BMP FAQ  
Engineering Standard Detail Sheets  
Drainage Review Fee Ordinance  
Fee Schedule (UDC Article 22)  
City-Wide Drainage Master Plans  
TCEQ Stormwater Links

City Government » City Departments » Planning & Development » Engineering » Drainage and Design Requirements

### Drainage/Erosion and EPA Pollution Complaints

Font Size: [+] Share & Bookmark [+] Feedback [x] Print

File a drainage/erosion complaint or an EPA construction pollution complaint using the online form below.

Call 972-237-8536 or email [DrainageStatus@gptx.org](mailto:DrainageStatus@gptx.org) to get the status of an existing complaint.

View [Erosion Policy Resolution 4812-2016 \(PDF\)](#).

1. Your Information: \*

Name

Email

2. Location of Complaint (please be specific as possible) \*

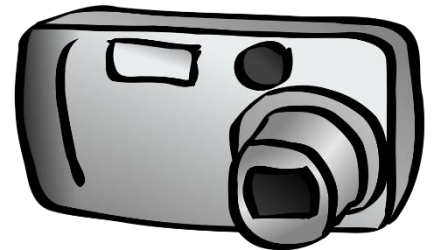
Street Address

**Contact Info**  
Engineering  
Drainage Complaints  
206 W. Church St.  
P.O. Box 534045  
Grand Prairie, TX 75053  
Phone: 972-237-8536  
Email [DrainageComplaints@gptx.org](mailto:DrainageComplaints@gptx.org) to report complaints.  
Email [DrainageStatus@gptx.org](mailto:DrainageStatus@gptx.org) to check the status of an existing complaint.

# What do you do with the call?



- Get information about the problem from the caller
- Explain that you will be out to investigate the issue
- Schedule a site visit
- Prepare map of area and download relevant documents
- If the report is a flooded house, bring the FEMA Substantial Damage Estimator form to complete onsite
- Perform a site visit and document findings



# What can you do?



## Caller wants City to:

- **Fix it!**
- Suggest potential solutions
- Provide recommendations for professional services
- Serve as mediator between neighbors

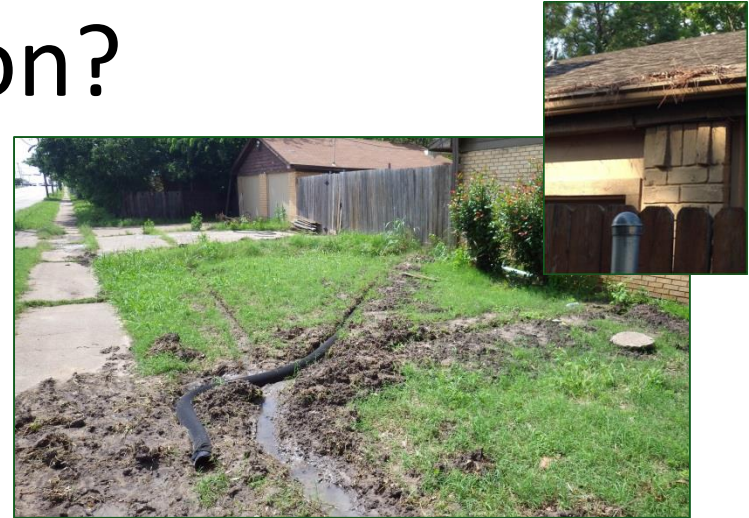


## City can:

- Work within legal limitations
- Suggest potential solutions
- Mention other potential permit requirements (USACE)
- Perform additional investigation if warranted
- Provide names of professional services providers
- Mediate and/or issue citations
- Provide flood insurance information

# How do you deliver the results of the investigation?

- Be respectful
- Be compassionate
- Be encouraging
- Be truthful about the findings
- Do not blast them with information overload



# Standard City responses

- This is a lot-to-lot drainage issue, which is a civil matter between you and your neighbor. The City does not get involved in civil matters. Here is a copy of the City Resolution 4812-2016.
- You own the area above and below your fence. You are welcome to trim that tree that overhangs the fence.
- The area behind your house is a no maintenance zone. The City does not mow or trim in that area.

# Standard City responses

- It is illegal to use public equipment to perform work on private property for private property benefit.
- The City does not maintain private property, even if it is within an easement.
- The lot to which you are referring is not a City-owned lot. That property owner is responsible for maintaining said property.

# Standard City responses

- More than 20% of the flood insurance claims are outside the 1% annual chance floodplain.
- Residents that live within a high risk flood area have a 25% chance of flooding in a 30-year mortgage.
- During the May 2015 flood events, most of the properties that flooded (in Grand Prairie) were NOT within the high risk floodplain.



# Intentional public outreach regarding stormwater and flood risk

You are receiving this brochure because your property is in or near a floodplain, or 'Special Flood Hazard Area' (SFHA) mapped by the Federal Emergency Management Agency (FEMA). This does not mean that your property has flooded or will flood in the future. However, mortgage lenders must require the purchase of flood insurance for any loan secured by real property located in a SFHA. If you are renting property in a SFHA, flood insurance is available to help protect your belongings and valuables in the event of a flood.

*Be flood wise - know your flood hazard!*



## Natural Resources and Flooding

Grand Prairie's local marshes and wetlands provide breeding and feeding grounds for fish and wildlife, create and enhance waterfowl habitat, and protect habitats for rare and endangered species. The floodplains are an important asset. They provide open space, aesthetic pleasure and areas for active and passive uses. The City of Grand Prairie is a 'Water Wise' community, and has implemented a number of programs and ordinances to encourage residents to conserve water year-round and avoid contaminating the soil and waterways. The City's Public Works Department works to educate residents regarding "Don't Clog the Drain." Code Enforcement Officers help monitor activities associated with protecting the City's floodplains and waterways. The City offers residents a household waste recycling program in an effort to eliminate junk, litter, and debris left in yards which clog storm drains and block natural waterways. Removing these items along with tree trimmings and brush debris aides in preventing overbank flooding in low-lying areas and waterways.

## Flood Warnings

The ability to safely evacuate residents during a disaster depends on strong disaster preparedness planning and requires the cooperation of all affected citizens. Evacuations require the establishment of emergency shelters during disasters for evacuees. Significant coordination among City departments during disasters is critical in order to maintain essential City services.

The City's Emergency Management Department provides information on the City's outdoor warning siren system, instructions on responding to the alerts, how to prepare and plan for possible hazards, and evacuation and shelter information. Call 972-237-7595 or visit the website at <http://gptx.org/disaster>

## Property Protection

Act now to protect your property from flood damage. If the first floor level of your structure is lower than the Base Flood Elevation (BFE) on the FEMA's Flood Insurance Rate Map (FIRM), consider ways to reduce the risk of flooding such as retrofitting or renovating to protect your structure.

### Retrofitting measures include:

- Elevating the building so that floodwaters do not enter or reach the lowest floor above flood level,
- Constructing barriers out of compacted soil or concrete between the building and flood waters,
- "Dry floodproofing" to make the building walls and floor watertight,
- "Wet floodproofing" to protect a building by allowing floodwaters to enter uninhabited areas of the property such as parking and storage areas,
- Preventing basement flooding from stormwaters or sump pump failure.

Reference materials on retrofitting can be found in the Grand Prairie Public Library or online at <https://www.fema.gov>

## Flood Hazard

The City of Grand Prairie has 12 major watersheds, each of which has areas that are subject to flooding from rising streams or localized street and yard flooding. Most stream flooding areas have been mapped by the Federal Emergency Management Agency (FEMA); however, not all flood-prone areas, areas with poor drainage, or localized street flooding have been mapped. Your property may have never been flooded or may be shown on the FEMA maps to be outside the mapped limits of flooding.

Most areas of the City have yet to see the record 1% annual chance flood event. There is no guarantee your property will never flood. Statistics show that the 1% annual chance flood event has approximately a 30% chance of occurring over a 30-year mortgage period.

Mapped flood-prone areas and historical flooding information is available by visiting the City's Stormwater Department.

Floods are among the most frequent and costly natural disasters. Conditions that cause floods include heavy or steady rain for several hours or days that saturates the ground. Flash floods occur suddenly due to rapidly rising water along a stream or low-lying area.

## Flood Safety

- Stay away from floodwaters. If you come upon a flowing stream where water is above your ankles, stop, turn around and go another way. Six inches of swiftly moving water can sweep you off your feet.
- If you come upon a flooded road while driving, "Turn Around Don't Drown." Do not drive into flooded roadways or around barricades. If you are caught on a flooded road and waters are rising rapidly around you, get out of the car quickly and move to higher ground. Most cars can be swept away by less than one foot of moving water.
- Keep children out of the water. Flood waters are dangerous and may also be contaminated with hazardous materials and poisonous snakes.
- If power lines are down, do not step in puddles or standing water. Turn off all utilities, gas and electricity, and be alert for gas leaks.
- During cleanup, wear protective clothing, including rubber gloves and boots.

As a result, flood insurance premium rates are discounted to reflect the



# Intentional public outreach regarding stormwater and flood risk

- Program for Public Information (PPI)
  - Continue current activities
  - Expand outreach efforts
    - Bilingual letters, brochures and mailings
    - Target audiences
    - Cover the six CRS topics in the City newsletter
    - Electronic message boards
    - Train bus drivers about TADD™
    - Host a booth at Flight of the Monarch Festival

# Six topics for CRS credit

1. Know your flood risk
2. Insure your property for your flood hazard
3. Protect people from the flood hazard
4. Protect your property from the flood hazard
5. Build responsibly
6. Protect natural floodplain functions

# Documenting public outreach

- Floodplain in relation to specific property
- Floodplain inquiries prior to purchasing property
- Information provided
  - Elevation certificate, if we have it
  - Floodplain map with FEMA FIRM, flood zone, BFE, depth of flooding, etc.
  - Link to [www.floodsmart.gov](http://www.floodsmart.gov) to find local flood insurance agent

# Public Outreach Wrap-Up

- Waiting on FEMA's approval of PPI Plan
- Encouraging flood insurance – everyone can purchase this coverage!

# Texas Floodplain Management Association (TFMA)



## ► About TFMA

- Non-Profit Established in 1988 with over 2,200 Members
- **Premier professional organization leading floodplain management and flood risk reduction in Texas**
- State Chapter of the Association of State Floodplain Managers (ASFPM)

## ► Outreach

- Committed to educating the general public on the dangers and risks of natural hazards that affect Texas, with special emphasis on flash flooding.
- **Turn Around Don't Drown (TADD)** was developed over 10 years ago with The National Weather Service and other local and state agencies to serve as the Primary Flood Safety Outreach Slogan.
- TFMA presents and sponsors events targeted towards school children and parents in order to promote flood safety. Host an Annual TADD Calendar Contest with over 15,000 calendars distributed annually.



**Like us on Facebook: TXFMA**  
**Follow us on Twitter: @TexasCFM**



# Texas Floodplain Management Association (TFMA)



## ► CFM Program

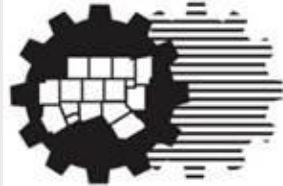
- TFMA pioneered the Professional Certification of Floodplain Managers, the **Certified Floodplain Manager (CFM)** program, with the goal to increase the educational and professional skills of the state's floodplain management professionals.
- Over 2,000 in Texas currently hold the CFM certification, demonstrating their knowledge of the National Flood Insurance Program and Floodplain Management Regulations.
- TFMA offered the CFM exam 30 times in 2015, with 200+ new CFMs certified last year.

## ► Training

- TFMA hosts a variety of **floodplain management courses** each year in coordination with the Federal Emergency Management Agency (FEMA) and the Texas Water Development Board (TWDB.)
- In 2015, over 2,000 attendees participated in 50 training classes hosted throughout the state.



# Partnerships



North Central Texas  
Council of Governments



FEMA



Texas Water  
Development Board





# **Texas FloodED**

***2016 Grassroots Education Effort to Introduce Floodplain Management to our Elected Officials***

- **Over 30 meetings held in past 3 months**
- **Gaining Support for increased state funding for floodplain management and planning programs in Texas**



# Governor's Proclamation

# Texas Flood Awareness Week

# May 23 – 27, 2016



STATE OF TEXAS  
OFFICE OF THE GOVERNOR

Flooding and flash flooding have threatened Texans' safety, property and occupations throughout our history and can occur any time of the year. In just the past two years, our state has seen flood events of extraordinary levels. As we approach the first anniversary of the tragic flooding of Memorial Day weekend in 2015, and after last month's storms, it is imperative that Texans unite and prepare for potentially sudden and violent acts of Mother Nature. Flash flooding is the No. 1 cause of weather-related damage, and sadly, Texas often leads the nation in flood-related deaths, many of which are preventable.

While dangerous floods and flash floods are possible throughout the year, they often have a higher frequency during spring and summer thunderstorms, tropical storms and hurricanes. Intense rainfall or slow-moving storms that track over the same areas can cause a rapid rise of water, and flash floods can develop within minutes.

It is crucial that Texans understand and respect the power of water. Planning and preparing are the keys to reducing loss of life and property. Texans should be familiar with the implications of flood watches and warnings, assemble a "preparedness kit" of supplies, develop a communication strategy for reaching friends and family members in case of emergency and designate a meeting place in case of evacuation.

At this time, I encourage all Texans to be informed and prepared for floods and flash floods and to be mindful of signs and barriers warning of flood dangers. Always "Turn Around, Don't Drown" — you could save your life or the life of a loved one.

Therefore, I, Greg Abbott, Governor of Texas, do hereby proclaim May 23–27, 2016, to be

## Flood Awareness Week

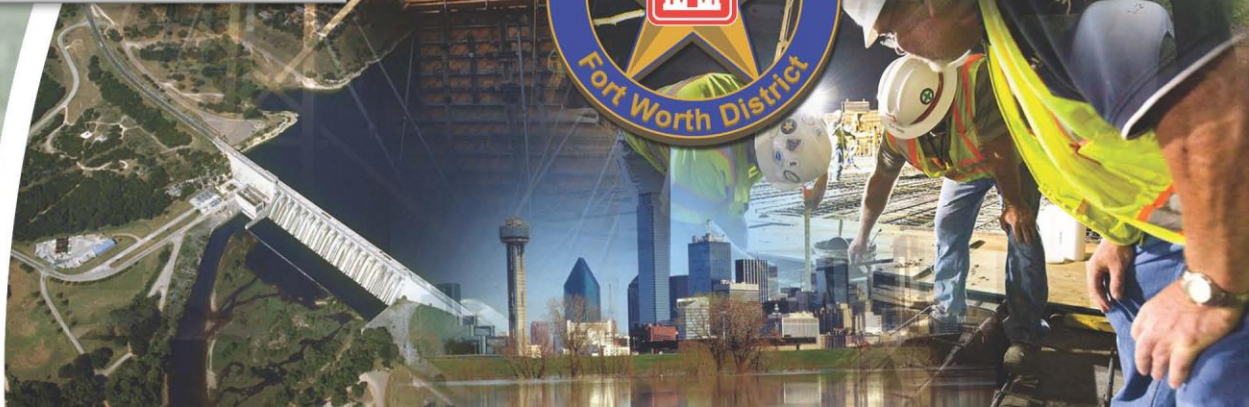


in Texas, and urge the appropriate recognition whereof.

In official recognition whereof, I hereby affix my signature this the 6<sup>th</sup> day of May, 2016.

  
Governor of Texas

# Dallas-Fort Worth Flood System & Remaining Vulnerabilities





# Reservoir Development

## Dallas and Waco Floods



1908 Carrollton, TX



19XX Waco, TX



1908 Carrollton, TX

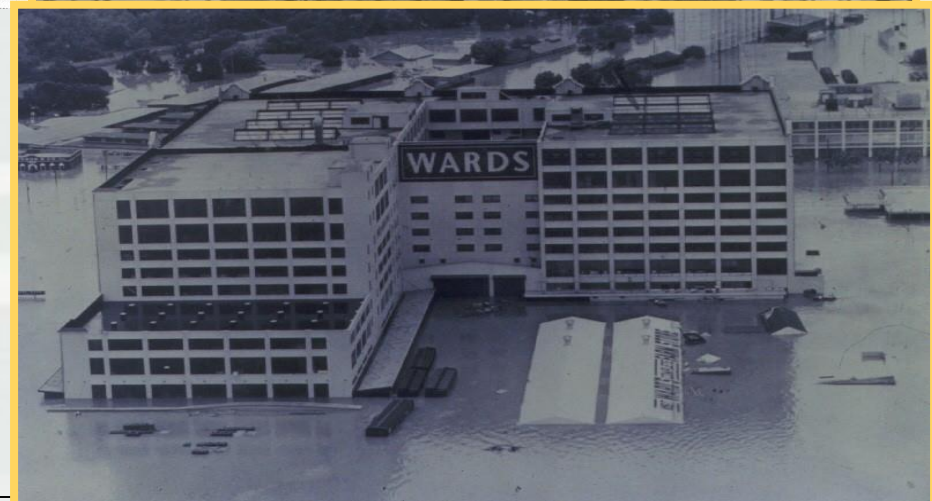
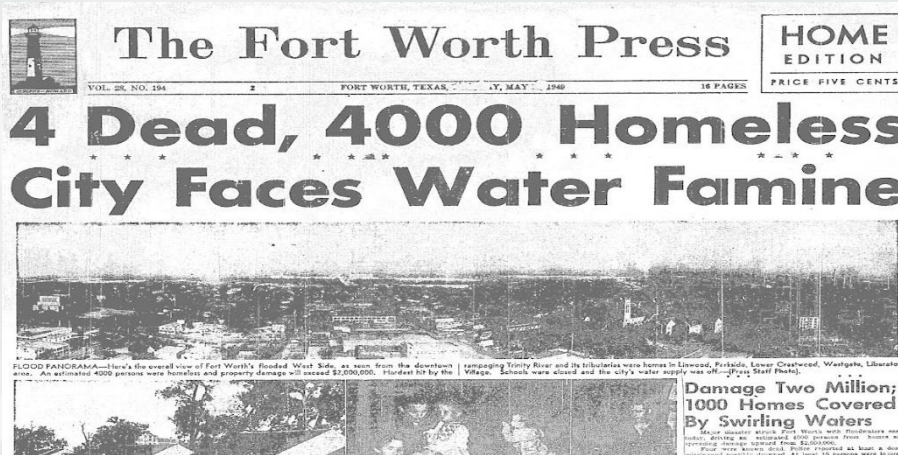


1942 Dallas, TX



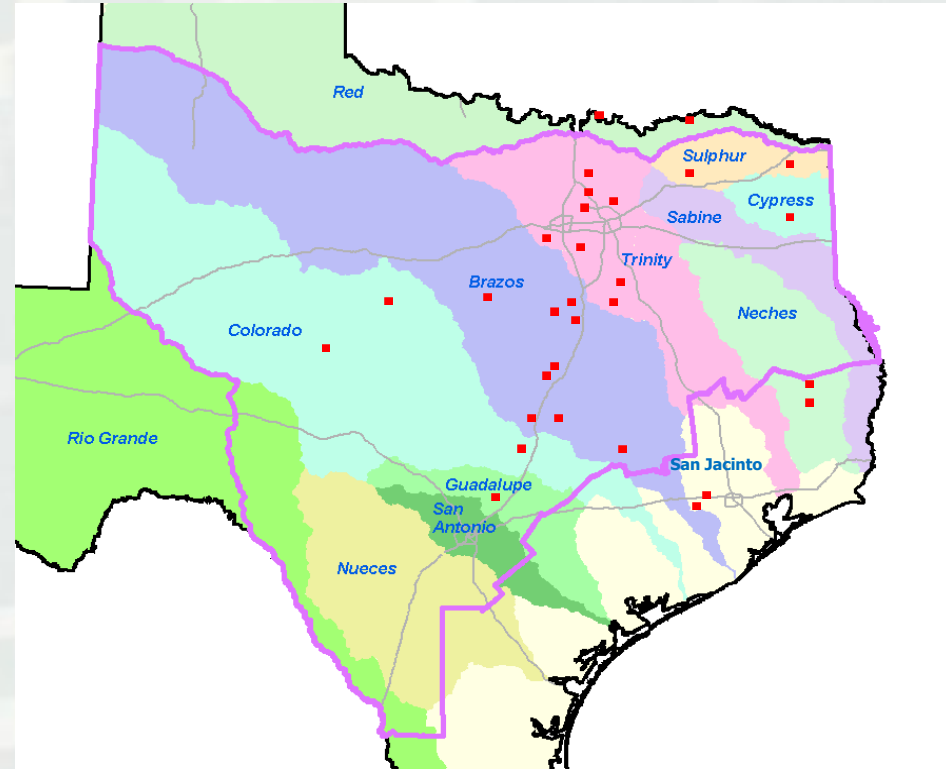
# Reservoir Development

## 1949 Fort Worth Flood



# Statewide Reservoir Development Background

- Planned/constructed dams 111/32
  - ▶ 1<sup>st</sup> - Marshall Ford Dam (Lake Travis) 1942
  - ▶ Last – Cooper (Jim Chapman Reservoir) 1991
- Multi-purpose
  - ▶ Flood control, water supply, hydropower, environmental, recreation, navigation
- Critical to the early development of Texas
- Significant federal economic contribution
- 8.8 M ac-ft conservation storage
  - ▶ 20% - 25% surface water supply
- 15.9 M ac-ft flood storage in 31 federal dams
- Costs (2013)
  - ▶ Construction - \$8.2 billion
  - ▶ Benefits - \$76 billion (flood only)
  - ▶ B/C ratio – 9.3
- Annual recreation visits – 22 M



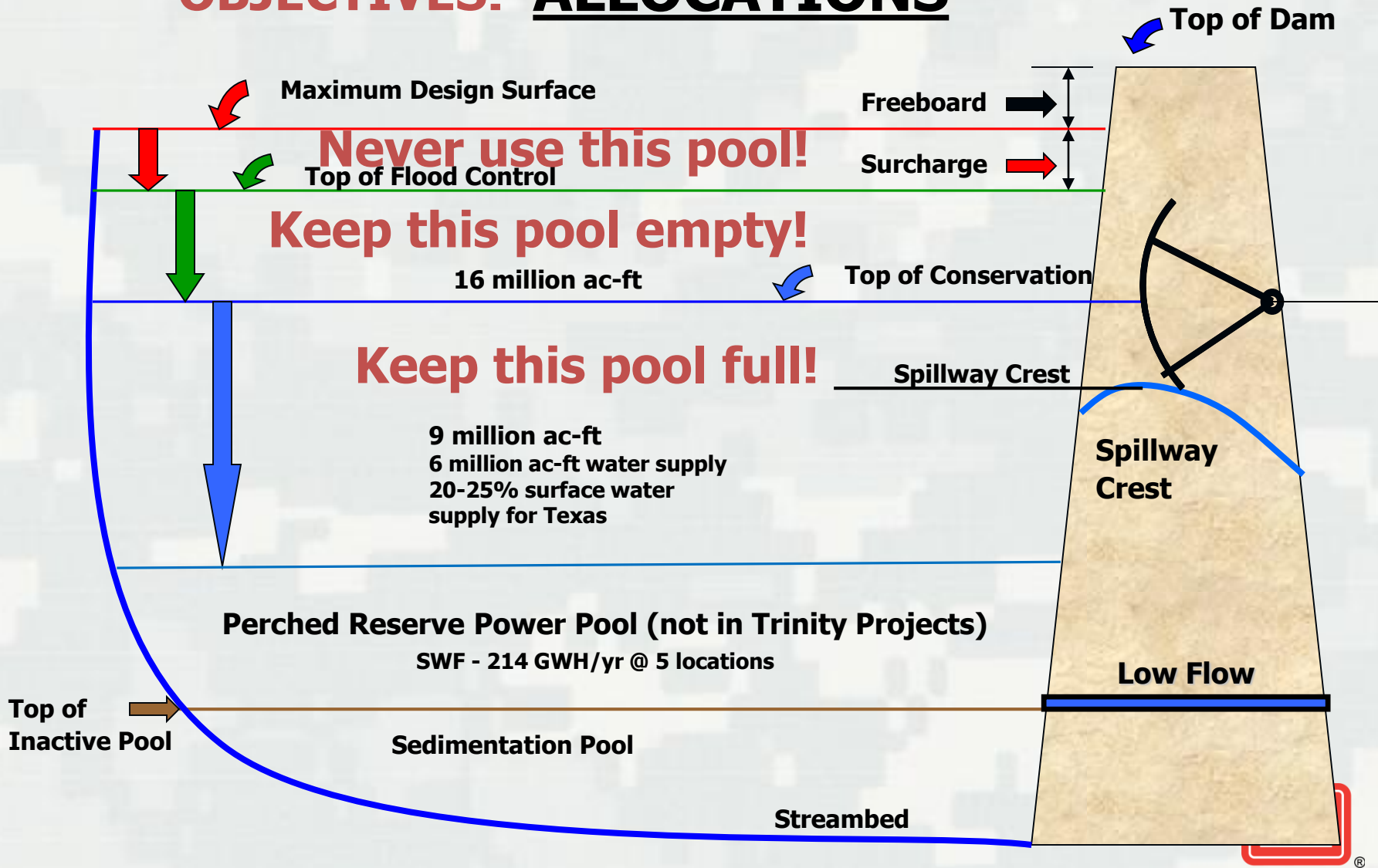
# TRINITY RIVER BASIN

- Significant floods
  - ▶ 1908, 1942, 1949
- Authorizing legislation
  - ▶ River and Harbor Act of March 1945; Flood Control Acts of 1954, 1960, 1962; Public Law 86-339; River and Harbor Act of 1965
- Planned/constructed dams- 21/8
  - ▶ 1<sup>st</sup> - Grapevine 1952
  - ▶ Last - Ray Roberts 1987
- Conservation/flood storage- 2.2 M/1.5 M ac-ft
- Cost (2013)
  - ▶ Construction- \$1.67 billion
  - ▶ Benefits- \$72.3 billion
  - ▶ B/C ratio- 43.2





# GOALS AND OBJECTIVES! RESERVOIR ALLOCATIONS



# Normal Reservoir Conditions



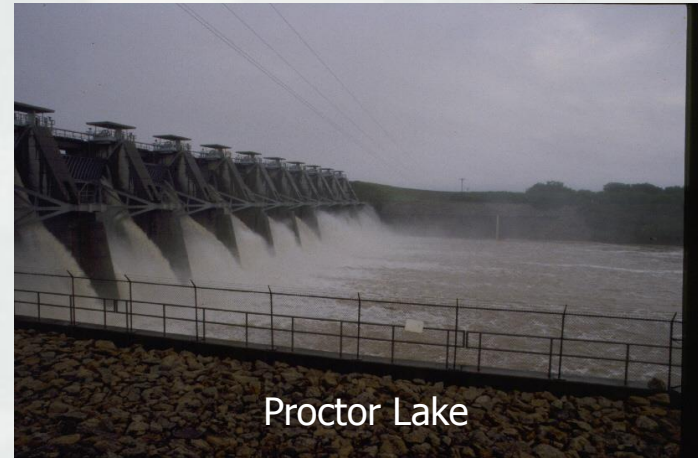
**BUILDING STRONG®**



# Drought Reservoir Conditions



# Canyon Dam Surcharge Operations



Proctor Lake



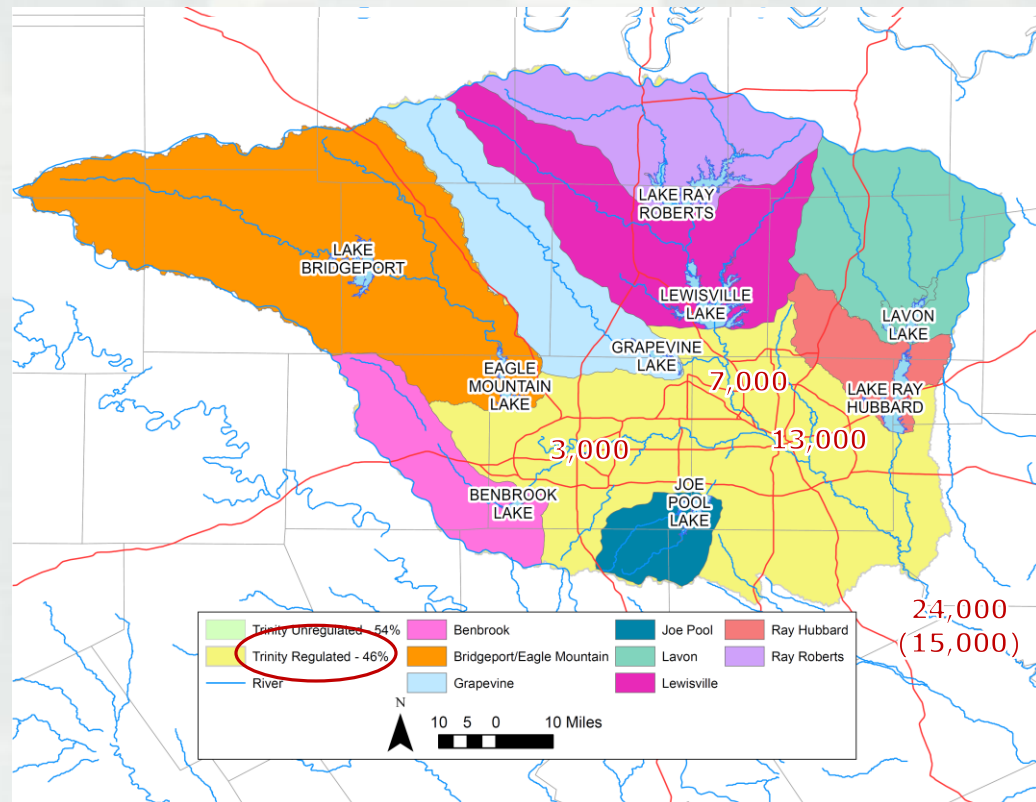
Lavon Lake





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

- **Flood Control System**
  - **Over \$79 billion in damages prevented**
  - **\$2-3 billion per year**
- **Water Supply System**
  - **6.8 million served**
  - **Cost = \$2.5 billion**



# USACE Reservoir Effectiveness

	Conservation Storage AC-FT	Flood Storage AC-FT	Sq. Mi.	Inches	Surcharge	millions of \$
<b>Benbrook</b>	72,500	170,350	429	7.4	6.6	7,261
<b>Joe Pool</b>	142,900	123,100	232	9.9	27.3	3,179
<b>Ray Roberts</b>	749,200	260,800	692	7.1	23.5	
<b>Lewisville</b>	640,986	340,777	968	6.6	21.3	55,638
<b>Grapevine</b>	145,100	244,400	695	6.6	9.8	13,226
<b>Lavon</b>	380,000	275,600	770	6.7	4.2	354
<b>Totals</b>	2,130,686	1,415,027	3,786			79,658
Total Trinity River Drainage Area			8,147			
Percent of Watershed Regulated by USACE			46%			
Inches of Runoff (flood pool)			7.0	= 9"-24" rainfall		
Inches of Runoff (surcharge pool)			14.8	= 18"-36" rainfall		



# Real-Time Operations and FRM

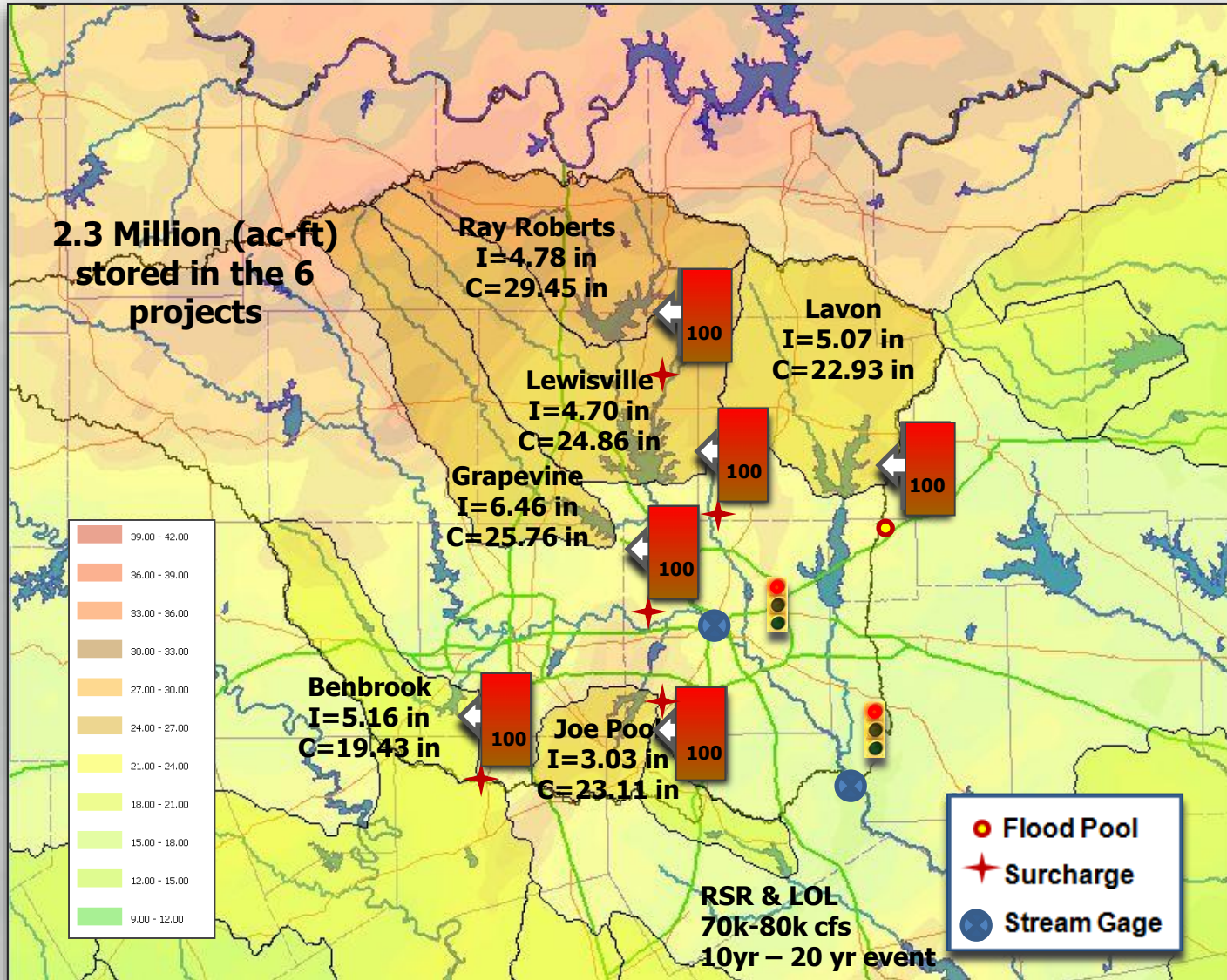
- Local, state and federal partnership – Takes more than an army
  - ▶ Real-time operations
    - USGS, NWS-RFC
    - City of Dallas, TRWD
  - ▶ EM community – State and local
  - ▶ Dam safety community
  - ▶ FRM
    - NCTCOG, CDC Program, ISWM
    - Local, state
    - FEMA
    - TFMA



# Remaining Vulnerabilities



# May-June 2015 Flooding



\*Pool percent taken on the last day



# 2015 Surcharge Operations



Denton Creek

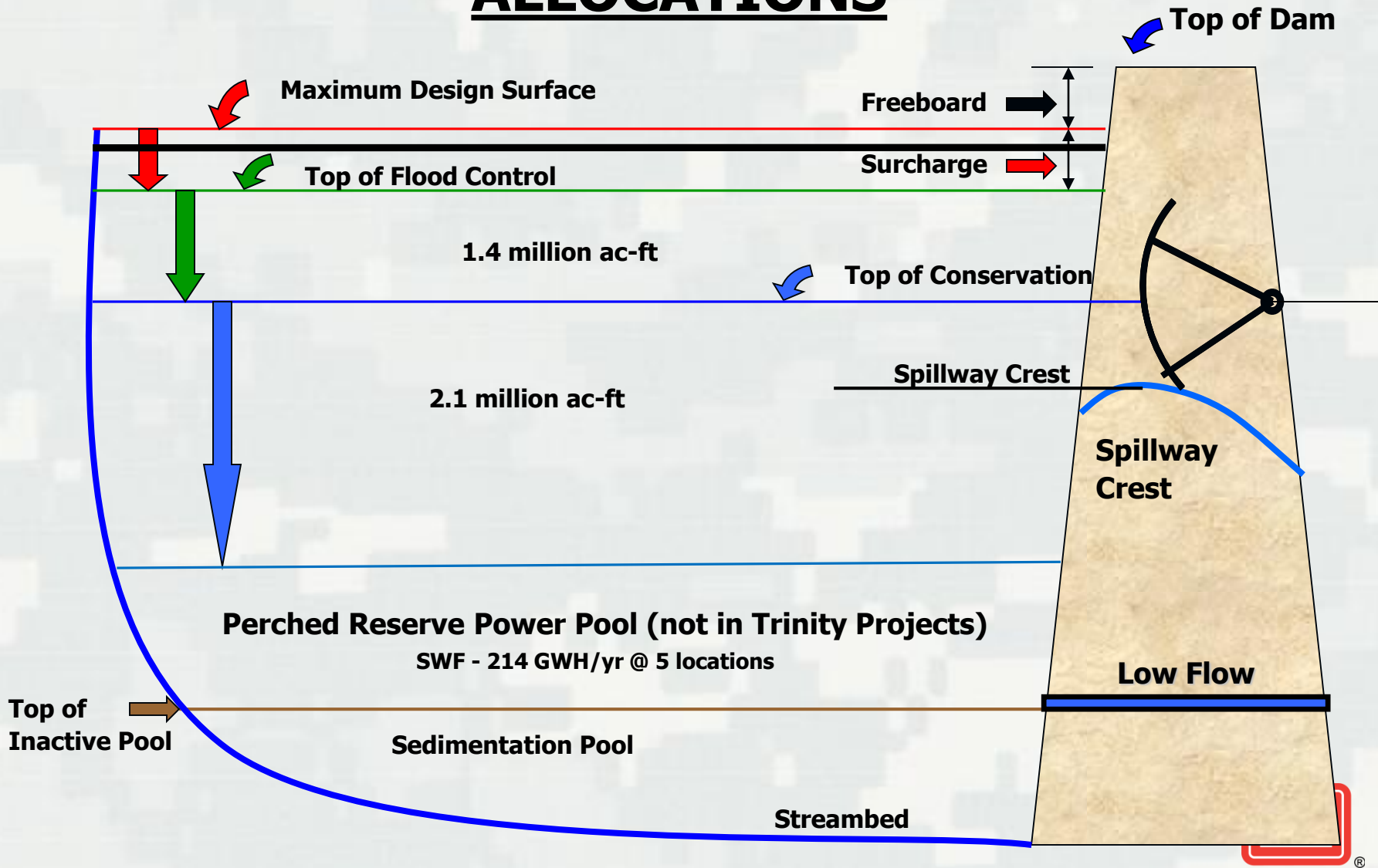


Lavon



Lewisville

# RESERVOIR ALLOCATIONS

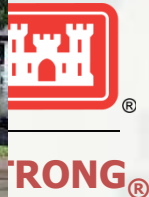
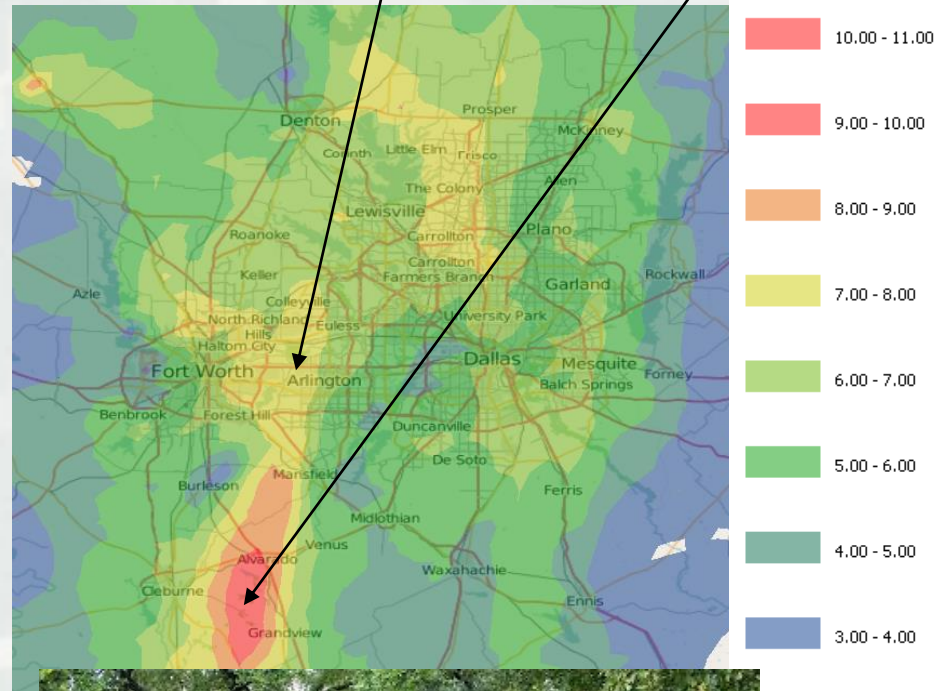




# 2010 Tropical Storm Hermine Flood Rush Creek, Arlington, TX

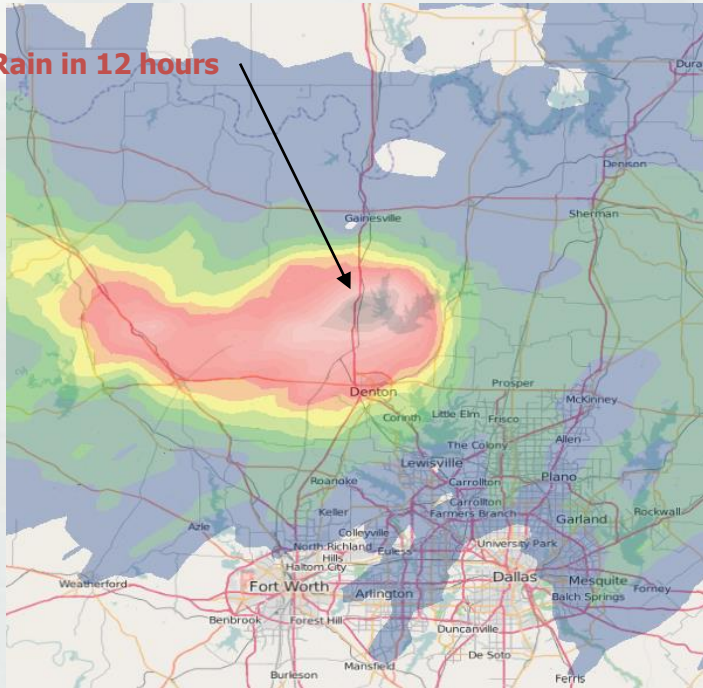
7-8" Rain over Rush Creek

11" Rain

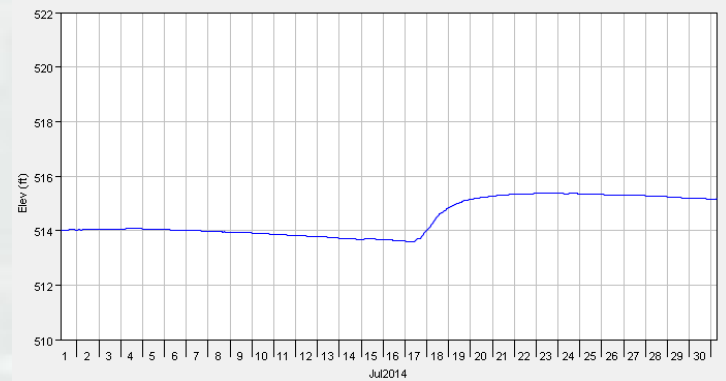


# July 2014 – Valley View – Elm Fork Flood

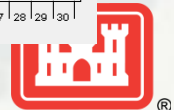
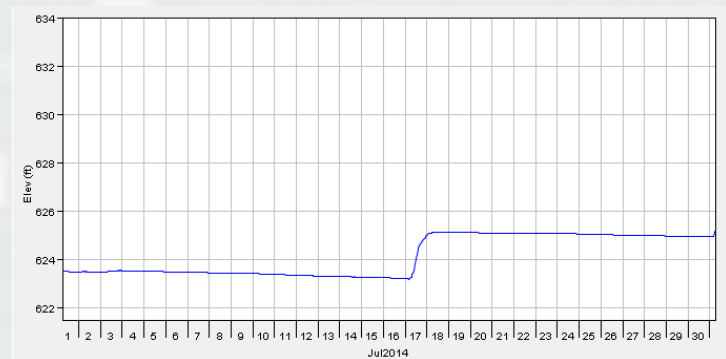
15" Rain in 12 hours



Lewisville Lake Elevation July 2014

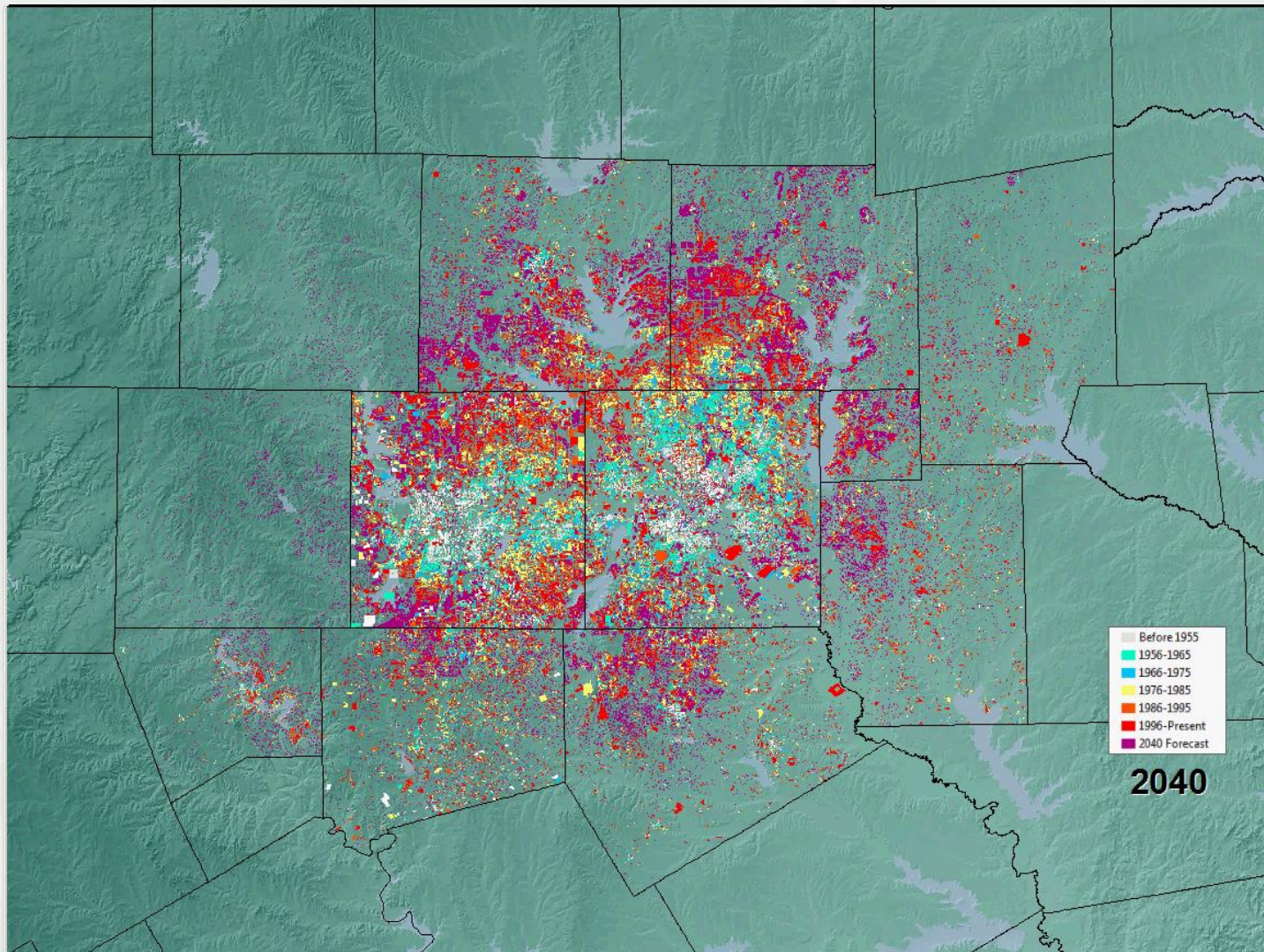


Ray Roberts Lake Elevation July 2014





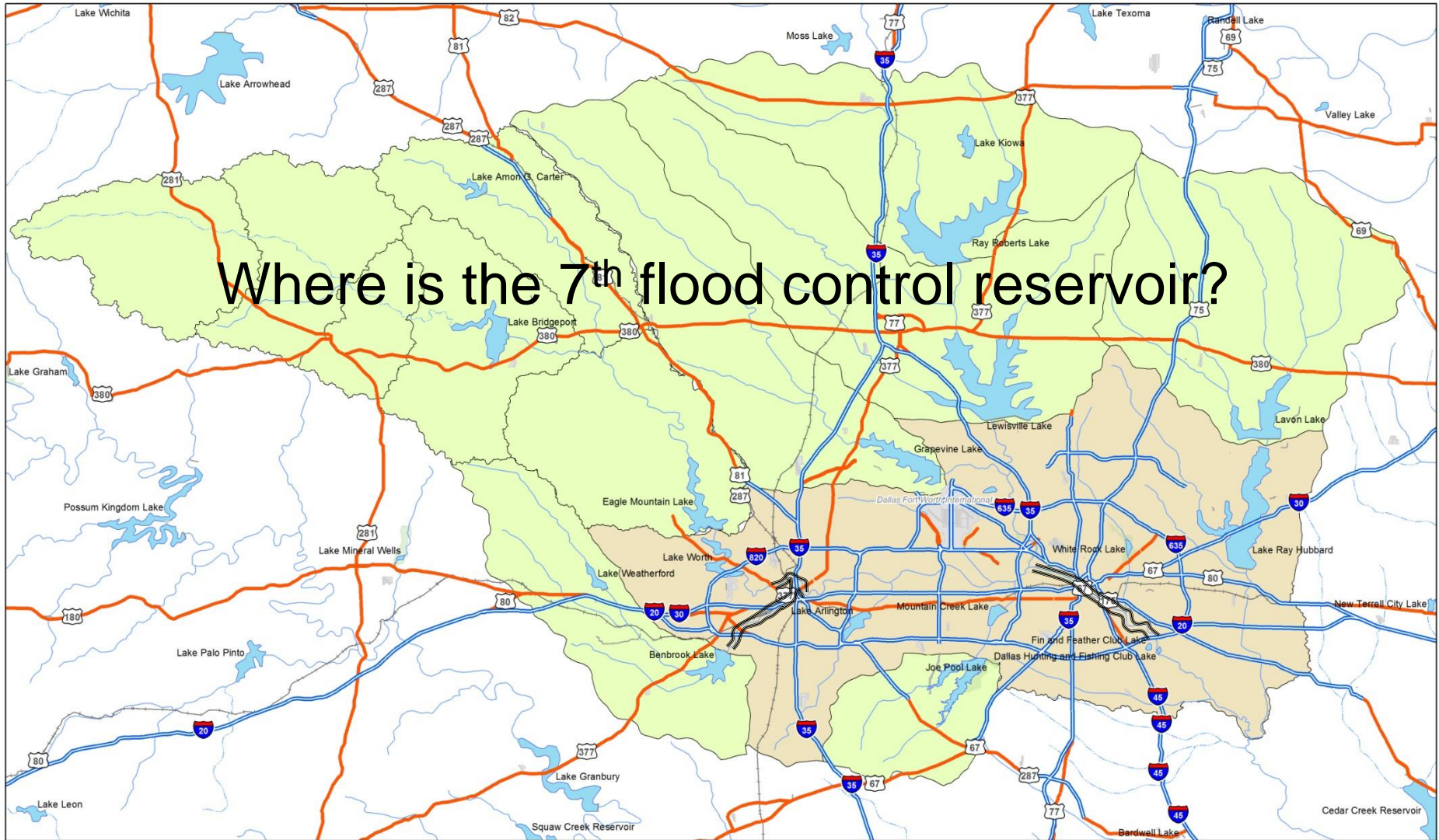
# 1950-2040 Growth Animation





# NCTCOG/Local Gov./USACE Partnership

Where is the 7<sup>th</sup> flood control reservoir?



# Seventh Flood Control Reservoir NCTCOG - CDC Regulatory Program

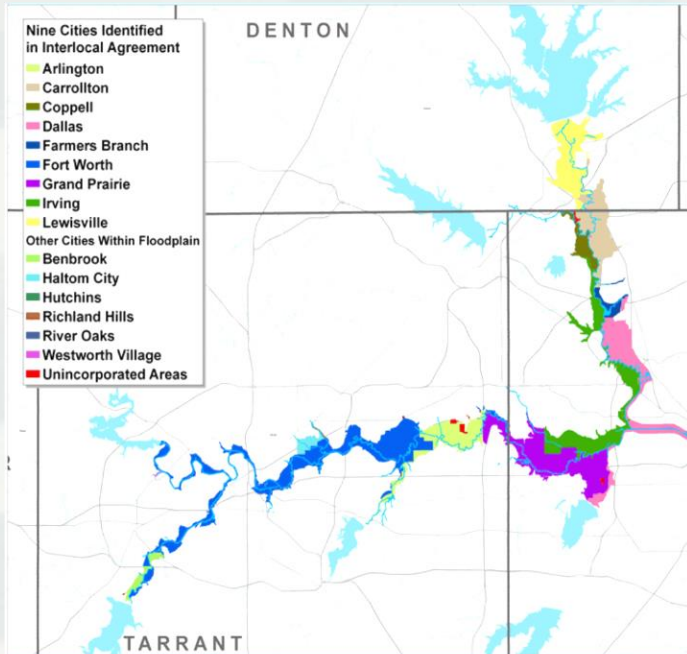
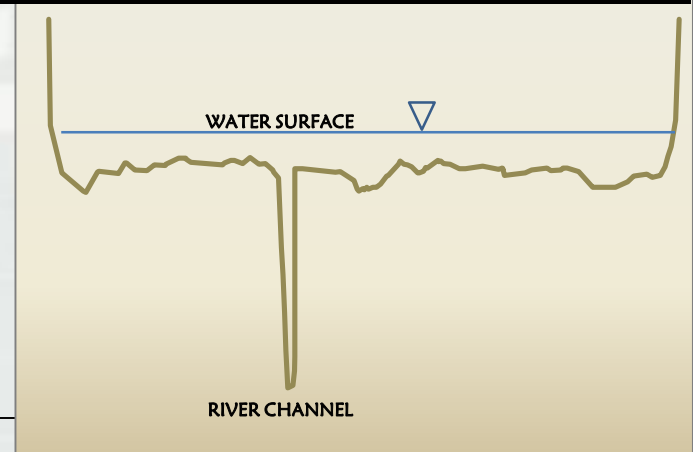
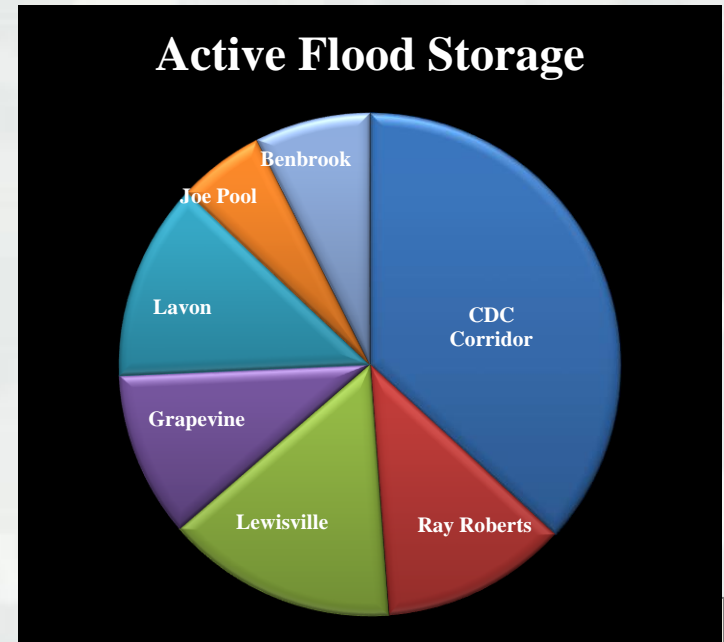


Figure is for demonstration purposes only and should not be used in determining exact cover



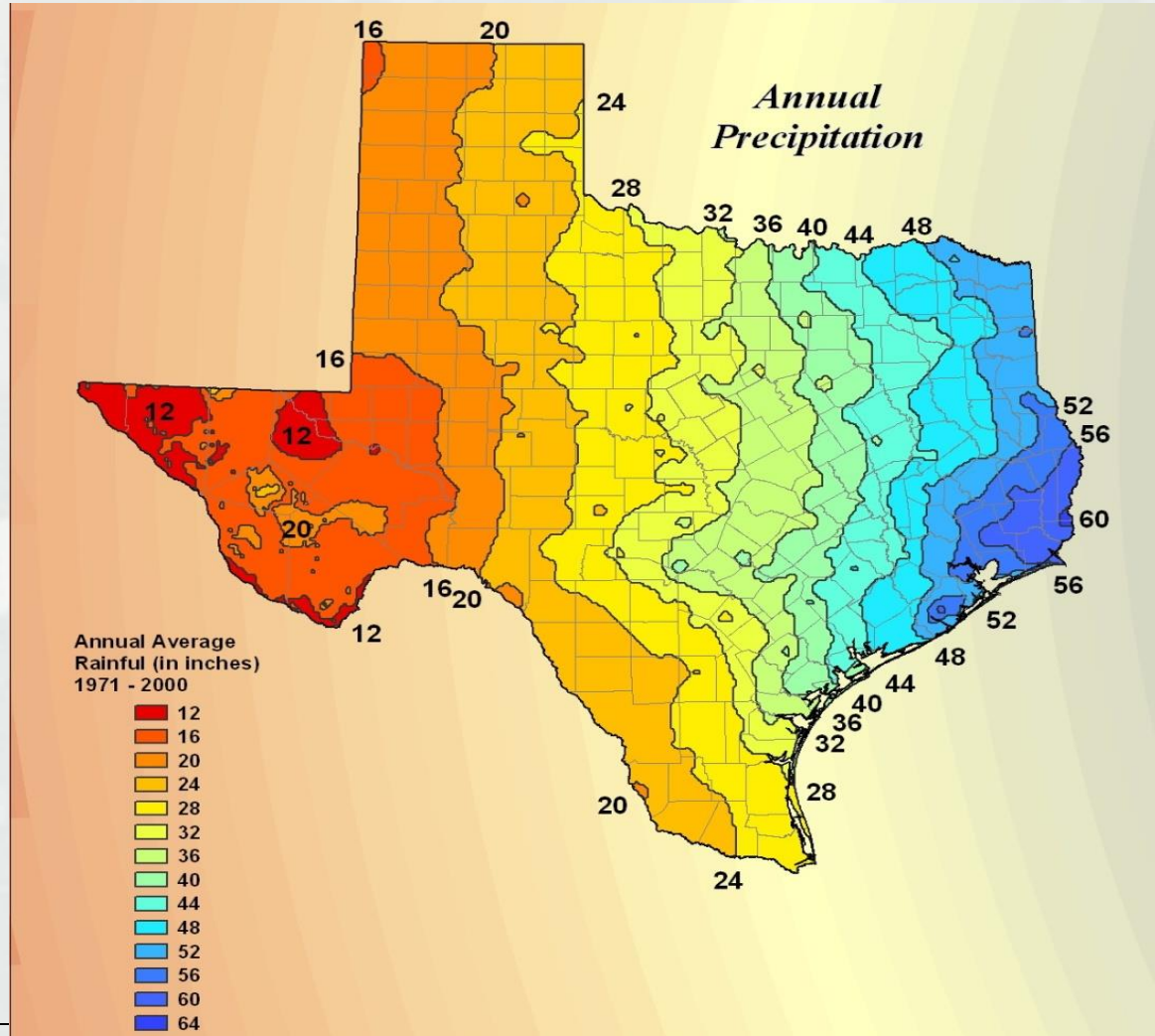
**BUILDING STRONG®**

Full floodplain conveyance and storage

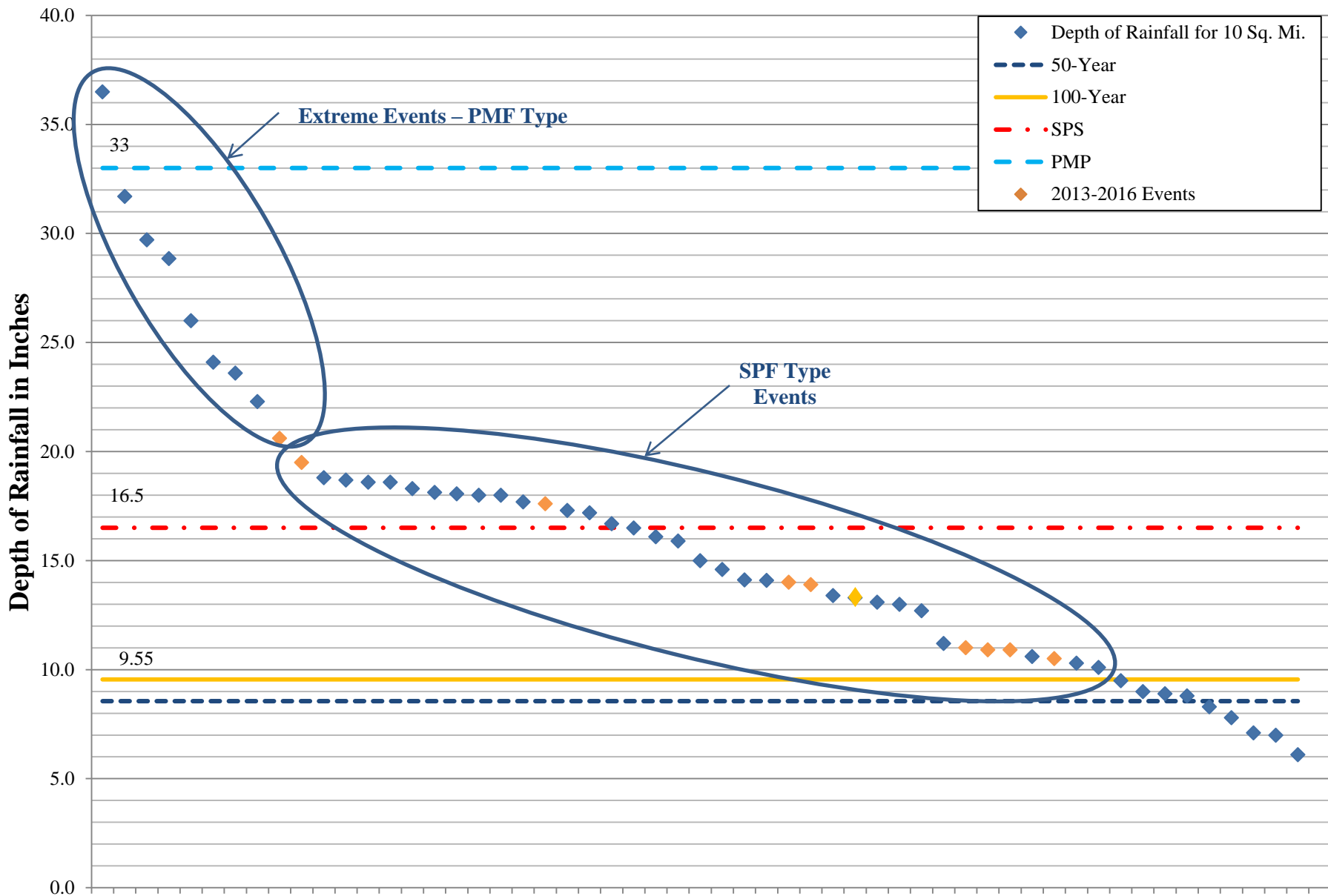




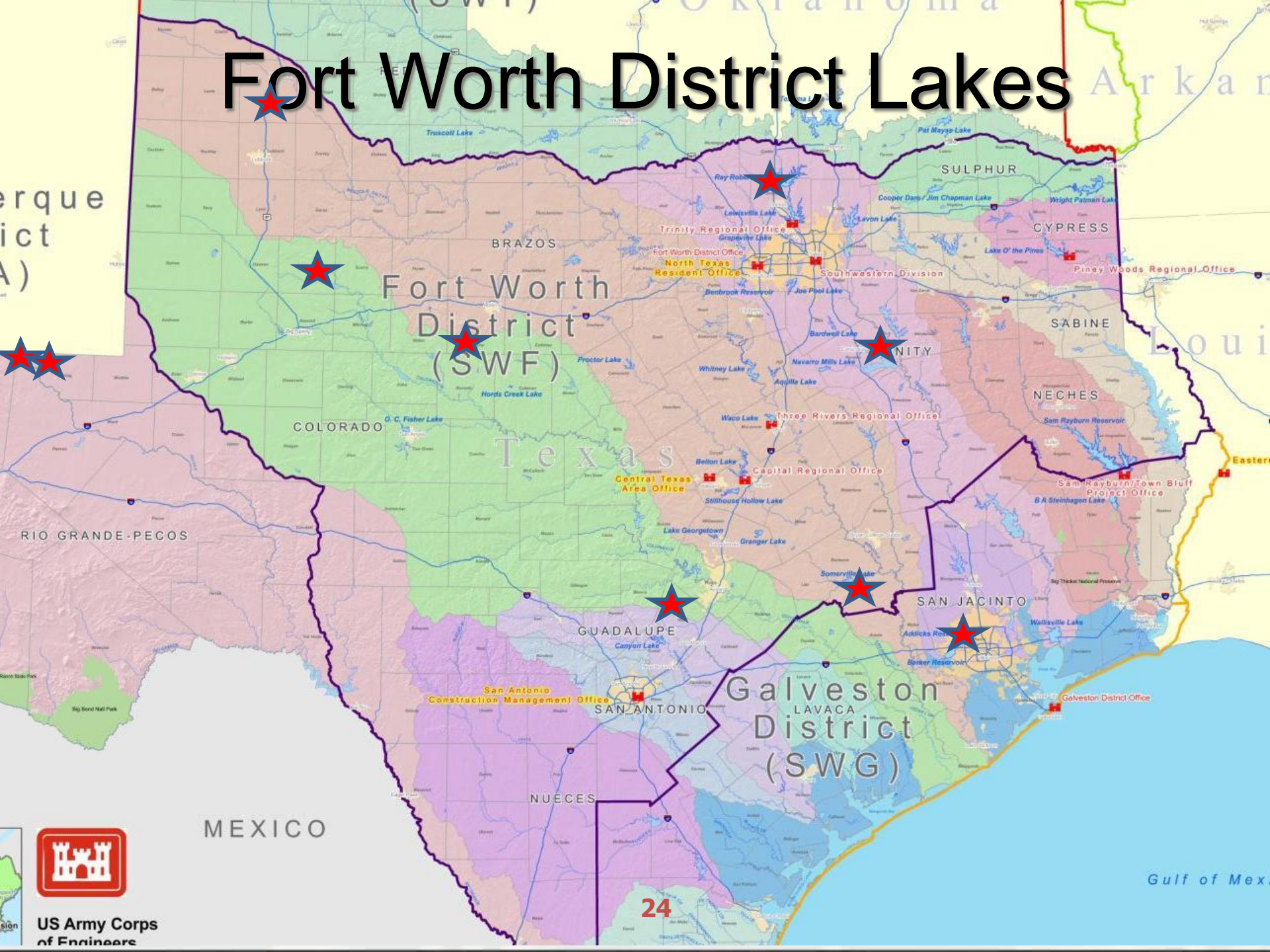
# Mean Annual Precipitation for Texas



# 24 Hour Rainfall for 10 Sq. Mi.



# Fort Worth District Lakes



erque  
ict  
(A)



US Army Corps  
of Engineers



# Higher Standards

- Existing National Standard (Is this Appropriate for Texas)
  - ▶ 1' above the 1% exceedance or 100-year level
- Higher standards
  - ▶ 2' above the 1% exceedance or 100-year level
  - ▶ At or above the .2% exceedance or 500-year level
- Executive Order 11988 amended by 13690
  - ▶ 2' or 3' above the 1% exceedance or 100-year level
  - ▶ At or above the .2% exceedance or 500-year level
- Why
  - ▶ Less risk
  - ▶ Decrease future losses and costs
  - ▶ Lower insurance premiums



# Dam Safety Program In USACE

## **Routine (Locally Managed)**

- Managed locally with national guidelines
- Inspections
  - ▶ Annual, periodic
  - ▶ Periodic assessments
- Emergency action plans
  - ▶ Table top exercises
- WM activities
  - ▶ Scalable real-time to 24/7/365
  - ▶ State of the art forecasting, inundation mapping (CWMS)
- Surveillance during floods
  - ▶ Scalable to 24/7

## **Non-Routine (Nationally Managed)**

- National program (700 + dams)
- Risk based approach
  - ▶ Failure processes
  - ▶ Consequences
  - ▶ DFW – elevated consequences
- DSAC
- Processes
  - ▶ Portfolio risk assessments screening
  - ▶ IRRM
  - ▶ IES
  - ▶ DSMS





# Questions?



**US Army Corps  
of Engineers**

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

**Jerry L. Cotter, P.E.**

**Chief Water Resources**

**(817) 886-1549 TEL**

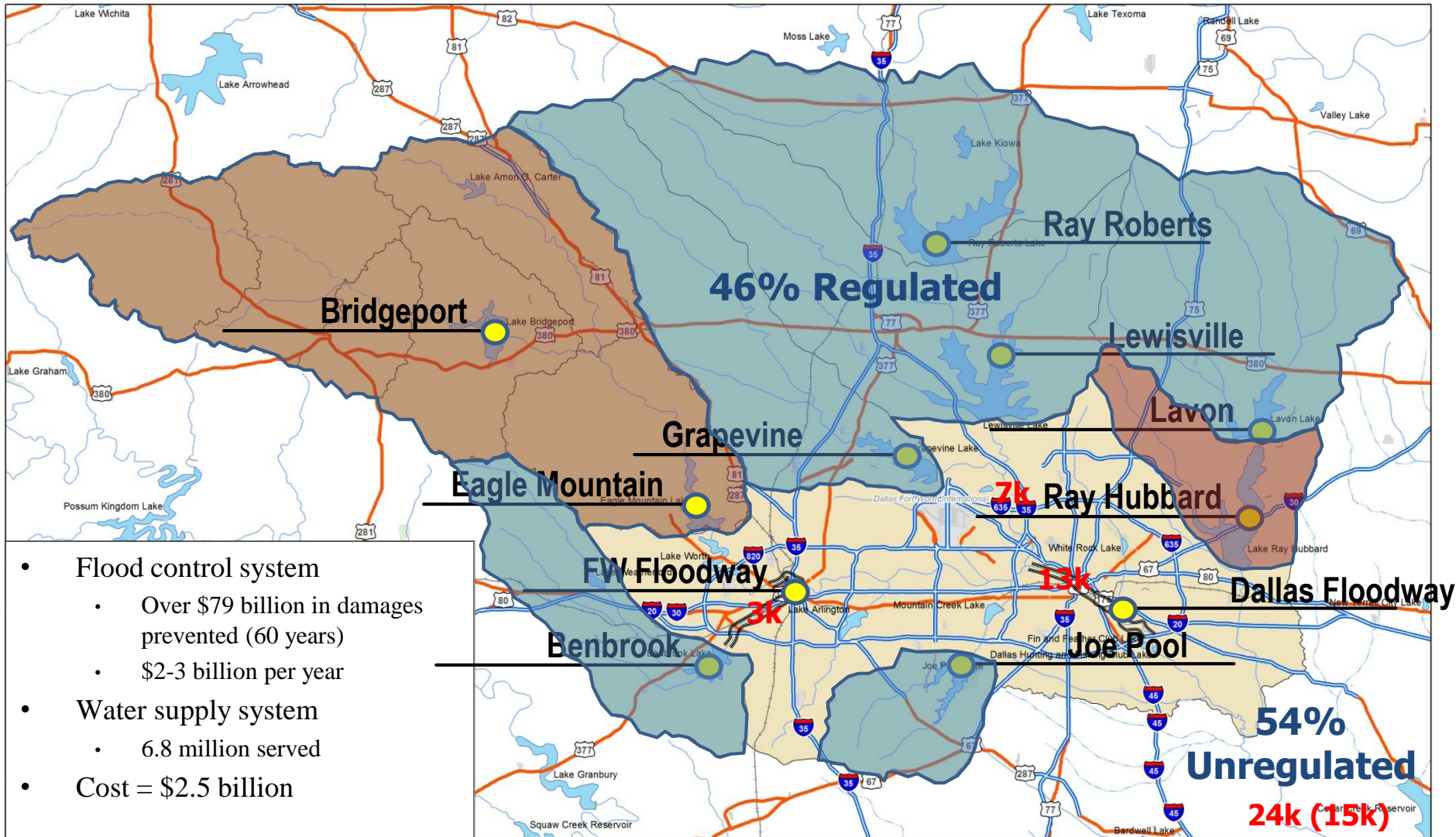
**(817) 454-1290 CEL**

**[Jerry.L.Cotter@usace.army.mil](mailto:Jerry.L.Cotter@usace.army.mil)**



**BUILDING STRONG®**

# Upper Trinity River Flood System



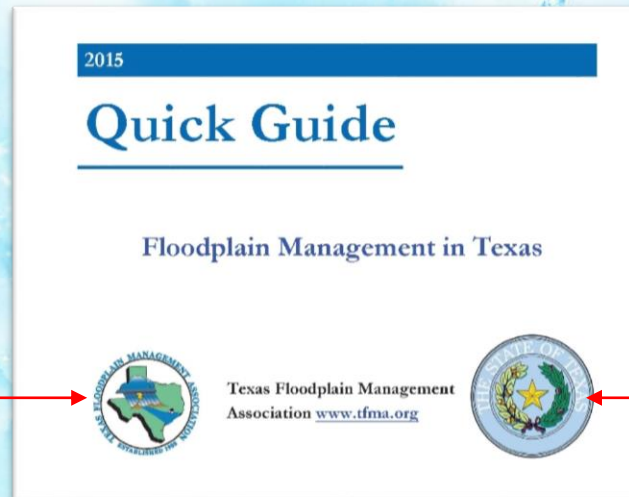
- Flood control system
  - Over \$79 billion in damages prevented (60 years)
  - \$2-3 billion per year
- Water supply system
  - 6.8 million served
- Cost = \$2.5 billion

**54% Unregulated**  
**24k (15k)**

**Legend**  
 Trinity Unregulated  
 Trinity Regulated

# A Very Quick Look at the 2015 Texas Quick Guide

CRS Users Group – Aug 31, 2016  
North Texas Central Council of Government  
Arlington, TX



**TFMA**



Texas Floodplain Management  
Association [www.tfma.org](http://www.tfma.org)



**TWDB**

T. Lynn Lovell, PE, CFM, D.WRE





# Outline of Presentation

- What is the Texas Quick Guide
- How can it help Texas floodplain administrators?
- Example pages from 2015 Texas Quick Guide
- TFMA initiative for updates and additions to Texas Quick Guide



2015

# Quick Guide

---

## Floodplain Management in Texas

**Previous Texas Quick Guides 2002 and 2008**



Texas Floodplain Management  
Association [www.tfma.org](http://www.tfma.org)



The 2015 Quick Guide is ninety one pages and covers seventy-five floodplain-related subjects.

2015

# Quick Guide

Floodplain Management in Texas



Texas Floodplain Management  
Association [www.tfma.org](http://www.tfma.org)



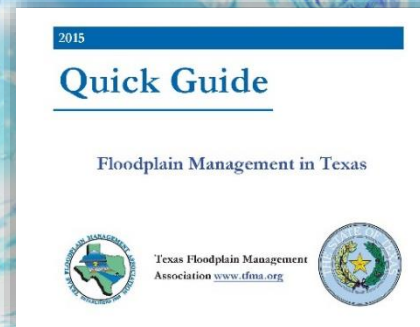


# Quick Guide Includes:

- Why Communities Regulate Floodplains
- Safe Uses of the Floodplain
- Significant coverage of the National Flood Insurance program
- Floodplain Ordinances and Permits
- Common Issues with Development in the Floodplain
- Much, much More...

A quote from the Guide provides an insight to its content:

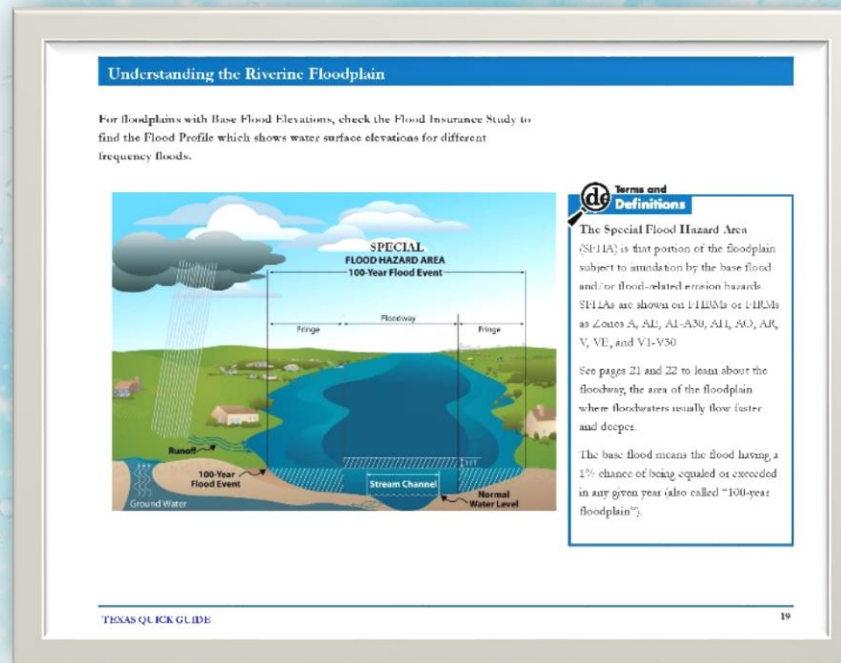
“This Quick Guide will help you understand more about why and how communities in the State of Texas manage floodplains to protect people and property.”





# Why is the Texas Quick Guide Important?

- Have you tried to explain a floodplain or the 44 CFR - Federal Floodplain Management Regulations to an elected official, developer or concerned citizen?
- Pictures are worth a 1,000 words!



# Texas Quick Guide Example Slides

## Texas Flood Events and Flood Facts

- Each year, an average of 14,000 flood events occur in Texas.
- Millions of dollars in damage are caused by floods each year.
- Over 100,000 people have died in flood events in the United States.
- Approximately 10% of the United States population lives in flood-prone areas.

**WHEN DISASTERS STRIKE**  
PRESIDENTIAL & SBA DECLARATIONS 1943-2022

**Number of Declarations**

- 1-5
- 6-10
- 11-15
- 16-20
- 21-25

**Not all flood events are declared major disasters. Many floods are local, affecting only small areas or a few watersheds.**

TEXAS QUICK GUIDE 5

## FEMA's Risk Mapping Assessment and Planning (Risk MAP) Program

This slide program is based on the Risk MAP Assessment and Planning (Risk MAP) program and is designed to help you understand the Risk MAP program and its benefits. The Risk MAP program is a voluntary, multi-step process that helps you assess your community's flood risk and develop a plan to reduce that risk. The Risk MAP program is a multi-step process that helps you assess your community's flood risk and develop a plan to reduce that risk.

**RiskMAP**  
Assessing Hazards Together

**Goals:**

- Deliver High Quality Risk Data
- Increase Awareness of Flood Risk
- Promote Community Mitigation Actions

**Products:**

- High Quality Risk Data
- Risk Data - Maps, Reports, and Data
- Flood Risk Assessment
- Flood Risk Assessment
- Flood Risk Assessment

**Processes:**

- Enhance delivery of Risk MAP Products
- Collaborate across all levels of government

**MITIGATION PLANNING**

**Reduce Risk to Lives and Property**

16 TEXAS QUICK GUIDE

## Nature Doesn't Read Maps

**Important Information**

Many people don't realize and just how risky the floodplain can be. There is a 26% chance that a new normal home in the floodplain will be damaged during a 30-year occupancy period. The chance that a major fire will occur during the same period is less than 5%.

**CAUTION:** Nature doesn't read the flood maps. More rains and flash floods can cause flooding that is higher than the 1% annual chance floodplain (100-year) flood. Contact your insurer to discuss your home's location by looking at the map. See page 31 to see how this will save you money on insurance.

TEXAS QUICK GUIDE 11

## Be Flood Safe — Don't Drive Through Flooded Roads

- Never drive through flooded roads — they may be washed out.
- Changing cars may float in only 18" of water.
- Floating cars rarely get stopped downstream, making rescue difficult and dangerous.
- Be especially cautious at night when it's harder to recognize dangers.
- Hundreds of people have died in floods in Texas — many were trapped in cars.
- It takes only six inches of fast-moving water to sweep an adult off their feet.

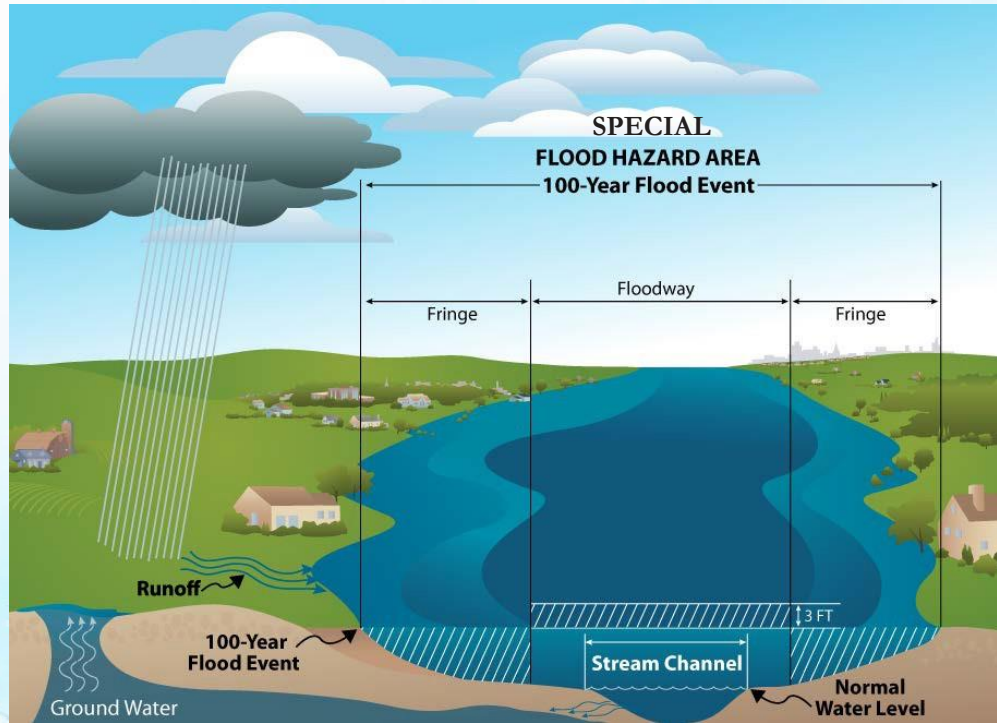
**Flash floods are dangerous. Do not try to walk or drive through fast-moving water.**

TEXAS QUICK GUIDE 12



## Understanding the Riverine Floodplain

For floodplains with Base Flood Elevations, check the Flood Insurance Study to find the Flood Profile which shows water surface elevations for different frequency floods.



### Terms and Definitions

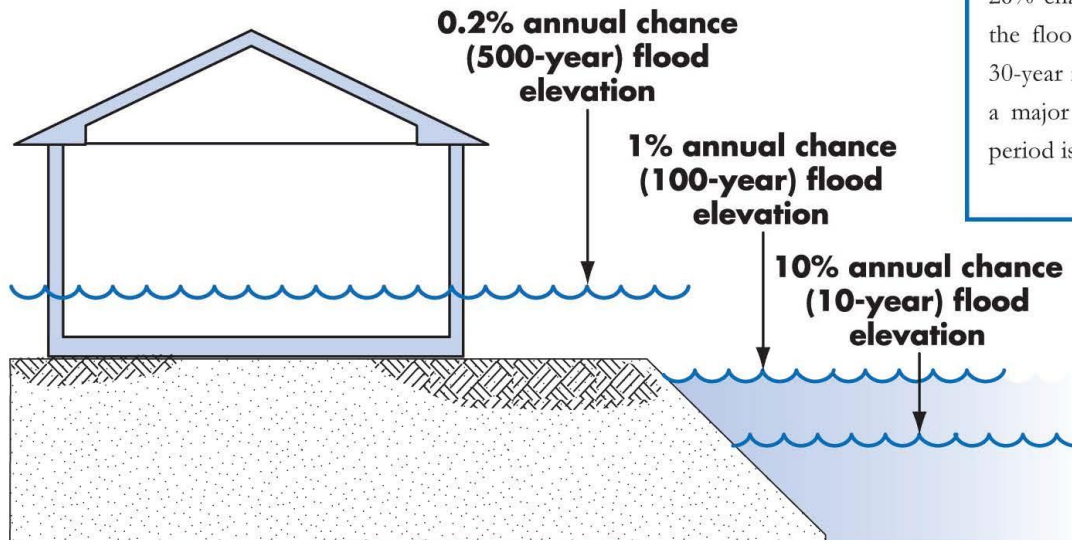
#### The Special Flood Hazard Area

(SFHA) is that portion of the floodplain subject to inundation by the base flood and/or flood-related erosion hazards. SFHAs are shown on FHBMs or FIRMs as Zones A, AE, A1-A30, AH, AO, AR, V, VE, and V1-V30.

See pages 21 and 22 to learn about the floodway, the area of the floodplain where floodwaters usually flow faster and deeper.

The base flood means the flood having a 1% chance of being equaled or exceeded in any given year (also called “100-year floodplain”).

## Nature Doesn't Read Maps



### Important Information

Many people don't understand just how risky the floodplain can be. There is a 26% chance that a non-elevated home in the floodplain will be damaged during a 30-year mortgage period. The chance that a major fire will occur during the same period is less than 5%.

**CAUTION:** Nature doesn't read the flood map. Major storms and flash floods can cause flooding that rises higher than the 1% annual chance floodplain (BFE). Consider safety - protect your home or business by building higher. See page 34 to see how this will save you money on insurance.



# ***What is Floodplain Management?***

- **Floodplain management is the operation of a program of preventive and corrective measures for reducing flood damage. FEMA helps communities develop floodplain management regulations that comply with NFIP regulations. Communities may adopt more restrictive regulations. Community officials may have knowledge of local conditions that require higher standards than the NFIP regulations, particularly for human safety.**

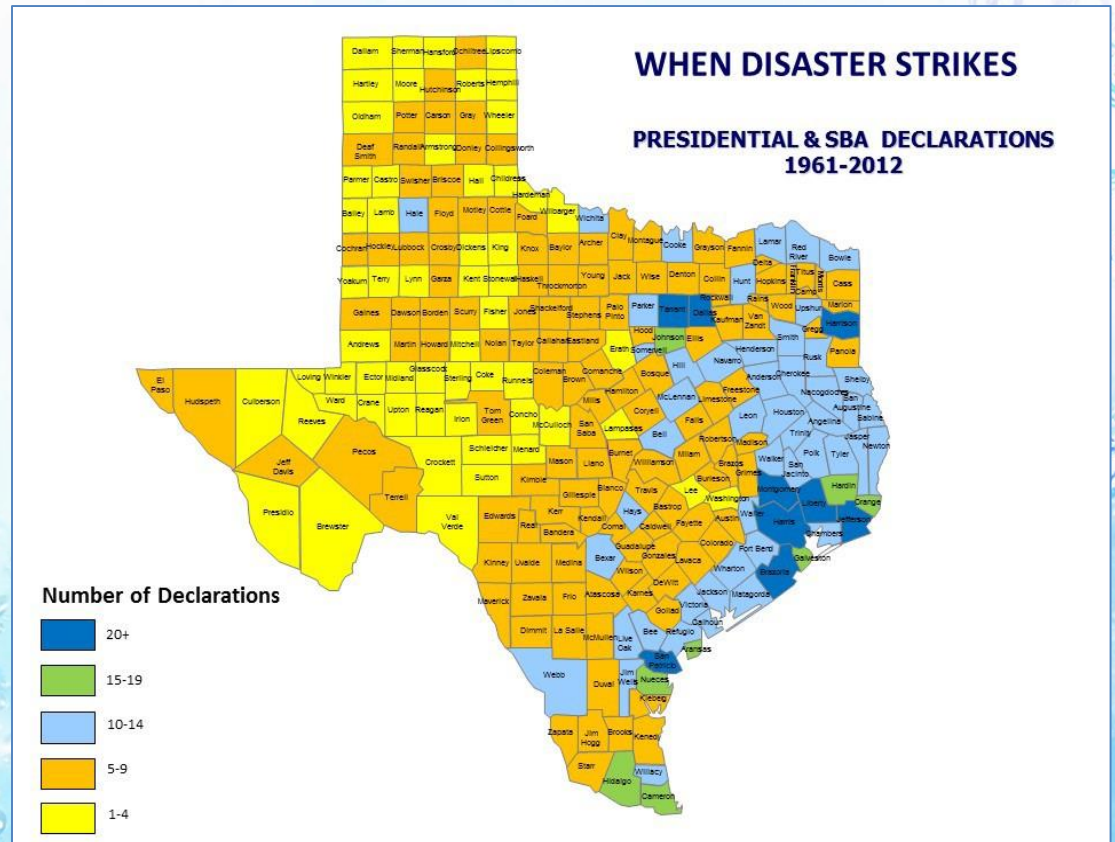
• Source: FEMA Fact Sheet - *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*

**This is a new slide for updated TX Quick Guide**

## Texas Flood Events and Flood Facts

- Flood-prone areas have been identified in most counties, cities and towns in Texas.
- Millions of structures are located in mapped flood-prone areas.
- Since 1988, over 400 people have died in flood-related incidents and over \$4 billion in damage has occurred.
- About 12% of the state's land area is mapped floodplain. Many waterways have not been mapped.

**To Be Updated Through 2016**



Not all flood events are declared major disasters. Many floods are local, affecting only small areas or a few watersheds.



## The NFIP's Community Rating System (CRS)

The NFIP's CRS gives "extra credit" to communities in the form of reduced flood insurance premiums. Communities must apply to the CRS and commit to implement and certify activities that contribute to reduced flood risk. Examples of actions your community can take to reduce the cost of your insurance premiums include:

- Preserve open space in the floodplain
- Enforce higher standards for safer development through zoning, stormwater, subdivision, and flood damage protection ordinances
- Develop hazard mitigation plans
- Undertake engineering studies and prepare flood maps
- Obtain grants to buy out or elevate houses or to floodproof businesses
- Maintain drainage systems
- Monitor flood conditions and issue warnings
- Inform people about flood hazards, flood insurance, and how to reduce flood damage

### DID YOU KNOW?

Community officials can request assistance from CRS specialists to help with the application process and prerequisites. Check the online CRS Resource Center ([see page 76](#)).

**Did You Know? Property owners who live in communities that participate in the CRS program receive a discount on their flood insurance premium.**

**This is only CRS slide in 2015 Texas Quick Guide  
We hope to add several more!**

# CRS Freeboard Credit

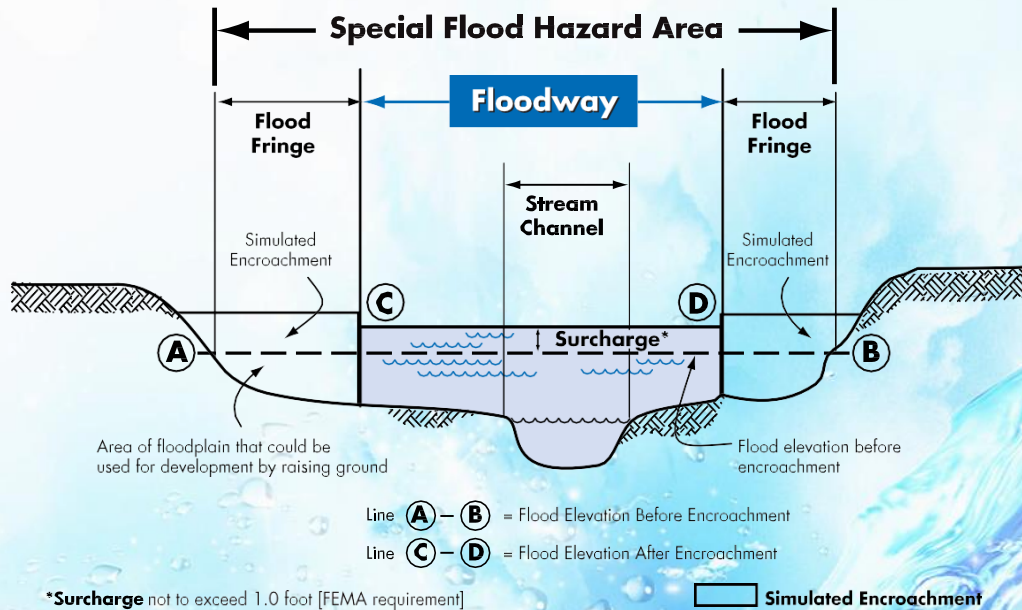
- For CRS credit, freeboard must be applied not just to the elevation of the lowest floor or floodproofing level, but also to the level of protection provided to ALL COMPONENTS OF THE BUILDING.
- All building utilities, including ductwork, must be elevated or protected to the freeboard level and all portions of the building below the freeboard level must be constructed using materials resistant to flood damage.
- If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures.

**This is a new slide for updated TX Quick Guide**



## Understanding the Floodway

For any proposed floodway development, before a local floodplain permit can be issued, the applicant must provide evidence that “no rise” will occur (see page 44). You will need a qualified registered engineer to make sure your proposed project won’t increase flooding on other properties.



### de Terms and Definitions

The Floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to pass the base flood discharge without increasing flood depths.

Computer models of the floodplain are used to simulate “encroachment” or fill in the flood fringe in order to predict where and how much the base flood elevation would increase if the floodplain is allowed to be filled.



## New Flood Insurance Rate Map (Riverine)



- 1 Zone A** (unnumbered) is flood hazard areas without BFEs.
- 2 Cross Section** location (see page 14)
- 3 Zone X** (unshaded) is all other areas considered low risk (formerly Zone C).
- 4 Base Flood Elevation (BFE)** is the water surface elevation of the base flood at specific locations.
- 5 Zone AE** is the 100-year (1% annual chance) floodplain (also called Zone A1-A30).
- 6 The Floodway** is the "cross-hatched" area.
- 7 Zone X** (shaded) shows low risk areas affected by the 500-year flood (0.2% annual chance) floodplain (also called Zone B).



## Be Flood Safe — Don't Drive Through Flooded Roads

- Never drive through flooded roads – they may be washed out.
- Passenger cars may float in only 18-24 inches of water.
- Floating cars easily get swept downstream, making rescues difficult and dangerous.
- Be especially cautious at night when it is harder to recognize dangers.
- Hundreds of people have died in floods in Texas – many were trapped in cars.
- It takes only six inches of fast moving water to sweep an adult off their feet.



**Flash floods are dangerous. Do not try to walk or drive through fast-moving water.**

# Federal Emergency Management Agency (FEMA) & National Flood Insurance Program (NFIP)



- FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards.

## FEMA/NFIP



**FloodSmart.gov**  
The official site of the NFIP

<https://www.floodsmart.gov/>

### FLOODING & FLOOD RISKS

<https://www.floodsmart.gov/floodsmart/understanding-flooding-flood-risks/ffr-overview.jsp>

### ABOUT THE NATIONAL FLOOD INSURANCE PROGRAM

<https://www.floodsmart.gov/floodsmart/pages/about/nfip-overview.jsp>

### FLOOD MAP CENTER

<https://www.floodsmart.gov/portal>

### PLAN, PREPARE & MITIGATE

<https://www.fema.gov/plan-prepare-mitigate>

**Lots of Resources, References, and Useful Links**



# Additional Guidance – **FEMA** Technical Bulletins & FEMA 480 Desk Reference Set

- Local floodplain managers often find FEMA Floodplain Mandatory Development Criteria as found in the Code of Federal Regulations, 44 CFR, Section 60.3 somewhat vague and more generic rather than defining and specific. To help locals better manage floodplain development, FEMA has published a series of Technical Bulletins to provide additional guidance, clarification and definition to a number of building/construction/development situations. The following Bulletins are available for review and download:
- Technical Bulletin 0 – User’s Guide to NFIP Technical Bulletins  
<https://www.fema.gov/media-library/assets/documents/1169?id=1484>
- Technical Bulletin 1 – Openings in Foundation Walls & Walls of Enclosures (2008)  
<https://www.fema.gov/media-library/assets/documents/2644?id=1579>
- Technical Bulletin 2 – Flood Damage-Resistant Materials Requirements (2008)  
<https://www.fema.gov/media-library/assets/documents/2655?id=1580>
- Technical Bulletin 3 – Non-Residential Floodproofing Requirements for Certification (1993)  
<https://www.fema.gov/media-library/assets/documents/3473?id=1716>
- Technical Bulletin 4 – Elevator Installation (2010)  
<https://www.fema.gov/media-library/assets/documents/3478?fromSearch=fromsearch&id=1717>



# Texas Floodplain Management Association

<http://www.tfma.org/>

The Texas Floodplain Management Association (TFMA) is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program (NFIP), flood preparedness, flood warning, flood safety and disaster recovery.

TFMA is the largest State Chapter of the Association of State Floodplain Managers (ASFPM) and is one of only five states authorized by ASFPM to administer a National Accredited Certified Floodplain Manager Program (CFM).

TFMA is actively involved in NFIP training through working partnerships and coordination with FEMA and Texas Water Development Board (TWDB).

## **TFMA/ASFPM CERTIFIED FLOODPLAIN MANAGER PROGRAM (CFM)**

<http://www.tfma.org/?page=Certification>

## **TFMA MEMBERSHIP**

<http://www.tfma.org/?page=Membership>

## **TFMA MENTOR PROGRAM**

<http://www.tfma.org/?page=Mentor>

## **TFMA TRAINING CALENDAR**

[http://www.tfma.org/events/event\\_list.asp](http://www.tfma.org/events/event_list.asp)

## **TFMA OUTREACH & FLOOD SAFETY**

<http://www.tfma.org/?page=Outreach>

**TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION**  
**"Turn Around Don't Drown" TADD**  
**Flood Safety Education and Outreach Program**



# 2017 TFMA Texas Quick Guide

- Major Concept: Establishing a Mechanism and Structure to Keep the QG Updated Regularly in the Future (**Living Document**)
- Needs Updates/Revisions/New Subjects
- TFMA Texas Quick Guide Task Force
- Volunteers to Make it Happen!



2015

# Quick Guide

[http://www.twdb.texas.gov/flood/resources/doc/Texas\\_Quick\\_Guide.pdf](http://www.twdb.texas.gov/flood/resources/doc/Texas_Quick_Guide.pdf)

## Floodplain Management in Texas



Texas Floodplain Management  
Association [www.tfma.org](http://www.tfma.org)



**QUESTIONS?**





# TFMA Higher Standards Guide

Elected Officials  
and  
NCTCOG CRS Users Group  
Arlington, TX  
August 31, 2016

T. Lynn Lovell, PE, CFM, D.WRE  
John Ivey, PE, CFM





# 2016 – 13th Annual TFMA Higher Standards Survey

Special Acknowledgement  
To  
Charlie Hastings, PE, CFM, who initiated the  
First TFMA Survey in 2004

# “Work in Progress”

- Roy Sedwick, CFM – TFMA/TCRFC
- Mike Segner, CFM – TWDB
- John Ivey, PE, CFM – TFMA Higher Standards/Mentor Committee



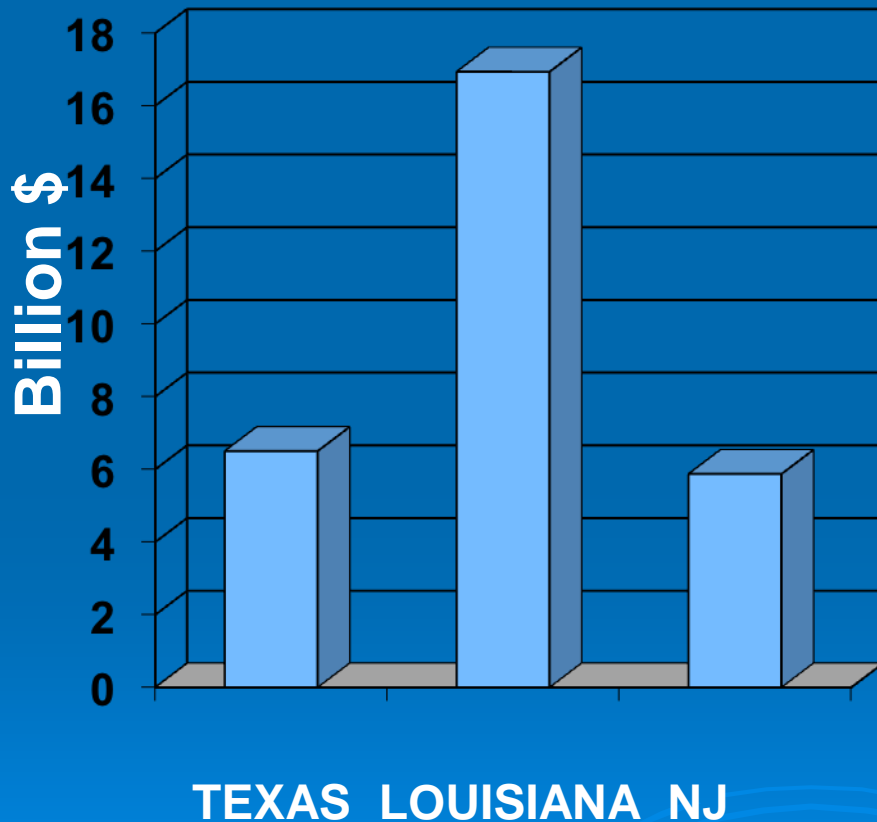
# Senate Bill 936

- Amends the Texas Water Code
- Authorizes political subdivisions to adopt more comprehensive floodplain management rules
- Authorizes participate in floodplain management and mitigation initiatives such as FEMA's Community Rating System (CRS) Program
- Allows collection of reasonable fees to cover the cost of administering a local floodplain management program
- Allows steps, using regional, watershed, and multi-objective approaches, to improve the long-range management and use of flood-prone areas
- Passed - 77<sup>th</sup> Legislature 2001

# TFMA's Higher Standard Goals

- Reduce the risk of loss of life and property damage from floods
- Encourage wise floodplain development
- Reduce annual flood claims
- Reduce the number of Repetitive Loss and Severe Repetitive Loss properties
- Encourage higher floodplain standards
- Increase participation in CRS

# NFIP Flood Claims



- 1978-2016
- \$6.5 Billion (Texas)
- \$53.1 Billion Nationally
- Texas represents 12.2%
- AL, FL, LA, MS, NJ, NY, PA and TX = 82.2% (WOW)

Source: [www.fema.gov](http://www.fema.gov)



# 2016 Questionnaire - Freeboard

- Zone AE/VE - New construction must be elevated 1'; 2'; 3' feet above BFE as shown on FIRM (existing conditions).
- Zone AE/VE - New construction must be elevated 1'; 2'; 3' feet above BFE determined by a study based on fully developed watershed (future conditions)

# Zone A (no BFE)

- Zone A (no BFE) - Developer must conduct a study to define the BFE.

Yes \_\_\_\_\_; No \_\_\_\_\_;

[Note: Study required to identify BFE if development exceeds 50 lots or 5 acres – 44CFR60.3(b)(3)]

# Zone A (unnumbered)

- Developer must conduct a study to define the floodplain and floodway boundaries and BFE's based on existing conditions.

Yes \_\_\_\_\_; No \_\_\_\_\_;



# Zone A (unnumbered)

- Developer must conduct a study to define the floodplain and floodway boundaries and BFE's based on fully developed watershed (future conditions)

Yes \_\_\_\_\_; No \_\_\_\_\_;

# Floodway Requirements

- Floodway - no development is allowed within the floodway boundary.

Yes \_\_\_\_\_; No \_\_\_\_\_;

[Several communities prohibit all development in the floodway]

# Floodway Requirements

- No fill is allowed in the floodway or floodplain without mitigation (No Adverse Impact = NAI).

Yes \_\_\_\_\_; No \_\_\_\_\_;

[Several communities prohibit floodway development even if there is no rise]



# Detention Requirements

## ➤ Is Detention Required?

Yes \_\_\_\_\_; No \_\_\_\_\_;

## ➤ Notes:

- 1. Several communities require “No Adverse Impact” (NAI)
- 2. Several communities require mitigation of all fill placed in floodplain and floodway
- 3. Several communities require zero rise for all development within the SFHA

# Requirements in Zones B, C & X

## Zone X (Shaded)

- Zone X (Shaded) - New construction must be elevated 1'; 2'; 3' feet above natural grade or above the crown of the nearest street.
- [Friendswood and other communities require new construction to be elevated a minimum of +2' in Zone X-shaded and Zone X-unshaded]

# Requirements in Zones B, C & X

## Zone X (Unshaded)

- Zone X (Unshaded) - New construction must be elevated 1'; 2'; 3' feet above natural grade or the crown of the nearest street.
- Note: FEMA's definition of Zone X (shaded) is areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

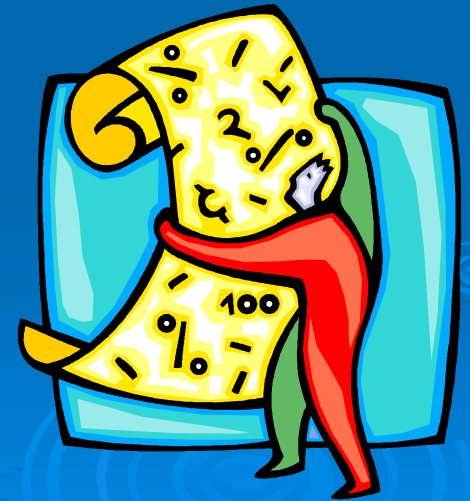


# Elevation Certificates

- Elevation Certificate Requirements -
  - (1) Submitted prior to forming/pouring lowest floor. Yes \_\_\_\_\_; No \_\_\_\_\_;
  - (2) Submitted when structure is completed. Yes \_\_\_\_\_; No \_\_\_\_\_;
  - (3) Required prior to issuing a CO. Yes \_\_\_\_\_; No \_\_\_\_\_;
  
- Note: Several communities require multiple EC submittals.

# CFM's

- Is your community floodplain manager a CFM? Yes \_\_\_\_\_; No \_\_\_\_\_;
- How many CFM's does your community have on staff? \_\_\_\_\_



# 2016 Higher Standards Survey

- Is your community interested in enrolling in CRS?
- What is the top floodplain management issue facing your community?
- What other floodplain management requirements has your community established?



# CRS in Texas

- Only 63 (5%) Texas cities and counties have enrolled in FEMA's Community Rating System
- CRS is FEMA's method to acknowledge community efforts to enforce higher floodplain management programs that mitigate flood risks
- TFMA's goal is to increase the number of CRS communities in Texas

# Bastrop County - TFMA's 2015 Higher Standards Award

- (1) New development must be elevated a minimum of +2' above BFE based on both current and fully developed watershed conditions. (2) Developer must conduct a study, based on fully developed watershed conditions, and determine BFE in Zone A; (3) On-site compensatory storage required along with floodway setback and mitigation of downstream impacts (4) County enforces "cumulative damage over the life of the structure" threshold for substantial damage. (5) Elevation Certificates are required prior to framing and when construction is completed. (6) One acre minimum lot size with buildable area outside SFHA (7) Floodplain must be preserved as open space, drainage easement or other defined area that limits impact (8) Drainage study required to define detention needed to prevent adverse impact and mitigate downstream impacts (9) Bastrop County is CRS Class 8. (9) LFA is a CFM and County has 4 CFM's on staff.

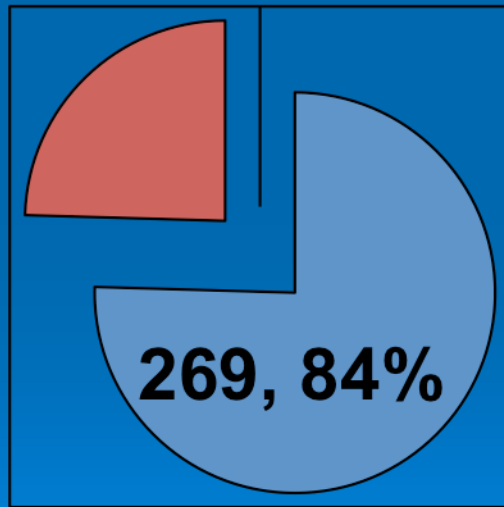
# Higher Standards

- Detention (on-site and/or regional)
- Setbacks from FP and/or FW boundaries
- CLOMR required before permit issued
- No development in floodway or “Zero Rise”
- No development in floodplain or “Zero Rise”
- No Adverse Impact (NAI)
- Additional Wetland/Wildlife requirements
- Floodplain area must be open space or in easement
- Critical Facilities must be elevated above 500-year
- No loss of “Valley Storage”
- Cumulative Substantial Improvement/Damage
- Water quality (protection) requirements
- iSWM and other higher standards .....



# 2016 Survey Results

142, 44%



■ +1 or Higher Freeboard

■ +1 or Higher (Fully-Developed Conditions)

# 2016 TFMA Higher Standards Survey

- 321 communities responded (240 cities & 68 counties)
- 269 (84%) have adopted +1' or more freeboard
- 142 (44%) require BFE's using fully developed hydrology
- 115 (36%) require freeboard (1' to 3') in Zone X
- 258 (83%) require detention
- 239 (76%) have a CFM on staff
- HCFCD has 9 CFM's on staff
- Austin has 30 CFM's on staff
- Dallas has 22 CFM's on staff
- Houston has 13 CFM's on staff
- TxDOT has 31 CFM's across the state

# FEMA Recommends Freeboard

- Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management.
- "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed.
- Source: [www.fema.gov](http://www.fema.gov)



# Federal Flood Risk Reduction = BFE +1'

- EO 13632 (2012) created the Federal Interagency Hurricane Sandy Rebuilding Task Force (Sandy Task Force)
- Sandy Task Force reevaluated the 1% chance (100-year) flood standard
- In April 2013, the Sandy Task Force announced a new Federal Flood Risk Reduction which required elevation or other flood-proofing to +1' above the best available and most recent base flood elevation and applied that standard to all Federal disaster recovery investments in Sandy-affected communities.

# CRS Freeboard Credit

- Mitigate flood risks, reduce risk of loss of life and property damage from flood.....
- And:
  - +1' Freeboard = 100 CRS Credits
  - +2' Freeboard = 200 CRS Credits
  - +3' Freeboard = 300 CRS Credits
- So why stop at +1'

# CRS Freeboard Credit

- For CRS credit, freeboard must be applied not just to the elevation of the lowest floor or floodproofing level, but also to the level of protection provided to ALL COMPONENTS OF THE BUILDING.
- All building utilities, including ductwork, must be elevated or protected to the freeboard level and all portions of the building below the freeboard level must be constructed using materials resistant to flood damage.
- If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures.



# Benefits of Freeboard on Flood Insurance Premiums – Zones VE and AE

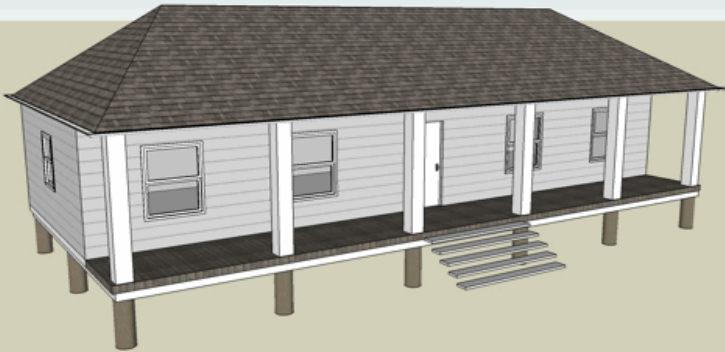
- **Maximum coverage for a \$250,000 residential building and \$100,000 contents**

➤ <u>Freeboard</u>	<u>Zone VE</u>	<u>Zone AE</u>
➤ AT BFE	\$8500	\$1700
➤ +1'	\$5800	\$900
➤ +2'	\$4000	\$800
➤ +3'	\$2800	\$600
➤ +4'	\$2500	\$500

- Source: FEMA Fact Sheet - *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*
- Savings over a 30 year mortgage varies from \$15,000 to \$51,000 for Zone AE and \$75,000 to \$255,000 for Zone VE

# Reduced Flood Insurance Premiums in Zone VE

No Freeboard

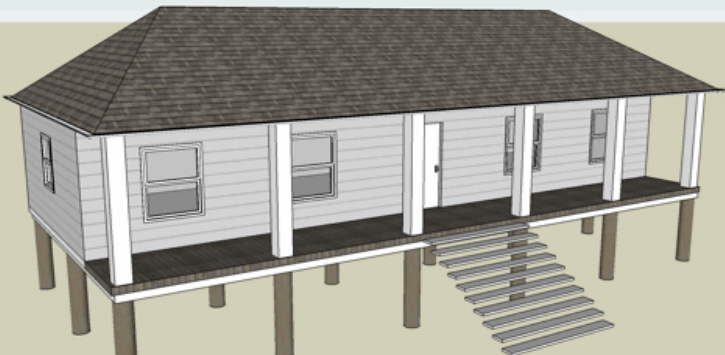


flood insurance: **\$5,499**

➤ Current Rates

➤ At BFE=\$8,500

3' of Freeboard



flood insurance: **\$2,084**

➤ BFE+3'=\$2,800

Under the Flood Insurance Reform Act of 2012, you could save more than \$90,000 over 10 Years if you build 3 Feet above BFE

➤ If you rebuild to pre-flood conditions, your flood insurance premium could increase dramatically in the future.

- PREMIUM AT 4 FEET BELOW BASE FLOOD ELEVATION = \$9,500/yr
- \$95,000/10 years
- PREMIUM AT BASE FLOOD ELEVATION = \$1,410/yr
- \$14,100/10 years
- PREMIUM AT 3 FEET ABOVE BASE FLOOD ELEVATION = \$427/yr
- \$4,270/10 years



# FEMA Supports Freeboard

- FEMA's Fact Sheet, *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*
- Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a 1-foot freeboard to account for the 1-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated. Freeboard results in significantly lower flood insurance rates due to lower flood risk.

# Freeboard is included in the 2015 International Residential Code

## Section R322.2.1 Elevation requirements.

- Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

# EO 11988

- Under Executive Order 11988, Floodplain Management, Federal agencies funding and/or permitting critical facilities are required to:
  - avoid the 0.2% (500-year) floodplain, or
  - protect the facilities to the 0.2% chance flood level.
  - Note: EO 11988 has been amended by EO 13650 and we are awaiting Federal agency implementation



# Executive Order 13690

## Federal Flood Risk Management Standard (FFRMS)

- The new federal flood risk standard requires all future federal investments in and affecting floodplains to meet the level of resilience as established by the standard. For example, this applies where federal funds are used to build new structures and facilities or to rebuild those that have been damaged.

# FEMA PROPOSED RULE 08/22/2016

- The 8/22/16 Federal Register
- Updates to Floodplain Management and Protection of Wetlands Regulations to implement EO 13690 and the FFRMS
- Comment period ends 10/21/16
- FEMA will adopt regulations to implement EO 13690

# FFRMS 4 Options available to Federal Agencies

- 1) CISA – Climate Informed Science Approach
- 2) FVA – Freeboard Value Approach (FEMA Baseline Approach)
- 3) 0.2 FPA – 0.2% annual Chance Flood Approach
- 4) Elevation and Flood Hazard Area that result from using any other method identified in an update to FFRMS

# FFRMS

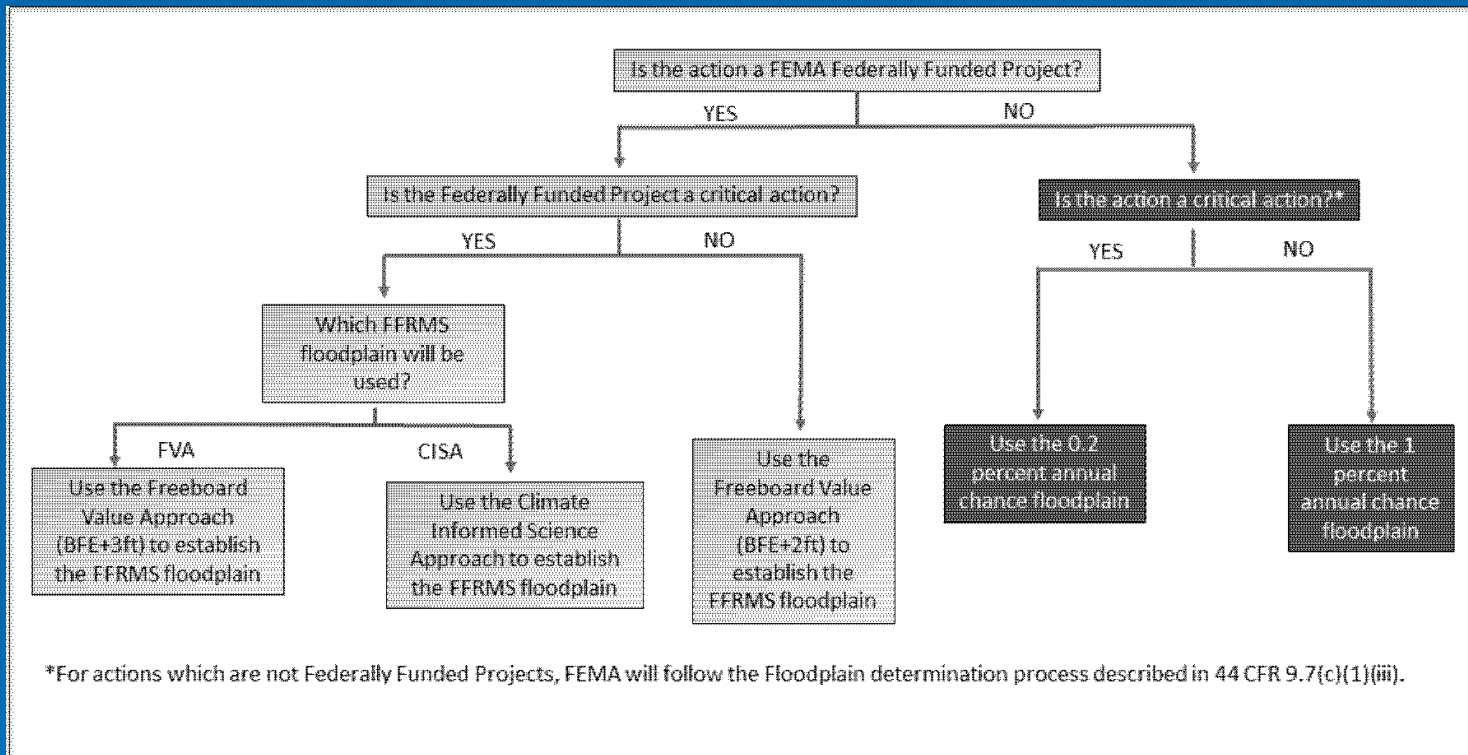
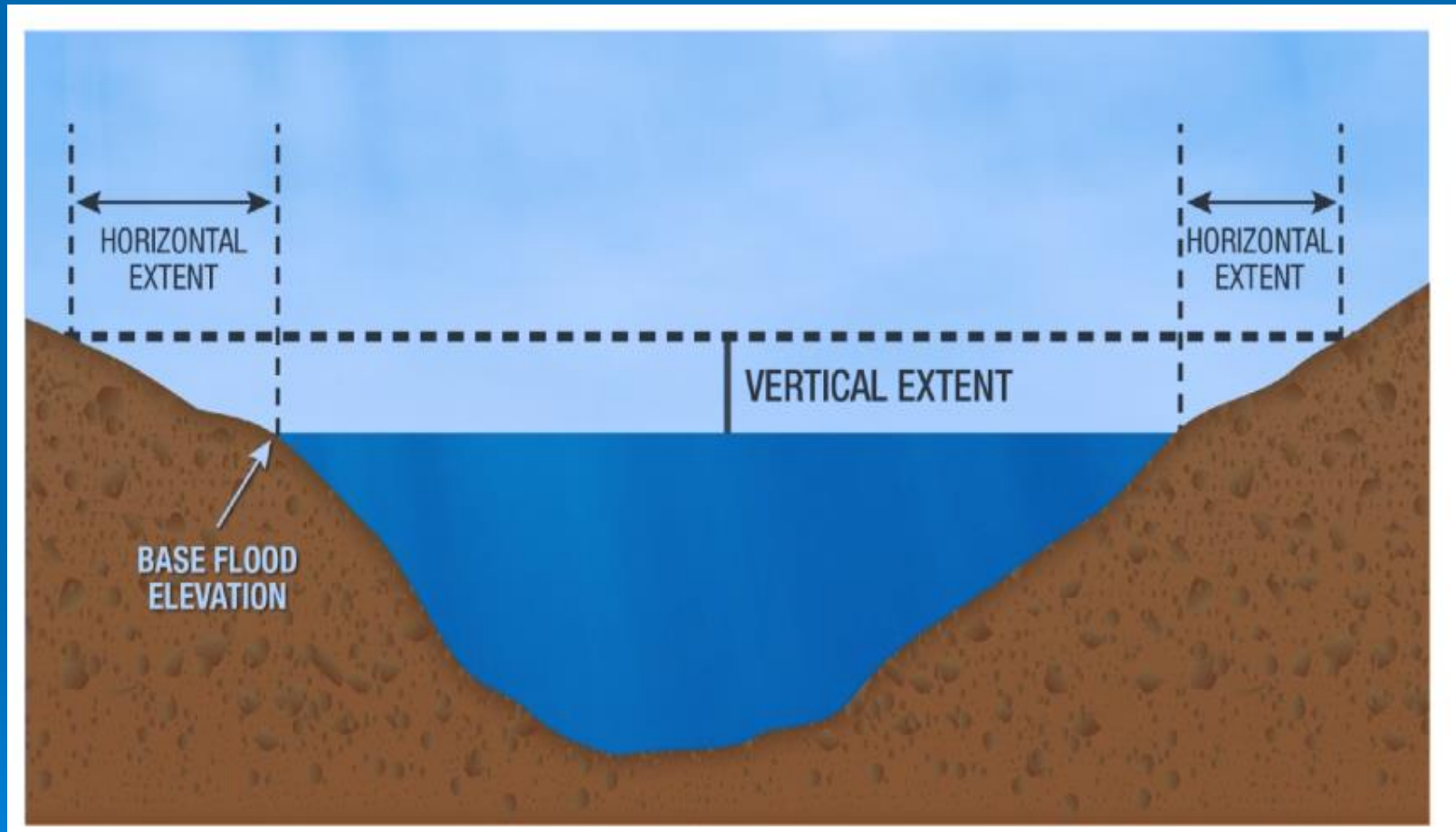


Figure 1: Process to Establish the Appropriate Floodplain for the 8-Step Decision-Making Process



# Higher Elevation = Wider Floodplain



# NCTCOG Higher Standards

- Higher Standard Ordinances (1980's)
  - Freeboard - +1', +2' or +3'
  - BFE's & Floodways - fully developed conditions

## *The John Promise Rule:*

- Non participating communities should join the NFIP
  - NFIP communities should adopt higher standards and join CRS
  - CRS communities adopt higher standards and improve rating
- Source: NCTCOG Regional Risk Assessment, 2003

# North Texas CRS Communities (21)

- Arlington – CRS 7
- Benbrook – CRS 6
- Burleson – CRS 7
- Carrollton – CRS 6
- Cleburne - CRS 8
- Coppell - CRS 7
- Dallas - CRS 5
- Denton - CRS 6
- Denton Co – CRS 10
- Duncanville - CRS 7
- Fort Worth – CRS 8
- Garland - CRS 7
- Grand Prairie - CRS 5
- Haltom City – CRS 7
- Hurst – CRS 7
- Lewisville – CRS 7
- North Richland Hills – CRS 6
- Plano – CRS 5
- Richardson – CRS 7
- Richland Hills – CRS 8
- Tarrant Co – pending
- Wichita Falls – CRS 8

# Benefits of NCTCOG's Higher Standards

➤ 2016 Population	7,000,000 (est)
➤ 2000-2010 Growth	1,230,673 (23%)
➤ NFIP Policies	24,266
➤ NFIP paid Claims	5,871 <sup>(1)</sup>
➤ Claims/10,000 pop	8.38

➤ (1) Total from 1978 to 2016



# Benefits of NCTCOG's Higher Standards

- RL Properties 538 (1)
- RL Claims 1,546 (1)
- SRL Properties 106 (1)
- Planning Area 12,796 sq mi
- Density 511 persons/sq mi
- CRS Communities 20 (31%)
- (1) Total from 1978 to 2016
- Data sources:

- NCTCOG
- FEMA.gov

# NCTCOG

- NCTCOG is 4<sup>th</sup> largest metro area in US
- NCTCOG 2010 population = 6,539,950
- NFIP paid claims (1978 – 2016) = 5,871
- Claims/year (38 years) = 154.5
- Claims/100,000 population = 83.8
- Repetitive Loss/100,000 population = 8.2
- Severe Repetitive Loss/100,000 = 1.6

# Texas Communities with Freeboard

- In the 8/22/16 Federal Register, FEMA points out that Higher Floodplain Management Standards have already been implemented throughout the US.
- Currently 22 states and 596 localities have adopted freeboard requirements ranging from 1 to 3 feet.
- The 2016 TFMA Higher Standards Survey shows that 269 Texas cities and counties have adopted freeboard ranging from +1' to +4'.

# Resources

## ASFPM Higher Standards Guide:

- [http://www.floods.org/ace-files/documentlibrary/committees/Higher\\_Std\\_Ref\\_Guide\\_07-12-11.pdf](http://www.floods.org/ace-files/documentlibrary/committees/Higher_Std_Ref_Guide_07-12-11.pdf)
- [www.floods.org](http://www.floods.org) NAI Committee - *A Common Sense Strategy for Floodplain Management*
- 2015 Texas Quick Guide - [http://www.twdb.texas.gov/flood/resources/doc/Texas\\_Quick\\_Guide.pdf](http://www.twdb.texas.gov/flood/resources/doc/Texas_Quick_Guide.pdf)
- FEMA's Community Rating System (CRS) - <http://www.fema.gov/national-flood-insurance-program-community-rating-system>



**Thanks to all communities that  
participated in the TFMA Higher  
Standards Survey!**

***Roy says “Higher Standards saves lives and  
reduce flood losses”***

Survey summary posted on

**[www.tfma.org](http://www.tfma.org)**



## **A Guide for Higher Standards in Floodplain Management**

Pilot Project by:

TFMA Mentor/Higher Standards Committee

Updated from ASFPM's 2013 HS Guide

# TFMA Higher Standards Guide

- In 2016, TFMA's Higher Standards Committee initiated a project to update the 2013 version of the ASFPM Regulations Committee's *Higher Standards Guide*
- TFMA HS Guide documents higher standards implemented by Texas cities and counties and serves as a companion to the *Texas Quick Guide* published by TWDB in 2015

# TFMA Higher Standards Guide

- The TFMA HS guide is in MS Word format to assist communities as they develop flood damage prevention ordinances, floodplain regulations and court orders.
- Many higher standards, such as “freeboard”, allow selection of +1', +2', +3' above BFE or select fractional values should the community desire: 1.5', 18 inches.....



# Guide for Higher Standards

- I. FREEBOARD
- II. ACCESS (INGRESS-EGRESS)
- III. COMPENSATORY STORAGE
- IV. CRITICAL DEVELOPMENT PROTECTION
- V. CUMULATIVE SUBSTANTIAL DAMAGE/IMPROVEMENT
- VI. REPETITIVE LOSS PROPERTIES
- VII. FLOODPLAIN FILL STANDARDS
- VIII. FLOODWAY RISE
- IX. FOUNDATION DESIGN

- **X. FULLY DEVELOPED WATERSHED HYROLOGIC MAPPING**
- **XI. MATERIALS STORAGE**
- **XII. SETBACKS**
- **XIII. STORMWATER MANAGEMENT**
- **XIV. STORMWATER DETENTION**
- **XV. SUBDIVISION STANDARDS**
- **XVI. FLOODPLAIN USE RESTRICTIONS**
- **XVII. REGULATING AREAS NOT MAPPED ON FIRM**
- **XVIII. HIGHER STANDARDS IN ZONE D**
- **XIX. ELEVATION REQUIREMENTS FOR STRUCTURE ADDITIONS**
- **XX. COASTAL SITING**
- **XXI. DUNE PROTECTION**

- **XXII. COASTAL CONSTRUCTION**
- **XXIII. COASTAL A ZONE - LIMWA**
- **XXIV. SINK HOLE STANDARDS**
- **XXV. PLAYA LAKE STANDARDS**
- **XXVI. ALLUVIAL FAN STANDARDS**
- **XXVII. RIGHT OF ENTRY TO ENFORCE FLOODPLAIN ORDINANCE**
- **XXVIII. ENFORCEMENT – FINES AND PENALTIES**
- **XXIX. GAS and LIQUID STORAGE TANKS**
- **XXX. GLOSSARY/REFERENCES**

# Examples from the TFMA Higher Standards Guide

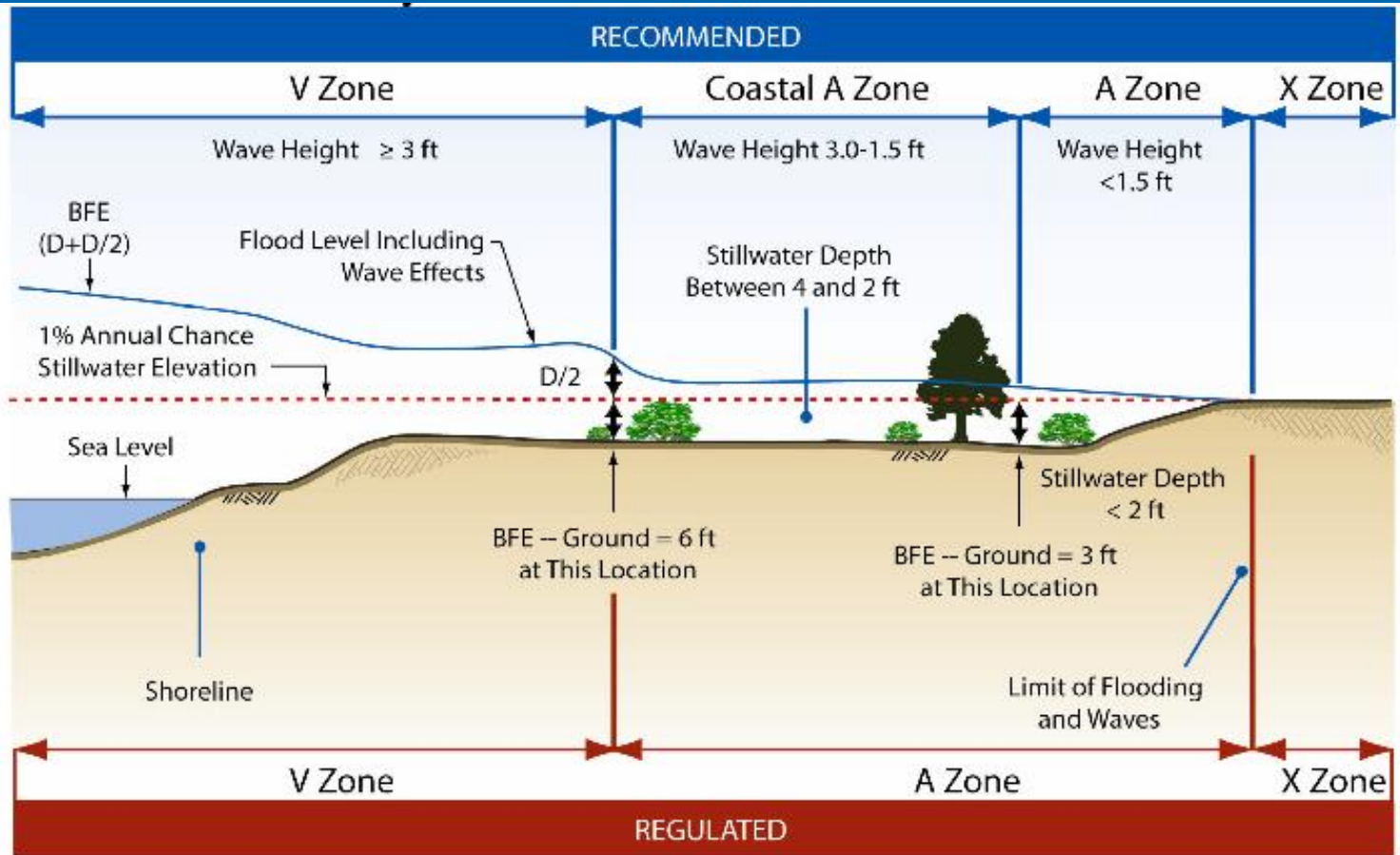
- Coastal A Zone - LiMWA
- Zone A (no BFE)
- Zone X (Shaded and not Shaded)
- Zone D
- Gas and Liquid Storage Tanks



# Freeboard Requirements in Coastal A Zones:

- Coastal V Zones (Zone VE) are areas where wave height exceeds 3' and new construction must be elevated on piling or piers
- Coastal A Zones are areas adjacent to Zone VE where wave height is less than 3' and greater than 1.5', also known as LiMWA – Limit of Moderate Wave Action.
- TFMA's recommended "higher standard" is to require new construction in Coastal A Zones and LiMWA areas to meet VE Zone requirements (elevated on piers or piling)

# Coastal Floodplain Zones



1% Annual Chance Flooding Stillwater Depth = D

# Zone A (no BFE)

- The base flood elevation is the level of the 1% chance flood.
- TFMA recommends- where base flood elevation data is not available, a floodplain study must be performed by a Professional Engineer (PE) establishing the base flood elevation (BFE) and the floodplain and floodway boundaries prior to issuing a development permit.

# Zone A (no BFE) Ordinance Language

- *Where base flood elevation data is not available, a floodplain study must be performed by a Professional Engineer (PE) establishing the base flood elevation (BFE) and the floodplain and floodway boundaries prior to issuing a development permit.*



# Freeboard in Zone X

- Why do you need Freeboard in Zone X?
- During Tropical Storm Allison (2001) heavy rainfall over a 5-day period in Harris County, Texas, resulted in over 73,000 residences being flooded with over 30,000 located outside the Special Flood Hazard Area (SFHA) in Zones B, C, X (shaded) and X (unshaded).

# Freeboard in Zone X

- In areas mapped as Zone X (shaded) on the community Flood Insurance Rate Map (FIRM), defined as Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

# Zone X (shaded)

- Based on the previous definition of Zone X (shaded) it is conceivable that a new “at grade” structure in Zone X (shaded) could be flooded with 12” or more of floodwater during the 1% annual chance (100-year) flood.
- A good reason for Freeboard in Zone X

# Zone X Ordinance Language

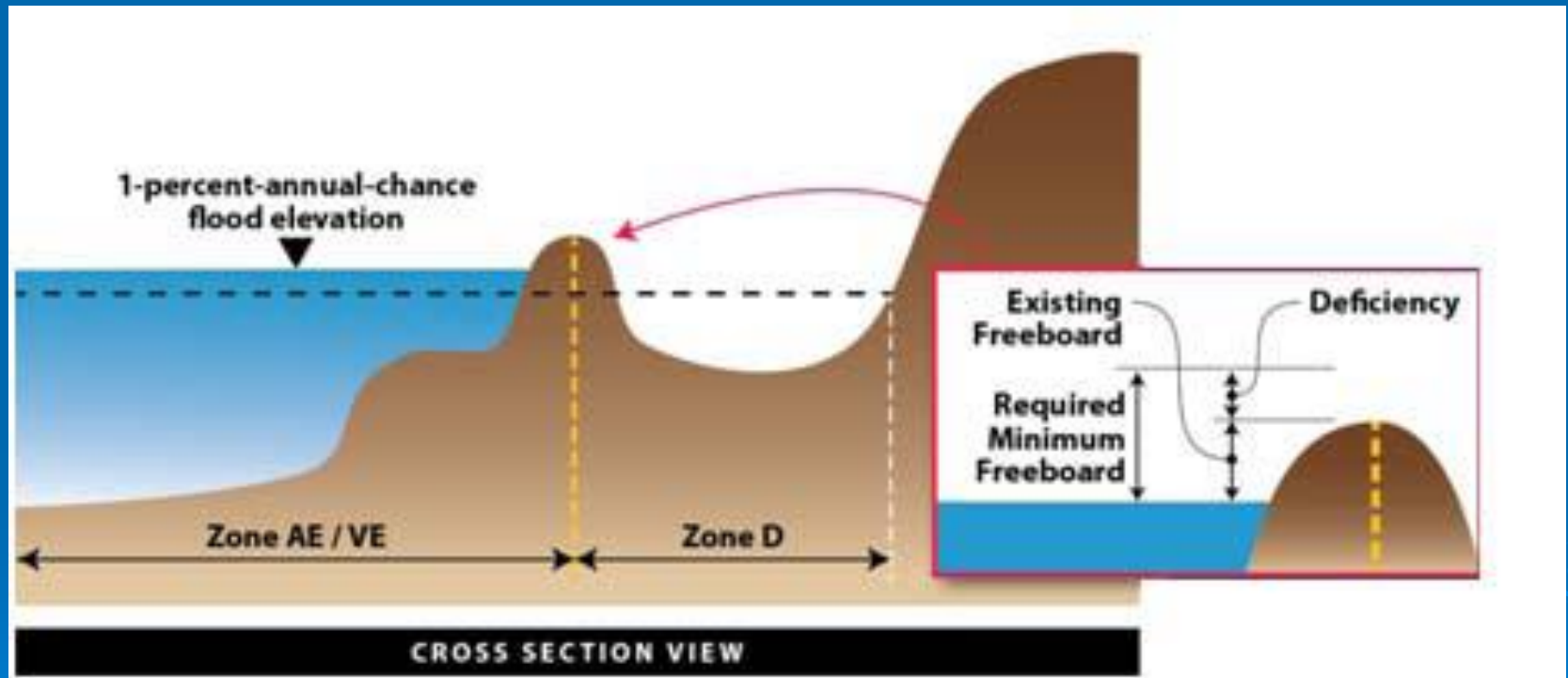
- *In areas mapped as Zone X (shaded and unshaded) on the community Flood Insurance Rate Map (FIRM), new construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor, including basement, elevated at least two feet above the highest adjacent natural grade or above the crown of the nearest street, whichever is higher.*



# Freeboard Requirements in Zone D:

- Zone D: areas mapped as Zone D on the community Flood Insurance Rate Map (FIRM), are defined as areas in which flood hazards are undetermined, but possible.

# Figure 4-4. Freeboard Deficient Cross Section View



# Freeboard Requirements in Zone D:

- TFMA recommends that communities require new development in Zone D to meet the recommended freeboard requirements for new development in Zone X. By requiring new structures to be elevated +2' above natural grade provides a level of protection and allows owners to benefit when Zone D areas are remapped and placed in a higher risk zone.

# Gas and Liquid storage tanks located in the floodplain

- NFIP Regulations 44 CFR 59.1 defines a “structure” as:
- *Structure* means, for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.
- Surprise Surprise! Gas and liquid storage tanks are structures!



# Structures in the Floodplain

- 44 CFR 60.3.c
- Require that all new construction and substantial improvements of nonresidential structures within Zones A1– 30, AE and AH zones on the community's firm (i) have the lowest floor (including basement) **elevated to or above the base flood level** or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

# Protecting Building Utilities From Flood Damage

- *Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*
- *FEMA P-348, Edition 1 / November 1999*



# Protecting Building Utilities From Flood Damage

Principles and Practices for the Design and Construction of  
Flood Resistant Building Utility Systems

FEMA P-348, Edition 1 / November 1999



# Elevated Storage Tanks

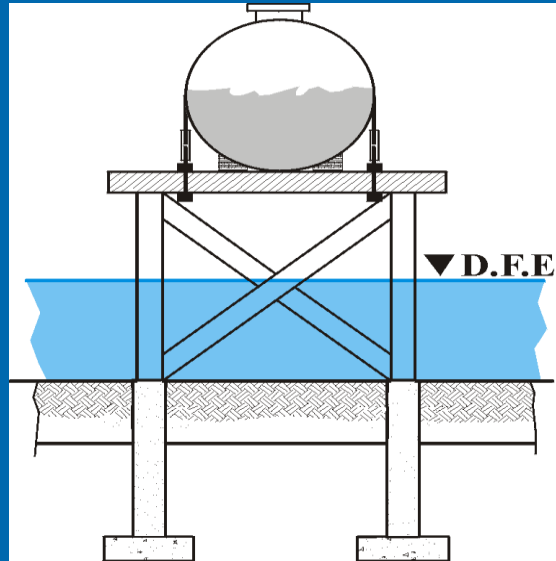
- FEMA P-348 Section 3
- The most effective technique for providing flood protection for a fuel storage tank is **elevation of the tank on a platform** above the Design Flood or Base Flood Elevation.
- 
- The following outlines some additional considerations when protecting tanks:
  - 1. The tank should be anchored to the platform with straps, which would constrain the tank in wind, earthquake, and other applicable forces.
  - 2. In coastal zones, the straps should be made of non-corrosive material to prevent rusting. should be supported by posts or columns that are adequately designed for all loads including flood and wind loads.

## Construction requirements:

- (1) The posts or columns should have deep concrete footings embedded below expected erosion and scour lines.
- 3. In velocity flow areas, the platform
  - (2) The piles, posts, or columns should be cross-braced to withstand the forces of velocity flow, wave action, wind, and earthquakes; cross-bracing should be parallel to the direction of flow to allow for free flow of debris.

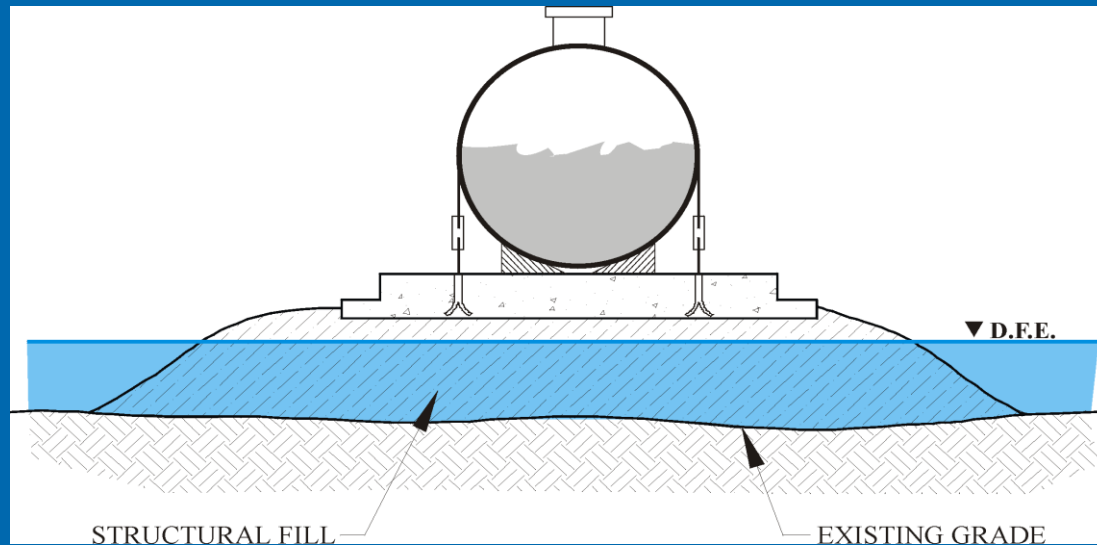


# FEMA P-348 Figure 3.2.3A



- A storage tank elevated above the DFE on a platform in a velocity flow area

# Anchored Storage Tanks – FEMA P-348 Section 2.3B



- In non-velocity flow floodplains, elevation can also be achieved by using compacted fill to raise the level of the ground above the DFE and by strapping the tank onto a concrete slab at the top of the raised ground.

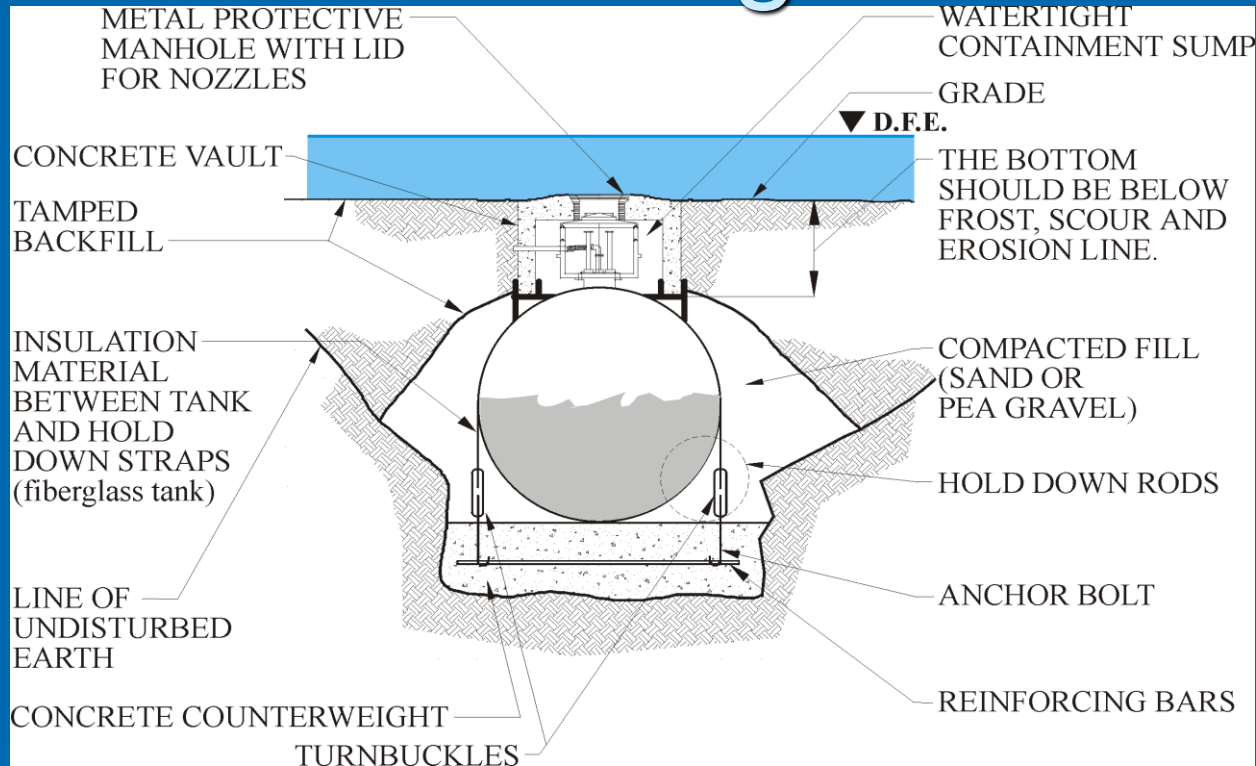
# Storage Tanks below Grade

- FEMA P-348 Section 3.2.3C
- If a tank must be located below the DFE in an SFHA, it must be protected against the forces of buoyancy, velocity flow, and debris impact. This can be achieved by the following methods:

## Anchoring Tanks Below Ground

- A tank located below ground in a flood-prone area can be anchored to a counterweight in order to counteract the buoyancy force that is exerted by saturated soil during a flood.
- One effective method is to anchor the tank to a concrete slab with (non-corrosive) hold-down straps. The straps must also be engineered to bear the tensile stress applied by the buoyancy force. The maximum buoyancy force is equal to the weight of floodwaters which would be required to fill the tank minus the weight of the tank.

# FEMA P-348 Figure 3.2.3C



Courtesy of Adamson Global Technology Corp.

- An underground fuel tank anchored to a concrete counterweight





# Protecting Building Utilities From Flood Damage

Principles and Practices for the Design and Construction of  
Flood Resistant Building Utility Systems

FEMA P-348, Edition 1 / November 1999



**FEMA**



**A Guide for Higher Standards in Floodplain Management**  
Soon to be posted on [www.tfma.org](http://www.tfma.org)

# TFMA Higher Standards Guide

Elected Officials  
and  
NCTCOG CRS Users Group  
Arlington, TX  
August 31, 2016

T. Lynn Lovell, PE, CFM, D.WRE  
John Ivey, PE, CFM







# CRS Freeboard Credit

- Freeboard is a term for an extra margin of protection. Ordinances or codes often include a freeboard requirement to add height above the base flood elevation to account for future flood fringe development, uncertainties inherent with the methods for calculating the expected flood, lack of data, waves or debris that accompany the base flood, and floods higher than the base flood.
- In a community floodplain management ordinance, a freeboard requirement means that new buildings will be protected to a level higher than the NFIP's base flood elevation.

➤ Can a Texas County adopt higher Standards?

➤ Yes X; No

# +1' Minimum Freeboard

- Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated.
- Freeboard results in significantly lower flood insurance rates due to lower flood risk.

# EO 13690 Slides



# Federal Flood Risk Management Standard (Options)

- 1. Elevating +2 feet above the 100-year, or 1% annual-chance flood elevation (+3' for critical facilities)
- 2. Elevating to the 500-year, or 2% annual-chance flood elevation, or
- 3. Utilizing best-available, actionable data and methods that integrate current and future changes in flooding based on science. (Science based technology)

# Freeboard is important to Floodplain Management

- Floodplain management is the operation of a program of preventive and corrective measures for reducing flood damage. FEMA helps communities develop floodplain management regulations that comply with NFIP regulations. Communities may adopt more restrictive regulations. Community officials may have knowledge of local conditions that require higher standards than the NFIP regulations, particularly for human safety.

- Source: FEMA Fact Sheet - *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*

# Critical Facilities

- For some activities and facilities, even a slight chance of flooding is too great a threat. Typical critical facilities include hospitals, fire stations, police stations, storage of critical records, and similar facilities. These facilities should be given special consideration when formulating regulatory alternatives and floodplain management plans.

Source: [www.fema.gov](http://www.fema.gov) – Critical Facility - definition/description

# Critical Facilities

- A critical facility should not be located in a floodplain if at all possible. If a critical facility must be located in a floodplain it should be provided a higher level of protection so that it can continue to function and provide services after the flood. Communities should develop emergency plans to continue to provide these services during the flood.
- Source: [www.fema.gov](http://www.fema.gov) – Critical Facility - definition/description



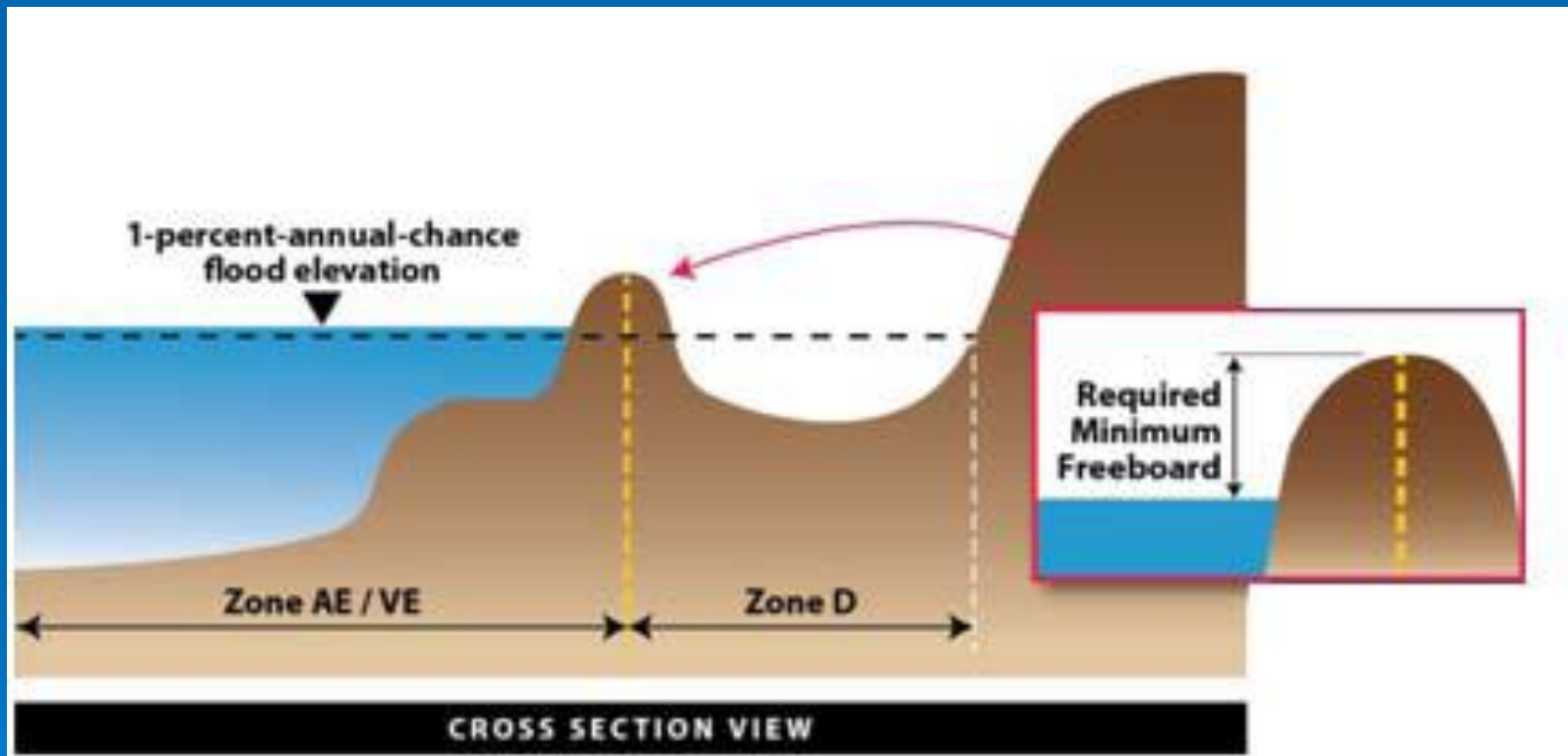
# Higher Standards for Critical Facilities

- Both EO 11988 and EO 13690 apply to Federal agency funding and/or permitting critical facilities and does not pertain to NFIP communities.
- However, a community can adopt higher standards requiring new and substantially improved “critical facilities” to be elevated or protected to a higher level such as BFE +3’; above the 0.2% (500-year) level; or elevation determined by science based technology.
- Hint – Define “critical facility” in your ordinance

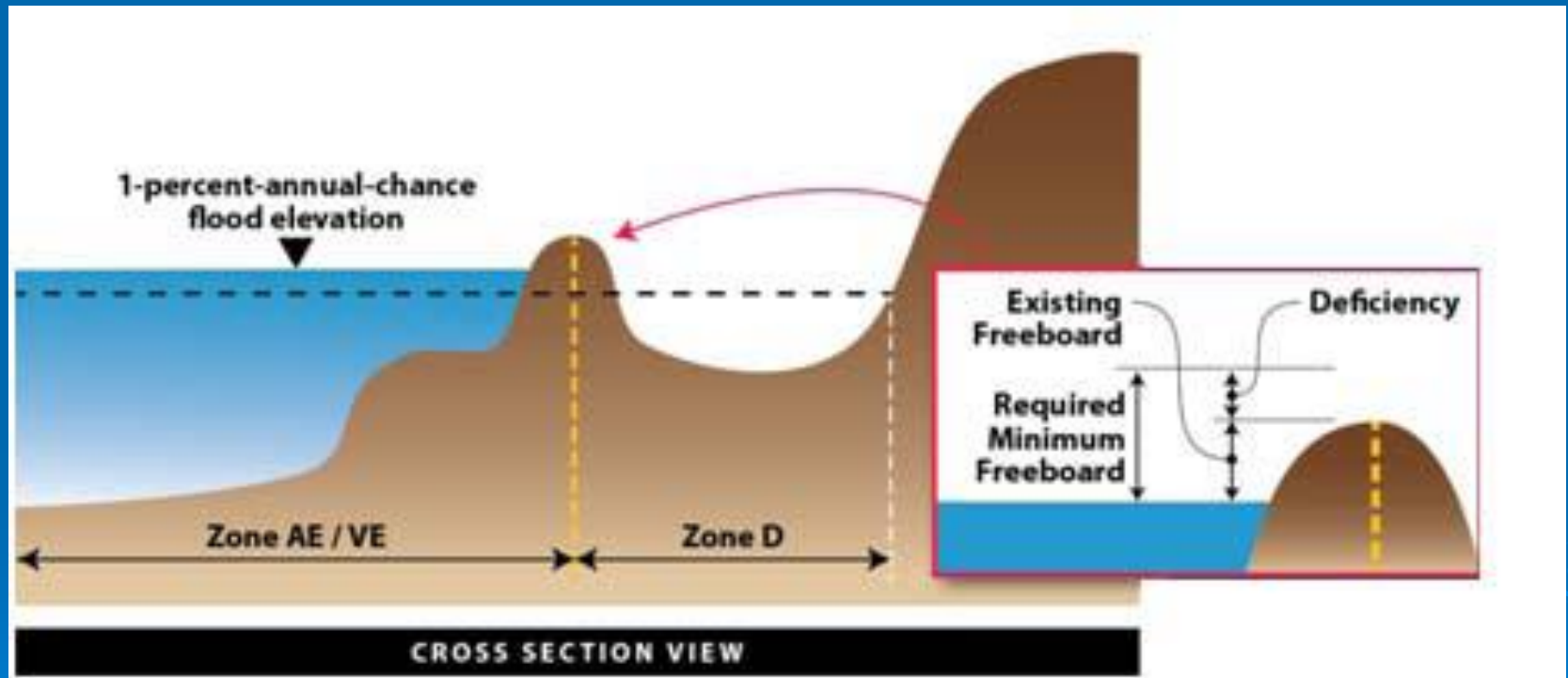
# Levees

- Unaccredited Levees and Zone D

# Figure 4-2. Sound Reach Cross Section View

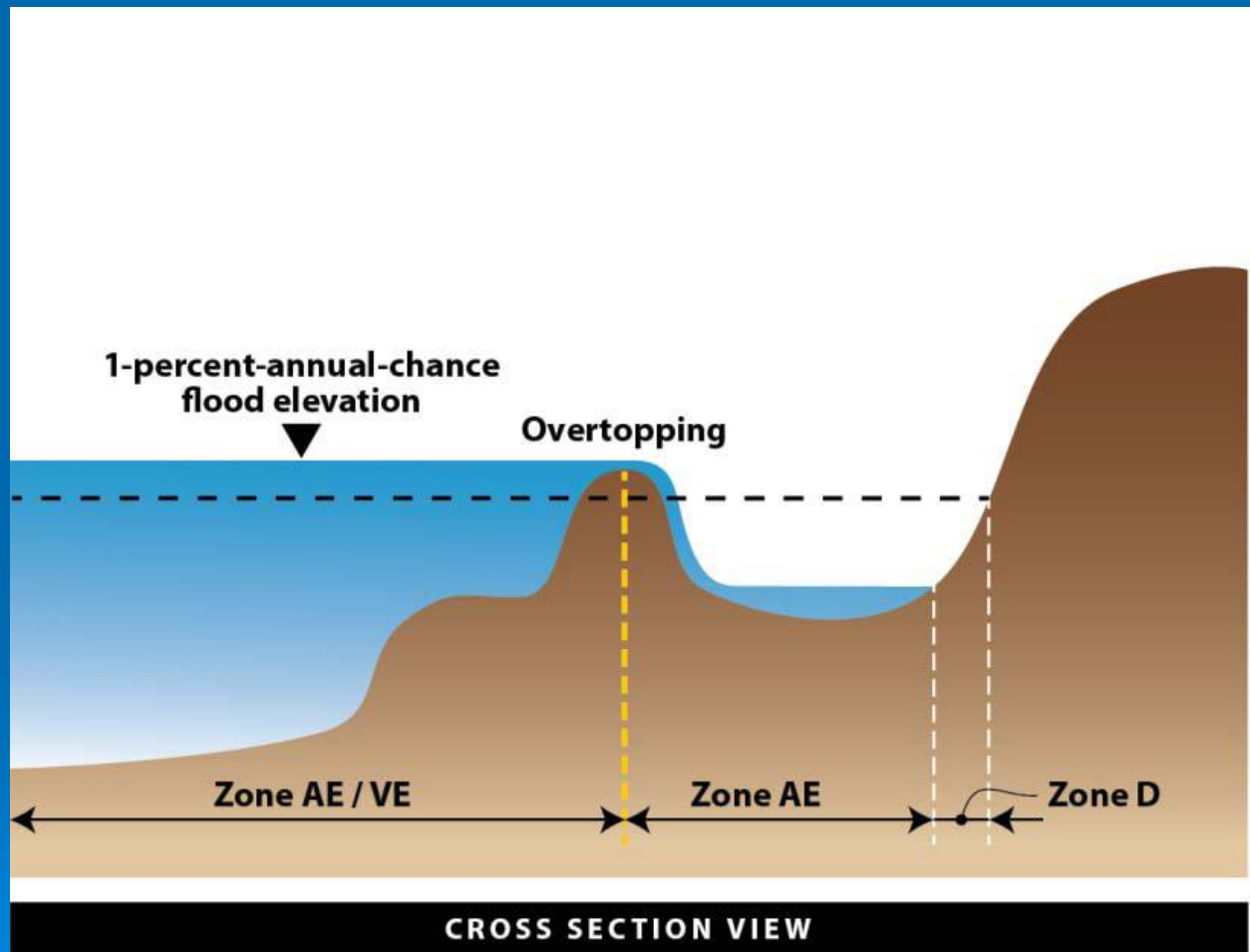


# Figure 4-4. Freeboard Deficient Cross Section View

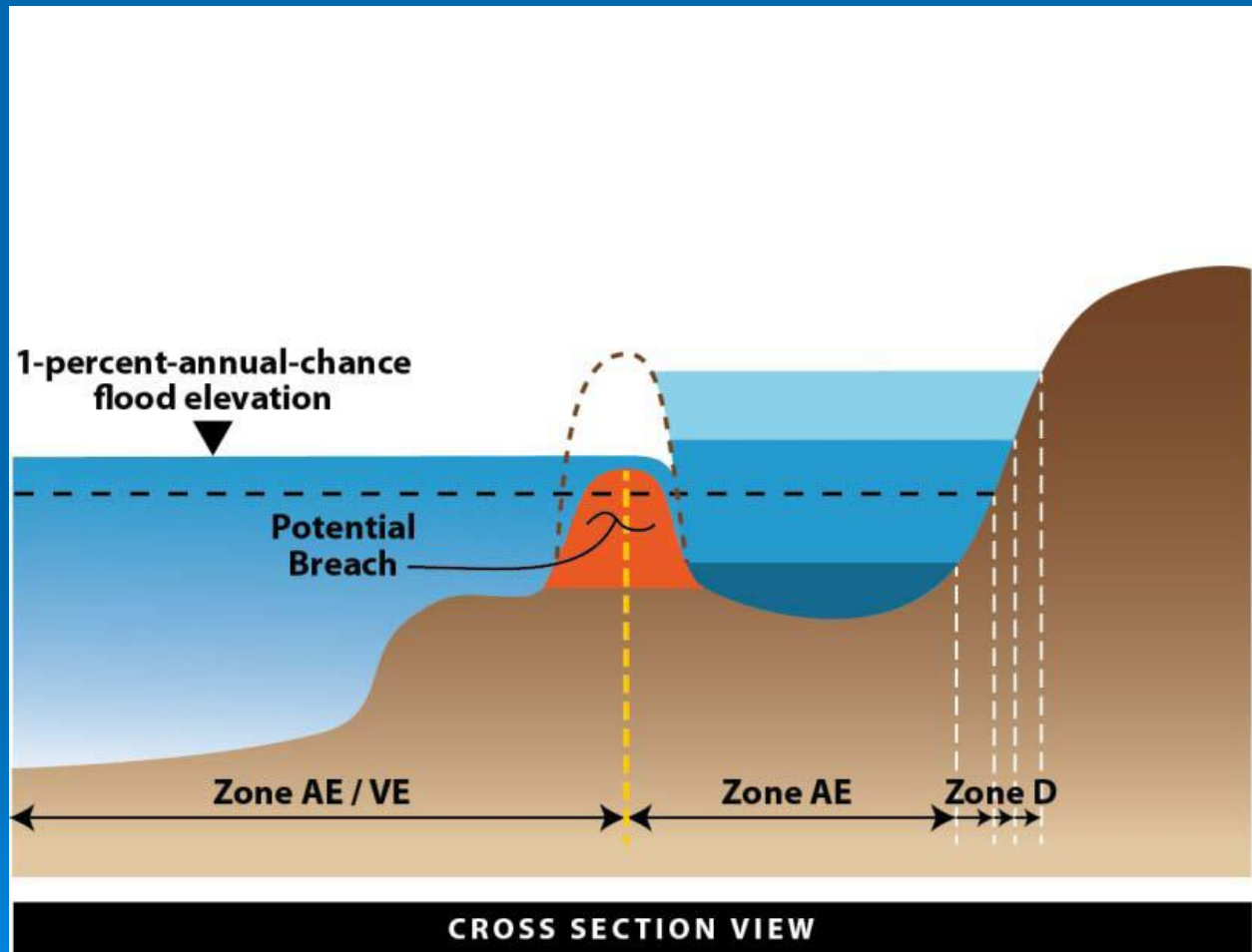




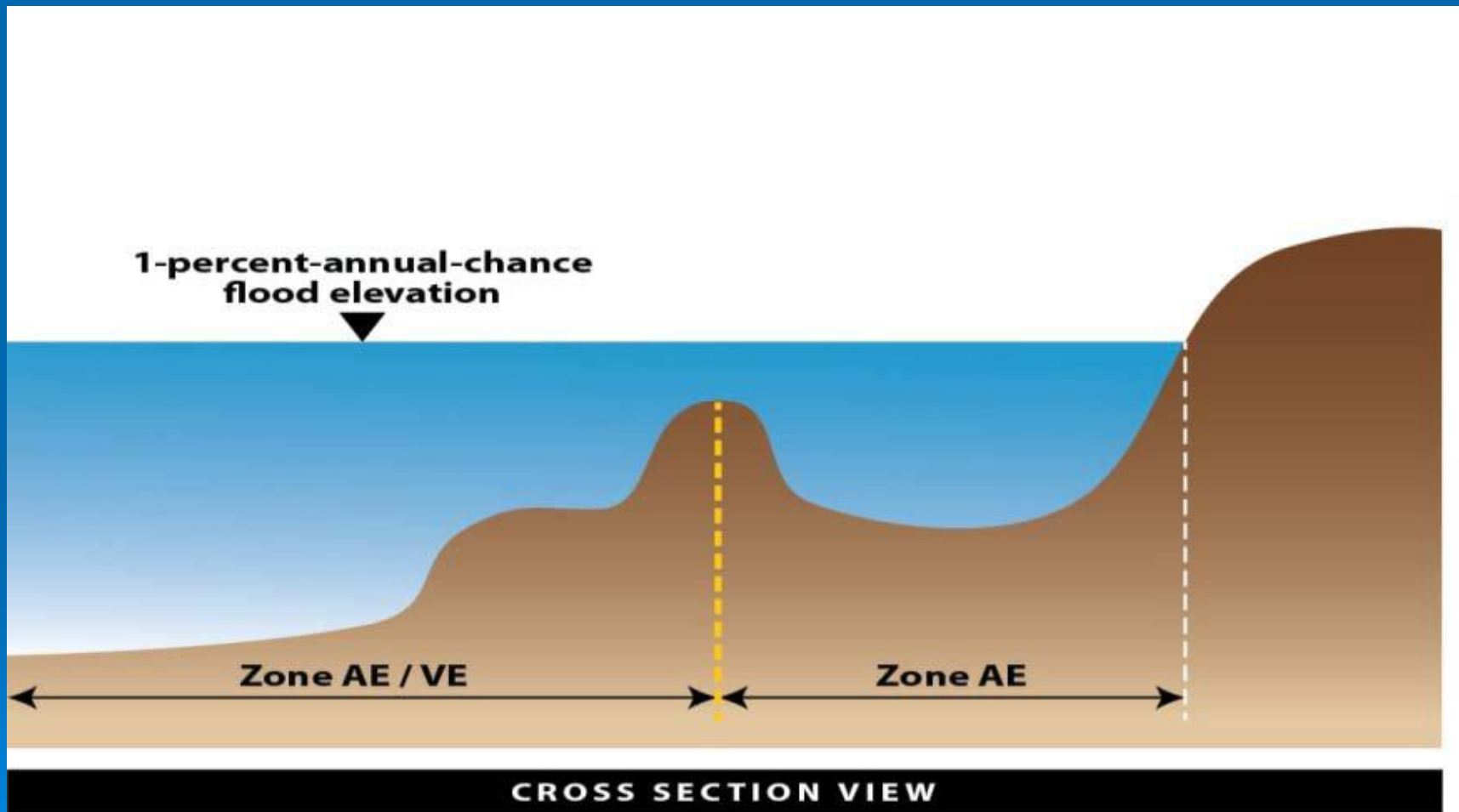
# Figure 4-6. Overtopping Cross Section View



# Figure 4-8 Structural-Based Inundation Cross Section View



# Figure 4-10. Natural Valley Cross Section View



# Zone D Challenges

- Communities typically do not deal with Zone D
- Flood insurance is not required in Zone D however lenders may require anyway
- Zone D rates are higher than Zones B, C, X



# Model Language

- Add the following sentence (bolded) to specific requirements for Residential Structures and Non-Residential structures:
- ***In areas mapped as Zone D on the community Flood Insurance Rate Map (FIRM), the structure shall have the lowest floor, including basement, elevated at least two feet above the highest adjacent natural grade or above the crown of the nearest street, whichever is higher.***