

Flood Risk Report

East Fork Trinity Watershed

HUC8 12030106

September 2019



FEMA

Project Area Community List

| Community Name |
|------------------------|
| Collin County |
| Dallas County |
| Fannin County |
| Grayson County |
| Hunt County |
| Kaufman County |
| Rockwall County |
| City of Allen |
| City of Anna |
| City of Balch Springs |
| City of Blue Ridge |
| City of Celina |
| City of Combine |
| City of Crandall |
| City of Dallas |
| City of Dorchester |
| City of Fairview |
| City of Farmersville |
| City of Fate |
| City of Forney |
| City of Frisco |
| City of Garland |
| City of Grunter |
| City of Health |
| Town of Howe |
| City of Lavon |
| City of Leonard |
| City of Lowry Crossing |

| Community Name |
|---------------------------|
| City of Lucas |
| City of McKinney |
| City of McLendon-Chisholm |
| City of Melissa |
| City of Mesquite |
| City of Mobile City |
| City of Murphy |
| City of Nevada |
| Town of New Hope |
| City of Parker |
| City of Plano |
| City of Princeton |
| Town of Prosper |
| City of Richardson |
| City of Rockwall |
| City of Rowlett |
| City of Sachse |
| Town of Saint Paul |
| City of Seagoville |
| Town of Sunnyvale |
| Town of Talty |
| City of Tom Bean |
| City of Trenton |
| City of Van Alstyne |
| City of Weston |
| City of Wylie |
| |
| |

Flood Risk Report History

| Version Number | Version Date | Summary |
|-----------------------|---------------------|--|
| v1.0 | 7/31/2019 | Discovery, Base Level Engineering (BLE), and Flood Risk Report |
| V2.0 | 8/30/2019 | Final Discovery, Base Level Engineering (BLE), and Flood Risk Report |

Preface

The Department of Homeland Security, Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states and local communities with flood risk information, datasets, risk assessments, and tools that they can use to increase their resilience to flooding and better protect their residents. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP transforms the traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

The Flood Risk Report (FRR) is one of the tools created through the Risk MAP program. A FRR provides non-regulatory information to help local officials, floodplain managers, planners, emergency managers, and others. Local along with Federal and state officials can use the information in the FRR to establish a better understanding of their flood risk, take steps to mitigate those risks, and communicate those risks to residents and local businesses.

The FRR serves as a guide when communities update local hazard mitigation plans, community comprehensive plans, and emergency operations and response plans. It is meant to communicate risk to officials and inform them of the modification of development standards, as well as assist in identifying necessary or potential mitigation projects. The FRR extends beyond community limits to provide flood risk data for the East Fork Trinity Watershed.

Flood risk is always changing, and studies, reports, or other sources may be available that provide more comprehensive information. This report is not intended to be the regulatory nor the final authoritative source of all flood risk data in the watershed. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

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Executive Summary

The Flood Risk Report has two goals: (1) **to inform communities of their risks** related to certain natural hazards, and (2) **to enable communities to act to reduce their risk**. The information within this Risk Report is intended to assist Federal, state, and local officials with the following goals:

- **Communicate risk** – Local officials can use the information in this report to communicate with property owners, business owners, and other residents about risks and areas of mitigation interest.
- **Update local hazard mitigation plans and community comprehensive plans** – Planners can use risk information to develop and/or update hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes can be changed to provide for more appropriate land uses in high-hazard areas.
- **Update emergency operations and response plans** – Emergency managers can identify high-risk areas for potential evacuation and low-risk areas for sheltering. Risk assessment information may show vulnerable areas, facilities, and infrastructure for which continuity of operations plans, continuity of government plans, and emergency operations plans would be essential.
- **Inform the modification of development standards** – Planners and public works officials can use information in this report to support the adjustment of development standards for certain locations.
- **Identify mitigation projects** – Planners and emergency managers can use this risk assessment to determine specific mitigation projects of interest. For example, a floodplain manager may identify critical facilities that need to be elevated or removed from the floodplain.

The North Central Texas Council of Governments (NCTCOG), Texas, became a FEMA Cooperating Technical Partner (CTP) in Fiscal Year 2004 (FY2004) and in FY2016 contracted with FEMA to provide Risk MAP Discovery and Base Level Engineering (BLE) products for the East Fork Trinity Watershed, Texas. The project area covers the counties bounded by the East Fork Trinity Hydrologic Unit Code 8 (HUC-8) Watershed: Collin, Dallas, Fannin, Grayson, Hunt, Kaufman, and Rockwall. Locator maps covering the study area can be found in Appendix III of this report.

This Flood Risk Report focuses on the FY2016 Risk MAP Discovery and BLE project. It showcases risk assessments, which analyze how a flood hazard affects the built environment, population, and local economy to identify mitigation actions and develop mitigation strategies.

The information in this Risk Report should be used to identify areas in need of mitigation projects or flood risk identification projects (RiskMAP Phase 2) to support additional efforts to educate residents on the hazards that may affect them. The areas of greatest hazard impact are identified in the Areas of Mitigation Interest (AOMI) section of this report, which can serve as a starting point for identifying and prioritizing actions a community can take to reduce its risks.

About the FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program

Flood risk is continually changing over time due to factors such as new building and development and weather patterns. The goal of the Federal Emergency Management Agency's (FEMA) Risk MAP program

is to work with Federal, state, tribal, and local partners to identify and reduce flood risk across communities. These projects are conducted using watershed boundaries, and bring together multiple communities to identify broader mitigation actions and create consistency across the watershed. The program provides resources and support that are tailored to each community to help mitigate their risk and work towards a reduction in risk and future loss.

Through coordination and data sharing, the communities in the watershed work as partners in the mapping process. In addition to providing data, the communities can also provide insight into flooding issues and flood prevention within their areas. To prepare for a future study and assist in mitigation, FEMA provides several data sources, including information from the community, such as the following:

- Areas of repeated flooding and insurance claims
- Future development plans
- Areas of low water crossings
- High water marks from recent flooding events
- Areas of evacuation during high water
- Master drainage plans, flood risk reduction projects, and large areas of fill placement
- Local flood studies
- Other flood risk information

For more information about ways communities can take action or take advantage of available resources, please review the attached appendices.

FEMA provides communities with BLE data for select watersheds during the Risk MAP process. BLE is a form of hydrologic and hydraulic modeling which, when completed, can provide modeled flood hazard data in existing Zone As or where no effective flood hazard zone has been designated. Knowing the extent of flooding during the 1-percent-annual-chance flooding event supports risk reduction efforts and supports more resilient community planning. Completed BLE data is provided to watershed communities for planning, risk communication, floodplain management, and permitting activities, and to inform future flood study needs. BLE is large scale watershed based modeling that lacks the detail of Zone AE modeling such as road crossings and the effects of routing storage. BLE does not replace Zone AE data and should be used for comparison purposes only in these areas.

For information on BLE in the East Fork Trinity Watershed, see the Phase Zero: Investment section of this report or Appendix II: Base Level Engineering Report.

About the East Fork Trinity Watershed

The first FEMA flood hazard mapping within the East Fork Trinity HUC-8 Watershed was released in the 1970s. As of 2019, all the participating communities in the East Fork Trinity Watershed Discovery have modernized countywide Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Study (FIS) Reports. Approximately 67 percent of the area in the East Fork Trinity Watershed is undeveloped; including grasslands, croplands, and forests. Roughly 28 percent of the area is developed, and the remaining five percent is open water. Over the past half century, the area experienced rapidly increasing development and many severe floods. The City of McKinney alone experienced 10 severe floods in a 40-year period. The Memorial Day Floods and Tropical Storm, named Bill, of 2015 damaged roads and claimed lives throughout the East Fork Trinity Watershed, causing over a \$1 billion in damages.

In 2009, NCTCOG and the Texas Water Development Board (TWDB) created a Mapping Needs Assessment (MNA) study for the Upper Trinity River Basin, which included parts of the East Fork Trinity HUC-8 Watershed. The MNA project identified and prioritized the floodplain management needs of over 2,300 stream miles. To prioritize the floodplain management needs, NCTCOG and TWDB created a database of all the engineering flood studies in the Basin. In 2016, FEMA authorized NCTCOG to continue the work of the MNA Study by performing a Discovery and BLE Risk MAP Project effort in the East Fork Trinity HUC-8 Watershed to gather local information, readily available data to determine project viability, and create Risk MAP products to assist in the movement of communities towards resilience. The goal of the 2016 project was to work closely with communities to better understand local flood risks, mitigation efforts, and other topics in order to spark watershed-wide discussions about increasing resilience to flooding.

Introduction

Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over a normally dry area. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the accumulation of unwanted debris. Severe flood losses can destroy buildings and crops and cause severe injuries or death.

Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Even if people know where a flood might occur, they may not know the level of flood risk in that area. The most common method for determining flood risk, also referred to as vulnerability, is to identify both the probability and the consequences of flooding:

Flood Risk (or Vulnerability) = **Probability x Consequences**; where

Probability = the likelihood of occurrence

Consequences = the **estimated** impacts associated with the occurrence on life, property, and infrastructure

The probability of a flood is the likelihood that it will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. These factors will also have an effect on the area that is impacted by the flood, increasing or decreasing the size of the affected area. The ability to assess the probability of a flood, and the level of accuracy for that assessment, are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated effects associated with its occurrence. Consequences relate to human activities within an area and how a flood affects the natural and built environment. It is important that individuals and communities have an accurate and current understanding of their risk because anyone can be vulnerable to flooding. Individuals that are located outside of the high-risk Special Flood Hazard Area (SFHA) file more than 20 percent of insurance claims and receive one-third of disaster assistance for flooding. Having an awareness of risk can allow communities and their residents to address the potential consequences. Understanding risk can also allow for long-term development planning, opportunities for revitalization efforts, and modifications in how interaction occurs with the existing risk.

Watershed Basics

Background

The East Fork Trinity HUC-8 Watershed is located in North Texas and covers portions of Collin, Dallas, Fannin, Grayson, Hunt, Kaufman, and Rockwall Counties. See Figure 1 for a location map of the East Fork Trinity Watershed. The watershed encompasses 54 communities covering approximately 1,303 square miles (sq. mi.).

The East Fork Trinity Watershed is in the Blackland Prairie ecoregion, which is dominated by either forests, pastures, or grasslands outside of urbanized areas. The forests normally surround rivers and streams, and contain trees of elm, pecans, oaks, mesquite, and bois d'arc. Native grasslands include species such as indiagrass, switchgrass, and big and little bluestem grass. Pasturelands often have invasive woody plants, such as lotebush and mesquite, and grasses such as buffalograss and Texas grama. Soils in the Blackland prairie are dark alkaline soils in the western portions or gray clays and loams, both of which drain water quickly.

The East Fork Trinity Watershed has approximately 273 dams which are primarily used for water supply. These dams provide other benefits such as irrigation for agriculture, recreation, and flood control. The dams are owned either by the local government or local government agency. Others are privately owned dams. Sixty-three percent (63%) of these dams are classified as low hazard dams. The largest dam is the Lavon Lake Dam, which was completed in 1952 and is used mainly for water supply, recreation, and flood control. Duck Creek Waste Water Treatment Plant Levee is the only certified levee in the East Fork Trinity HUC-8 Watershed, and it was certified in 2013. Other small private levees may exist.

Intense, localized thunderstorms and frontal-type storms in spring and summer cause most of the flooding issues in East Fork Trinity Watershed. Flash flooding occurs throughout the watershed, with the clay subsoils often eroding during large rain events. The unincorporated areas of Rockwall County within the East Fork Trinity HUC-8 Watershed have minimal flooding issues due to several connected Soil Conservation Service (SCS) detention dams in the area. In both Fannin and Grayson Counties, though the places most susceptible for flood damage are not located within the East Fork Trinity Watershed, flooding does occur throughout all communities.

The most significant recorded historical flood events are located outside of the watershed in Kaufman County (areas adjacent to Buffalo Creek), and these areas are likely to become more vulnerable. Buffalo Creek is located south of Lake Ray Hubbard and will likely see increased runoff due to the increased urbanization of Rockwall County along the lake. Likewise, in Rockwall County, increased runoff from storm events due to increased impervious surfaces can change the areas most susceptible to flooding. Thompson Branch is the only recorded Rockwall County Stream with recorded flooding problems in the East Fork Trinity Watershed.

In Hunt County, none of the major flooding issues have occurred within the East Fork Trinity Watershed. Though there are dams on streams within the watershed, none of them are flood control dams. Collin County experiences most of its flooding issues within the East Fork Trinity Watershed. Widespread flooding occurs on Sister Grove Creek, the East Fork Trinity River, and Rowlett Creek, with an average of four and a half years between successive flood events.

Dallas County contains several streams with large exposure to development structure and population during major flood events, but most of these streams are outside of the East Fork Trinity Watershed. Lake Ray Hubbard, located partially within Dallas County, serves as a water source but not a flood control for the county. Muddy Creek and its tributaries contain five Natural Resources Conservation Service (NRCS) flood retarding structures, and both South Mesquite Creek and Long Branch are channelized. Currently, a 2017 FEMA Regional Task Order (RTO) detail study is underway along the Trinity River and the East Fork Trinity River below Lake Ray Hubbard. This study may result in regulatory FIRM updates for the study region. For more information, please refer to the FEMA case number 18-06-00145.

Figure 1 provides an overview of the East Fork Trinity Watershed and its geographic location within the state.

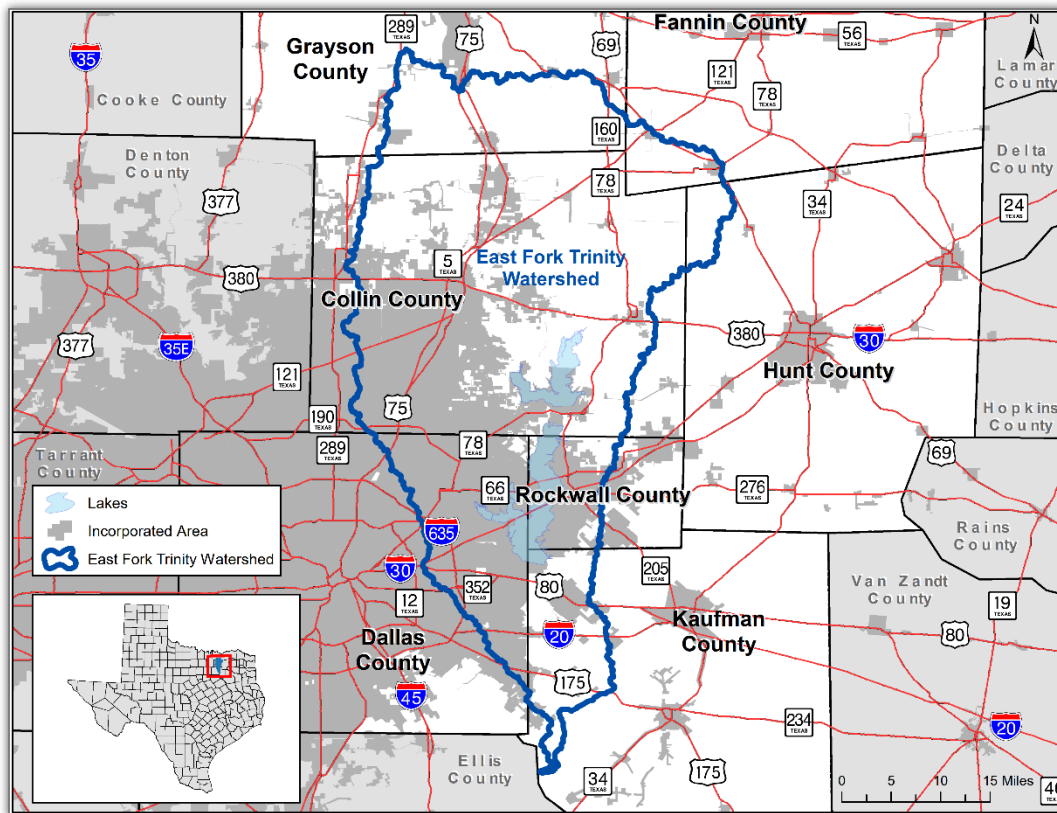


Figure 1: Overview map for the East Fork Trinity Watershed

Population

A review of land cover changes and population growth patterns in the watershed revealed that significant development occurred from 2010 to 2016 in many cities of Collin County. Within Collin County, the Towns of Celina, Lavon, New Hope, and Prosper and the Cities of Blue Ridge, McKinney, Murphy, Weston, and Wylie all increased in population between 20 - 61 percent. The City of Heath also increased in over 20 percent, and the Counties of Grayson and Kaufman increased by about 45 percent.

Since 2016, most communities within the East Fork Trinity Watershed have experienced population growth. However, six communities (Cities of Fate, Leonard, Mobile City, Melissa, the Town of Sunnyvale,

and the unincorporated areas of Fannin and Collin Counties) have declined in population since 2010, with Fannin County serving 59 percent fewer people.

Excluding the combined areas of previously developed land and open water, roughly 900 sq. mi. of the watershed still has the potential for new construction. Using the average annual growth rate for the cities and unincorporated county areas in the project area, the total population within the watershed has the potential to substantially rise by 2022. Therefore, the probability is high that populated areas will expand and rural land will be developed.

To help mitigate the flood risk to areas where increased population and development are expected, communities can adopt (or exceed) the minimum standards of the National Flood Insurance Program (NFIP). This is recommended as a proactive strategy to manage construction within the floodplain and avoid negative impacts to existing and future development.

Watershed Land Use

East Fork Trinity Watershed is urban on the eastern half of the watershed, with several cities of populations between under 100 to over 1,200,000. On the western and northern portions of the watershed, the land is mainly rural with land uses including agriculture, livestock farming, and hunting tourism. Collin, Dallas, Kaufman, and Rockwall Counties provides water sports and tourism on Lake Ray Hubbard and Lavon Lake. Oil and gas exploration sites are plentiful throughout the watershed with the largest concentration in Navarro County. Light manufacturing is a prominent industry in Kaufman County. Although most of the watershed is undeveloped at present time, it will likely have steady growth due to lower housing costs in the Dallas-Fort Worth (DFW) metroplex compared to other areas in the nation. The communities in Collin and Dallas counties are commercial and industrial centers, with many residents of the rural areas of the watershed commuting in for employment.

Table 1: Population and Area Characteristics ¹

| Risk MAP Project | Total Population in Study Area | Average % Population Growth/Yr (2010-2040) | Predicted Population (by 2040) | Land Area | Developed Area | Open Water |
|---|--------------------------------|--|--------------------------------|----------------|----------------|------------|
| East Fork Trinity HUC-8 Watershed (HUC8 12030106) | 1,273,869 | 64.3% | 2,092,479 | 1,303* sq. mi. | 376 sq. mi. | 73 sq. mi. |

*Total Land Area includes land and water.

National Flood Insurance Program Status and Regulation

To be a participant in the National Flood Insurance Program (NFIP), all interested communities must adopt and submit floodplain management ordinances that meet or exceed the minimum NFIP regulations. These regulations can be found in the Code of Federal Regulations and most of the community ordinance requirements are in Parts 59 and 60. The level of regulation depends on the level of information available and the flood hazards in the area. The levels are as follows:

¹ Data obtained from the U.S. Census Bureau; ESRI Demographic 5-year Projections; and National Land Cover Database

- A: The Federal Emergency Management Agency (FEMA) has not provided any maps or data – 60.3(a)
- B: Community has maps with approximate A zones – 60.3(b)
- C: Community has a Flood Insurance Rate Map (FIRM) with Base Flood Elevations (BFE) – 60.3(c)
- D: Community has a FIRM with BFEs and floodways – 60.3(d)
- E: Community has a FIRM that shows coastal high hazard areas (V zones) – 60.3(e)

To help mitigate the risk to areas where increased population and development are expected, communities can adopt (or exceed) the minimum standards of the National Flood Insurance Program (NFIP). This is recommended as a proactive strategy to manage construction within the floodplain and avoid negative impacts to existing and future development.

To increase mitigation efforts and community flood awareness through potentially discounted premium rates, an NFIP community that has adopted more stringent ordinances or is actively completing mitigation and outreach activities is encouraged to consider joining the Community Rating System (CRS). The CRS is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions.

All communities within the project area, except for the Cities of Combine, Dorchester, Lucas, Mobile City, Nevada, and Tom Bean have a level of regulation suitable for managing floodplains with mapped regulatory floodways and Base (1-percent-annual-chance) Flood Elevations (44 CFR 60.3(d)). The Cities of Lucas, Nevada, Dorchester, Tom Bean, Combine, and Mobile City do not participate in the NFIP and, therefore, do not have any regulation for managing floodplains with mapped regulatory floodways and Base (1-percent-annual-chance) Flood Elevations (44 CFR 60.3(d)).

Communities can review their current ordinances and reflect potential flood hazard changes by adopting updated ordinances early. This action can reduce future flood losses by affecting how substantial improvements or new construction are regulated.

Hazard Mitigation Plan

State and local governments must develop and adopt Hazard Mitigation Plans (HMP) to be eligible for certain types of funding. To remain eligible, communities need to update and resubmit their plans every five years for FEMA approval. Hazard mitigation plans are created to increase education and awareness, identify strategies for risk reduction, and identify other ways to develop long-term strategies to reduce risk and protect people and property.

As of July 2019, the Cities of Nevada and Weston do not have hazard mitigation plans. Grayson County and its municipalities; Cities of Dorchester, Gunter, Plano and Van Alstyne, and Towns of Howe, Talty and Tom Bean have expired hazard mitigation plans. The unincorporated areas of Rockwall County and the Cities of Fate, Heath, McLendon-Chisholm, Mobile City, and Rockwall participate in the Rockwall County Hazard Mitigation Plan, which is set to expire in 2022. Kaufman County and the Cities of Combine, Crandall, and Forney participate in the Kaufman County Hazard Mitigation Plan. The Cities of Leonard and Trenton participate in the Fannin County Hazard Mitigation Plan. The Cities of Garland, McKinney, and Mesquite each have a hazard mitigation plan separate from their respective counties' plans. The Dallas County Hazard Mitigation Plan includes the Cities of Balch Springs, Richardson, Rowlett, Sachse and

Seagoville, and the Town of Sunnyvale. The Collin County Hazard Mitigation Plan is also adopted by the Cities of Allen, Anna, Blue Ridge, Celina, Farmersville, Frisco, Lavon, Lowry Crossing, Lucas, Melissa, Murphy, Parker, Princeton, and Wylie, and the Towns of Fairview, New Hope, Prosper, and Saint Paul.

Hazard Mitigation Plans effectively allow for FEMA to assess hazards identified through local, state, and federal partnerships and mitigation action items that communities have identified. These HMPs were used in the compilation and preparation of this report.

Community Rating System

The Community Rating System (CRS) is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that communities undertake in addition to the minimum requirements they must meet when joining the NFIP. Individuals that carry flood insurance in a community that participates in the CRS program can receive a discount on their flood insurance premium. Discounts can range from 5 to 45 percent. The Cities of Dallas, Garland, Plano, and Richardson participate in CRS. Table 2 depicts NFIP and CRS participation status and provides an overview of the effective flood data availability.

Table 2: NFIP and CRS Participation ²

| Risk MAP Project | Participating NFIP Communities/ Total Communities | Number of CRS Communities | CRS Rating Class Range | Average Years since FIRM Update | Level of Regulations (44 CFR 60.3) |
|---|---|---------------------------|------------------------|---------------------------------|------------------------------------|
| East Fork Trinity HUC-8 Watershed (HUC8 12030106) | 48/54 | 4 | 5 - 8 | 7 | 44 CFR 60.3(d) |

Flood Insurance Rate Maps (FIRMs)

The average age of the effective FIRMs within the East Fork Trinity HUC-8 Watershed is seven years. The oldest effective maps are for Rockwall County, which are 11 years old and have an effective date of September 26, 2008. The newest FIRMs are dated June 7, 2018 and are for Collin County within the study watershed. Though Dallas County has FIRMs effective March 2019, these FIRMs fall outside of the East Fork Trinity HUC-8 Watershed. As of 2019, all communities in the watershed have modernized digital county-wide Effective DFIRMs.

Dams

The East Fork Trinity Watershed has abundant water resources. Several dams along the numerous streams in the watershed are used to maintain water storage and to control or divert flow. As recorded by the USACE in the National Inventory of Dams and the FEMA DFIRM databases, there are approximately 273 dams within the watershed, with 101 of these dams classified as high-hazard dams. For these high-hazard dams, the owners and operators are required to develop and maintain Emergency Action Plans (EAP) to reduce the risk of loss of life and property if the dam fails.

² Data obtained from FEMA Community Information Systems.

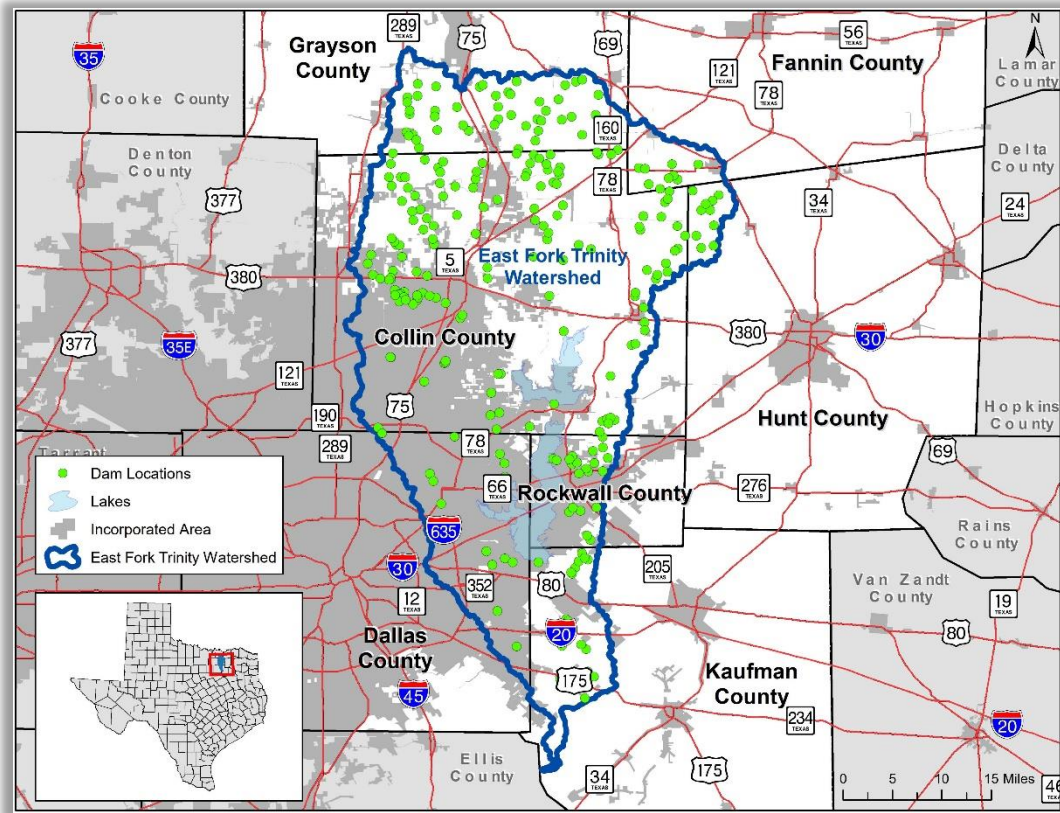


Figure 2: Dam Location Map for East Fork Trinity Watershed

Table 3 provides the characteristics of the dams identified in the project area. Lavon Lake Dam is the largest dam in the watershed, storing 1,020,500 acre-ft of water.

Table 3: Risk MAP Project Dam Characteristics³

| Risk MAP Project | Total Number of Identified Dams | Number of Dams Requiring EAP | Percentage of Dams without EAP | Average Years since Inspection | Average Storage (acre-feet) |
|---|---------------------------------|------------------------------|--------------------------------|--------------------------------|-----------------------------|
| East Fork Trinity HUC-8 Watershed (HUC8 12030106) | 273 | 101 | 63% | 9 | 15,104 |

³ Data obtained from USACE National Inventory of Dams

Project Phases and Map Maintenance

Background

FEMA manages several risk analysis programs, including Flood Hazard Mapping, National Dam Safety, the Earthquake Safety Program, Multi-Hazard Mitigation Planning, and the Risk Assessment Program, all of which assess the impact of natural hazards and lead to effective strategies for reducing risk. These programs support the Department of Homeland Security's objective to "strengthen nationwide preparedness and mitigation against natural disasters."

FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing American communities for flood hazards. In the nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. A consistent risk-based assessment approach and a robust communication system are critical tools to ensure a community's ability to make informed risk management decisions and take mitigation actions. Flood hazard mapping is a basic and vital component for a prepared and resilient nation.

In Fiscal Year 2009, FEMA's Risk MAP program began to synergize the efforts of Federal, state, and local partners to create timely, viable, and credible information identifying natural hazard risks. The intent of the Risk MAP program is to share resources to identify

the natural hazard risks a community faces and ascertain possible approaches to minimizing them. Risk MAP aims to provide technically sound flood hazard information to be used in the following ways:

- To update the regulatory flood hazard inventory depicted on FIRMs and the National Flood Hazard Layer
- To provide broad releases of data to expand the identification of flood risk (flood depth grids, water-surface elevation grids, etc.)
- To support sound local floodplain management decisions
- To identify opportunities to mitigate long-term risk across the nation's watersheds

Flood-related damage between 1980 and 2013 totaled \$260 billion, but the total impact to our Nation was far greater—more people lose their lives annually from flooding than any other natural hazard.

FEMA, "Federal Flood Risk Management Standard (FFRMS)" (2015)

How are FEMA's Flood Hazard Maps Maintained?

FEMA's flood hazard inventory is updated through several types of revisions.

Community-submitted Letters of Map Change. First and foremost, FEMA relies heavily on the local communities that participate in the NFIP to carry out the program's minimum requirements. These requirements include the obligation for communities to notify FEMA of changing flood hazard information and to submit the technical supporting data needed to update the FIRMs.

Although revisions may be requested at any time to change information on a FIRM, FEMA generally will not revise an effective map unless the changes involve modifications to SFHAs. Be aware that the best floodplain management practices and proper assessments of risk result when the flood hazard maps present information that accurately reflects current conditions.

Under the current minimum NFIP regulations, a participating community commits to notifying FEMA if changes take place that will affect an effective FIRM no later than 6 months after project completion.

Section 65.3, Code of Federal Regulations

Letters of Map Amendment (LOMAs). The scale of an effective FIRM does not always provide the information required for a site-specific analysis of a property's flood risk. FEMA's LOMA process provides homeowners with an official determination on the relation of their lot or structure to the SFHA. Requesting a LOMA may require a homeowner to work with a surveyor or engineering professional to collect site-specific information related to the structure's elevation; it may also require the determination of a site-specific BFE. Fees are associated with collecting the survey data and developing a site-specific BFE. Local surveying and engineering professionals usually provide an Elevation Certificate to the homeowner, who can use it to request a LOMA. A successful LOMA may remove the Federal mandatory purchase requirement for flood insurance, but lending companies may still require flood insurance if they believe the structure is at risk.

FEMA-Initiated Flood Risk Project. Each year, FEMA initiates a number of Flood Risk Projects to create or revise flood hazard maps. Because of funding constraints, FEMA can study or restudy only a limited number of communities, counties, or watersheds each year. As a result, FEMA prioritizes study needs based on a cost-benefit approach whereby the highest priority is given to studies of areas where development has increased and the existing flood hazard data has been superseded by information based on newer technology or changes to the flooding extent. FEMA understands communities require products that reflect current flood hazard conditions to best communicate risk and implement effective floodplain management.

Flood Risk Projects may be delivered by FEMA or one of its Cooperating Technical Partners (CTPs). The CTP initiative is an innovative program created to foster partnerships between FEMA and participating NFIP communities, as well as regional and state agencies. Qualified partners collaborate in maintaining up-to-date flood maps. In FEMA Region 6, which includes the State of Texas, CTPs are generally statewide agencies that house the State Floodplain Administrator. However, some Region 6 CTPs are also large River Authorities or Flood Control Districts. They provide enhanced coordination with local, state, and Federal entities, engage community officials and technical staff, and provide updated technical information that informs the national flood hazard inventory.

Risk MAP has modified FEMA’s project investment strategy from a single investment by fiscal year to a multi-year phased investment, which allows the FEMA to be more flexible and responsive to the findings of the project as it moves through the project lifecycle. Flood Risk Projects are funded and completed in phases.

General Flood Risk Project Phases

Each phase of the Flood Risk Project provides both FEMA and its partner communities with an opportunity to discuss the data that has been collected and to determine a path forward. Local engagement throughout each phase enhances the opportunities for partnership, furthers the discussion on current and future risk, and helps identify local projects and activities to reduce long-term natural hazard risk.

Flood Risk Projects may be funded for one or more of the following phases:

- Phase Zero – Investment
- Phase One – Discovery
- Phase Two – Risk Identification and Assessment
- Phase Three – Regulatory Product Update

Local input is critical throughout each phase of a Flood Risk Project. More details about the tasks and objectives of each phase are included below.

Phase Zero: Investment

Phase Zero of a Flood Risk Project initiates FEMA’s review and assessment of the inventories of flood hazards and other natural hazards within a watershed area. During the Investment Phase, FEMA reviews the availability of information to assess the current floodplain inventory. FEMA maintains several data systems to perform watershed assessments and selects watersheds for a deeper review of available data and potential investment tasks based on the following factors:

Availability of High-Quality Ground Elevation Data. FEMA reviews readily available and recently acquired ground elevation data. This information helps identify development and earth-moving activities near streams and rivers. Where necessary, FEMA may partner with local, state, and other federal entities to collect necessary ground elevation information within a watershed.



If [high-quality ground elevation data](#) is both available for a watershed area and compliant with FEMA’s quality requirements, FEMA and its mapping partners may prepare engineering data to assess, revise, replace, or add to the current flood hazard inventory.

Mile Validation Status within Coordinated Needs Management Strategy (CNMS). FEMA uses the CNMS database to track the validity of the flood hazard information prepared for the NFIP. The CNMS database reviews 17 criteria to determine whether the flood hazard information shown on the current FIRM is still valid.



Communities may also inform and request a review or update of the inventory through the CNMS website at <https://msc.fema.gov/cnms/>. The [CNMS Tool Tutorial](#) provides an overview of the online tool and explains how to submit requests.

Local Hazard Mitigation Plans. Reviewing current and historic hazard mitigation plans provides an understanding of a community’s comprehension of its flood risk and other natural hazard risks. The

mitigation strategies within a local hazard mitigation plan provide a lens to local opportunities and underscore a potential for local adoption of higher standards related to development or other actions to reduce long-term risk.

Cooperating Technical Partner State Business Plans. In some states, a CTP generates an annual state business plan that identifies future Flood Risk Project areas that are of interest to the state. The Texas Water Development Board and the Texas Natural Resources Information System work to develop user-friendly data. In this project area, FEMA has worked closely with both entities to develop the project scope and determine the necessary project tasks.



Communities that have identified local issues are encouraged to indicate their data needs and revision requests to the State CTP so that they can be prioritized and included in the State Business Plans.

Possible Investment Tasks. After a review of the data available within a watershed, FEMA may choose to (1) purchase ground elevation data and/or (2) create some initial engineering modeling against which to compare the current inventory, also known as BLE modeling.

Phase One: Discovery

Phase One, the Discovery Phase, provides opportunities both internally (between the state and FEMA) and externally (with communities and other partners interested in flood potential) to discuss local issues with flooding and examine possibilities for mitigation action. This effort is made to determine where communities currently are with their examination of natural hazard risk throughout their community and to identify how state and Federal support can assist communities in achieving their goals.



The Discovery process includes an opportunity for local communities to provide information about their concerns related to natural hazard risks. Communities may continue to inform the project identification effort by providing previously prepared survey data, as-built stream crossing information, and engineering information.

For a holistic community approach to risk identification and mapping, FEMA relies heavily on the information and data provided at the local level. Flood Risk Projects are focused on identifying (1) areas where the current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) areas of mitigation interest that may require more detailed engineering information than is currently available, and (3) community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on these evaluations of flood risk, data needs, availability of elevation data, Regional knowledge of technical issues, identification of a community-supported mitigation project, and input from Federal, state, and local partners.

Possible Discovery Tasks. Discovery may include a mix of interactive webinar sessions, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Data collection, interviews, and interaction with community staff and data-mining activities provide the basis for watershed-, community-, and stream-level reviews to determine potential projects that may benefit the communities. A range of analysis approaches are available to determine the extent of flood risk along streams of concern. FEMA and its mapping partners will work closely with communities to determine the appropriate analysis approach, based on the data needs throughout the community.

These potential projects may include local training sessions, data development activities, outreach support to local communities wanting to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Two: Risk Identification and Assessment

Phase Two (Risk Identification and Assessment) continues the risk awareness discussion with communities through watershed analysis and assessment. Analyses are prepared to review the effects of physical and meteorological changes within the project watershed. The new or updated analysis provides an opportunity to identify how development has affected the amount of stormwater generated during a range of storm probabilities and shows how effectively stormwater is transported through communities in the watershed.



Coordination with a community's technical staff during engineering and model development allows FEMA and its mapping partners to include local knowledge, based on actual on-the-ground experience, when selecting modeling parameters.

The information prepared and released during Phase Two is intended to promote better local understanding of the existing flood risk by allowing community officials to review the variability of the risk throughout their community. As FEMA strives to support community-identified mitigation actions, it also looks to increase the effectiveness of community floodplain management and planning practices, including local hazard mitigation planning, participation in the NFIP, use of actions identified in the CRS Manual, risk reduction strategies for repetitive loss and severe repetitive loss properties, and the adoption of stricter standards and building codes.



FEMA is eager to work closely with communities and technical staff to determine the current flood risk in the watershed. During the Risk Identification and Assessment phase, FEMA would like to be alerted to any community concerns related to the floodplain mapping and analysis approaches being taken. During this phase, FEMA can engage with communities and review the analysis and results in depth.

Possible Risk Identification and Assessment Tasks. Phase Two may include a mixture of interactive webinars, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Flood Risk Project tasks may include hydrologic or hydraulic engineering analysis and modeling, floodplain mapping, risk assessments using Hazus-Multi Hazard software, and preparation of flood risk datasets (water-surface elevation, flood depth, or other analysis grids). Additionally, projects may include local training sessions, data development activities, outreach support to local communities that want to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Three: Regulatory Products Update

If the analysis prepared in the previous Flood Risk Project phases indicates that physical or meteorological changes in the watershed have significantly changed the flood risk since the last FIRM was printed, FEMA will initiate the update of the regulatory products that communities use for local floodplain management and NFIP activities.

Delivery of the preliminary FIRM and Flood Insurance Study (FIS) report begins another period of coordination between community officials and FEMA to discuss the required statutory and regulatory

steps both parties will perform before the preliminary FIRM and FIS report can become effective. As in the previous phases, FEMA and its mapping partners will engage with communities through a variety of conference calls, webinars, and in-person meetings.



Once the preliminary FIRMs are prepared and released to communities, FEMA will initiate the statutory portions of the regulatory product update. FEMA will coordinate a Consultation Coordination Officer meeting and initiate a 90-day comment and appeal period. During this appeal period, local developers and residents may coordinate the submittal of their comments and appeals through their community officials to FEMA for review and consideration.

FEMA welcomes this information because additional proven scientific and technical information increases the accuracy of the mapping products and better reflects the community's flood hazards identified on the FIRMs.



Communities may host or hold Open House meetings for the public. The Open House layout allows attendees to move at their own pace through several stations, collecting information in their own time. This format allows residents to receive one-on-one assistance and ask questions pertinent to their situations or their interests in risk or flood insurance information.

All appeals and comments received during the statutory 90-day appeal period, including the community's written opinion, will be reviewed by FEMA to determine the validity of the appeal. Once FEMA issues the appeal resolution, the associated community and all appellants will receive an appeal resolution letter and FEMA will revise the preliminary FIRM, if warranted. A 30-day period is provided for review and comment on successful appeals. Once all appeals and comments are resolved, the flood map is ready to be finalized.



After the appeal period, FEMA will send community leaders a Letter of Final Determination stating that the preliminary FIRM will become effective in 6 months. The letter also discusses the actions each affected community participating in the NFIP must take to remain in good standing in the NFIP.

After the preceding steps are complete and the 6-month compliance period ends, the FIRMs are considered effective maps and new building and flood insurance requirements become effective.

That is a brief general overview of a Flood Risk Project. The Flood Risk Report, which is described in the next section, will provide details on the efforts in the East Fork Trinity Watershed.

Phase Zero: Investment – FY16 East Fork Trinity Watershed Risk MAP Project

The East Fork Trinity Watershed represents one of the dominant flooding sources in North Texas and lies in the "flash-flood alley" of Texas. Figure 3 shows the number of flash floods per county in Texas. The watershed impacts over 50 communities which includes approximately 1.2 million people. The subject communities cover more than 1,300 sq. mi. with over 250 sq. mi. of mapped floodplain. Figure 3 shows an overview of flash flood risk in the East Fork Trinity Watershed. Much of the floodplain in the East Fork Trinity Watershed is in the unincorporated areas of Collin County, followed by the City of Dallas, and the unincorporated areas of Kaufman County. See Appendix III for figures showing floodplain mapping in the East Fork Trinity Watershed.

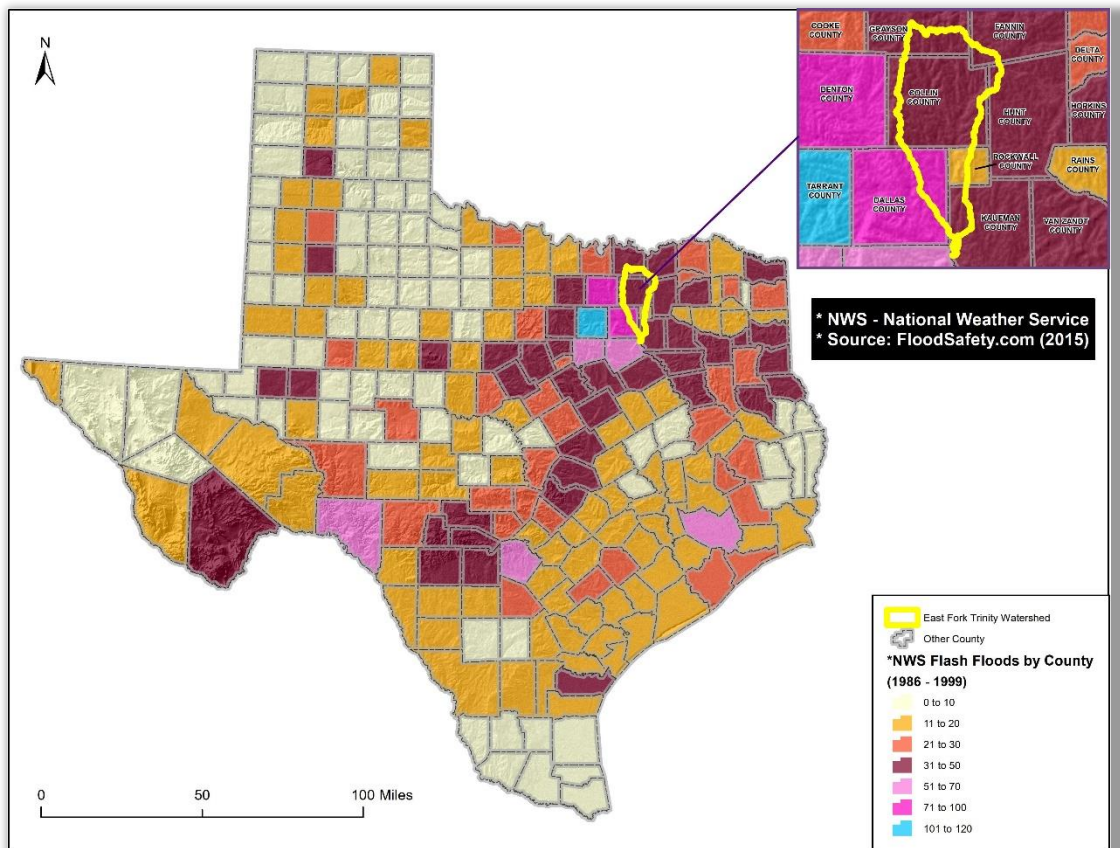


Figure 3: Flash Flood Incidents

All streams in the watershed are either direct or indirect tributaries to the East Fork Trinity River. These streams drain 36 HUC-12 watersheds comprising 1,300 sq. mi. of land. Flooding is highly dependent on rainfall and often follows tropical thunderstorm events hitting the watershed.

Throughout the watershed, annual rainfall totals exceed the Texas average annual precipitation rate of 34 inches. There is an increase in rainfall from the southwestern counties to the northeastern counties, with an average rainfall of 37.6 inches in Dallas County to 46.1 inches in Fannin County. Both the main stem of East Fork Trinity River and its many tributaries have several dams along their lengths, including

the Rockwall-Forney Dam on Lake Ray Hubbard, located in the counties of Collin, Dallas, Kaufman, and Rockwall.

All FEMA Risk MAP Project life cycles begins with Phase Zero (Investment/Discovery), and the 2019 East Fork Trinity Watershed project paves the way for the local communities to move towards resilience. FEMA selected and prioritized the watershed for BLE Investment and Discovery for the watershed with the overall goal of assisting the local governments in identifying flood risks and strengthening their ability to make informed decisions about reducing these risks. Figure 4 shows communities within the East Fork Trinity Watershed.

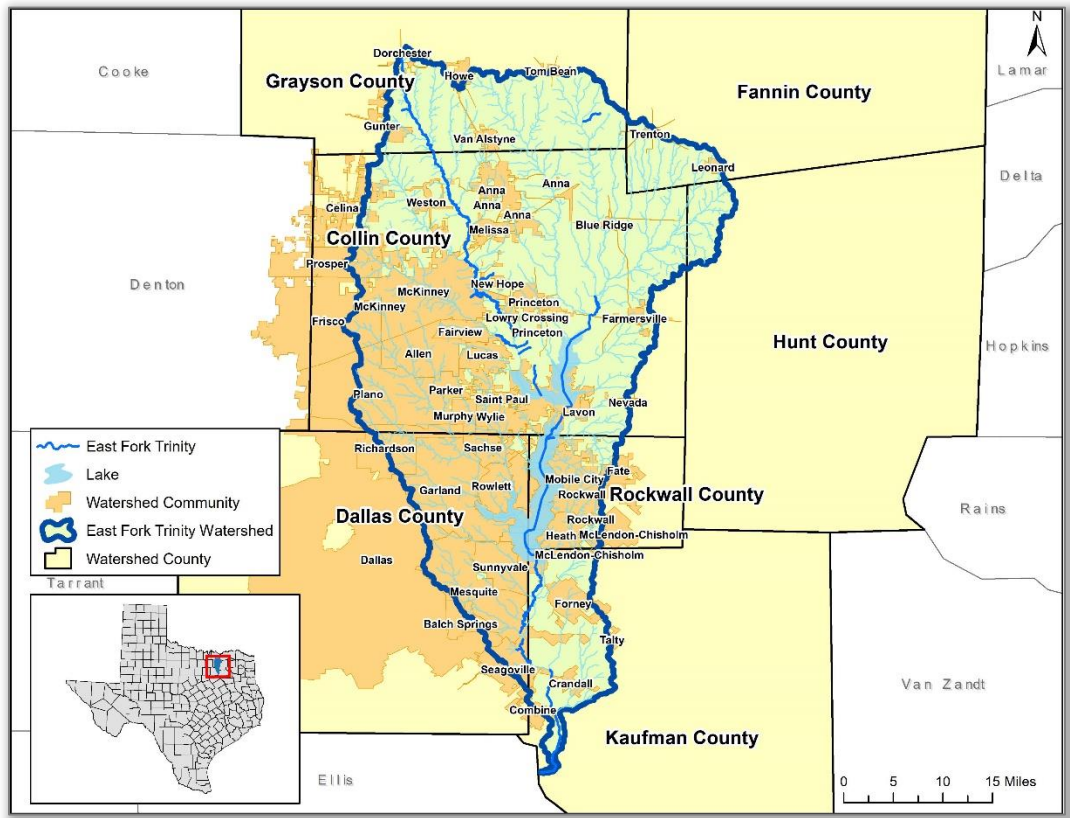


Figure 4: Overview of communities located within the East Fork Trinity Watershed.

Watershed Selection Factors

Many factors and criteria are reviewed for watershed selection: flood risk, the age of the current flood hazard data, population growth trends and potential for growth, recent flood claims, and disaster declaration history. The availability of local data and high-quality ground elevation data is reviewed for use in preparing flood hazard data. The CNMS database is reviewed to identify large areas of unknown or unverified data for streams. FEMA consults the State of Texas CTP, the State NFIP Coordinator, and the State Hazard Mitigation Officer when watersheds are identified for study.

Flood Risk. People who live along the East Fork Trinity River and its tributaries are not strangers to flood events, and numerous flooding events are listed in the historical record. Buffalo Creek in Rockwall County puts several homes in danger of flooding, and due to the increased urbanization the area’s potential for flood damage may rise. Once in the past ten years, counties in the East Fork Trinity Watershed were

declared major federal disaster areas due to damaging floods. This major disaster occurred in 2015 over Memorial Day weekend in Dallas, Kaufman, Grayson, and Fannin Counties.

As recently as October 2018, the City of Forney in Kaufman County experienced a flooding event which overtopped highways in multiple locations. Road closures are common in Collin County, where streams such as Elm Creek Tributary 4 and Cottonwood Creek No. 1 spill onto roadways. Though Grayson County has historical flooding issues, many of the modern flooding risks occur outside of the East Fork Trinity Watershed to the northwest.

Many additional flood related damages have been recorded in the various communities in the watershed. These flood events cause extensive damage to local infrastructure and illustrate the ongoing threat in the East Fork Trinity Watershed. Increased development, especially in the northern Dallas suburbs and east of Lake Ray Hubbard, will result in increased runoff and require improved drainage system and mitigation activities.

Growth Potential. Fannin, Grayson, Hunt, and Kaufman Counties are mostly rural, while Dallas and Rockwall Counties are urban within the East Fork Trinity Watershed. Collin County is mostly urban in the western half of the county, and rural in the eastern half. Most of the urbanization from 2010 through 2016 occurred in Rockwall County and western Collin County, and these areas increased in both impervious surfaces and population density. The Cities of Anna, Celina, Fate, Frisco, and McKinney and the Town of Prosper had some of the highest population growth during the last decade. Over the next twenty years, the Counties of Collin, Kaufman, Rockwall, and the Cities of Forney, Frisco, McKinney, Parker, Rowlett, Seagoville, and Wylie will experience the largest growth in population.

Age of Current Flood Information. All counties in the East Fork Trinity Watershed have been updated to countywide DFIRMs and FIS reports as part of FEMA's Map Modernization (Map Mod) program that began in 2004. Some studies in the Cities of Garland, Mesquite, and Rowlett went effective as recently as 2014. However, many of the hydrology and hydraulic models supporting the mapping currently shown in the FIRMs in these counties in the watershed have not been updated since the late 1970s or 1980s. Over half of the mapping shown on these FIRMs are also Zone A floodplains with no readily available Base Flood Elevations (BFEs).

The combination of related severe floods, outdated flood information, and increasing development indicate that this watershed needs updated flood hazard information to support floodplain management activities, especially outside of the inner ring of cities in the DFW region.

Availability of High-Quality Ground Elevation Data. FEMA's data availability review indicated that high-quality ground elevation data was available for most of the basin. This data provides a great basis for preparing hydrologic and hydraulic modeling and helps identify development and earth-moving activities near the streams and creeks. The source and date of the Light Detection and Ranging (LiDAR) topographic data as of July 2018 in the East Fork Trinity Watershed coverage is shown in Figure 5. The available LiDAR data was collected by TWDB and NCTCOG between 2009 and 2017.

The TWDB also collected elevation data for Lavon Lake and Lake Ray Hubbard in 2018. The basin data was collected between 2009 and 2011. The United States Geological Survey 10ft contours data was used in areas of Fannin county where no LiDAR is available. Figure 5 below shows the elevation sources and their extents within the East Fork Trinity Watershed.

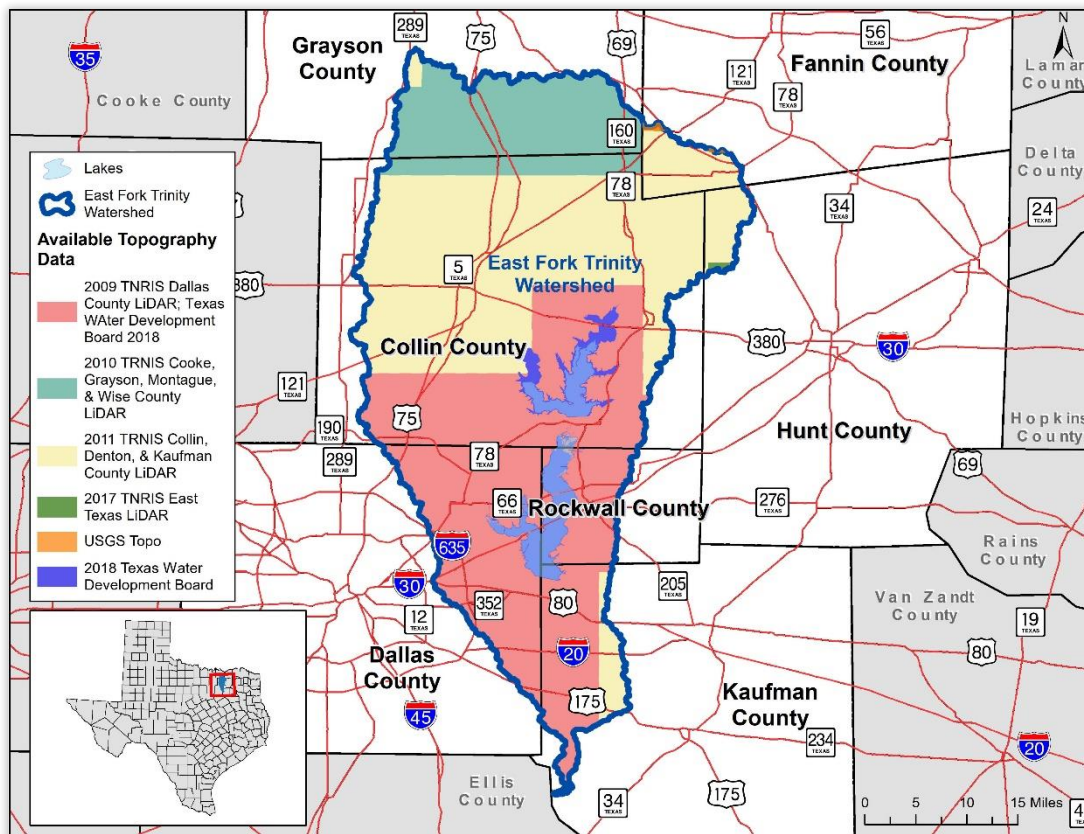


Figure 5: Availability of LiDAR data.

Coordinated Needs Management Strategy Database Review. The CNMS database indicates the validity of FEMA’s flood hazard inventory. CNMS reviews 17 criteria to determine whether flood hazard information shown on the current FIRMs is still valid. Streams that are indicated as *Unverified* or *Unknown* in the database indicate that the information used to map the floodplains currently shown on the FIRM is inaccessible or that a complete evaluation of the critical and secondary CNMS elements could not be performed.

Unmapped Stream Coverage. FEMA also reviewed the current stream coverage and reviewed the areas against the [National Hydrography Dataset \(NHD\)](#). The NHD medium-resolution data inventoried by the U.S. Geological Survey (USGS) maps created at a 1:100,000 scale was used to review the watercourses within the East Fork Trinity HUC-8 Watershed. Population centers of 1,000 or more were reviewed for additional mileage against the high-resolution data inventoried by the USGS Quadrangle maps created at a 1:24,000 scale. The intent of this review was to identify streams and watercourses and create a complete stream network for preparing Base Level Engineering data.

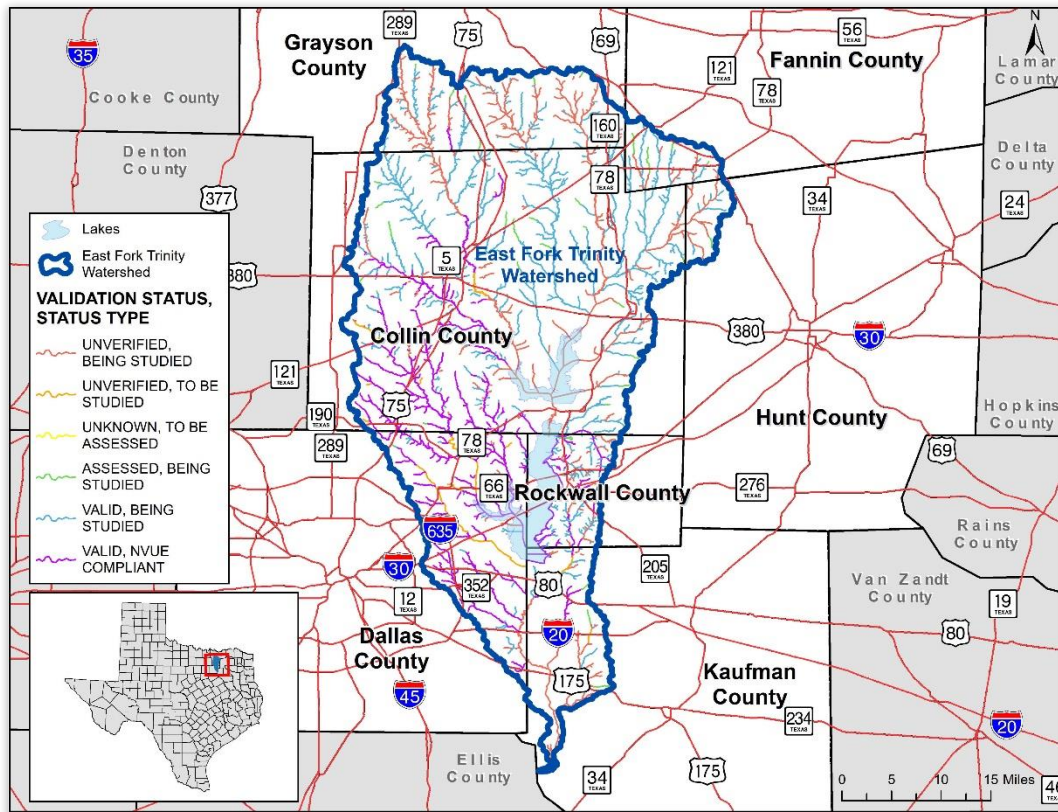


Figure 6: Overview of CNMS streams.

Base Level Engineering – East Fork Trinity Watershed (2018)

In 2018, FEMA through NCTCOG invested in BLE data development for the East Fork Trinity HUC-8 Watershed in Texas. This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area. BLE utilizes USGS regional regression equations with gage analysis to calculate flows. A full report of Base Level Engineering for the East Fork Trinity Watershed is provided in Appendix II.

Base Level Engineering provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter time. The data prepared through Base Level Engineering provides planning-level data that is prepared to meet FEMA’s Standards for Floodplain Mapping. Base level Engineering is scalable and can be updated for use as regulatory and non-regulatory products. Communities could choose to adopt the Base Level engineering as approximate, model-backed mapping in locations without model-backed Zone A mapping. Detailed studies can add structures to the BLE modeling for further refinement into Limited Detail studies or Detailed studies with or without floodway.

Figure 7 shows the network of streams analyzed using the BLE approach.

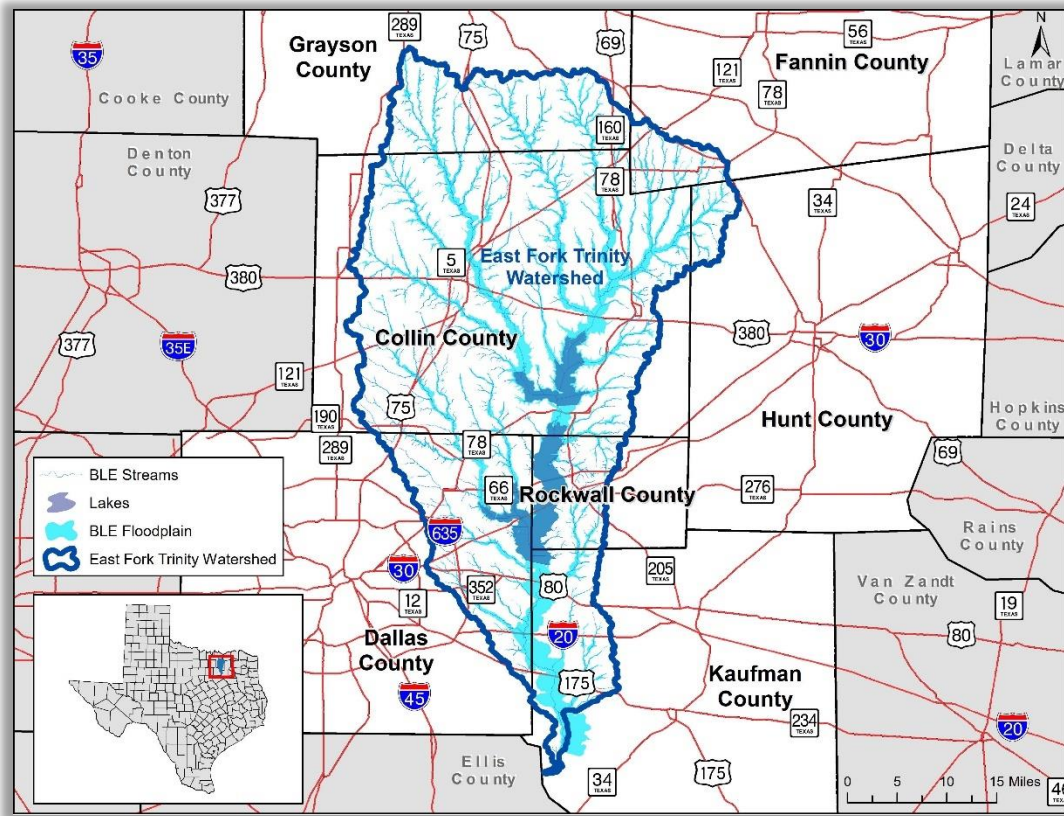


Figure 7: Overview BLE streams.

FEMA Investment (2016). The Base Level Engineering will provide the following items for use in the East Fork Trinity Watershed:

- Hydrology modeling (regression) flow values for the 10%, 4%, 2%, 1%, 1%+ and 0.2%, and 1%-frequencies
- Hydraulic (HEC-RAS) modeling for all study streams (for the same frequencies listed above)
- 10-, 1-, and 0.2-percent-annual-chance floodplain boundaries
- 1- and 0.2-percent-annual-chance Water Surface Elevation Grids
- 1- and 0.2-percent-annual-chance Flood Depth Grids
- HAZUS flood analysis for the watershed
- Point file indicating the location of culverts and inline structures that may be informed by local as-built information
- Flood Risk Map (See Appendix III)

The BLE approach will prepare flood hazard information for approximately 1,600 miles of stream, thus adding over 100 miles of supplementary flood hazard information for communities throughout the watershed. Once completed, the Base Level Engineering information is published on FEMA’s Estimated BFE viewer (<https://webapps.usgs.gov/infrm/estBFE/>) to allow communities to use for planning, risk

communication, floodplain management, and permitting activities. The BLE data development for the East Fork Trinity HUC-8 Watershed was completed in September 2019.

CNMS Validation and Assessment. The Base Level Engineering results were compared to the current flood hazard inventory identified in the CNMS database. This assessment will allow FEMA and NCTCOG to compare this updated flood hazard information to the current effective floodplain mapping throughout the watershed. A key feature of this assessment also included the collection of Areas of Mitigation Interest layers containing suggested structure inventory for the Discovery collection efforts and flood hazard inventory assessments.

Post-Discovery Webinar and Community Coordination. FEMA and NCTCOG rolled out the BLE mapping and datasets to the communities in the Fall of 2019. The meeting was a one-hour webinar held on July 31, 2019. Communities were provided information and training to support the use of Base Level Engineering for planning, floodplain management, permitting, and risk communication activities. FEMA will work with communities to review, interpret and incorporate the Base Level Engineering information into their daily and future community management and planning activities.

Follow-Up On Phase Project Decisions. The Base Level Engineering results and the current inventory was compared to identify any areas of significant change. If the results show large areas of change (expansions and contractions of the floodplain, increases and decreases of the computed BFEs, and increases in expected flow values) FEMA will continue to coordinate with the communities to identify the streams that should be considered for FIRM updates. These updates could be Letter of Map Revisions for small project areas, or a Physical Map Revision for large areas with mapping changes.

To identify other streams for future refinement, community growth patterns and potential growth corridors should be discussed with FEMA. These areas of expected community growth and development may benefit from updated flood hazard information. Base Level Engineering can be further refined to provide detailed study information for a Flood Risk Identification Study and a FIRM update.

Areas of communities that were developed prior to 1970 (pre-FIRM areas) may include repetitive and severe repetitive loss properties. They may also be areas where re-development is likely to occur. Having updated flood hazard information before re-development and reconstruction activities take place may benefit communities by providing guidance to mitigate future risk.



FEMA will work with communities following the delivery of Base Level Engineering to identify a subset of stream studies to be updated and included on the FIRMs. Communities may wish to review these possible areas and provide feedback once the Base Level Engineering data has been received. Local communities can also refine Base Level Engineering information and submit it through the Letter of Map Revision (LOMR) process to revise the existing flood hazard information and maintain the FIRMs throughout their community.

Phase One – Discovery: FY16 East Fork Trinity Watershed

The 2016 NCTCOG Discovery project was about the "Discovery" of flood hazards and risks throughout the East Fork Trinity Watershed. Through the Discovery process, FEMA can determine which areas of the watershed may/will be funded for further flood risk identification and assessment in a collaborative manner while taking into consideration the information collected from local communities. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand the interrelationships between upstream and downstream community flood risk throughout the watershed.

The East Fork Trinity Watershed 2016 Discovery project was completed through the following activities:

- Pre-Discovery Engagement Efforts
- Data Gathering
- Discovery Meeting
- Watershed Findings and Prioritizations

All possible efforts were made to ensure that stakeholders understood Discovery and the Risk MAP process through emails, phone calls, newsletters, and a developed website created for this Discovery project.

Pre-Discovery Engagement Efforts

A discovery newsletter was developed and distributed to all stakeholders to gain public awareness of the East Fork Trinity Discovery process. The newsletter contained information about FEMA's Risk MAP program, the discovery process, details of the upcoming Pre-Discovery webinar, the data collection process, and the Risk MAP process beyond discovery. A copy of the newsletter is included in Appendix III.

NCTCOG held two (2) informational webinars on June 26 and June 28, 2018 for stakeholders in the watershed. A copy of the presentation is available in Appendix III. The Pre-Discovery informational webinars were held to increase awareness of the Discovery process prior to the Discovery meeting so the stakeholders would be prepared to fully participate in the Discovery process. Six stakeholders participated in the webinars. The goals of the Pre-Discovery webinars were to:

- Explain the Discovery process
- Explain why the NCTCOG was conducting Discovery in the East Fork Trinity Watershed
- Explain FEMA's Risk MAP program and benefits
- To obtain information for Discovery in the watershed

Data Gathering

Data was collected from State and Federal organizations. These data were used to generate "backgrounder" information about each watershed community, and included various population metrics, collections of high water marks and low water crossings, and historical flooding information. Table 4 below summarizes the geospatial data collected.

The Discovery engagement process also included the development of a website for data collection. The website allowed participating stakeholders to view and update flood-related information about their community, including local flood risk, flood hazards, mitigation plans, mitigation activities, flooding

history, development plans, and floodplain management activities. It also allowed stakeholders to input mitigation concerns, mapping needs and requests on a web map.

Table 4: Geospatial Data Collection

| Data Type | Data Source | Data Description |
|---|--|--|
| HUC Watershed Boundaries | USGS | HUC boundaries clipped to the East Fork Trinity HUC-8. Also includes HUC-10 and HUC-12. |
| Roadways and Railroads | TNRIS Stratmap | Transportation Lines |
| Jurisdictional Boundaries | TNRIS | Data includes city and county Boundaries |
| Current Effective Floodplain Information | FEMA DFIRMs | Data includes Floodplains, BFEs, and Cross Sections |
| Stream Lines | FEMA DFIRMs | Stream Centerlines from DFIRM |
| Locations of Letters of Map Revision (LOMRs) | FEMA | LOMRs incorporated into Effective DFIRM databases and LOMRs filed after Effective DFIRM dates for watershed counties |
| Coordinated Needs Management Strategy | FEMA | CNMS database dated September 30, 2019 |
| Topography | TNRIS | List of the most current ground surface topography |
| HAZUS-based Average Annualized Loss Estimates | FEMA | 2015 HAZUS AAL per Census Tract |
| Coverage of Known Risk Assessment Data | Texas Hazard Mitigation Package | Based on 2000 Census: Population Vulnerability to 1% Flood and Property Value Vulnerability to 1% Flood |
| Location of Dams | National Inventory of Dams | Dam locations with Emergency Action Plan (EAP) status |
| Stream Gauges | USGS | Stream Gauge locations |
| Flood Claims | NFIP | Total claims per jurisdiction |
| Repetitive Loss or Severe Repetitive Loss Locations | FEMA | RL/SRL locations from 1979 to 2015 |
| Land Use | National Land Cover Database 2006 from TNRIS | Land Use data as of 2006, developed by USGS |
| Urban Cover | National Land Cover Database 2006 from TNRIS | Urban Cover is a field located in the Land Use |
| Census Tract Population Data | US Census Bureau | Census Tract Population data based on 2010 Census Data |
| Population Density | US Census Bureau | Population density based on 2016 American Community Survey |
| Congressional Areas | US Census Bureau | Congressional District Boundaries |
| High Water Marks | TNRIS | Historical high water marks obtained by TNRIS from USACE, FEMA Mitigation Team, USGS, and TxDOT |
| Low Water Crossings | TNRIS | Identified low water crossings in Texas with flooding source and road name |

Discovery Meeting

One (1) in-person Discovery Meeting was held in the watershed in an open house (come and go) format. The Discovery Meeting occurred on March 1st, from 10:00am-2:00pm at the Dallas County District 1 Urban Road and Bridge Office in Garland, Texas. Hosts of this meeting included FEMA, TWDB, NCTCOG, Dallas County, North Texas Municipal Water District (NTMWD), Texas Department of Transportation (TxDOT), and Halff Associates, Inc.

The main goals of the Discovery Meeting were to gather additional flood risk data; discuss the communities' flooding history, development plans, flood mapping needs, and flood risk concerns; discuss the vision for the watershed's future, and the importance of mitigation planning and community outreach.

The Discovery Meeting was held over a four hour period. Community stakeholders were able to participate in the meeting when most convenient to them. Discovery Ambassadors assisted stakeholder attendees through various stations in an "come and go" format. The stations included:

- *Texas Water Development Board (TWDB)* – information about available Federal and State Grant programs, Hazard Mitigation Planning, Emergency Action plans, as well as implementation of projects
- *North Texas Municipal Water District (NTMWD)* – discussion of current NTMWD projects in the region
- *United States Army Corps of Engineers (USACE)* – discussion of current USACE projects in the region
- *NCTCOG Programs* – information on NCTCOG programs available to stakeholders as well as answering NCTCOG questions from attendees
- *Texas Department of Transportation (TxDOT)* – information of current TxDOT projects in the region
- *Laptops* – stakeholders were able to review, edit, or add information entered on the Discovery website.
- *Discovery Maps* – data collection process to capture information on identifying flood risk locations and problems, areas of growth or planned development, answering floodplain questions, and identifying map need locations.

The 2016 East Fork Trinity Discovery project gathered 326 comments, including 50 new mapping requests.

Watershed Findings and Prioritizations

Watershed Findings

Following the Discovery meeting, the gathered community comments were placed into categories by comment type and by HUC-12s sub watersheds, as shown in Table 5.

South Mesquite Creek had the highest number of comments with 69 comments submitted by the City of Mesquite. While many of these comments are roads or buildings in the 100-year floodplain that overtop or get flooded during storm events, several of the areas of flooding risk submitted are outside the mapped extents of the regulatory floodplain, such as along Stream 2B7, Stream 2B8, Stream 2B5, Stream 2B3, and an unnamed stream. There were 17 out of 36 HUC-12s which did not receive any comments, and these were mostly in northeastern and southern parts of the watershed. Of the 326 new mapping requests, some are located across multiple watersheds and are listed in each applicable HUC-12 in Table 5.

Table 5: East Fork Trinity Comment Distribution by HUC-12 Watershed

| HUC-12 Watershed | Mapping Need Type | | | | | | Total Number of Comments |
|--|----------------------|------------------|---------------|--------------------------------|-------------------------------|-------------|--------------------------|
| | Flooding Risk | Mapping Concerns | Mapping Needs | Mitigation Actions- Identified | Mitigation Actions- Completed | Regulations | |
| Anthony Branch- Buffalo Creek | No comments received | | | | | | |
| Arnold Creek | No comments received | | | | | | |
| Bear Creek-Indian Creek | No comments received | | | | | | |
| Brown Branch Rowlett Creek | 3 | 25 | 6 | 4 | 2 | 0 | 40 |
| Camp Creek-Lake Ray Hubbard | 11 | 3 | 1 | 1 | 0 | 0 | 16 |
| Clemons Creek-East Fork Trinity River | 11 | 0 | 1 | 8 | 1 | 0 | 21 |
| Cottonwood Creek-East Fork Trinity River | 4 | 0 | 0 | 0 | 0 | 0 | 4 |
| Desert Creek-Pilot Grove Creek | No comments received | | | | | | |
| Duck Creek | 4 | 2 | 5 | 0 | 0 | 0 | 11 |
| Elm Creek-Lavon Lake | No comments received | | | | | | |
| Headwaters Pilot Grove Creek | No comments received | | | | | | |
| Headwaters Rowlett Creek | 12 | 7 | 17 | 3 | 0 | 0 | 39 |
| Headwaters Sister Grove Creek | No comments received | | | | | | |
| Honey Creek | 1 | 0 | 2 | 2 | 1 | 0 | 6 |
| Long Branch- Buffalo Creek | 6 | 0 | 0 | 0 | 0 | 0 | 6 |
| Lower Wilson Creek | 4 | 1 | 0 | 4 | 4 | 0 | 13 |
| Muddy Creek-Lake Ray Hubbard | 18 | 5 | 0 | 1 | 0 | 0 | 24 |
| Mustang Creek-East Fork Trinity River | No comments received | | | | | | |

Table 5: East Fork Trinity Comment Distribution by HUC-12 Watershed (Continued)

| HUC-12 Watershed | Mapping Need Type | Total |
|------------------|-------------------|-------|
|------------------|-------------------|-------|

| | Flooding Risk | Mapping Concerns | Mapping Needs | Mitigation Actions- Identified | Mitigation Actions- Completed | Regulations | Number of Comments |
|--|----------------------|------------------|---------------|-----------------------------------|----------------------------------|-------------|-----------------------|
| North Mesquite Creek-East Fork Trinity River | 21 | 0 | 12 | 0 | 0 | 0 | 33 |
| Pittman Creek-Spring Creek | 3 | 2 | 3 | 12 | 0 | 0 | 20 |
| Pot Rack Creek-Indian Creek | No comments received | | | | | | |
| Price Creek-Lavon Lake | 2 | 0 | 1 | 0 | 0 | 0 | 3 |
| Rowlett Creek-East Fork Trinity River | 3 | 2 | 0 | 0 | 0 | 0 | 5 |
| Rowlett Creek-Lake Ray Hubbard | No comments received | | | | | | |
| Sister Grove Creek- Pilot Grove Creek | No comments received | | | | | | |
| South Mesquite Creek | 69 | 0 | 0 | 0 | 0 | 0 | 69 |
| Squirrel Creek-East Fork Trinity River | No comments received | | | | | | |
| Stiff Creek-Sister Grove Creek | No comments received | | | | | | |
| Throckmorton Creek- East Fork Trinity River | 1 | 0 | 3 | 0 | 1 | 0 | 5 |
| Ticky Creek-Lavon Lake | No comments received | | | | | | |
| Town of Allen- Cottonwood Creek | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Upper Wilson Creek | 5 | 5 | 2 | 0 | 8 | 1 | 21 |
| West Prong Sister Grove Creek | No comments received | | | | | | |
| White House Ridge- East Fork Trinity River | No comments received | | | | | | |
| White Rock Creek- Levon Lake | 11 | 0 | 0 | 5 | 0 | 0 | 16 |
| Whites Creek-East Fork Trinity River | No comments received | | | | | | |

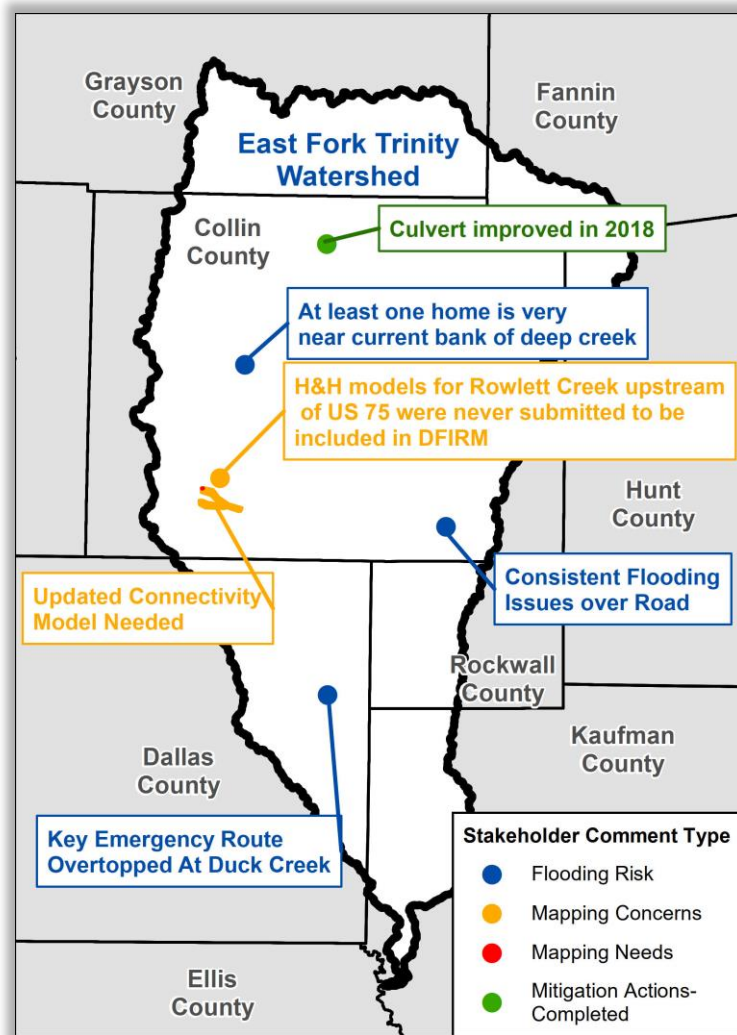


Figure 8: Stakeholder Comment Examples.

Figure 8 above shows a sample of the comments submitted by communities. There were 15 comments for key emergency routes overtopping during storms. There were 100 comments about roads overtopping or streets flooding during storm events. There were several comments related directly to structures, of which nine were specifically about culverts. There were 42 comments related to erosion, whether it was merely stream erosion or also structures impacted by erosion. Communities also submitted 16 comments related to studies that are not yet included on DFIRMs, and these do not include the 56 comments related to land use change that could have potential CLOMRs or LOMRs.

Figure 9 below shows the type and distribution of stakeholder comments across the watershed. Most comments were submitted in the central western portion of the watershed and taper off towards the east. Comments tended to be submitted by communities with higher relative population in the watershed.

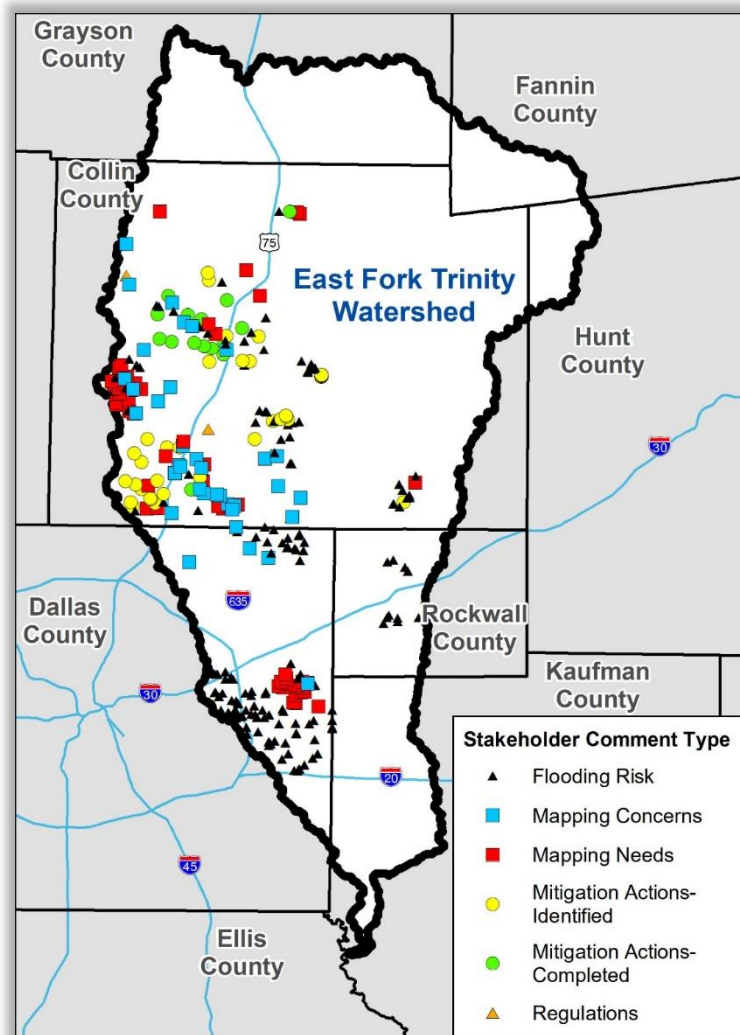


Figure 9: Stakeholder Comment Distribution.

Figure 10 demonstrates the differences in numbers per comment type. One hundred and seventy-nine comments were submitted for studies needed due to Flooding Risk, such as roads overtopping during storm events or areas of erosion with no mitigation plans in place. Mapping Concerns include 38 comments related to needs for updated mapping, such as inconsistencies between the floodway and the stream centerline, or older effective maps which do not match the current drainage patterns.

There are 50 Mapping Needs comments for unmapped sections in the watershed, such as places with new commercial development which need a Hydrology & Hydraulics study. Comments related to mitigation projects (needed or planned but have not yet started) are identified mitigation actions. These 16 identified mitigation actions include bridges or culverts which are damaged or plan to be constructed. Forty comments are completed mitigation actions, where mitigation projects have begun or are completed, including successful culvert improvements. The two comments on Regulations pertain to places where the regulatory information is incorrect, such as new city boundaries or incorrect FIS 100-year discharges.

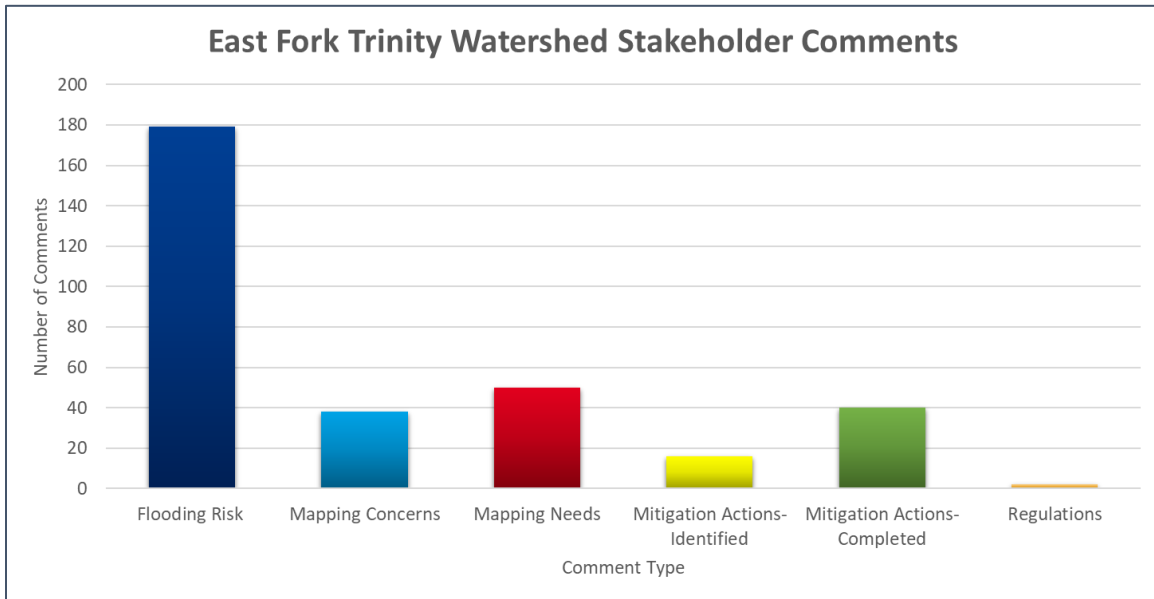


Figure 10: Stakeholder Comment Totals.

Watershed Prioritization

The community comments were one of fourteen criteria for prioritization of the HUC-12 subwatershed according to the 2009 NCTGOG Upper Trinity River Basin MNA standard of prioritization, described in Table 6. Criteria number 14, “Stakeholder Mapping Request” were documented from stakeholder comments listed in Table 5. These needs may come from outdated stream studies, large-scale development along a stream, or alterations to a stream itself to reduce flooding risk. An in-depth description of each field in Table 6 is available in the 2009 NCTCOG Upper Trinity River Basin MNA report.

Table 6: Prioritization Criteria

| Criteria No. | Description | Weight |
|--------------|---|--------|
| 1 | Population density | 10 |
| 2 | Population change | 10 |
| 3 | Predicted population growth | 10 |
| 4 | History of flood claims | 10 |
| 5 | History of flood events | 10 |
| 6 | Number of Letters of Map Change (LOMR/LOMA) | 5 |
| 7 | Available current topography | 10 |
| 8 | Age of technical data – hydrology | 5 |
| 9 | Age of technical data – hydraulics | 5 |
| 10 | Ability to leverage current studies | 5 |
| 11 | Potential for local funding | 5 |
| 12 | Potential for local “work in kind” | 3 |
| 13 | Previous contribution to a FEMA study | 2 |
| 14 | Stakeholder mapping request | 10 |

The criteria in Table 6 were used to calculate a priority score for each HUC-12. The HUC-12s were ranked into three risk groups (moderate, elevated, and high) based on their scores, shown in Table 7.

Table 7: East Fork Trinity Watershed Prioritization Rankings (HUC-12 Watersheds)

| HUC-8 Watershed | HUC-12 Sub Watershed Group | Rank |
|-------------------|--|----------|
| East Fork Trinity | Camp Creek-Lake Ray Hubbard | High |
| | Cottonwood Creek-East Fork Trinity River | High |
| | Duck Creek | High |
| | Headwaters Rowlett Creek | High |
| | Honey Creek | High |
| | Muddy Creek-Lake Ray Hubbard | High |
| | Pittman Creek-Spring Creek | High |
| | Rowlett Creek-Lake Ray Hubbard | High |
| | Upper Wilson Creek | High |
| | Anthony Branch-Buffalo Creek | Elevated |
| | Arnold Creek | Elevated |
| | Bear Creek-Indian Creek | Elevated |
| | Brown Branch Rowlett Creek | Elevated |
| | Clemons Creek-East Fork Trinity River | Elevated |
| | Headwaters Sister Grove Creek | Elevated |
| | Lower Wilson Creek | Elevated |
| | Mustang Creek-East Fork Trinity River | Elevated |
| | North Mesquite Creek-East Fork Trinity River | Elevated |
| | Pot Rack Creek-Indian Creek | Elevated |
| | Rowlett Creek-East Fork Trinity River | Elevated |
| | Sister Grove Creek-Pilot Grove Creek | Elevated |

| HUC-8 Watershed | HUC-12 Sub Watershed Group | Rank |
|-----------------------------|--|----------|
| East Fork Trinity | Stiff Creek-Sister Grove Creek | Elevated |
| | Throckmorton Creek-East Fork Trinity River | Elevated |
| | Ticky Creek-Lavon Lake | Elevated |
| | Town of Allen-Cottonwood Creek | Elevated |
| | Whites Creek-East Fork Trinity River | Elevated |
| | Brown Branch Rowlett Creek | Moderate |
| | Desert Creek-Pilot Grove Creek | Moderate |
| | Elm Creek-Lavon Lake | Moderate |
| | Headwaters Pilot Grove Creek | Moderate |
| | Long Branch-Buffalo Creek | Moderate |
| | Price Creek-Lavon Lake | Moderate |
| | Squirrel Creek-East Fork Trinity River | Moderate |
| | West Prong Sister Grove Creek | Moderate |
| | White House Ridge-East Fork Trinity River | Moderate |
| White Rock Creek-Levon Lake | Moderate | |

The prioritization rankings listed in Table 7 will be used by FEMA to determine targeted action items, potential projects, and multi-year flood risk project plans within the East Fork Trinity HUC-8 Watershed. Other figures, including Figure 15 and Figure 21 in Appendix III display the watershed-based prioritization ranking.

Pursuing studies along the entirety of requested miles would be cost prohibitive, so it was necessary for NCTCOG to reduce the list of potential stream projects. The ten (10) Study Stream Requests, listed in Table 8, are possible project highlights based on stakeholder comments and the results of the HUC-12 subwatershed prioritization.

Table 8: Stream Study Requests

| Communities | Stream | HUC-12s | HUC 12 Rank |
|--|------------------|---|--------------------------------------|
| City of Allen | Cottonwood Creek | Town of Allen-Cottonwood Creek | Elevated |
| City of Allen, City of McKinney, City of Plano | Rowlett Creek | Brown Branch Rowlett Creek Headwaters Rowlett Creek Rowlett Creek-Lake Ray Hubbard Rowlett Creek-East Fork Trinity River | Elevated High High Elevated |
| City of Celina | Wilson Creek | Lower Wilson Creek Upper Wilson Creek | Elevated High |
| City of Lavon, Collin County | Bear Creek 2 | Camp Creek-Lake Ray Hubbard | High |
| City of McKinney, Collin County | Stover Creek | Upper Wilson Creek | High |
| City of Plano | Brown Branch | Brown Branch Rowlett Creek | Elevated |
| City of Plano | Bowman Branch | Brown Branch Rowlett Creek | Elevated |
| City of Plano | Prairie Creek | Brown Branch Rowlett Creek | Elevated |
| City of Plano | Stream 2D8 | Brown Branch Rowlett Creek | Elevated |
| City of Plano | Stream 2D9 | Brown Branch Rowlett Creek | Elevated |

Potential Study Streams

Table 8 lists the streams with comments related to requests for updated H&H studies along streams. Rowlett Creek has future and potential LOMRs, a request to update calibrations based on stream gages, differences between FEMA flows and McKinney’s fully developed flow conditions, and an area of the channel with the potential to become a new stream gage location. Due to comments spread across multiple communities for Rowlett Creek, one cohesive connectivity model would benefit the Cities of Allen, McKinney, and Plano. Bowman Branch and Brown Branch need updated connectivity models, while Streams 2D8 and 2D9 have inconsistencies between the floodway and the stream centerline. Prairie Creek has discrepancies between flows and rainfall values, requests for new hydrology and hydraulic studies. Updating Prairie Creek could include coordination between the City of Plano and the City of Richardson.

The Cottonwood Creek 100-year discharge jumps from 7,475 to 14,000 cubic feet per second (cfs) near Greenville Ave and below confluence of Stream 2G2, though the drainage area only increases by approximately 1 sq. mi. in the Collin County FIS. In this area of Cottonwood Creek, it is likely that the discharges are incorrect either upstream or downstream. The discharge per square mile appears low based on the discharges in the 2017 FIS report and should be closer to 2000 cubic feet per second per square mile, rather than the 900 cubic feet per second per square mile currently in the report.

Breach area calculations for all NRCS dams and other dams could update the models and mapping of Stover Creek in areas downstream of Highland Lake. Downstream of County Road 124, the owner of Frozen Ropes Ballfields raised concerns over Stover Creek’s flows through his on-site, large diameter culverts. Wilson Creek has new hydrology and hydraulic studies submitted to put in bridges at three

locations with new planned development. There are also numerous drainage issues which do not match the older countywide effective studies. Wilson Creek also includes flooding of low-lying roads in this area, while US Highway 75 is elevated above floodplain despite the effective map not showing a structure or any floodplain containment. Updating the entire reach of both Wilson Creek and Stover Creek would tie in comments from multiple communities across the Cities of Celina, Prosper, and McKinney, as well as the unincorporated areas of Collin County.

Bear Creek 2 has many new subdivisions planned, which would likely need LOMRs to update the hydrology and hydraulics for the Creek. There are also comments about a culvert restricting flow, a low water crossing at County Road 484, and two ponds which frequently flood. Comments were submitted by the City of Lavon, but would benefit both the City of Lavon and the unincorporated areas of Collin County.

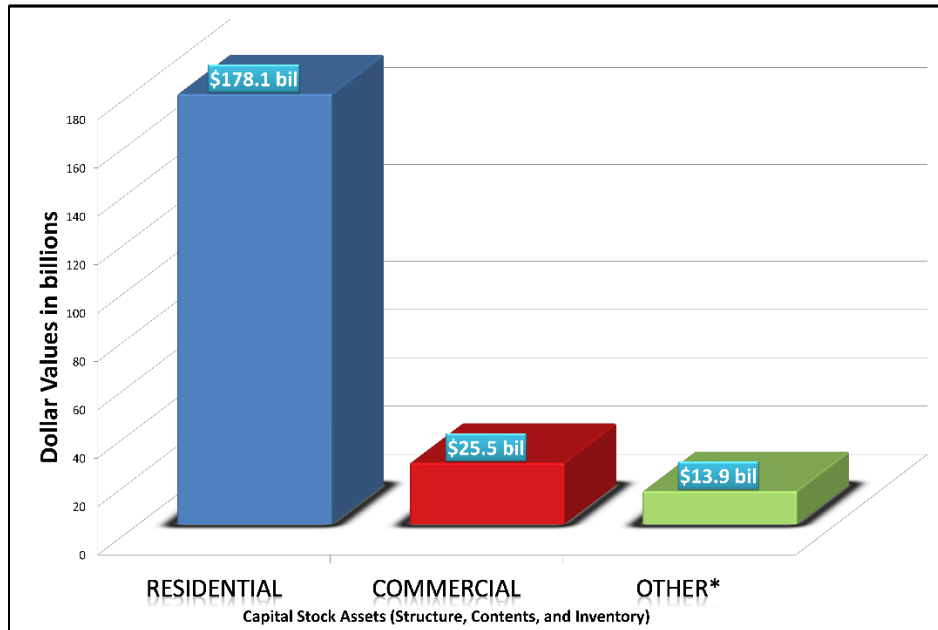
The HUC-12 sub watershed prioritizations and potential projects are shown in Figure 17 in Appendix III. FEMA's Hazards U.S. Multi-Hazard (HAZUS-MH) software was used to assess the consequences of flood events in the East Fork Trinity HUC-8 Watershed.

Flood Risk Assessments Results

HAZUS is a risk assessment software program for analyzing potential losses in dollars from floods, hurricane winds, and earthquakes. The BLE flood data developed for this project was used as input data for the HAZUS-based flood risk assessment. The East Fork Trinity HUC-8 Watershed has an estimated \$216 billion worth of vulnerable assets, including residential, commercial, and other asset types. If a 100-year storm event were to occur throughout the watershed, HAZUS estimated one percent of the assets will be damaged, with losses estimated at nearly \$1.26 billion dollars to physical assets. There will also be economic losses, including lost wages, inventory losses, losses in production, and economic opportunity losses, valued at \$1.2 billion. Figures 11 and 12 below identify the consequences of flooding and value the building and content damages aggregated from a census block level.

The HAZUS-based 100-year flood loss estimates were aggregated to the watershed communities to assess risk on a community level. When accounting for area, the Cities of Garland, Mesquite, Plano, Richardson, Rockwall and Rowlett have the highest potential losses due to flooding damage, ranging from 4.1 million to 7.2 million per sq. mi. in the watershed. Five communities (Mobile City, Tom Bean, Howe, Talty, and Nevada) have less than \$5,000 in potential total losses due to flooding within the East Fork Trinity Watershed.

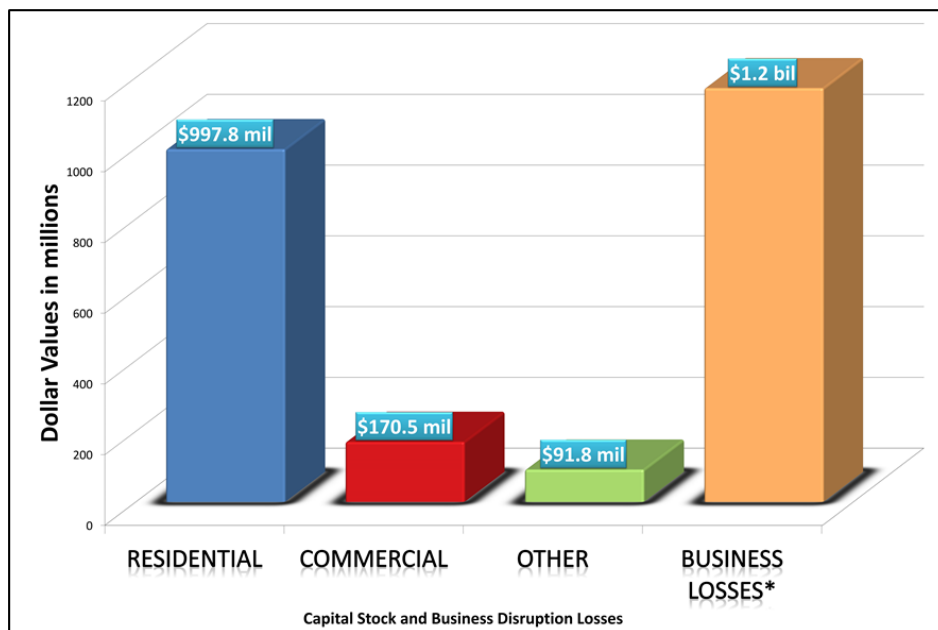
Asset Inventory Values



*Other: structure types include Industrial, Agricultural, Education, Religious, and Government structures.

Figure 11: Asset Inventory Value Totals.

100-Year Flood Event Potential Losses



*Business Losses are the sum of Inventory Loss, Relocation Costs, Income Loss, Rental Income Loss, Wage Loss, and Direct Output Loss.

Figure 12: 100-Year Flood Event Potential Loss Totals.

As 32 communities in the East Fork Trinity HUC-8 Watershed include land in at least one other HUC-8 watershed, these HAZUS-based 100-year flood loss estimates are not indicative of their total potential loss estimates. Hence, the losses shown in this report do not necessarily represent community-wide totals.

Aggregating the HAZUS-based 100-year flood loss estimates to HUC-12 subwatersheds provides another method to prioritize new studies and hazard mitigation projects in the watershed. Figure 13 below ranks the HUC-12s by estimated flood losses. Pittman Creek-Spring Creek has the highest potential loss, with \$280 million. There are 10 HUC-12 subwatersheds with elevated risks, and 15 HUC-12 subwatersheds with moderate risks based on the 100-year flood loss estimates.

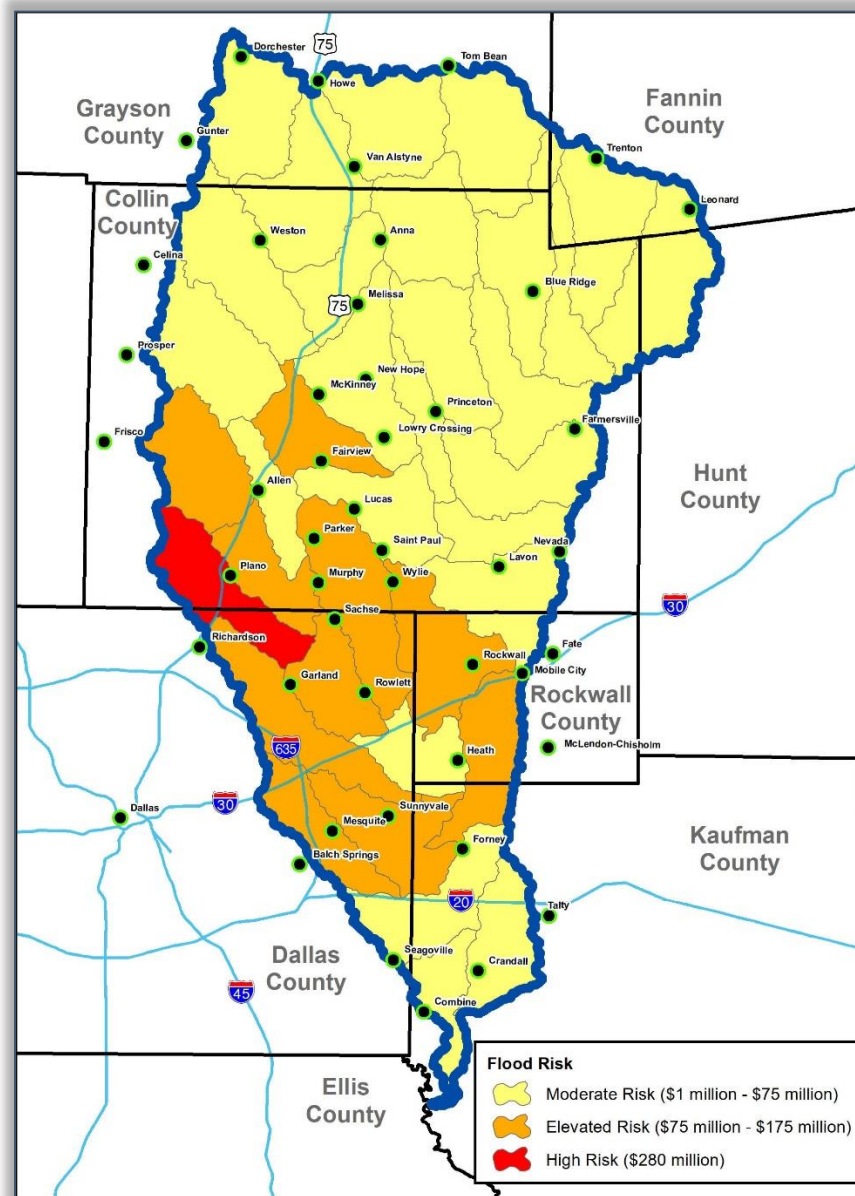


Figure 13: HAZUS-based Average Annualized Loss Estimates by HUC-12s.

Post-Discovery Coordination Effort

NCTCOG held one informational webinar on July 31, 2019 for stakeholders in the watershed. A copy of the presentation is available in Appendix III.

The Post-Discovery informational webinar was held to discuss the results of the Discovery process and findings, including a review of comments received, preliminary HAZUS results, and BLE data. The preliminary BLE data was made available at <http://nctcogeastforkble.halff.com/> for stakeholders until the data was finalized and becomes available on FEMA Estimated BFE viewer. The FEMA Estimated BFE viewer (<https://webapps.usgs.gov/infrm/estBFE/>), which can be used for reporting and downloading data, was presented and demonstrated to community stakeholders. The goals of the Post-Discovery webinar were to:

- Recap the FEMA’s Risk MAP program’s benefits and the Discovery process
- Discuss comments received by stakeholders
- Explain watershed prioritization and stream study requests
- Review HAZUS results
- Demonstrate temporary website for East Fork Trinity BLE data, and the permanent FEMA BFE viewer
- Release a draft report to the communities prior to the release of the final report.

Appendix I: Community-Specific Reports

East Fork Trinity Watershed Community Overview Table

| CID | Community | Total Community Population ¹ | Percent of Population in Study Watershed | Total Community Land Area (sq. mi) | Percent of Land Area in Study Watershed | NFIP Participant |
|--------|------------------------|---|--|------------------------------------|---|------------------|
| 480130 | Collin County | 40,084 | 84.66% | 488.3152 | 84.66% | Y |
| 480131 | City of Allen | 94,710 | 100.00% | 26.38398 | 100.00% | Y |
| 480132 | City of Anna | 10,335 | 100.00% | 14.96745 | 100.00% | Y |
| 481628 | City of Blue Ridge | 1,005 | 100.00% | 1.42571 | 100.00% | Y |
| 480133 | City of Celina | 7,236 | 9.15% | 21.19624 | 9.15% | Y |
| 480171 | City of Dallas | 1,278,433 | 11.95% | 385.3506 | 11.95% | Y |
| 481069 | Town of Fairview | 8,235 | 100.00% | 9.435036 | 100.00% | Y |
| 481627 | City of Farmersville | 3,416 | 91.99% | 4.238503 | 91.99% | Y |
| 480134 | City of Frisco | 145,646 | 17.05% | 66.7523 | 17.05% | Y |
| 485471 | City of Garland | 234,810 | 98.53% | 56.78026 | 98.53% | Y |
| 481313 | City of Lavon | 2,663 | 100.00% | 2.304465 | 100.00% | Y |
| 481631 | City of Lowry Crossing | 1,584 | 100.00% | 2.610185 | 100.00% | Y |
| 481545 | City of Lucas | 6,585 | 100.00% | 13.73145 | 100.00% | N |
| 480135 | City of McKinney | 156,821 | 99.63% | 63.94763 | 99.63% | Y |
| 481626 | City of Melissa | 6,844 | 100.00% | 10.25215 | 100.00% | Y |
| 480137 | City of Murphy | 20,015 | 100.00% | 5.825794 | 100.00% | Y |
| 481657 | City of Nevada | 1,032 | 51.66% | 0.884699 | 51.66% | N |
| 480138 | Town of New Hope | 645 | 100.00% | 1.432145 | 100.00% | Y |
| 480139 | City of Parker | 4,241 | 100.00% | 8.01574 | 100.00% | Y |
| 480140 | City of Plano | 279,088 | 60.94% | 72.22432 | 60.94% | Y |
| 480757 | City of Princeton | 8,278 | 100.00% | 7.949454 | 100.00% | Y |
| 480141 | Town of Prosper | 15,236 | 29.98% | 24.99863 | 29.98% | Y |
| 480184 | City of Richardson | 108,350 | 66.19% | 28.64608 | 66.19% | Y |
| 480186 | City of Sachse | 23,329 | 100.00% | 9.916376 | 100.00% | Y |
| 481318 | Town of Saint Paul | 1,235 | 100.00% | 1.66198 | 100.00% | Y |
| 481620 | City of Van Alstyne | 3,265 | 100.00% | 4.060715 | 100.00% | Y |
| 481324 | City of Weston | 335 | 100.00% | 5.110581 | 100.00% | Y |
| 480759 | City of Wylie | 45,655 | 100.00% | 36.6029 | 100.00% | Y |
| | | | | | | |
| 480165 | Dallas County | 7,614 | 5.75% | 71.19446 | 5.75% | Y |
| 480166 | City of Balch Springs | 25,043 | 25.08% | 9.028463 | 25.08% | Y |
| 485490 | City of Mesquite | 143,771 | 96.48% | 47.51888 | 96.48% | Y |
| 480185 | City of Rowlett | 59,203 | 100.00% | 20.11374 | 100.00% | Y |
| 480187 | City of Seagoville | 15,701 | 59.19% | 18.62512 | 59.19% | Y |
| 480188 | Town of Sunnyvale | 5,871 | 100.00% | 16.73825 | 100.00% | Y |

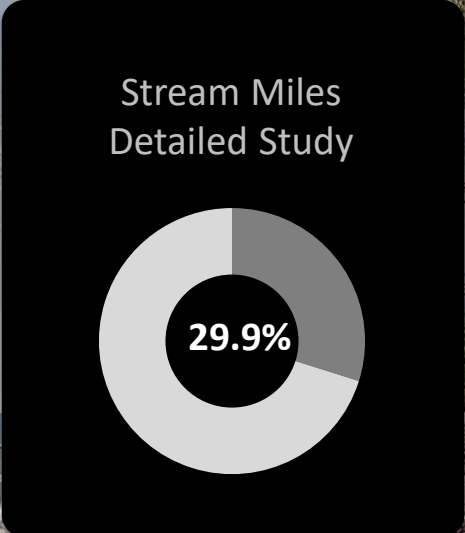
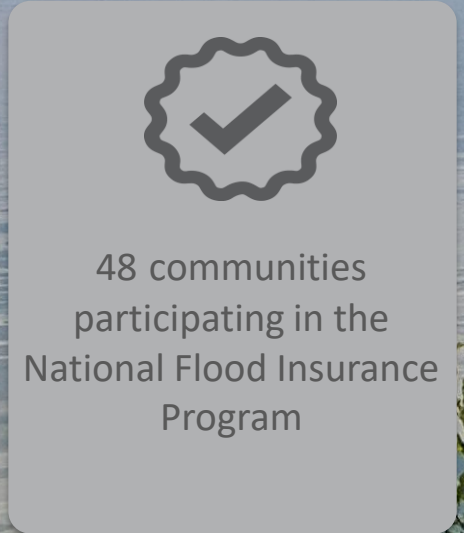
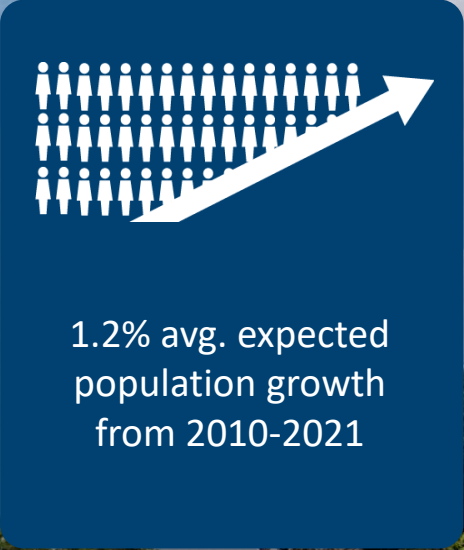
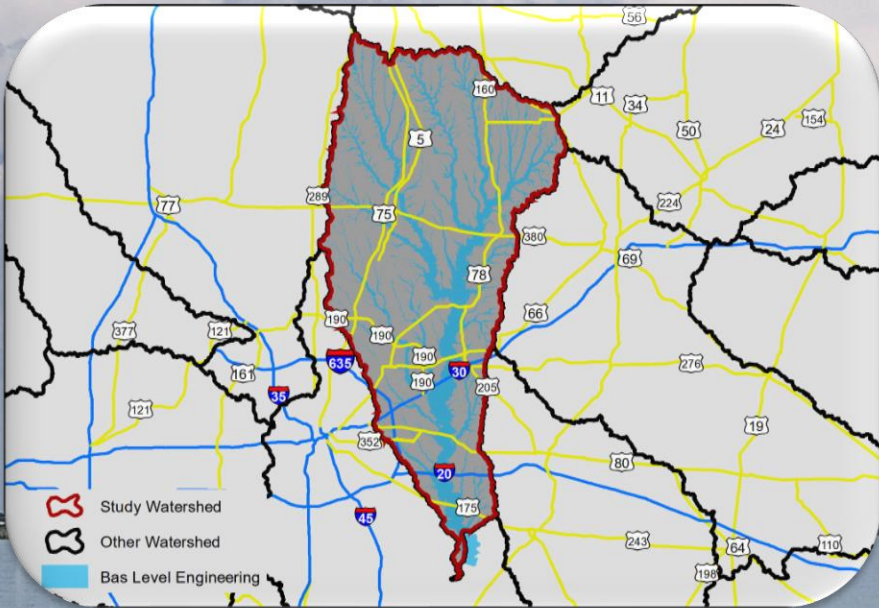
| CID | Community | Total Community Population ¹ | Percent of Population in Study Watershed | Total Community Land Area (sq. mi) | Percent of Land Area in Study Watershed | NFIP Participant |
|--------|---------------------------|---|--|------------------------------------|---|------------------|
| 480807 | Fannin County | 14,874 | 4.65% | 876.004 | 4.65% | Y |
| 480812 | City of Leonard | 2,125 | 97.32% | 1.924941 | 97.32% | Y |
| 480814 | City of Trenton | 768 | 78.17% | 1.739038 | 78.17% | Y |
| 480829 | Grayson County | 36,097 | 16.69% | 879.6591 | 16.69% | Y |
| 481309 | City of Dorchester | 93 | 73.56% | 1.644105 | 73.56% | N |
| 480832 | City of Gunter | 1,363 | 40.84% | 6.340374 | 40.84% | Y |
| 480833 | Town of Howe | 2,692 | 28.79% | 4.172276 | 28.79% | Y |
| 481621 | City of Tom Bean | 1,009 | 42.79% | 1.554384 | 42.79% | N |
| 480363 | Hunt County | 44,965 | 3.57% | 822.5619 | 3.57% | Y |
| 480411 | Kaufman County | 54,508 | 10.65% | 725.6471 | 10.65% | Y |
| 480408 | City of Combine | 2,008 | 25.53% | 6.593561 | 25.53% | N |
| 480409 | City of Crandall | 3,126 | 100.00% | 3.198382 | 100.00% | Y |
| 480410 | City of Forney | 16,842 | 89.51% | 14.16756 | 89.51% | Y |
| 480545 | City of Heath | 7,992 | 100.00% | 12.42992 | 100.00% | Y |
| 480388 | Town of Talty | 1,479 | 4.63% | 1.811535 | 4.63% | Y |
| 480543 | Rockwall County | 3,963 | 21.44% | 58.98913 | 21.44% | Y |
| 480544 | City of Fate | 9,234 | 21.52% | 7.516458 | 21.52% | Y |
| 480546 | City of McLendon-Chisholm | 2,005 | 17.05% | 10.22673 | 17.05% | Y |
| 480074 | City of Mobile City | 224 | 100.00% | 0.014262 | 100.00% | N |
| 480547 | City of Rockwall | 41,672 | 83.20% | 29.74956 | 83.20% | Y |

¹2010 United States Census Bureau Population Estimate

¹US Census (2010)

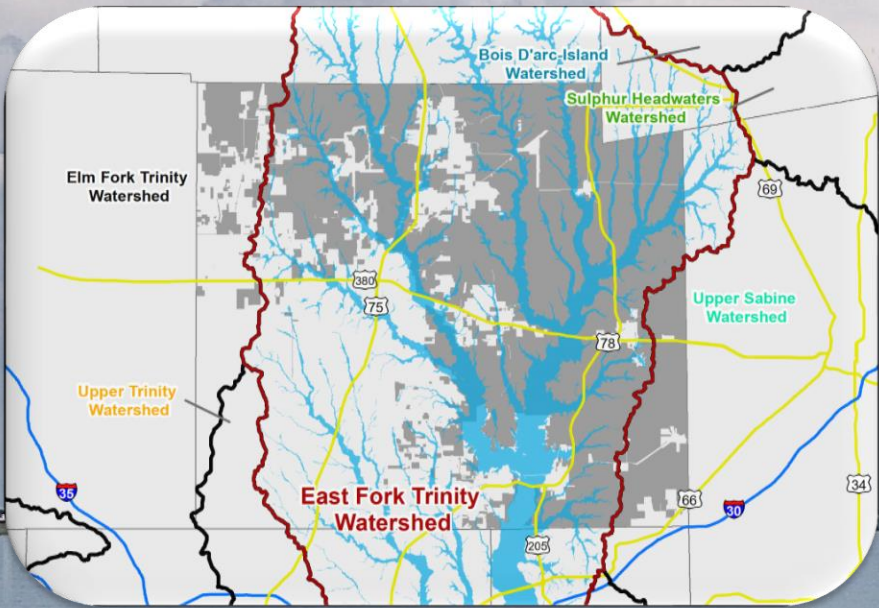
EAST FORK WATERSHED

KNOW YOUR RISK



COLLIN COUNTY

KNOW YOUR RISK



408.5
Sq. Miles

of the community is in the watershed

33,943

Population based on 2016 ACS in the watershed

1.6% expected population growth from 2010-2021 in the watershed

298

policies totaling approximately \$87,405,300 in coverage

3

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

90.3%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

529.9

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

5.7%

14

Flood-related presidential disaster declarations in your county

COLLIN COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Join Community Rating System (CRS) program
- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. Participation in FEMA's [Community Rating System](#)³ (CRS) reduces insurance premiums up to 45%, and FEMA will provide free technical assistance in designing and implementing programs designed to reduce flood damage. The State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)⁴ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.

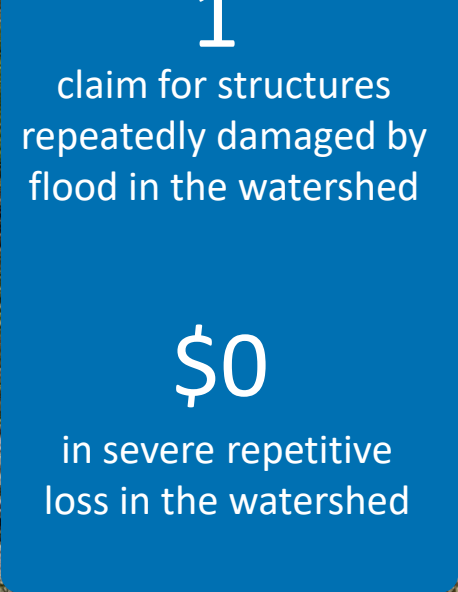
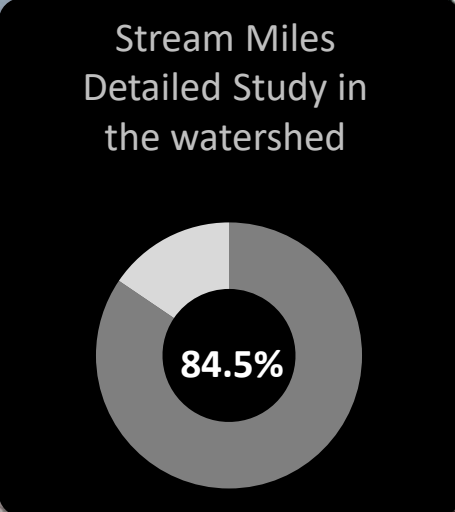
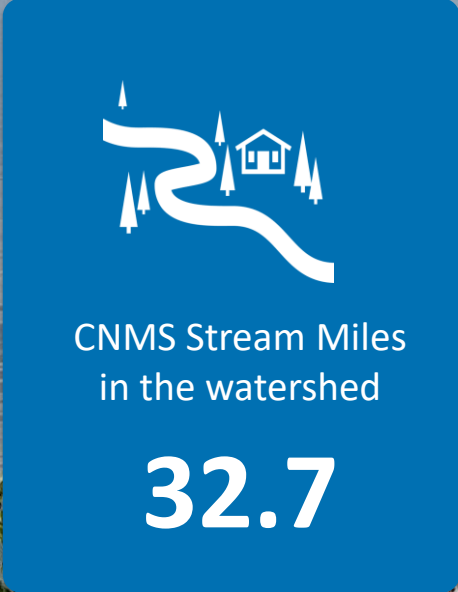
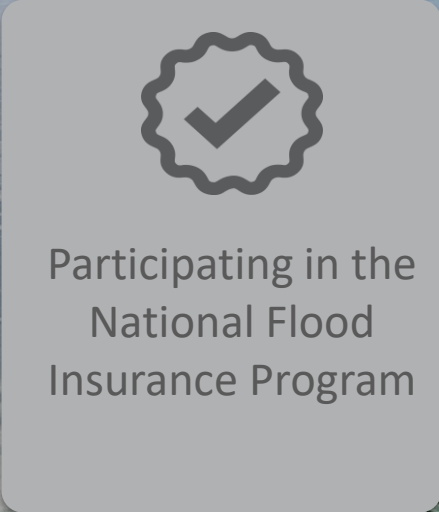
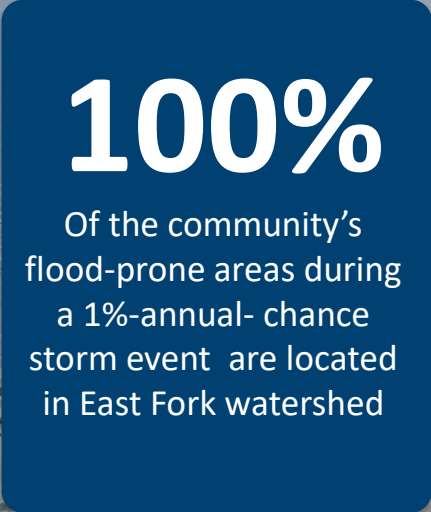
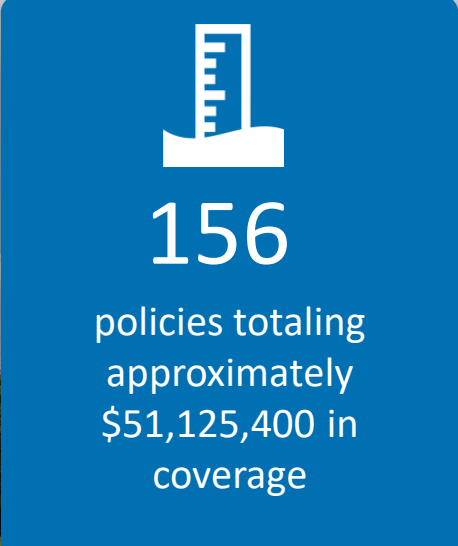
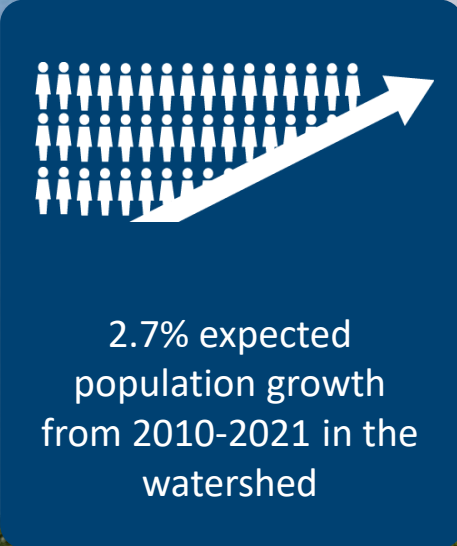
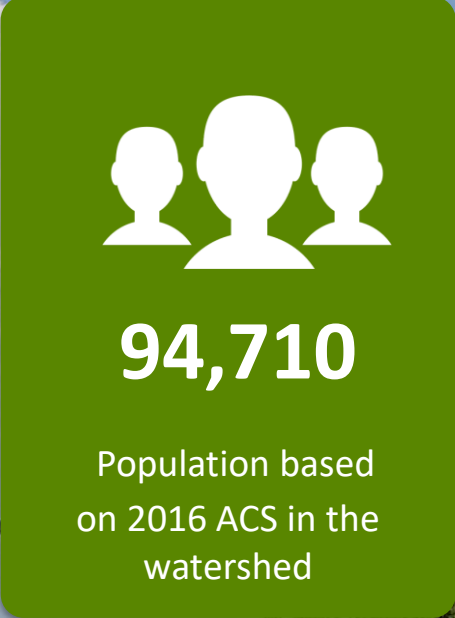
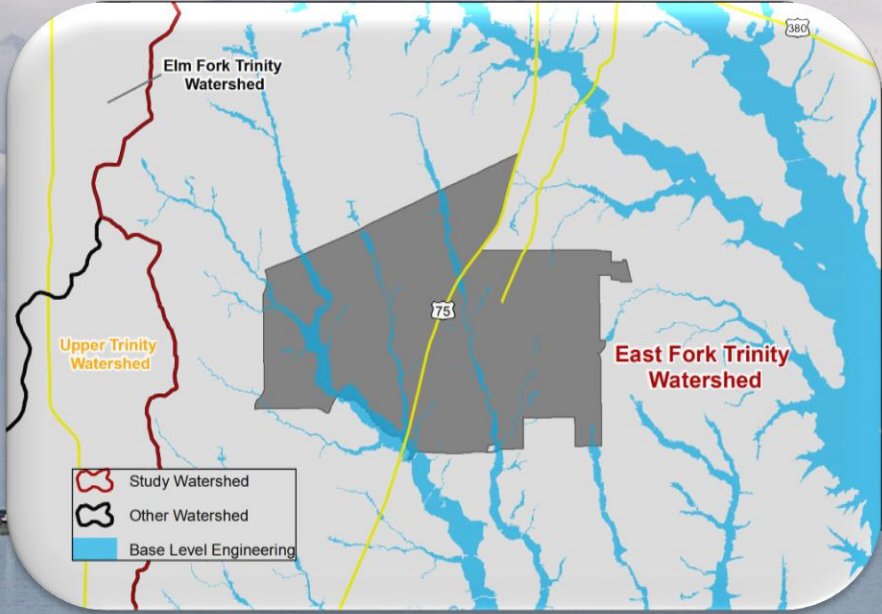
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.fema.gov/community-rating-system>.

4. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF ALLEN

KNOW YOUR RISK



CITY OF ALLEN

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

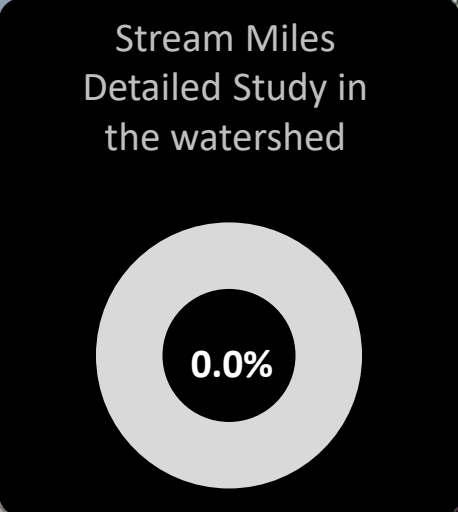
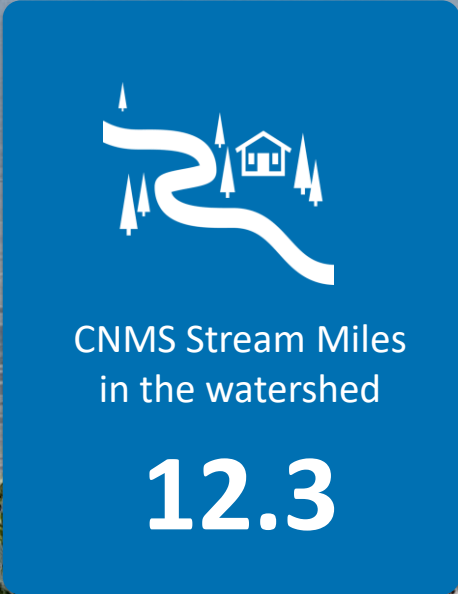
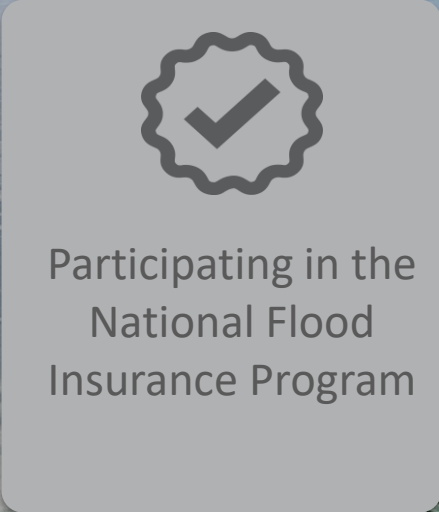
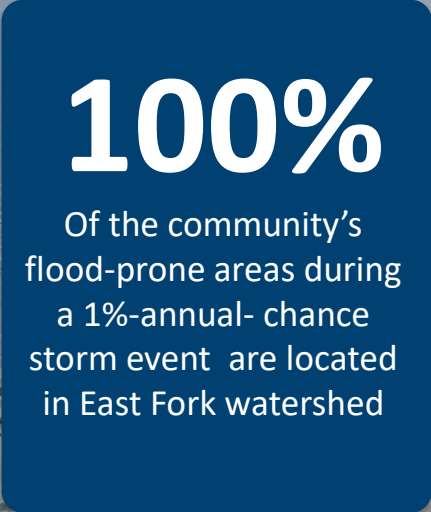
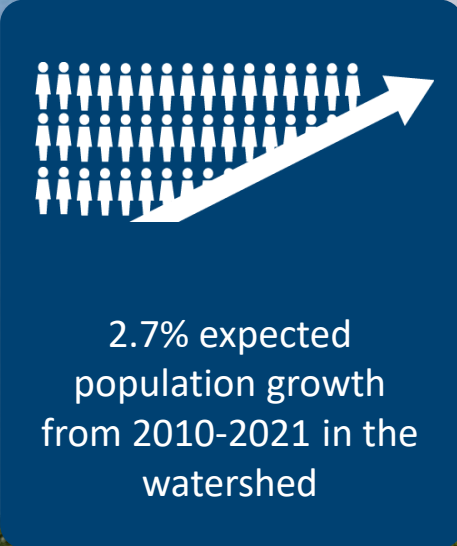
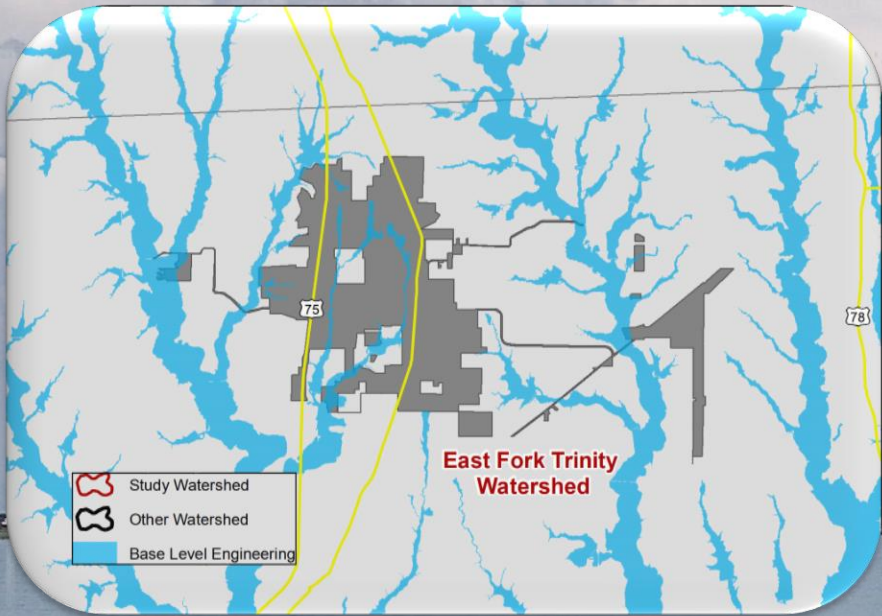
1. <https://www.fema.gov/hazard-mitigation-assistance>.

2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF ANNA

KNOW YOUR RISK



CITY OF ANNA

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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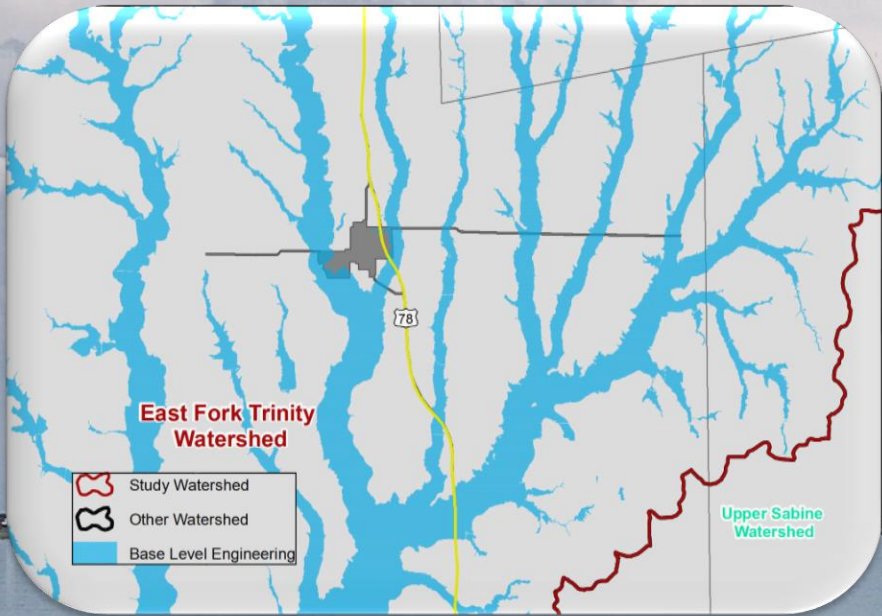
1. <https://www.fema.gov/hazard-mitigation-assistance>.

2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF BLUE RIDGE

KNOW YOUR RISK

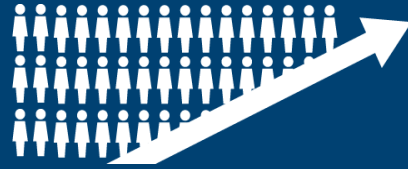


of the community is in the watershed



1,005

Population based on 2016 ACS in the watershed



2.7% expected population growth from 2010-2021 in the watershed



0

policies totaling approximately \$0 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



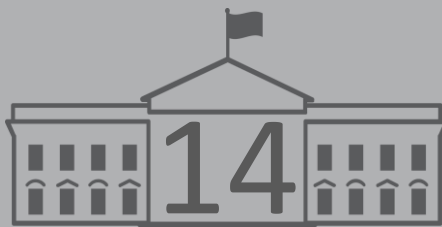
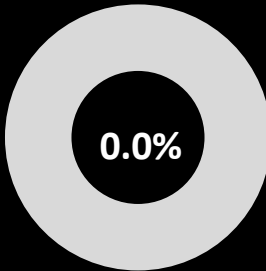
Participating in the National Flood Insurance Program



CNMS Stream Miles in the watershed

1.2

Stream Miles Detailed Study in the watershed



Flood-related presidential disaster declarations in your county

\$0

in severe repetitive loss in the watershed

CITY OF BLUE RIDGE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

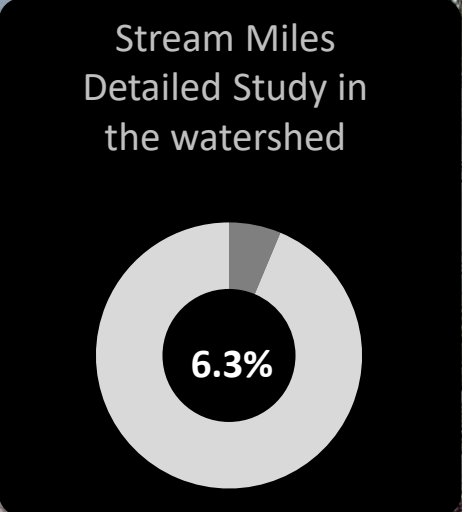
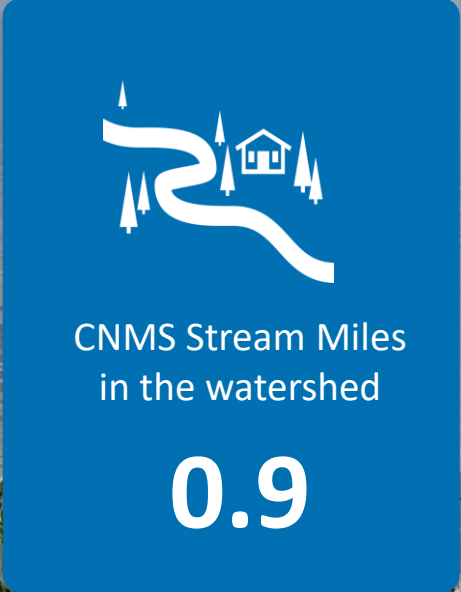
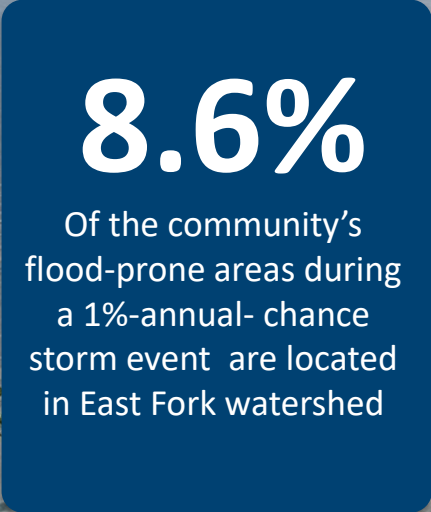
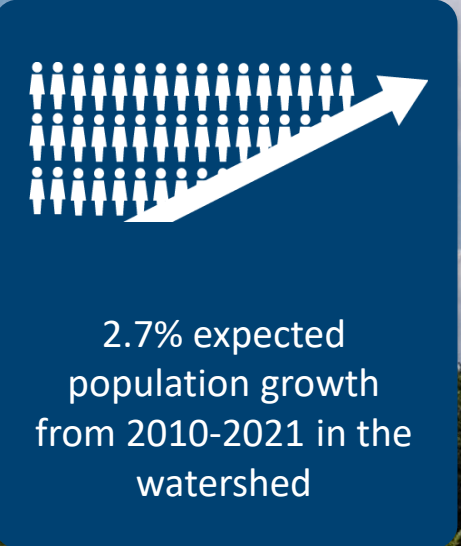
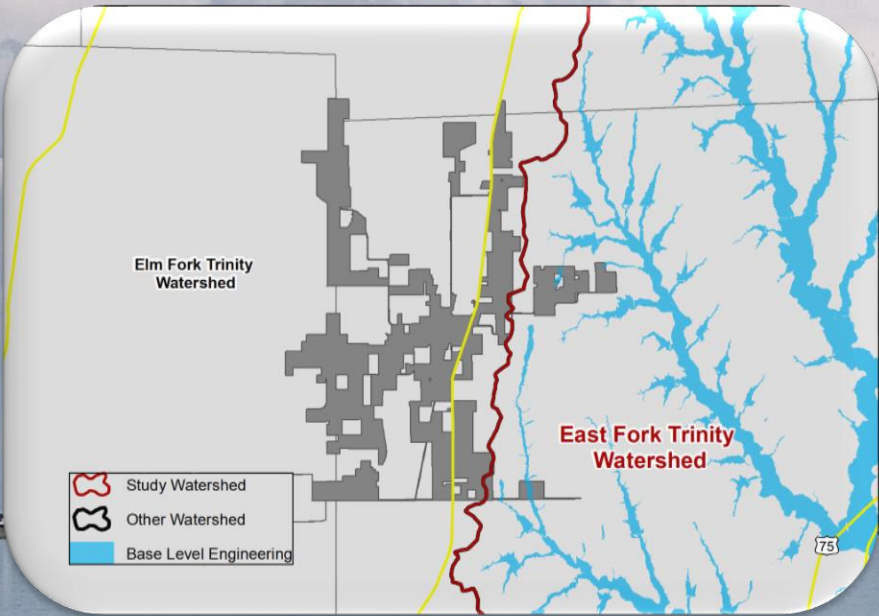
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF CELINA

KNOW YOUR RISK



CITY OF CELINA

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Purchase mobile back-up generator
- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

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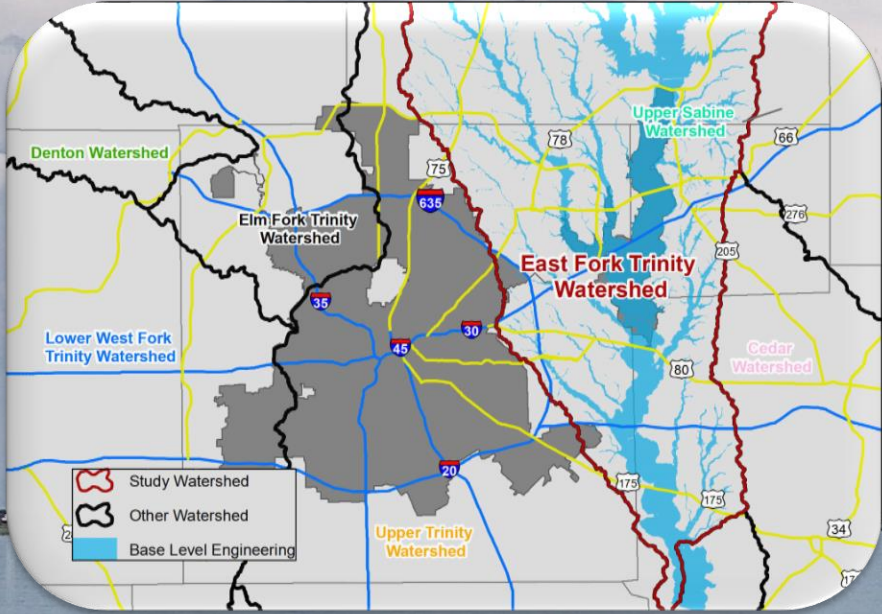
1. <https://www.fema.gov/hazard-mitigation-assistance>.

2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF DALLAS

KNOW YOUR RISK



46.1
Sq. Miles

of the community is in the watershed

152,778

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

4,364 policies totaling approximately \$1,166,151,400 in coverage

2.6%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

77.9

CNMS Stream Miles in the watershed

85.6%

Stream Miles Detailed Study in the watershed

11

Flood-related presidential disaster declarations in your county

81 claims for structures repeatedly damaged by flood in the watershed

\$2,081,283 in severe repetitive loss in the watershed

CITY OF DALLAS

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Improve levee system
- Land buyouts and wetland restoration
- Install early warning system
- Stream bank erosion reduction

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of structural hazards control, such as gabion walls and levees. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

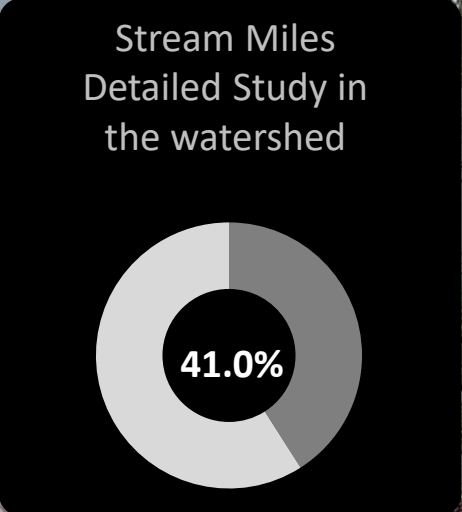
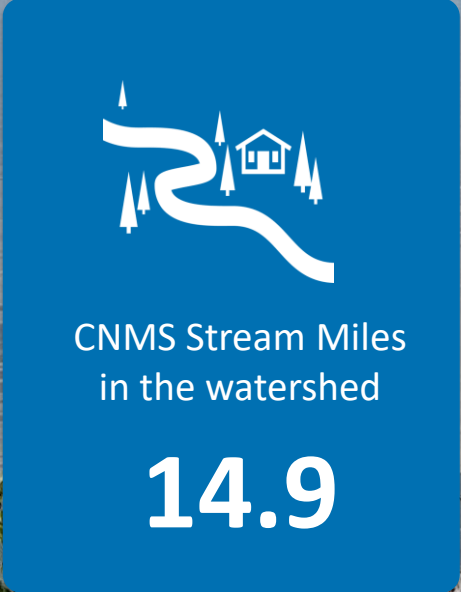
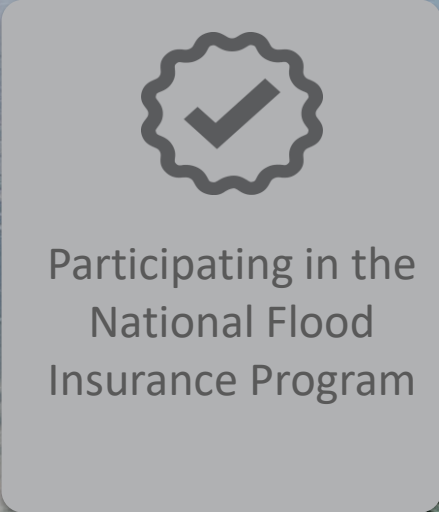
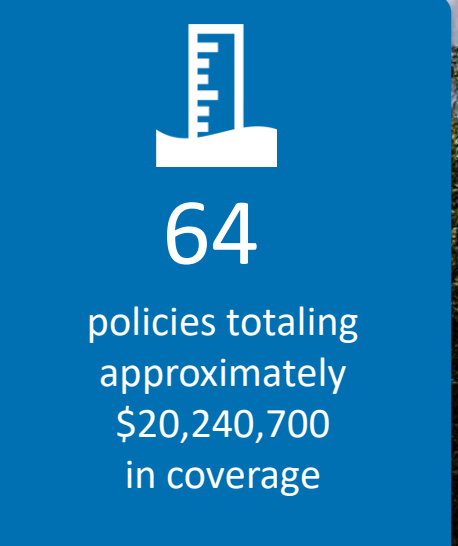
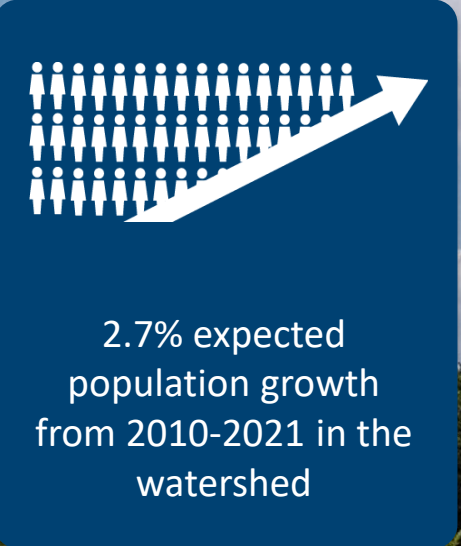
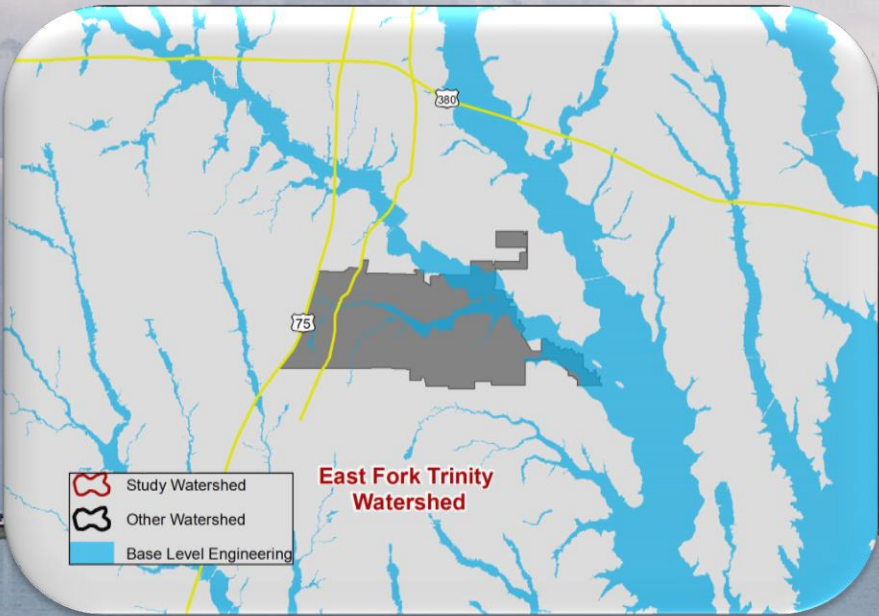
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF FAIRVIEW

KNOW YOUR RISK



CITY OF FAIRVIEW

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Implement public awareness program
- Install an early warning system

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

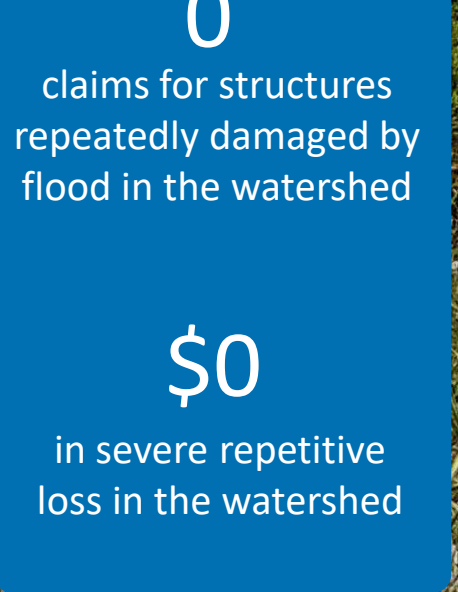
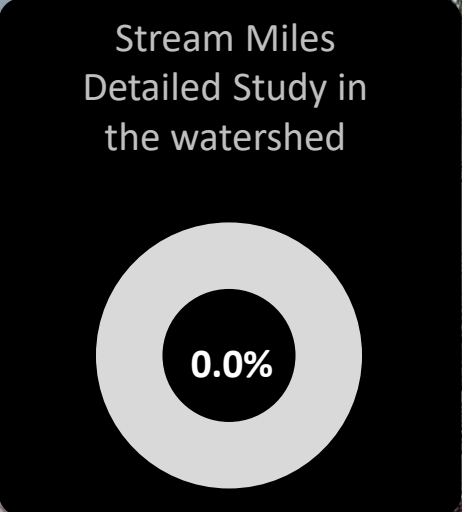
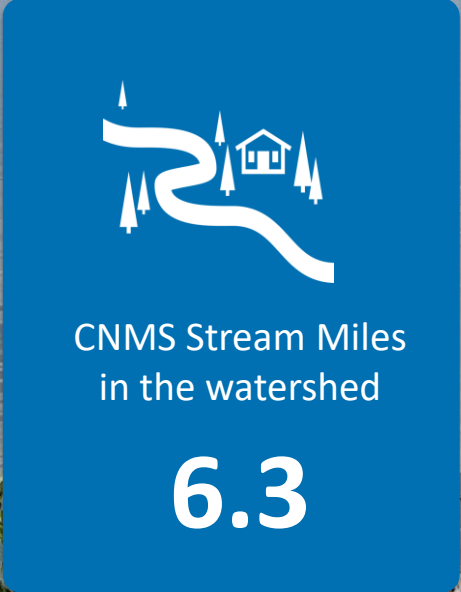
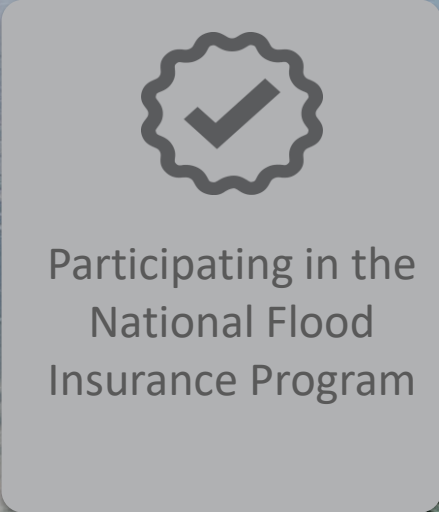
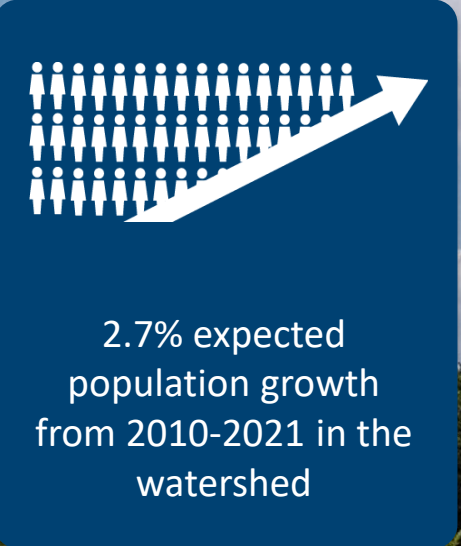
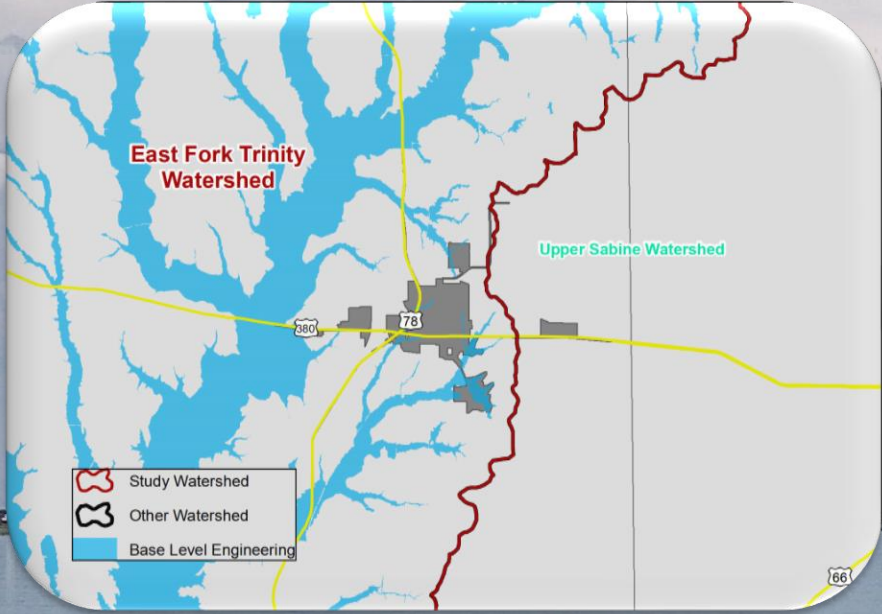
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2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF FARMERSVILLE

KNOW YOUR RISK



CITY OF FARMERSVILLE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

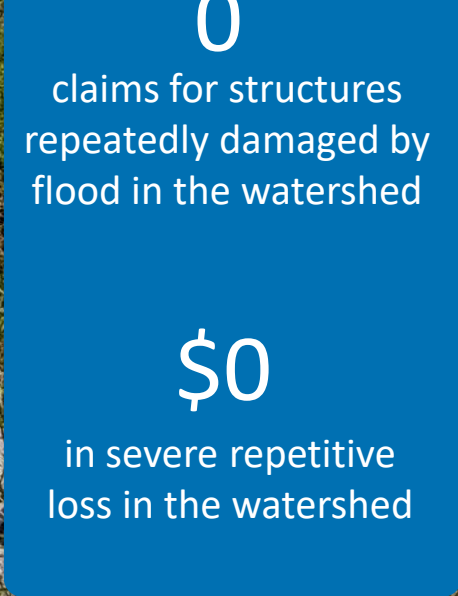
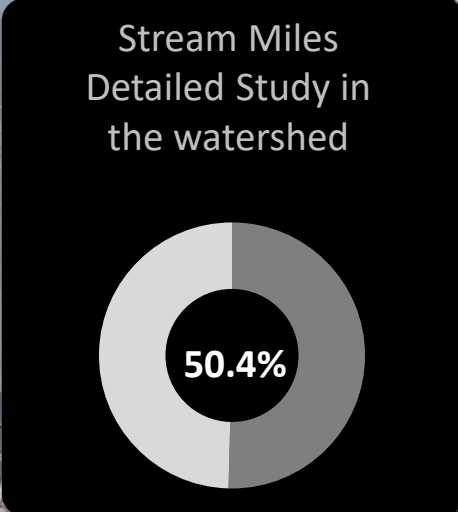
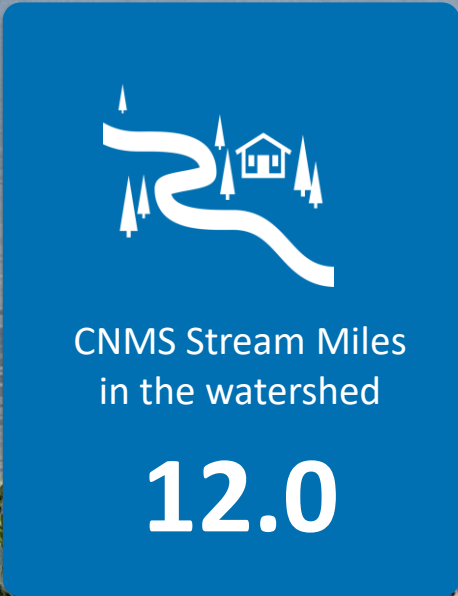
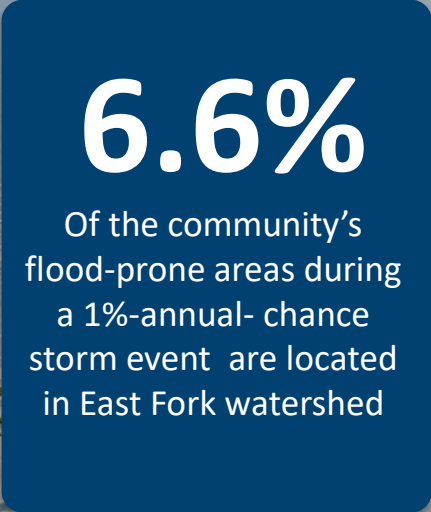
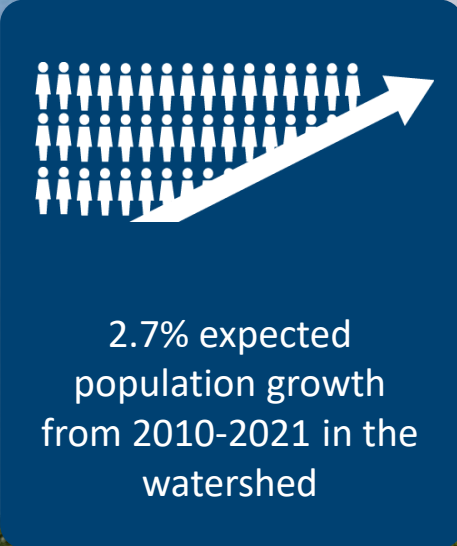
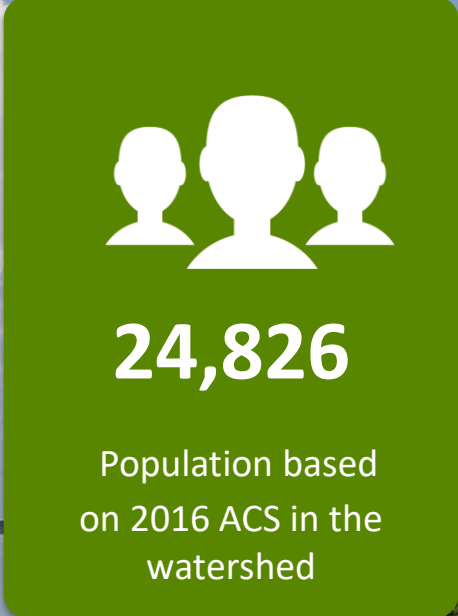
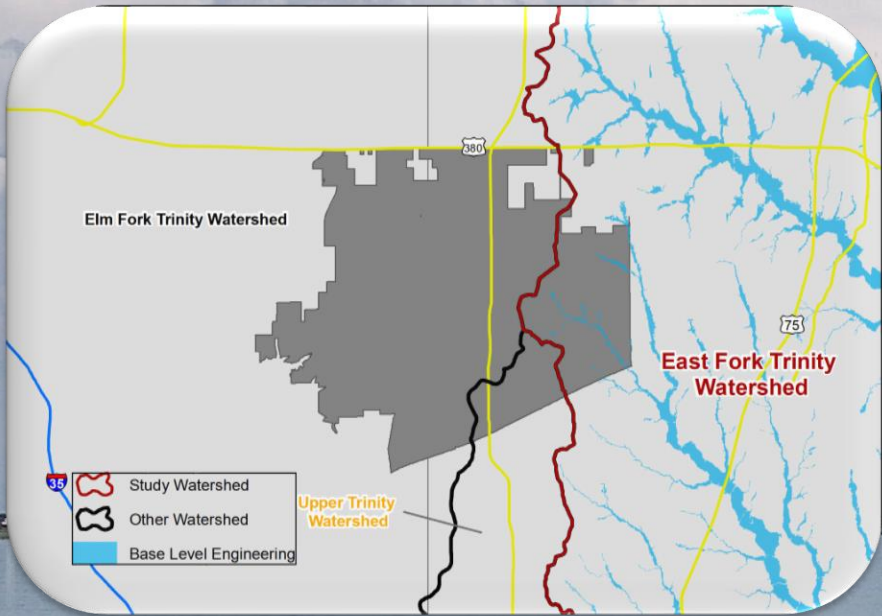
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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF FRISCO

KNOW YOUR RISK



CITY OF FRISCO

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Install an early warning system

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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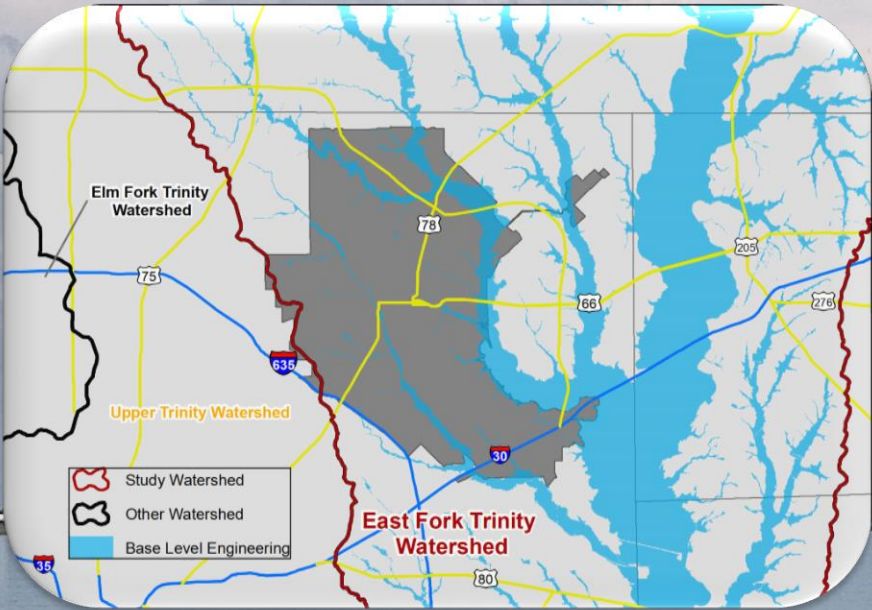
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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF GARLAND

KNOW YOUR RISK



55.9
Sq. Miles

of the community is in the watershed

231,367

Population based on 2016 ACS in the watershed

4.0% expected population growth from 2010-2021 in the watershed

585

policies totaling approximately \$145,102,000 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

62.5

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

89.5%

9

Flood-related presidential disaster declarations in your county

60

claims for structures repeatedly damaged by flood in the watershed

\$4,067,051

in severe repetitive loss in the watershed

CITY OF GARLAND

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **October 15, 2022**.

The hazard mitigation goals identified projects for:

- Finalize and adopt hazard mitigation plan
- Installation of a warning system
- Study and improve drainage utility infrastructure to minimize the impact of stormwater
- Channelize or widen streams

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of drainage channels to limit the impact of stormwater on existing infrastructure. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, sirens, or barricades at low-water crossings. The HMGP also provides financial assistance for flood reduction projects including stream channelization and restoration. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)⁴ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

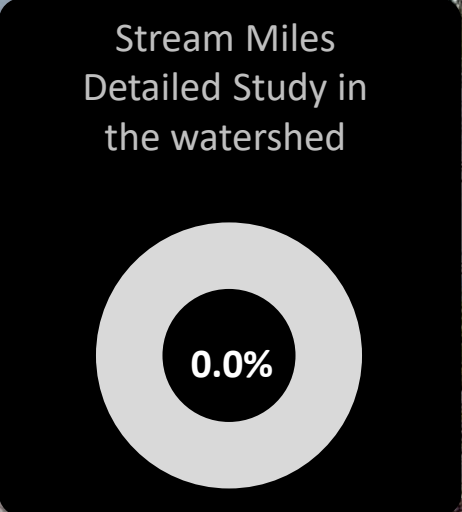
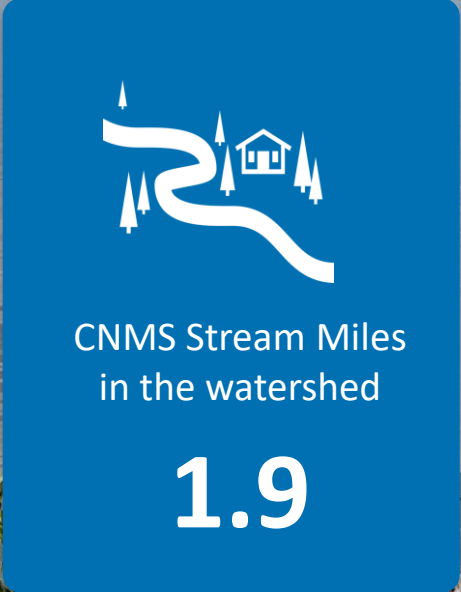
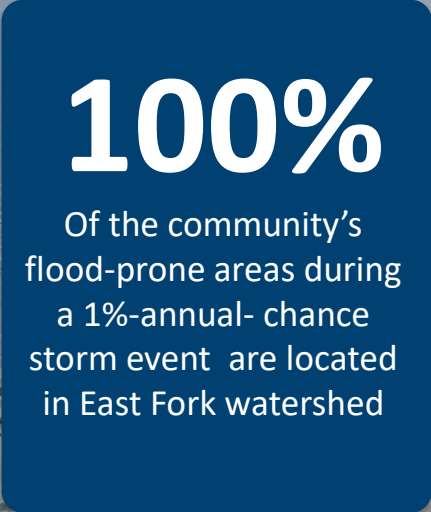
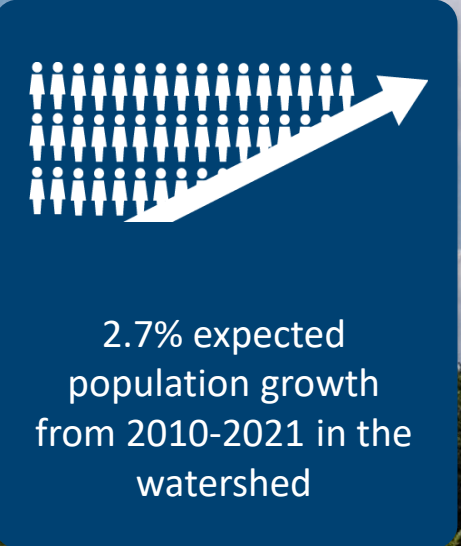
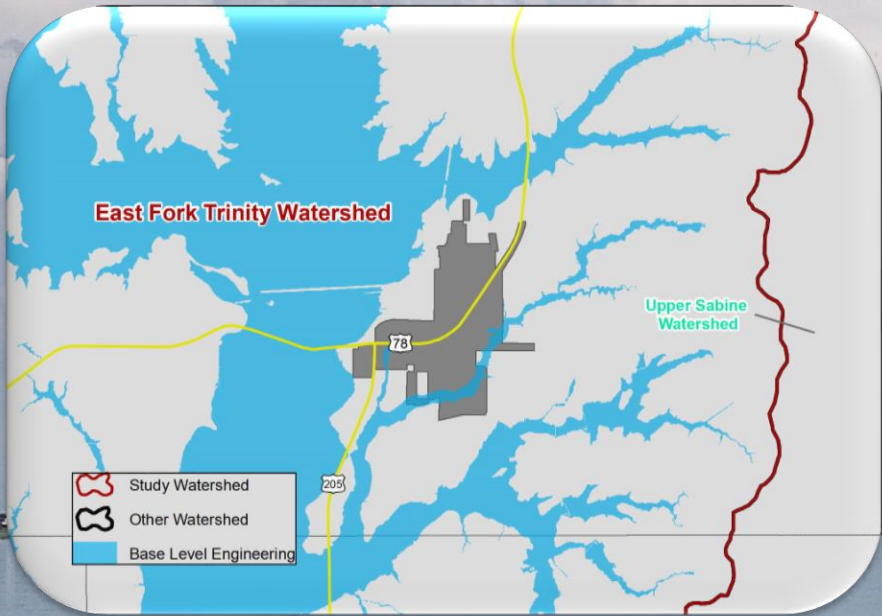
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF LAVON

KNOW YOUR RISK



CITY OF LAVON

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Create and implement master stormwater drainage plan
- Implement public awareness program
- Increase the early warning system, including an AM radio station for emergency notification information

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

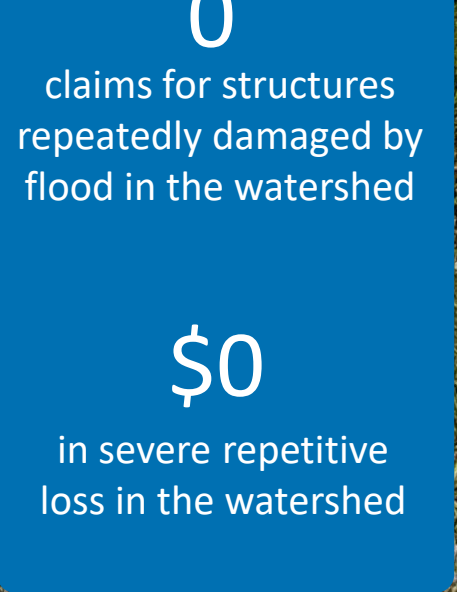
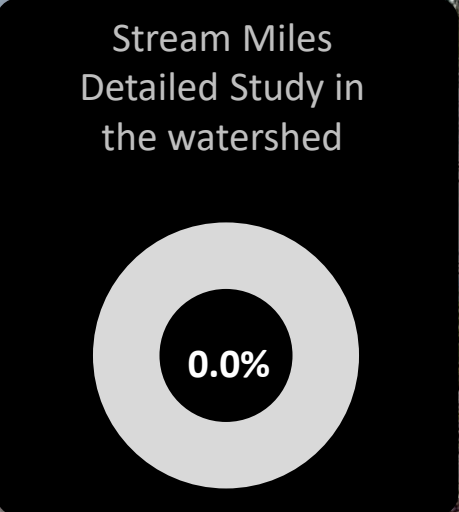
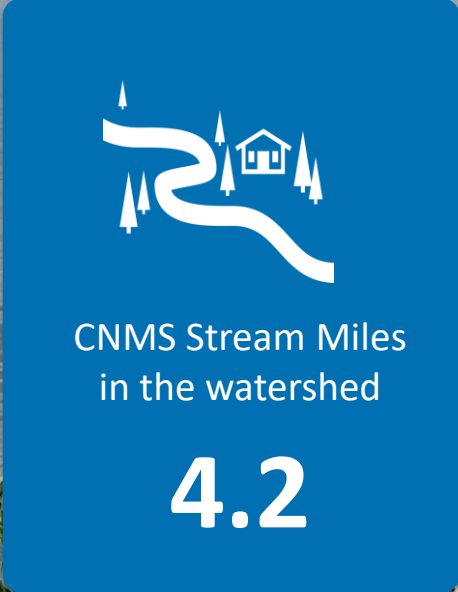
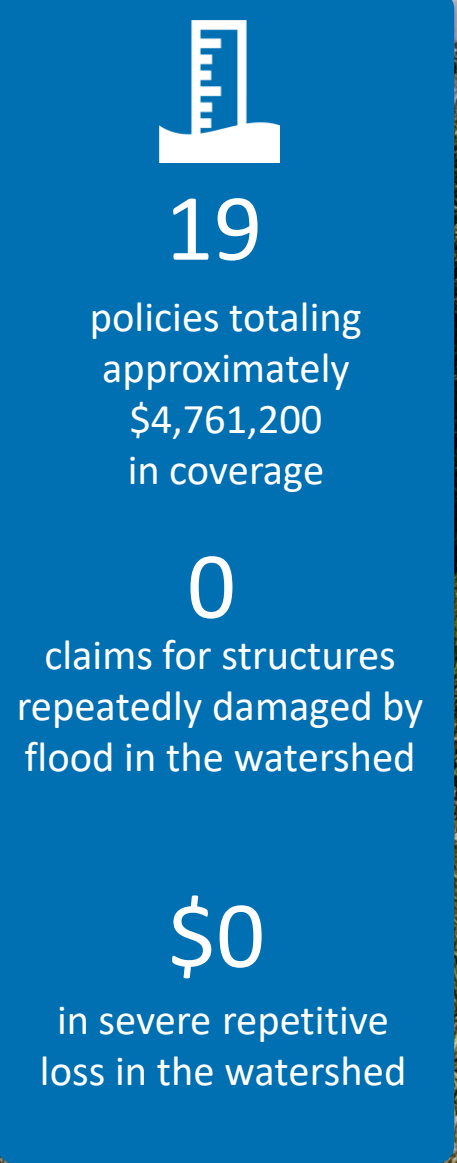
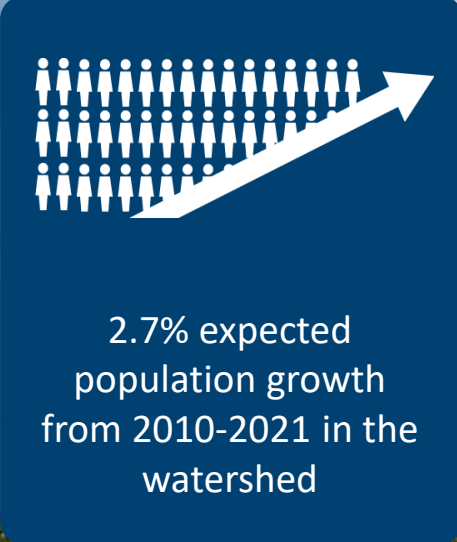
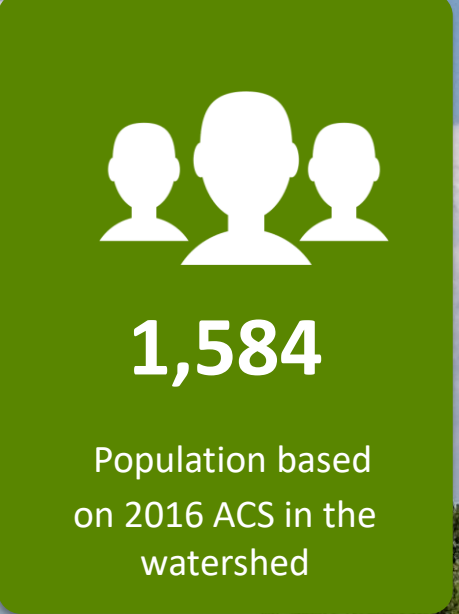
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF LOWRY CROSSING

KNOW YOUR RISK



CITY OF LOWRY CROSSING

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

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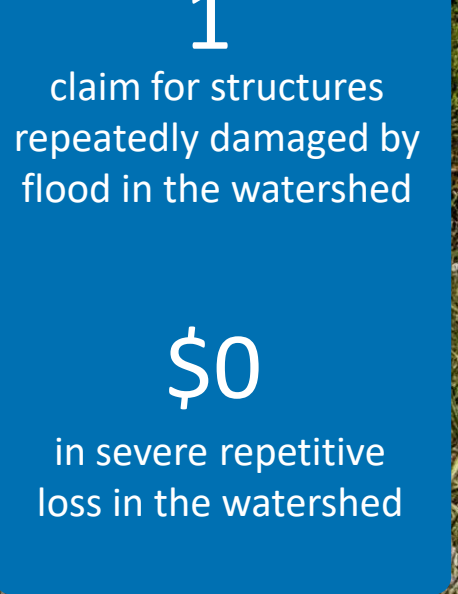
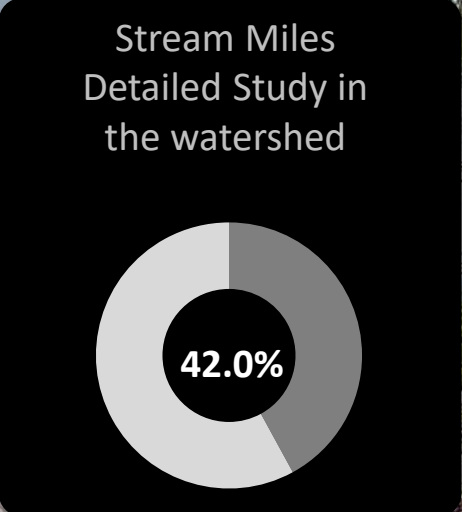
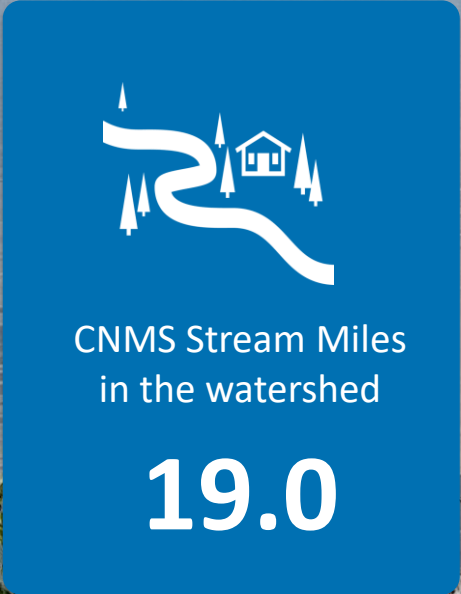
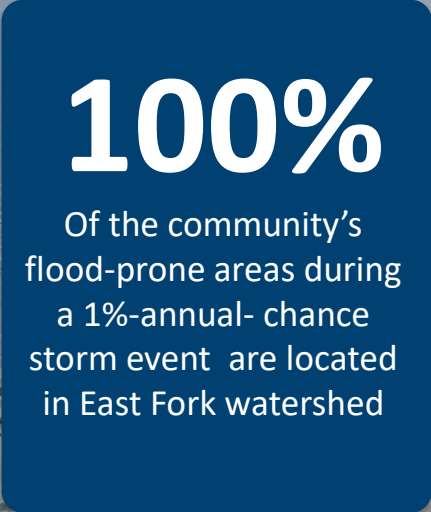
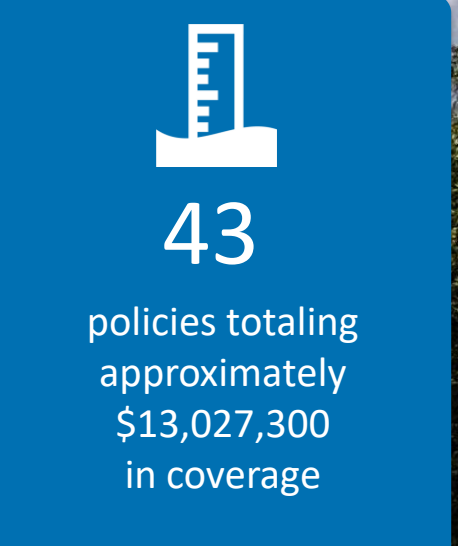
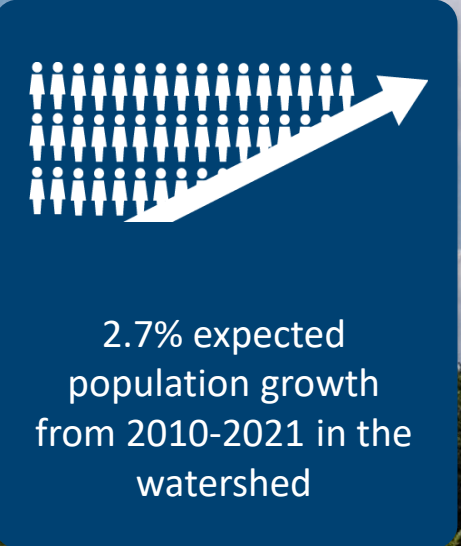
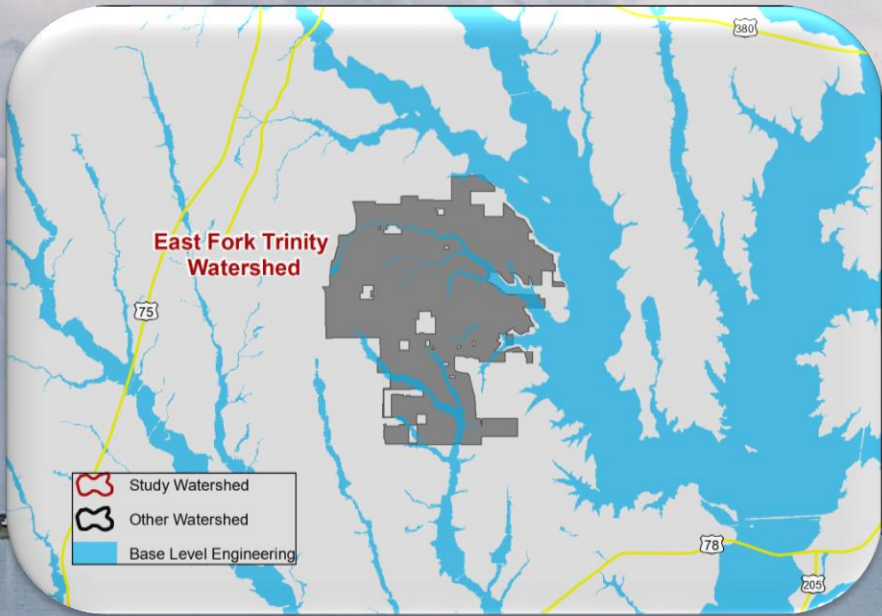
1. <https://www.fema.gov/hazard-mitigation-assistance>.

2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF LUCAS

KNOW YOUR RISK



CITY OF LUCAS

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP](#)³ can be found on our website.

[Texas Water Development Board's](#)⁴ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

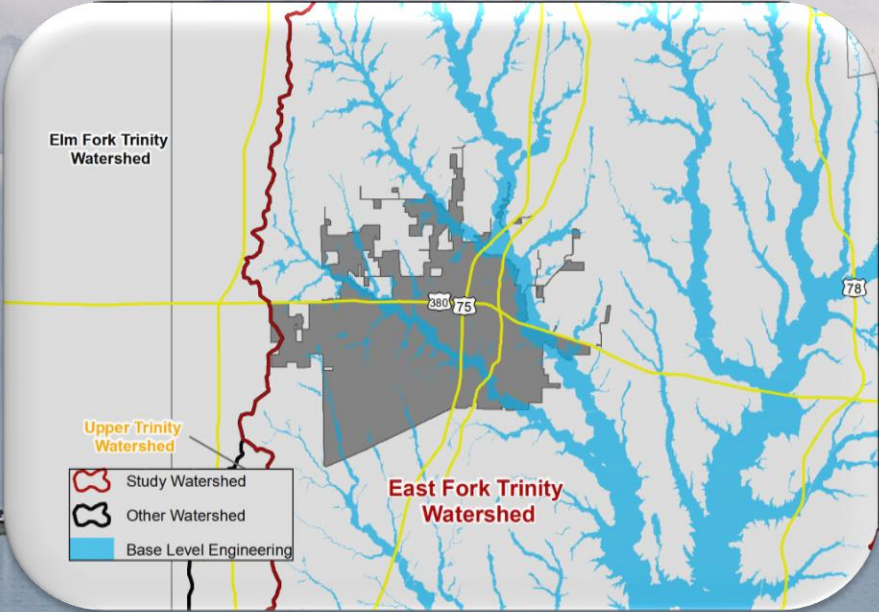
The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.fema.gov/media-library/assets/documents/13610>.

4. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MCKINNEY

KNOW YOUR RISK



63.7
Sq. Miles

of the community is in the watershed

156,242

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

249

policies totaling approximately \$70,945,800 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

86.1

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

52.6%

9

Flood-related presidential disaster declarations in your county

2

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF MCKINNEY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **April 15, 2020**.

The hazard mitigation goals identified projects for:

- Rehabilitate NRCS High Hazard Dams
- Design, engineering, and installation, or updating of drainage utility infrastructure to minimize or reduce the impact of stormwater
- Finalize Master Plan for all major creeks
- Assess structures within the 100 year floodplain

FEMA's Hazard Mitigation Grant Program (HGMP), the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. Additionally, these programs fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

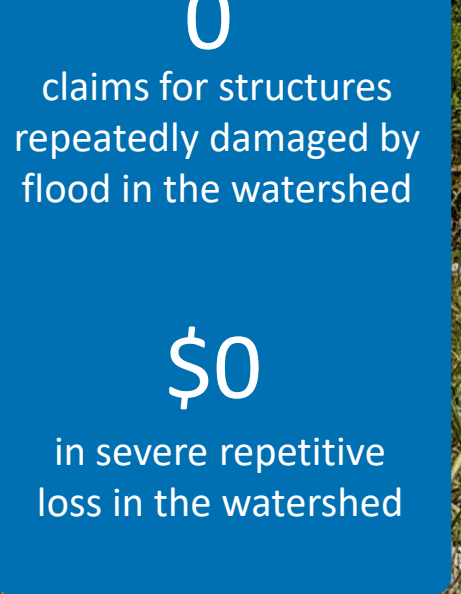
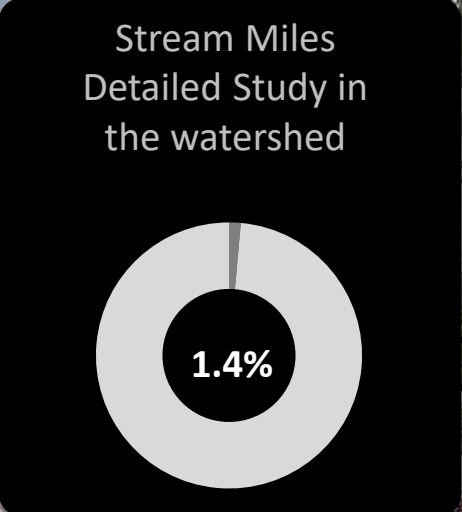
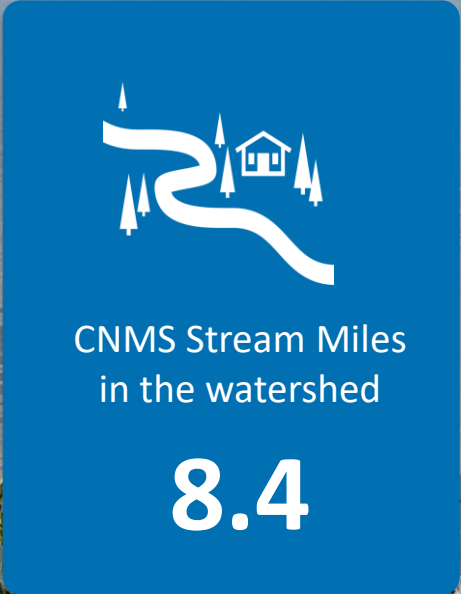
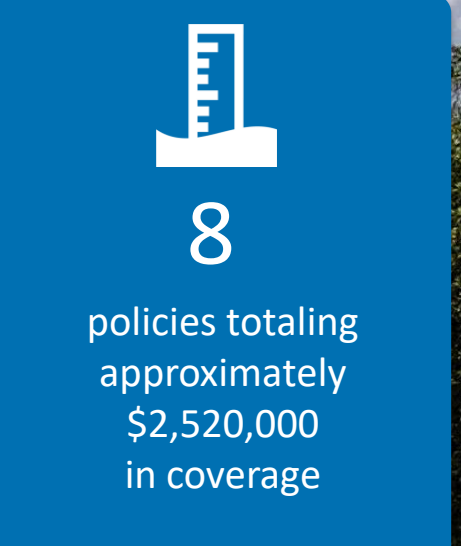
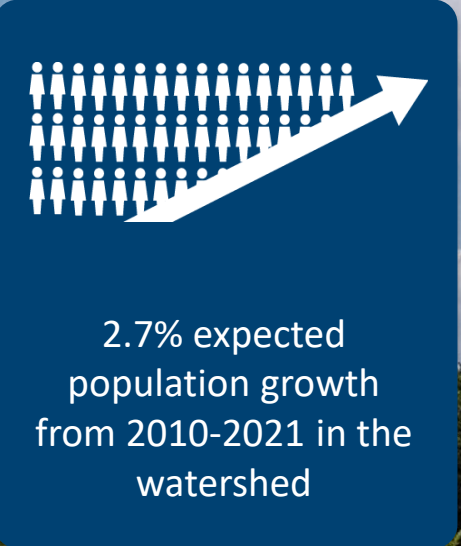
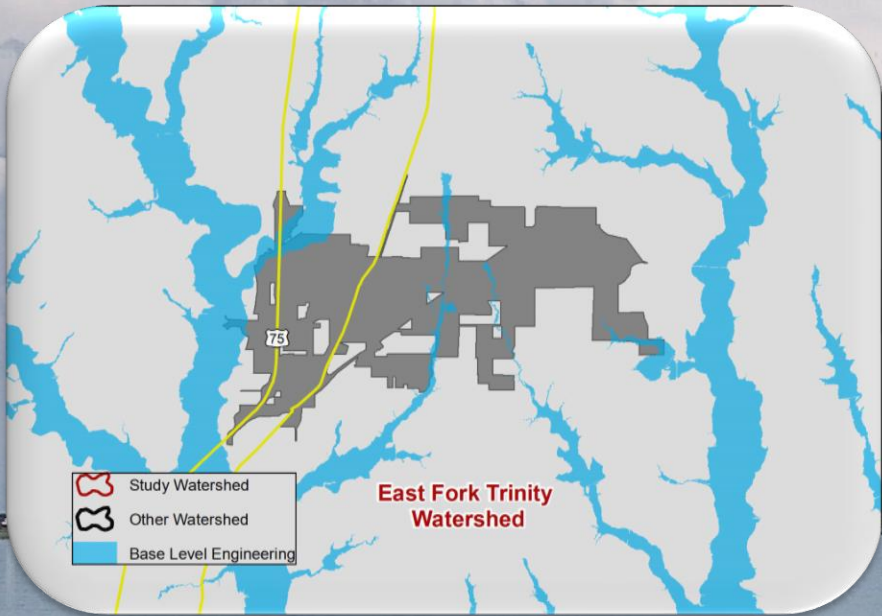
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MELISSA

KNOW YOUR RISK



CITY OF MELISSA

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

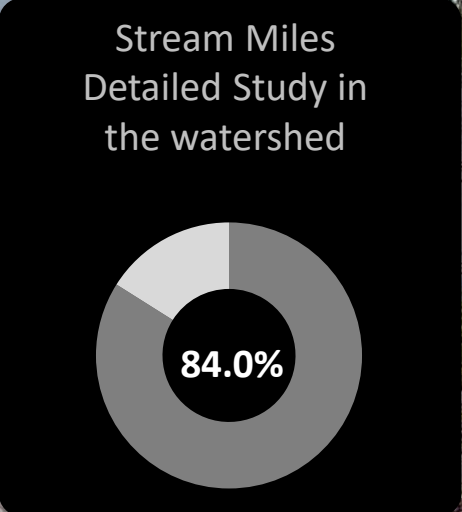
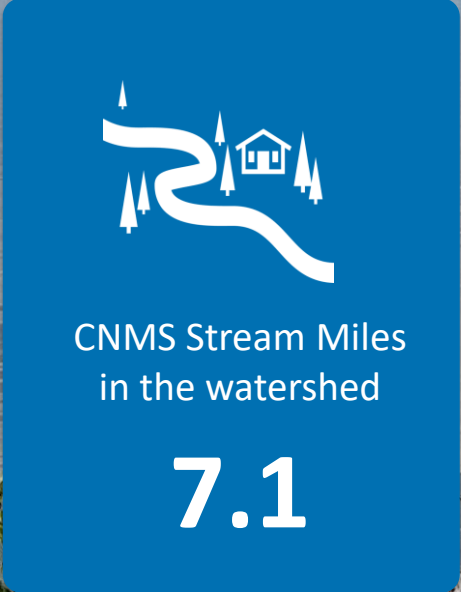
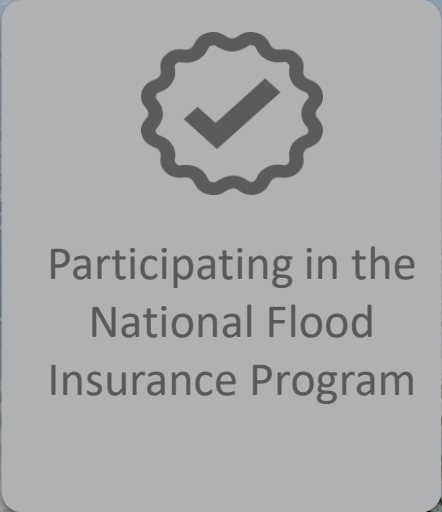
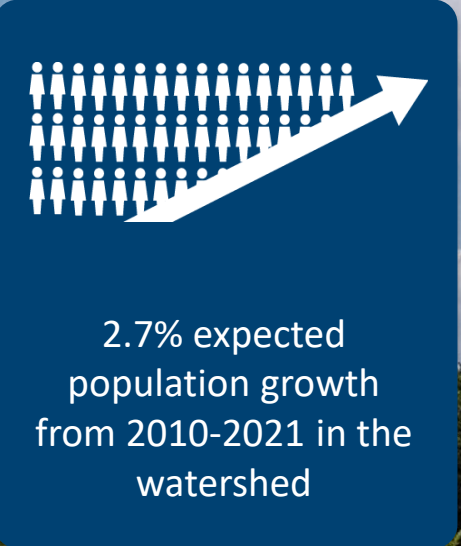
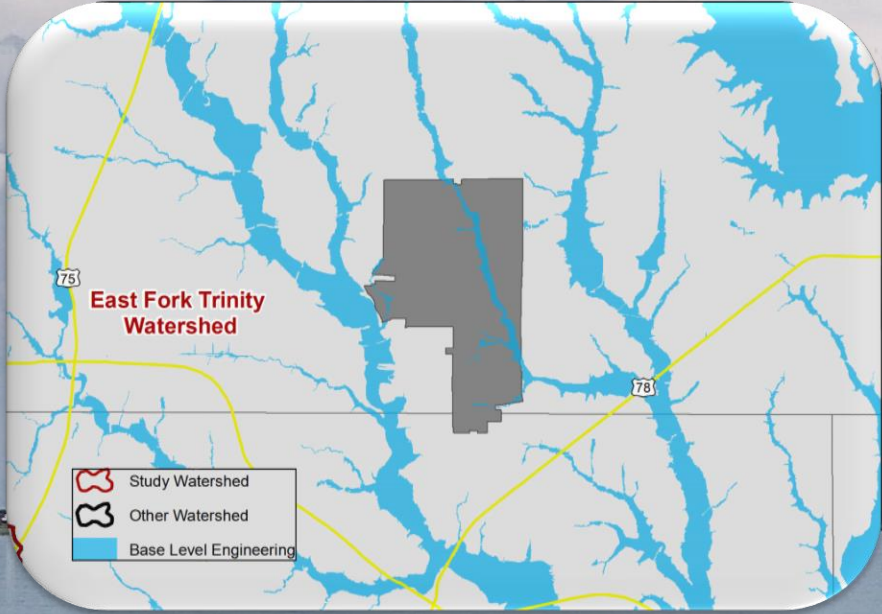
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MURPHY

KNOW YOUR RISK



CITY OF MURPHY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Purchase mobile back-up generator
- Create and implement buyout program for structures within the 100 year floodplain
- Floodproof Emergency Operations Center
- Implement public awareness program and distribute NOAA radios to vulnerable residents
- Improve drainage utility infrastructure

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities or retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

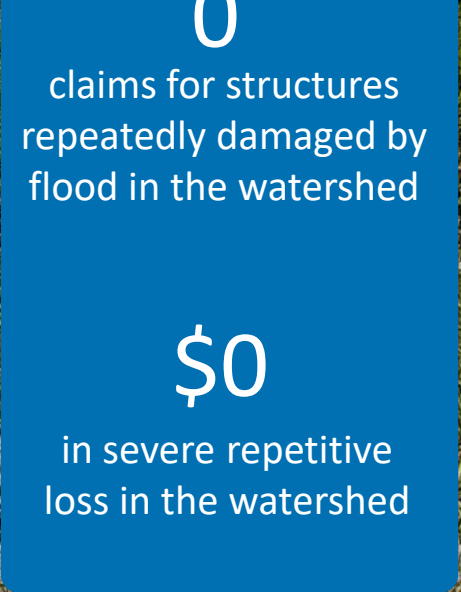
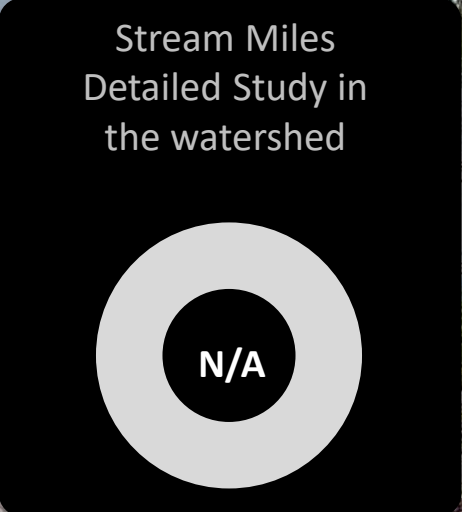
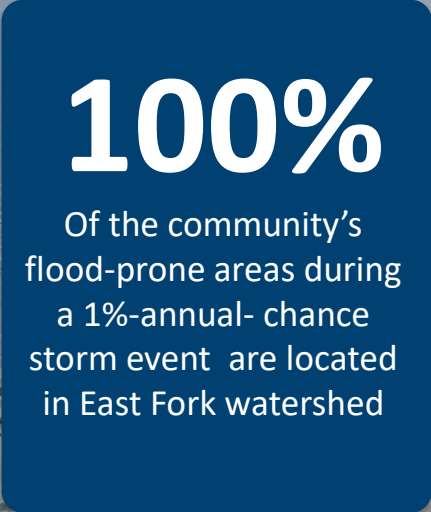
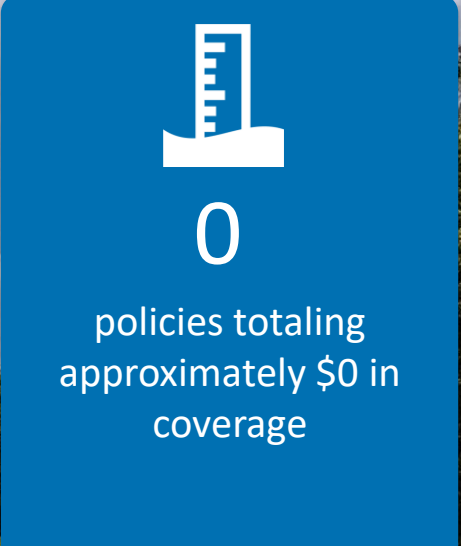
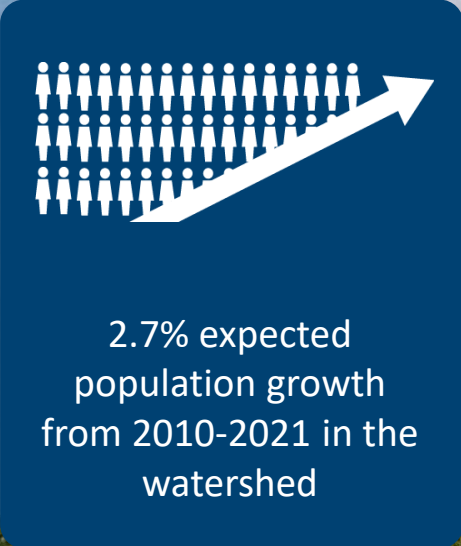
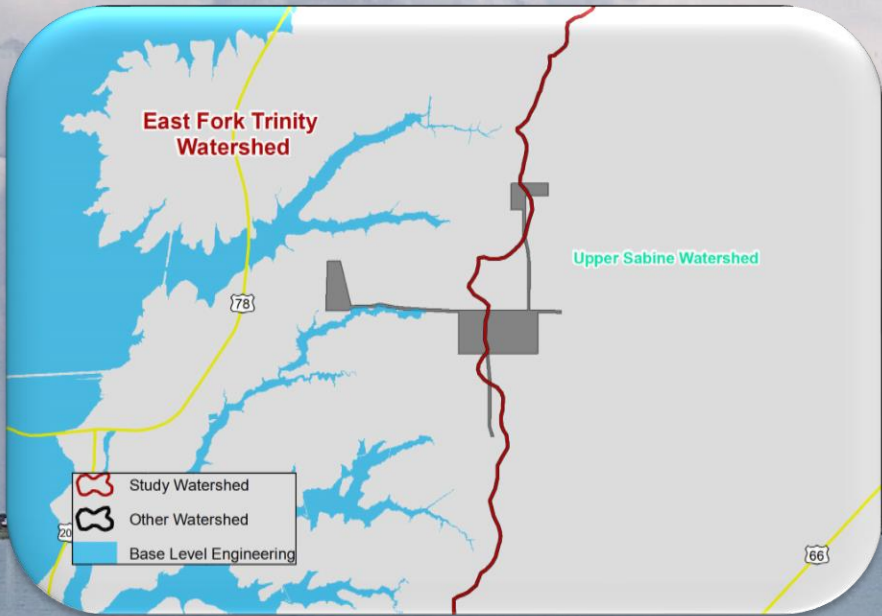
[Texas Water Development Board's](#)³ Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, and building water quality and green infrastructure. TWDB also funds the Severe Repetitive Loss (SRL) Grant, which can assist communities in engineering designs, acquisition or water-proofing of severe repetitive loss residential structures.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF NEVADA

KNOW YOUR RISK



CITY OF NEVADA

TAKE ACTION: Potential Next Step



You **do not have** a Hazard Mitigation Plan.

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Create and implement a hazard mitigation plan

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP¹](#) can be found on our website. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

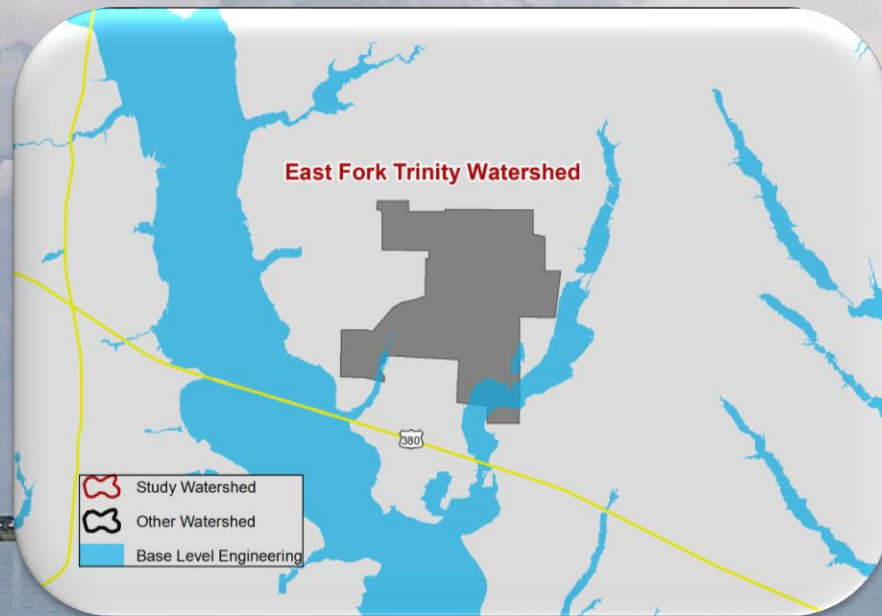
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The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>
3. <https://www.twdb.texas.gov/financial/programs/>

TOWN OF NEW HOPE

KNOW YOUR RISK

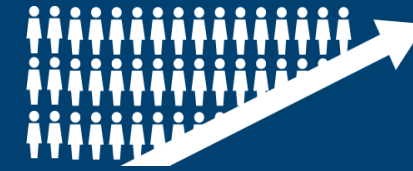


of the community is in the watershed



645

Population based on 2016 ACS in the watershed



2.7% expected population growth from 2010-2021 in the watershed



3

policies totaling approximately \$711,600 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



Participating in the National Flood Insurance Program

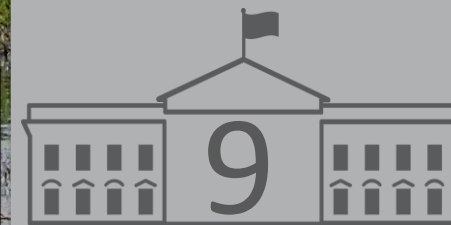


CNMS Stream Miles in the watershed

0.6

Stream Miles Detailed Study in the watershed

0.0%



Flood-related presidential disaster declarations in your county

TOWN OF NEW HOPE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

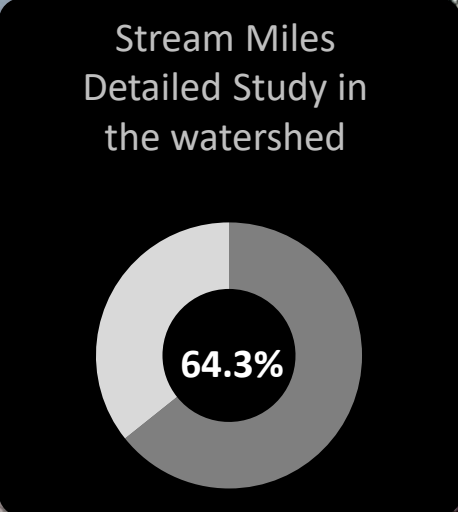
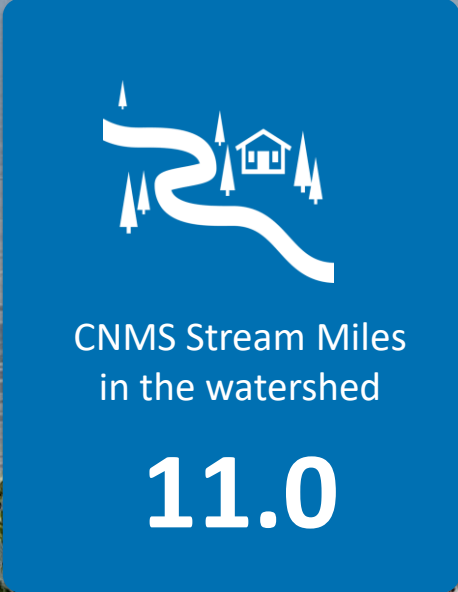
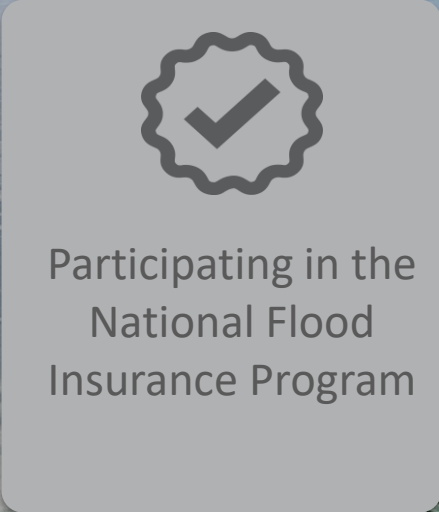
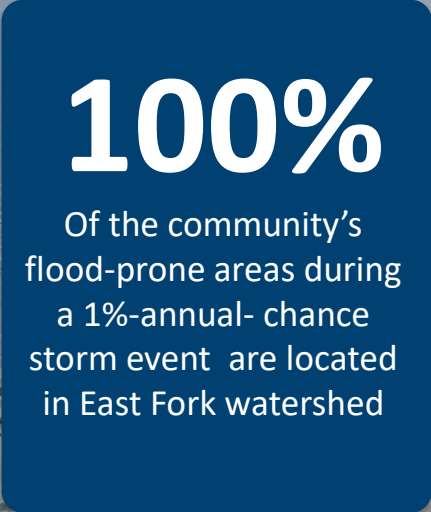
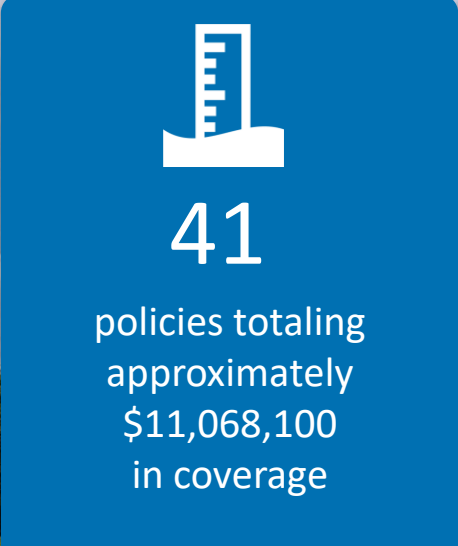
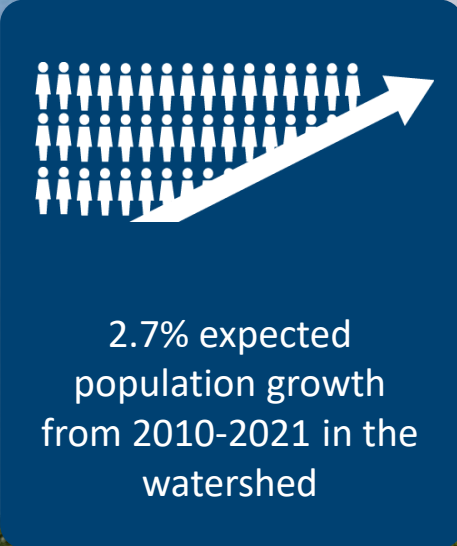
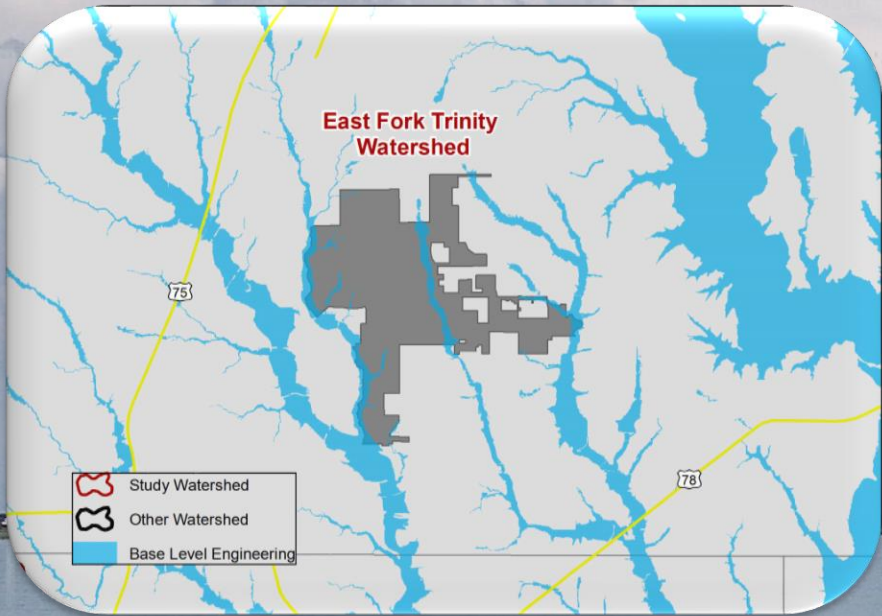
[Texas Water Development Board's](#)⁴ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF PARKER

KNOW YOUR RISK



CITY OF PARKER

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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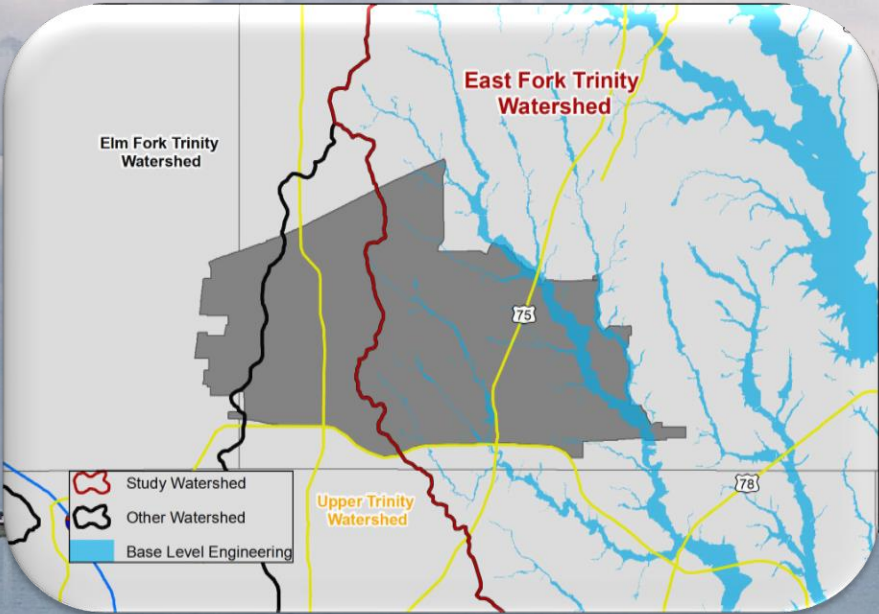
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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF PLANO

KNOW YOUR RISK



44.0
Sq. Miles

of the community is in the watershed

170,065

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

792

policies totaling approximately \$248,138,000 in coverage

73.1%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

58.3

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

89.4%

9

Flood-related presidential disaster declarations in your county

6

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF PLANO

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired**.

The hazard mitigation goals identified projects for:

- Adopt new Hazard Mitigation Plan
- Create Debris Management Plan
- Installation of permanent generators
- Stream bank erosion reduction
- Create and implement buyout program for structures within the 100 year floodplain
- Distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

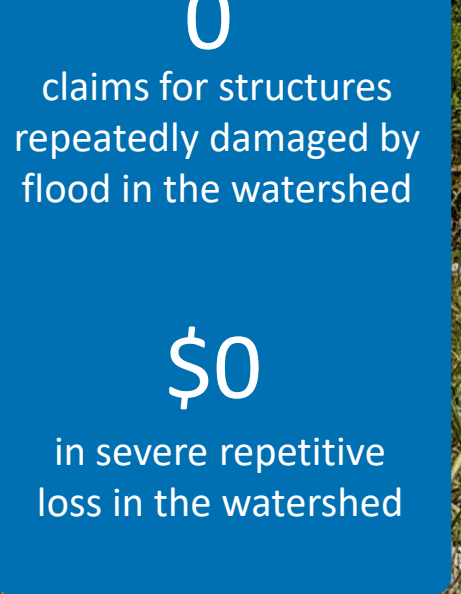
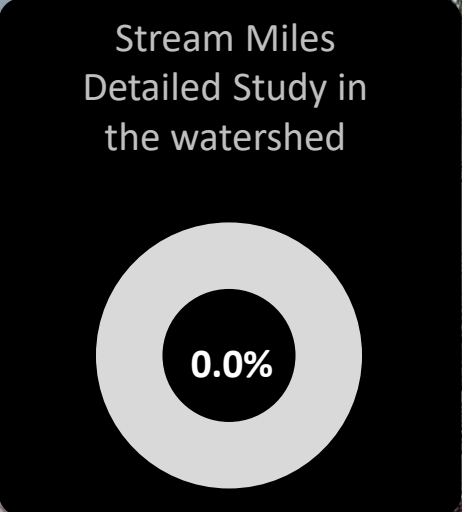
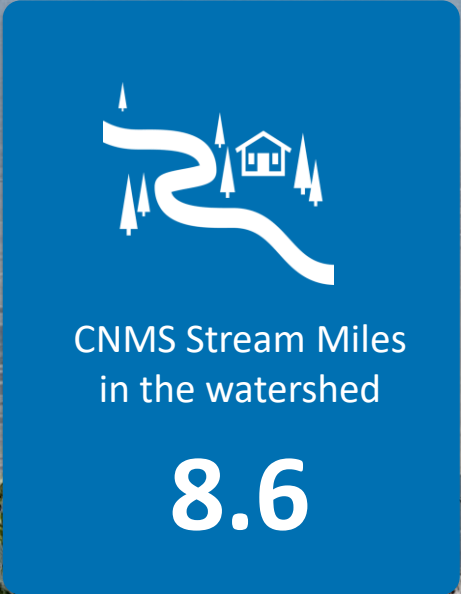
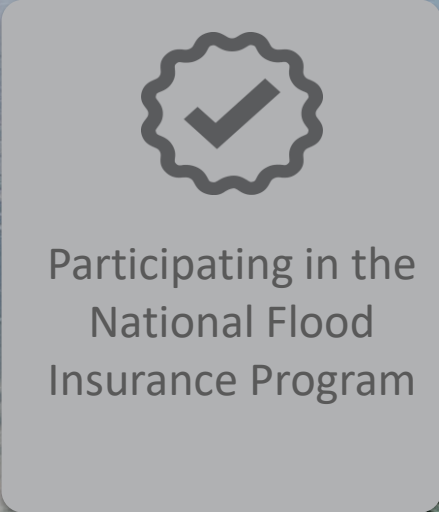
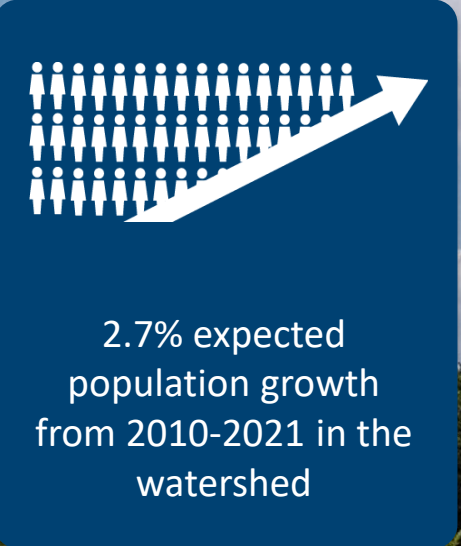
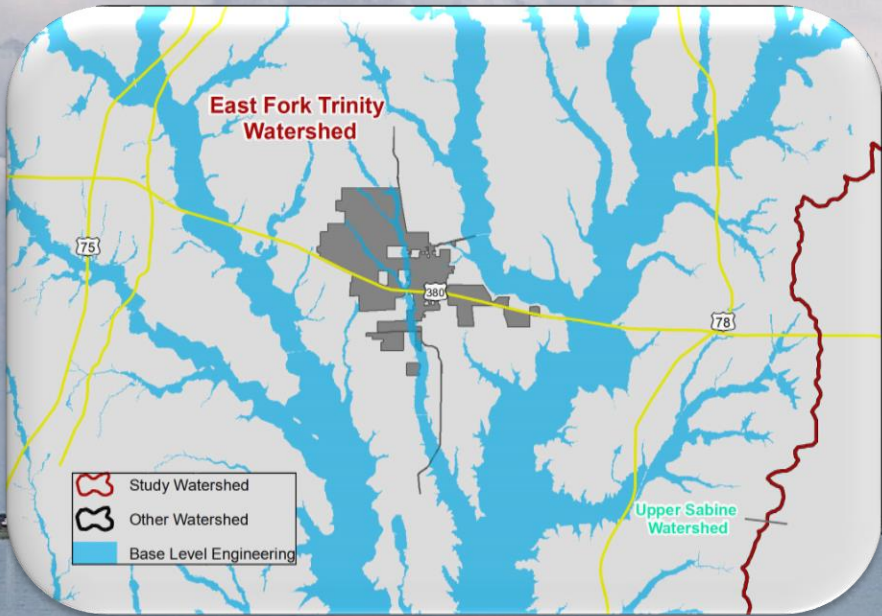
[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF PRINCETON

KNOW YOUR RISK



CITY OF PRINCETON

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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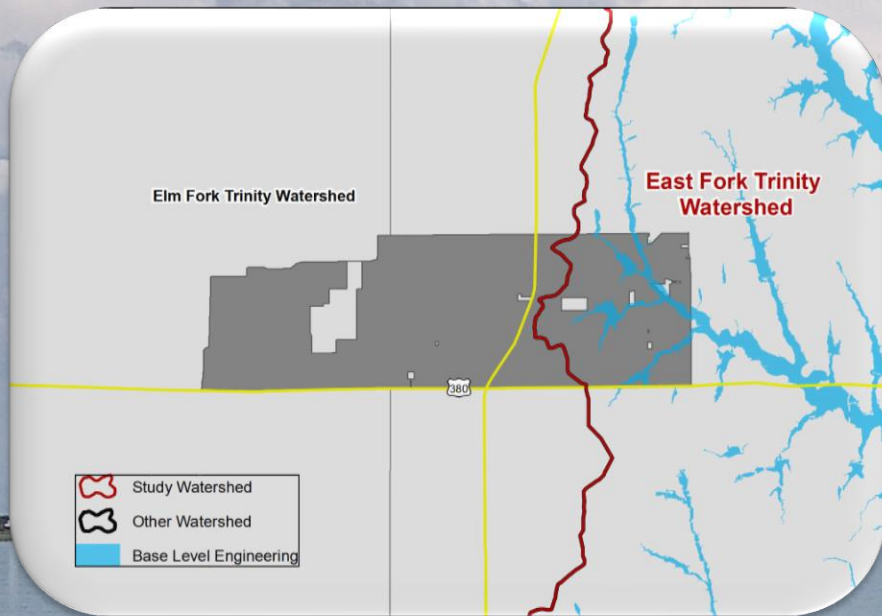
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TOWN OF PROSPER

KNOW YOUR RISK

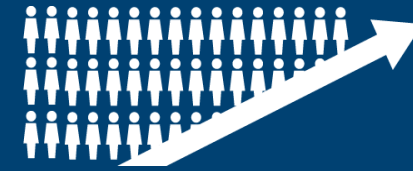


of the community is in the watershed



4,568

Population based on 2016 ACS in the watershed



2.7% expected population growth from 2010-2021 in the watershed



19

policies totaling approximately \$6,510,000 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

19.3%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



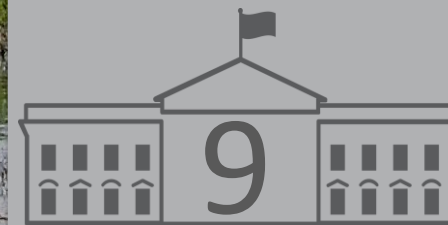
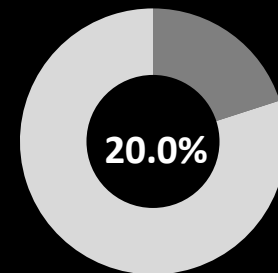
Participating in the National Flood Insurance Program



CNMS Stream Miles in the watershed

10.3

Stream Miles Detailed Study in the watershed



Flood-related presidential disaster declarations in your county

\$0

in severe repetitive loss in the watershed

TOWN OF PROSPER

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Create and adopt construction requirements to minimize flood damage
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

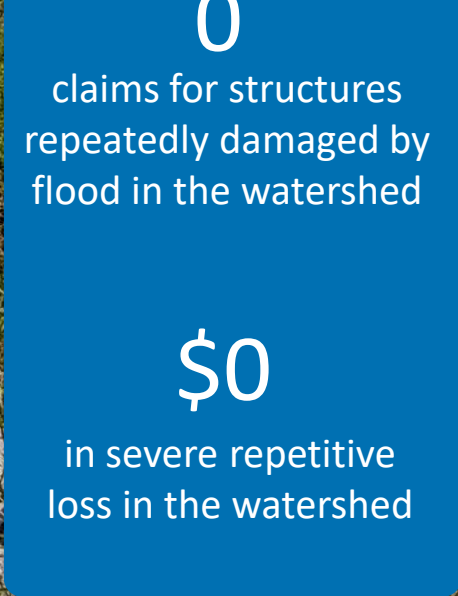
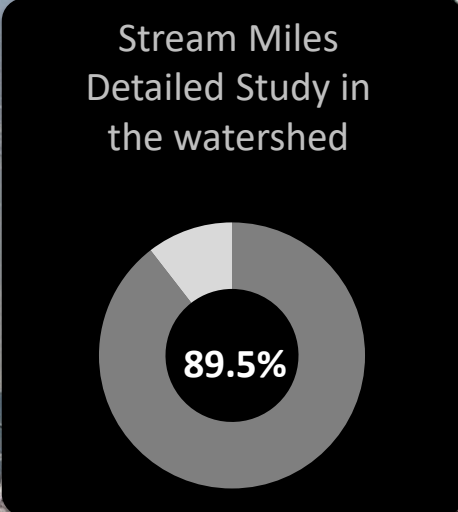
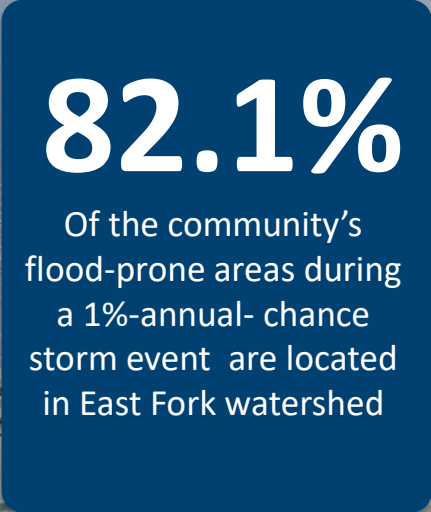
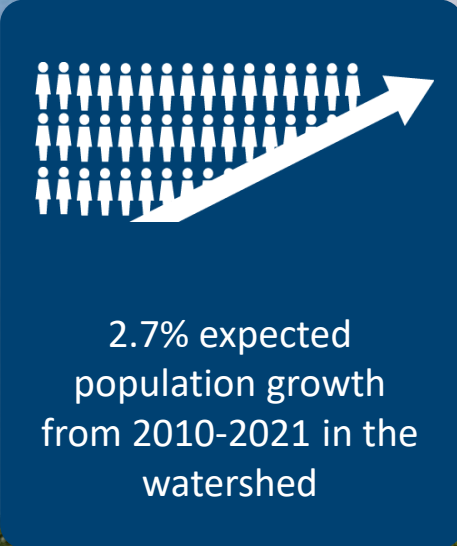
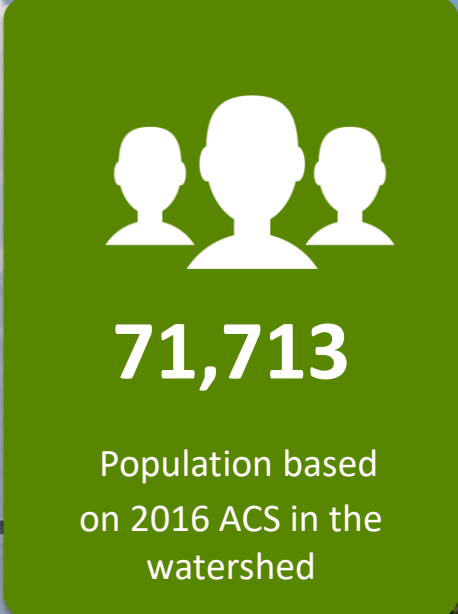
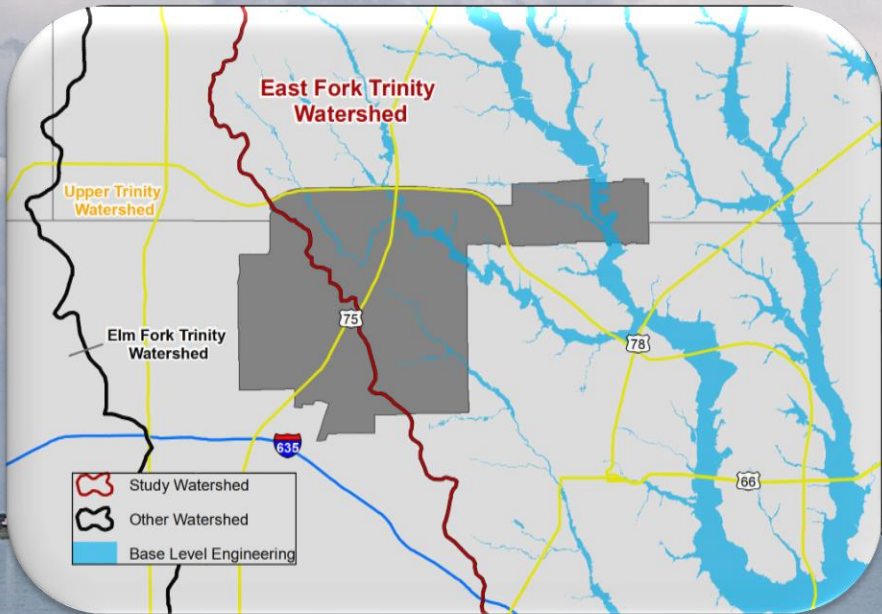
[Texas Water Development Board's](#)³ Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, and building water quality and green infrastructure. TWDB also funds the Severe Repetitive Loss (SRL) Grant, which can assist communities in engineering designs, acquisition or water-proofing of severe repetitive loss residential structures.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF RICHARDSON

KNOW YOUR RISK



CITY OF RICHARDSON

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Purchase mobile back-up generator
- Floodproof critical facilities
- Stream bank erosion reduction
- Implement public awareness program
- Install early warning system
- Improve drainage utility infrastructure

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities and retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

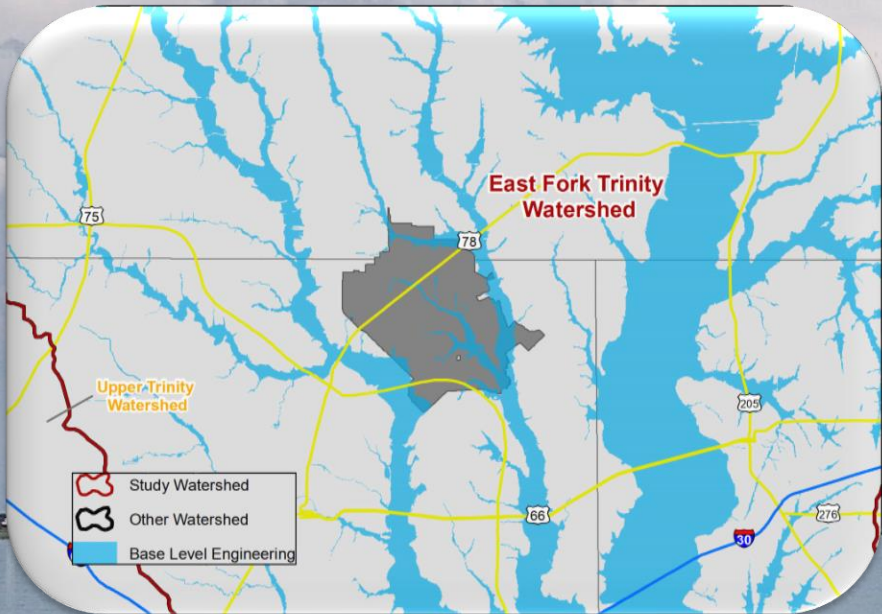
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3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF SACHSE

KNOW YOUR RISK



9.9
Sq. Miles

of the community is in the watershed

23,329

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

57 policies totaling approximately \$17,029,700 in coverage

0 claims for structures repeatedly damaged by flood in the watershed

\$0 in severe repetitive loss in the watershed

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

14.0

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

91.6%

9

Flood-related presidential disaster declarations in your county

CITY OF SACHSE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain and create parks in low-lying areas
- Stream bank erosion reduction
- Implement public awareness program
- Improve drainage utility infrastructure
- Installation of a warning system and permanent generators

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities and retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

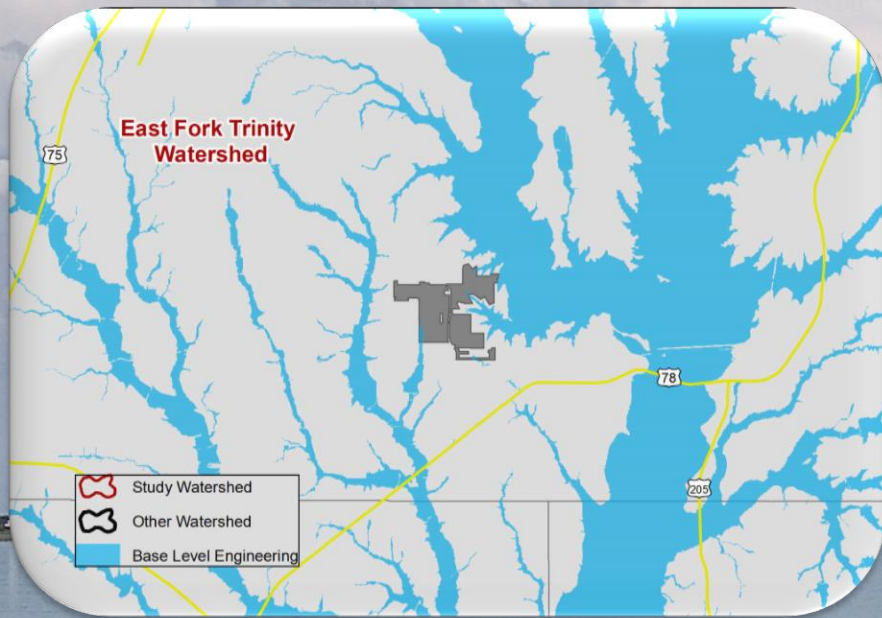
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TOWN OF ST. PAUL

KNOW YOUR RISK



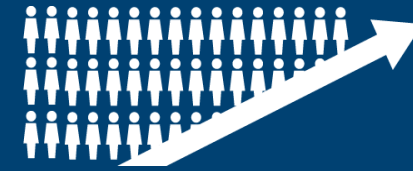
1.7
Sq. Miles

of the community is in the watershed



1,235

Population based on 2016 ACS in the watershed



2.7% expected population growth from 2010-2021 in the watershed



0

policies totaling approximately \$0 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



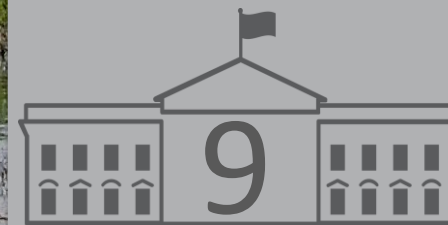
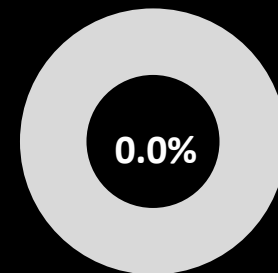
Participating in the National Flood Insurance Program



CNMS Stream Miles in the watershed

0.2

Stream Miles Detailed Study in the watershed



9
Flood-related presidential disaster declarations in your county

\$0

in severe repetitive loss in the watershed

TOWN OF ST. PAUL

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Create and adopt construction requirements to minimize flood damage
- Buy CASA (WX) Weather Radar system
- Improve drainage utility infrastructure
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

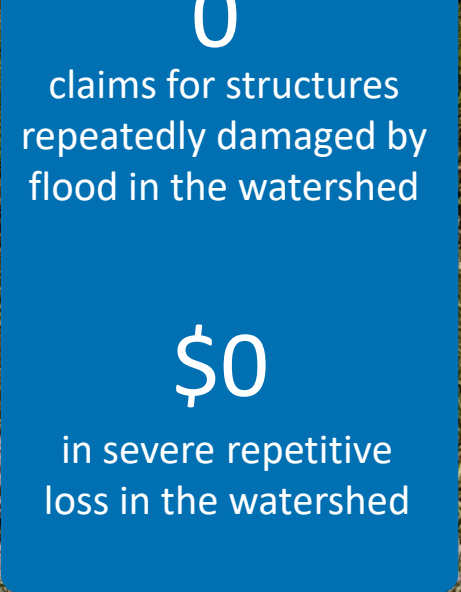
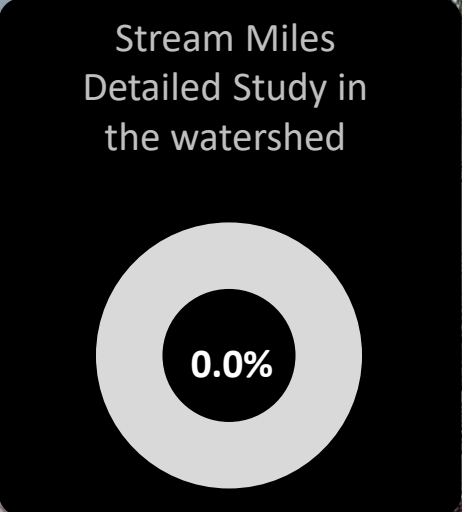
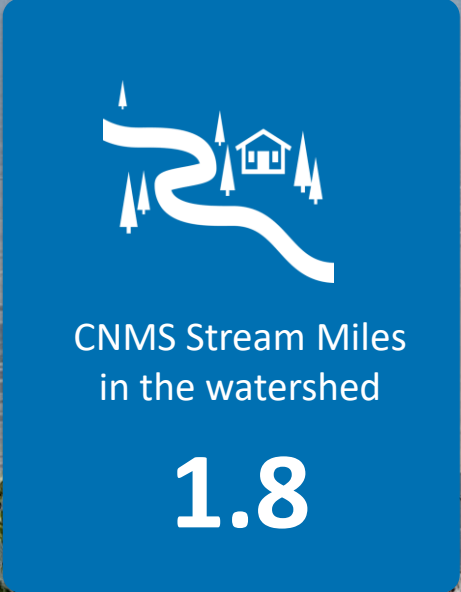
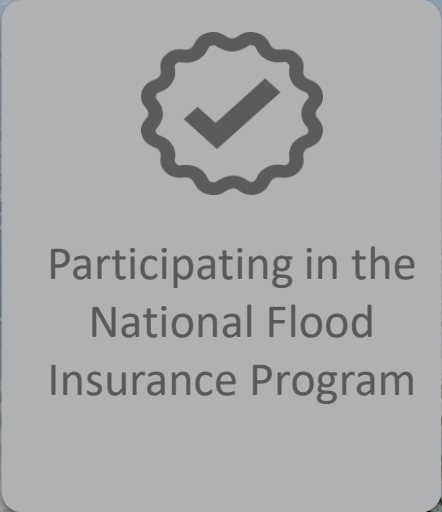
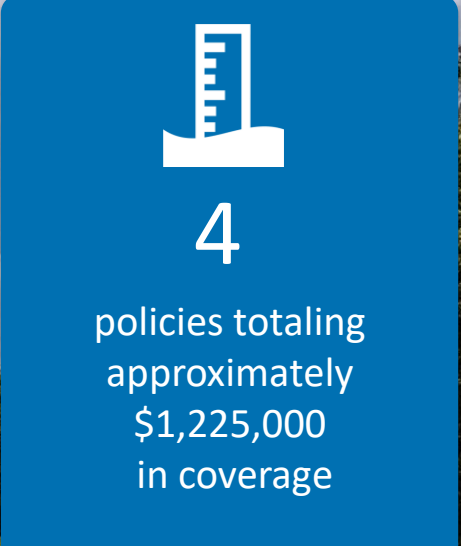
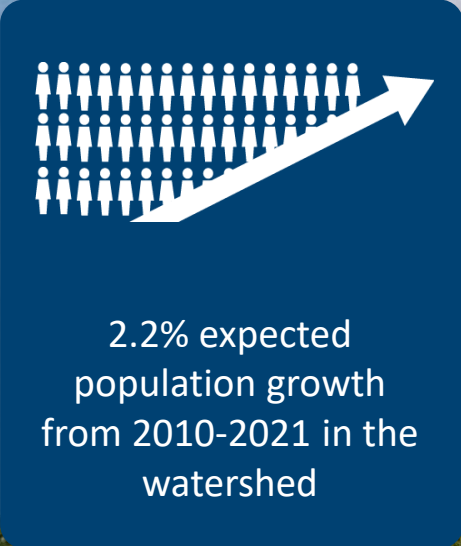
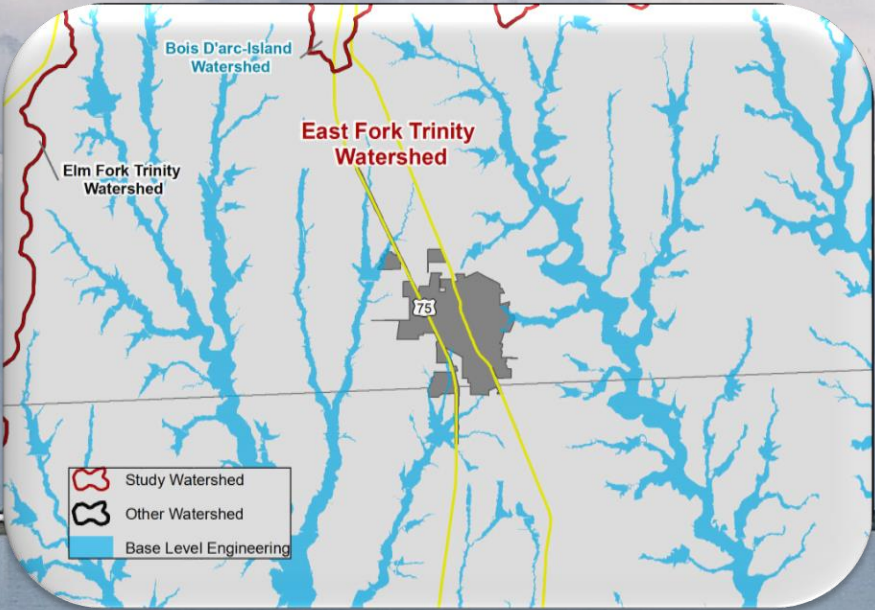
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CITY OF VAN ALSTYNE

KNOW YOUR RISK



CITY OF VAN ALSTYNE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Maintain NFIP participation and update city codes as needed

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [the NFIP¹](#) can be found on our website. . Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

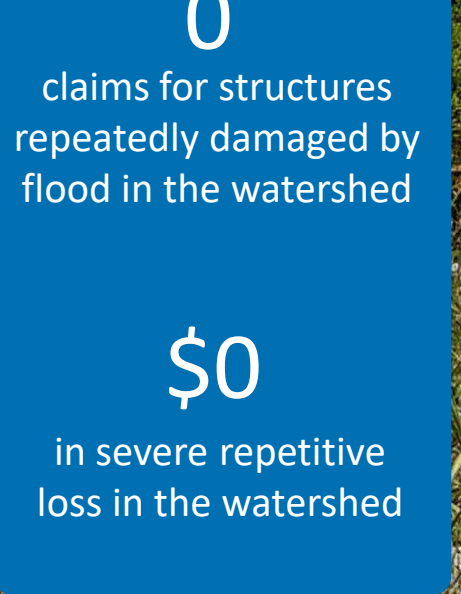
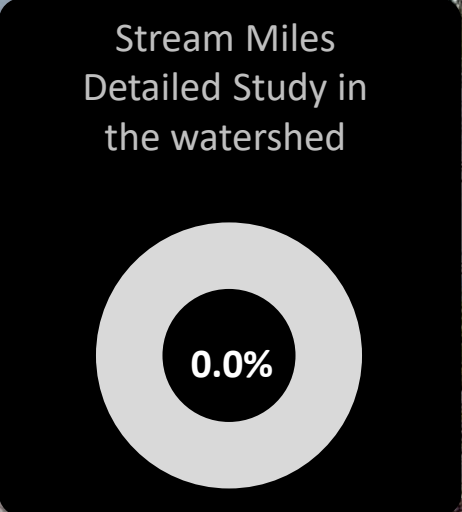
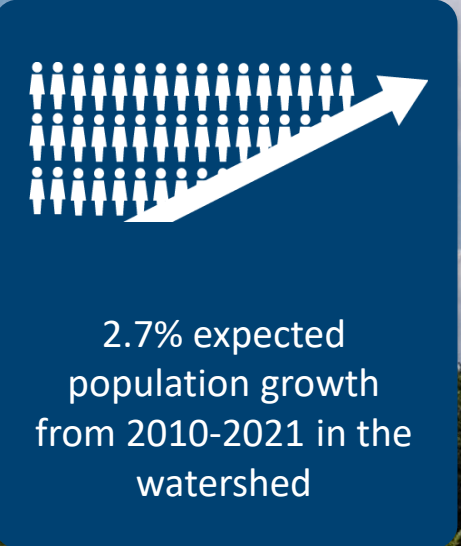
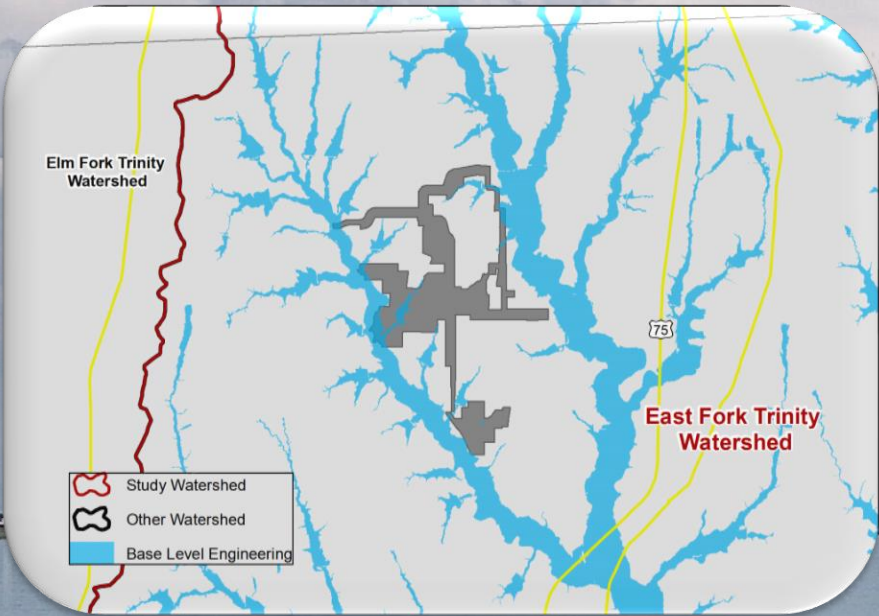
[Texas Water Development Board's²](#) Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
2. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF WESTON

KNOW YOUR RISK



CITY OF WESTON

TAKE ACTION: Potential Next Step



You **do not have** a Hazard Mitigation Plan.

The hazard mitigation goals identified projects for:

- Create and implement a hazard mitigation plan

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)¹ website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

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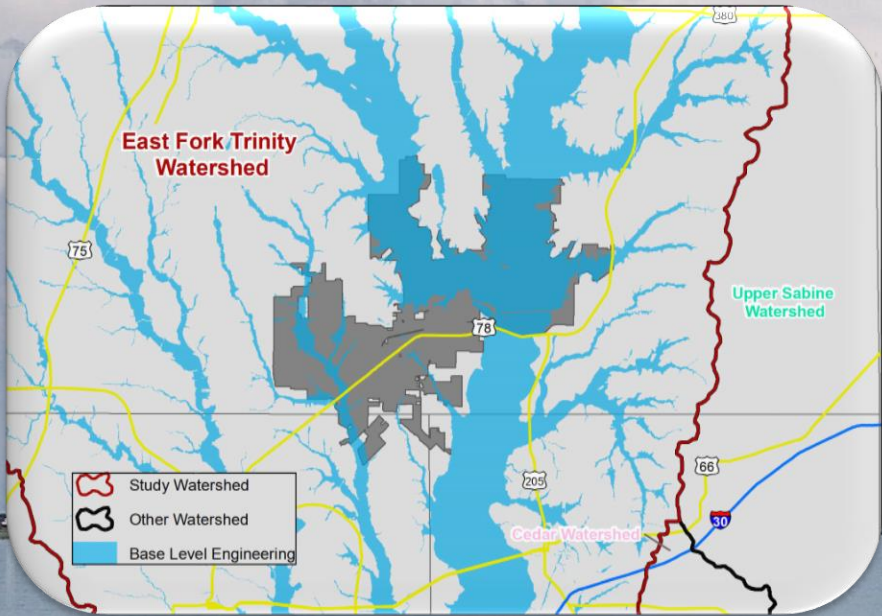
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1. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

2. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF WYLIE

KNOW YOUR RISK



36.6
Sq. Miles

of the community is in the watershed

45,655

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

75

policies totaling approximately \$21,908,600 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

41.8

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

38.8%

9

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF WYLIE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **December 28, 2021**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Improve drainage utility infrastructure
- Increase the early warning system and distribute NOAA radios to vulnerable residents

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

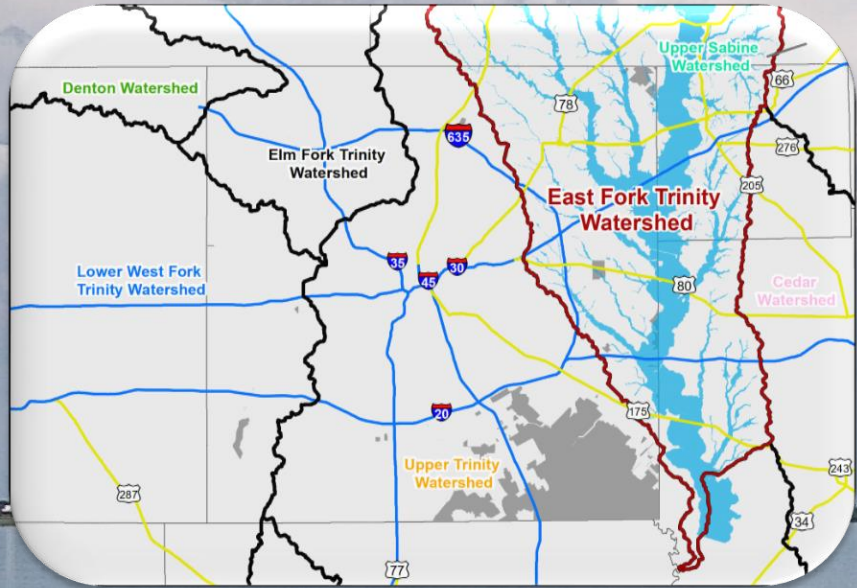
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The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

DALLAS COUNTY

KNOW YOUR RISK



Sq. Miles

of the community is in the watershed



438

Population based on 2016 ACS in the watershed



0.0% expected population growth from 2010-2021 in the watershed



19

policies totaling approximately \$4,335,900 in coverage

3

claims for structures repeatedly damaged by flood in the watershed

\$108,502

in severe repetitive loss in the watershed

40.7%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



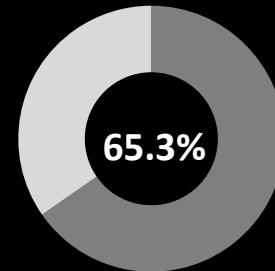
Participating in the National Flood Insurance Program



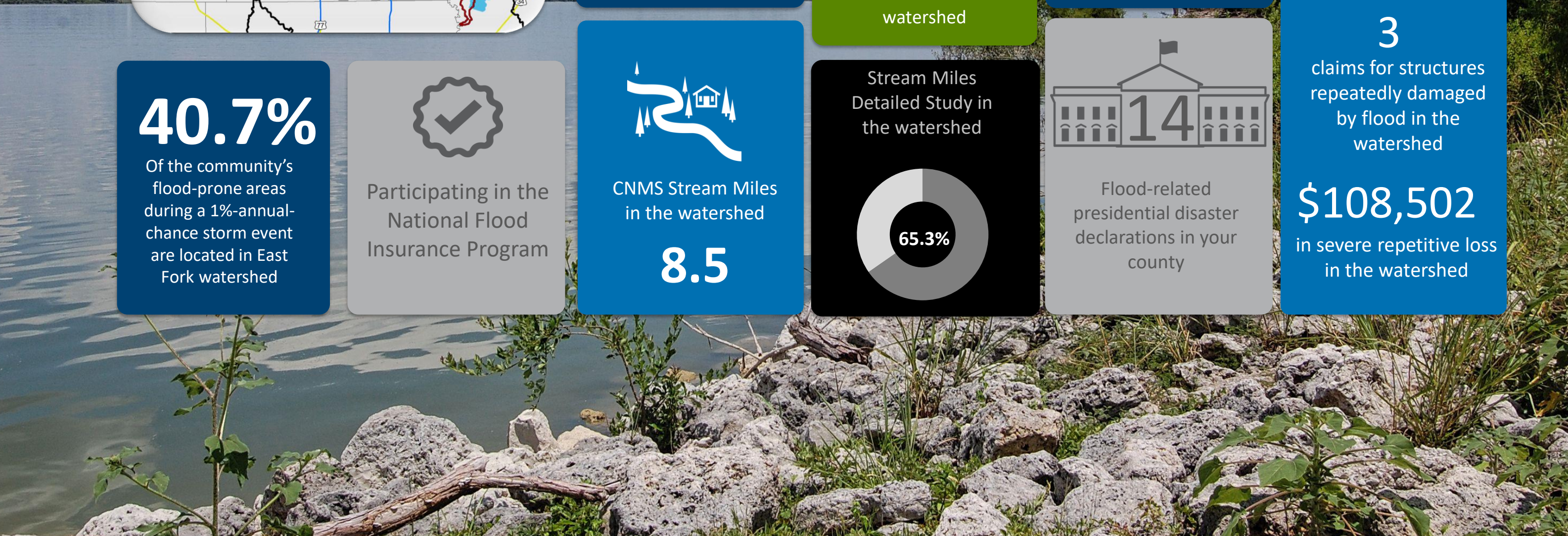
CNMS Stream Miles in the watershed

8.5

Stream Miles Detailed Study in the watershed



Flood-related presidential disaster declarations in your county



DALLAS COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Acquisition of flood prone structures
- Installation of permanent generators at critical facilities
- Implement public awareness program
- Adopt ordinances to manage floodplain above the minimum requirements, including building above required freeboard

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. FEMA's HMGP and PDM also allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

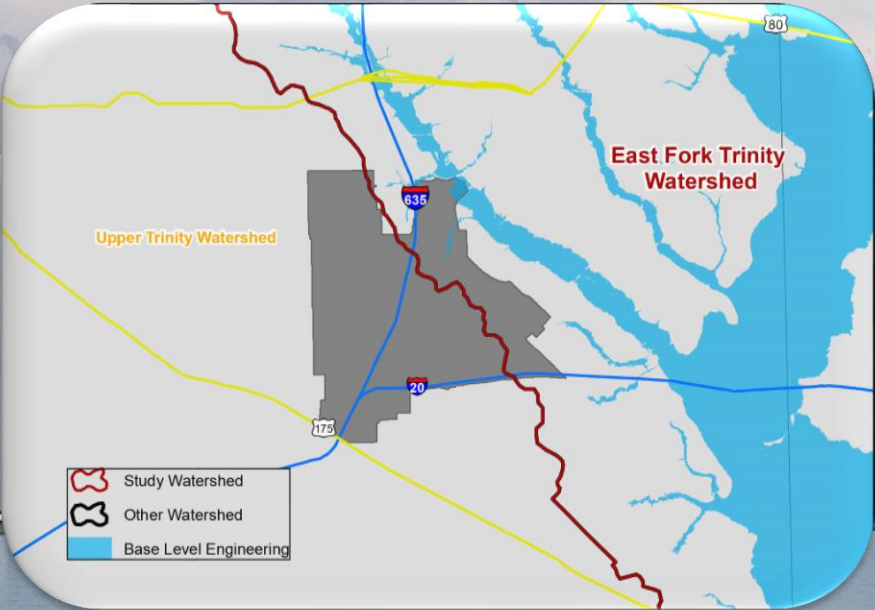
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF BALCH SPRINGS

KNOW YOUR RISK



2.3
Sq. Miles

of the community is in the watershed

6,280

Population based on 2016 ACS in the watershed

1.6% expected population growth from 2010-2021 in the watershed

61 policies totaling approximately \$9,598,900 in coverage

10.6%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

1.0 CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

91.5%

14 Flood-related presidential disaster declarations in your county

18 claims for structures repeatedly damaged by flood in the watershed

\$0 in severe repetitive loss in the watershed

CITY OF BALCH SPRINGS

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. State Hazard Mitigation Officer may be contacted for additional information.

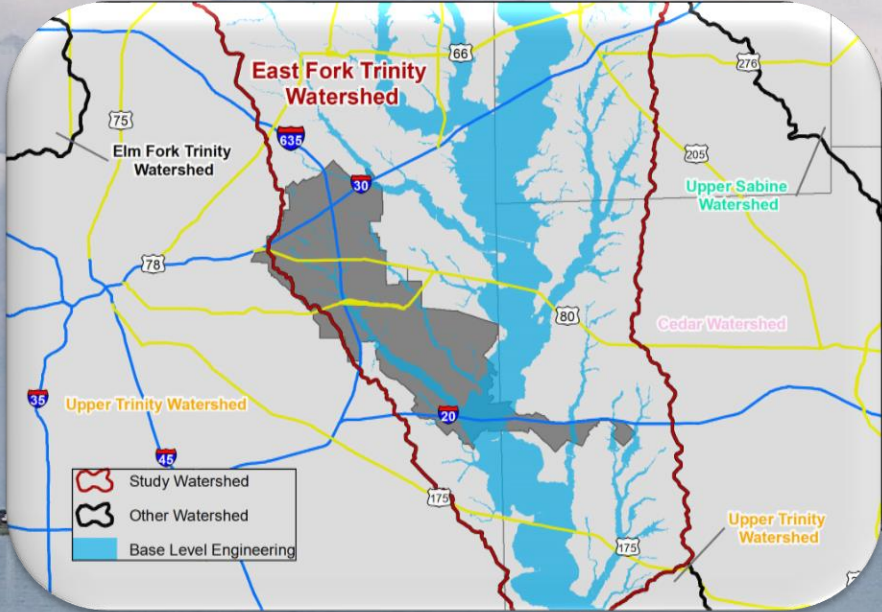
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The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MESQUITE

KNOW YOUR RISK



45.8
Sq. Miles

of the community is in the watershed

138,707

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

167

policies totaling approximately \$44,694,700 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

53.0

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

73.7%

13

Flood-related presidential disaster declarations in your county

14

claims for structures repeatedly damaged by flood in the watershed

\$89,858

in severe repetitive loss in the watershed

CITY OF MESQUITE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 2023**.

The hazard mitigation goals identified projects for:

- Release a public version of the Hazard Mitigation Plan

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications¹](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

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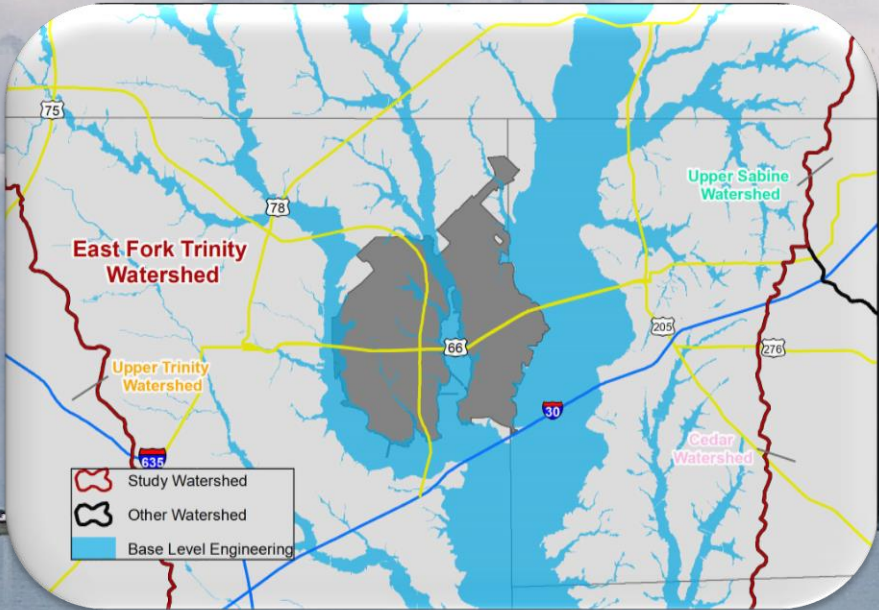
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1. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

2. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF ROWLETT

KNOW YOUR RISK



20.1
Sq. Miles

of the community is in the watershed

59,203

Population based on 2016 ACS in the watershed

1.6% expected population growth from 2010-2021 in the watershed

98

policies totaling approximately \$28,257,900 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

15.7

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

68.7%

13

Flood-related presidential disaster declarations in your county

1

claim for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF ROWLETT

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Create city parks in flood prone areas near Lake Ray Hubbard
- Implement public awareness program
- Create or improve drainage utility infrastructure to minimize stormwater impact or prevent stream bank erosion
- Develop dam inundation maps

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. State Hazard Mitigation Officer may be contacted for additional information.

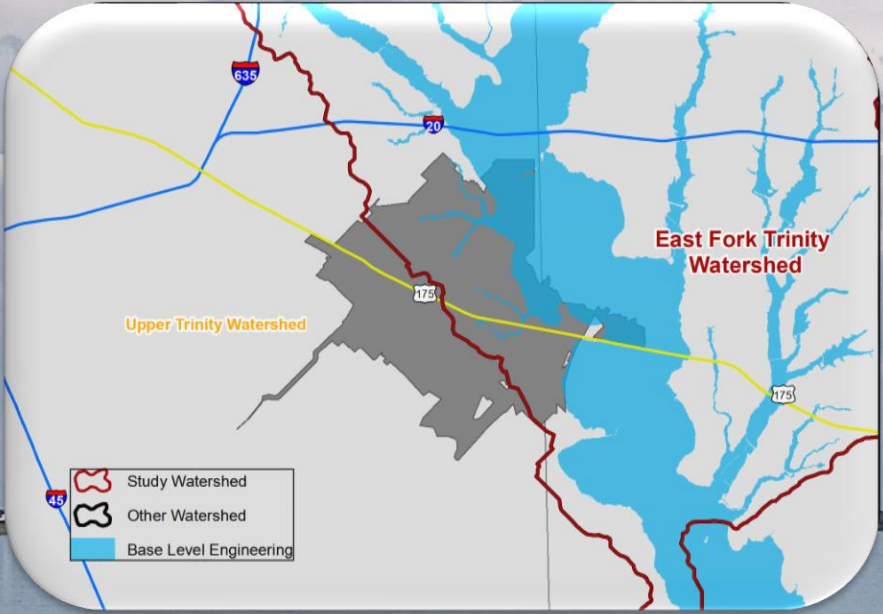
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1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF SEAGOVILLE

KNOW YOUR RISK



11.0
Sq. Miles

of the community is in the watershed

9,293

Population based on 2016 ACS in the watershed

4.8% expected population growth from 2010-2021 in the watershed

11

policies totaling approximately \$2,170,800 in coverage

66.6%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

10.8

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

23.5%

13

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF SEAGOVILLE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Reduce development in open spaces of floodplain
- Public awareness programs
- Installation of a warning system and generators at critical facilities
- Acquisition of flood prone structures

FEMA's Hazard Mitigation Grant Program (HGMP) and the Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities and retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

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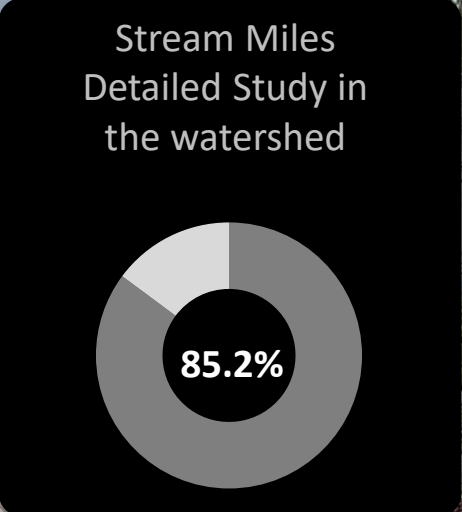
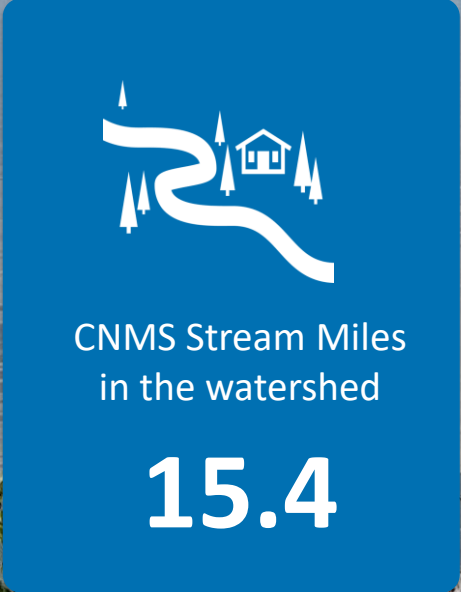
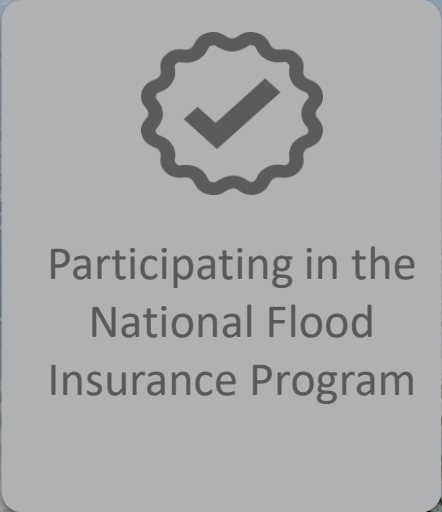
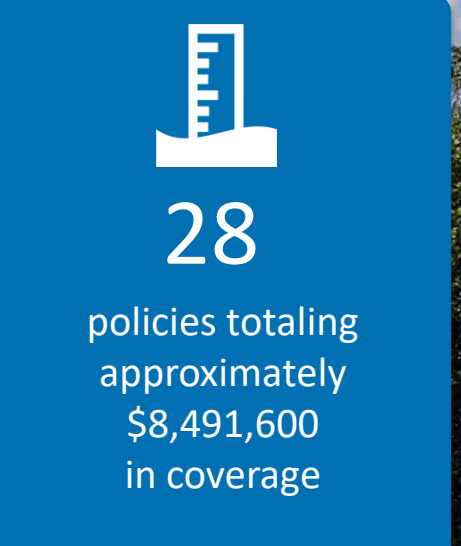
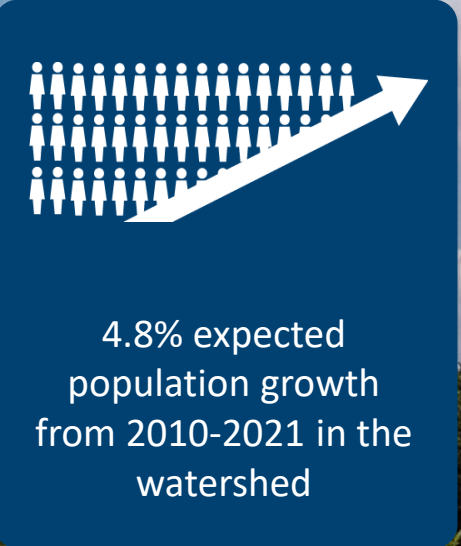
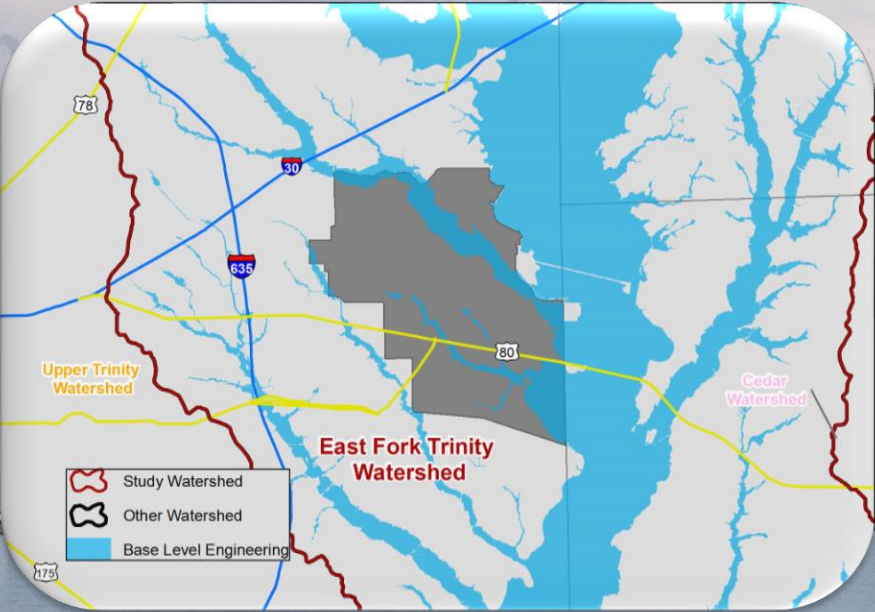
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2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF SUNNYVALE

KNOW YOUR RISK



CITY OF SUNNYVALE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **February 22, 2021**.

The hazard mitigation goals identified projects for:

- Reduce development in open spaces of floodplain
- Public awareness programs
- Installation of a warning system and generators at critical facilities
- Floodproof the water treatment facility
- Study areas for stream bank erosion
- Develop dam inundation maps

FEMA's Hazard Mitigation Grant Program (HGMP) and the Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities and retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

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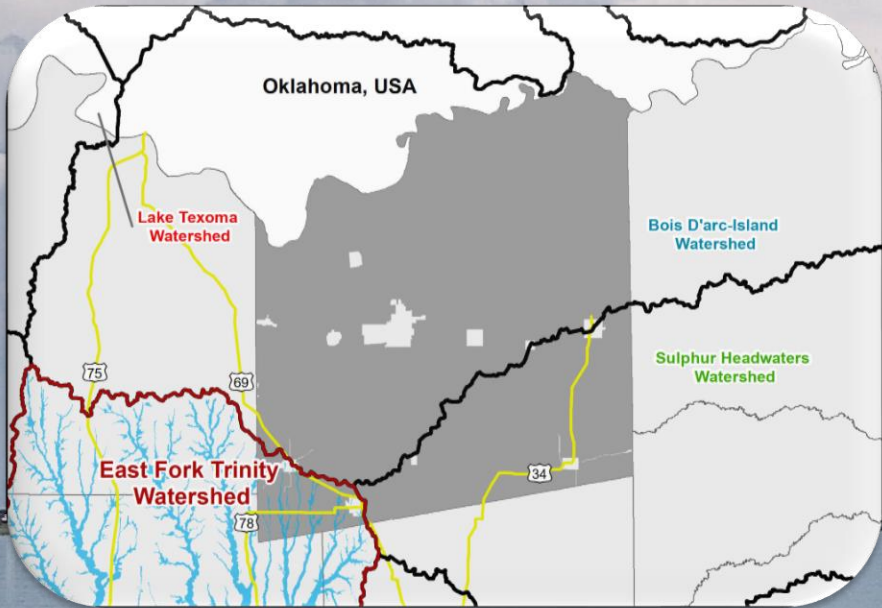
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3. <https://www.twdb.texas.gov/financial/programs/>.

FANNIN COUNTY

KNOW YOUR RISK

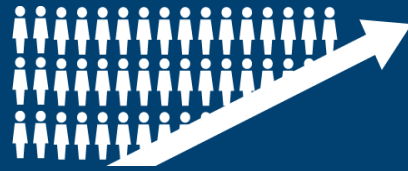


of the community is in the watershed



692

Population based on 2016 ACS in the watershed



2.7% expected population growth from 2010-2021 in the watershed



108

policies totaling approximately \$18,515,000 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

2.2%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



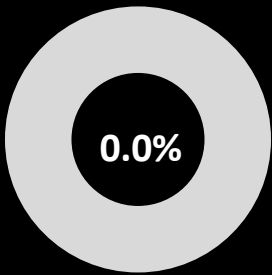
Participating in the National Flood Insurance Program



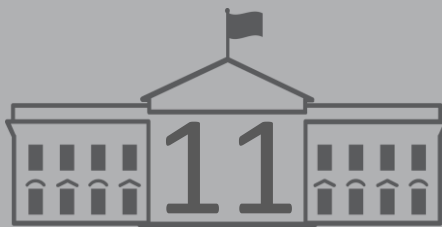
CNMS Stream Miles in the watershed

61.7

Stream Miles Detailed Study in the watershed



0.0%



Flood-related presidential disaster declarations in your county

11

\$0

in severe repetitive loss in the watershed

FANNIN COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **September 24, 2020**.

The hazard mitigation goals identified projects for:

- Establish a certified FPA in the county
- Implement a debris removal plan
- Prohibit development in flood prone areas around Bois D' Arc Lake
- Implement public awareness program, including "Turn Around Don't Drown" campaign
- Further research dam safety and inundation data

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

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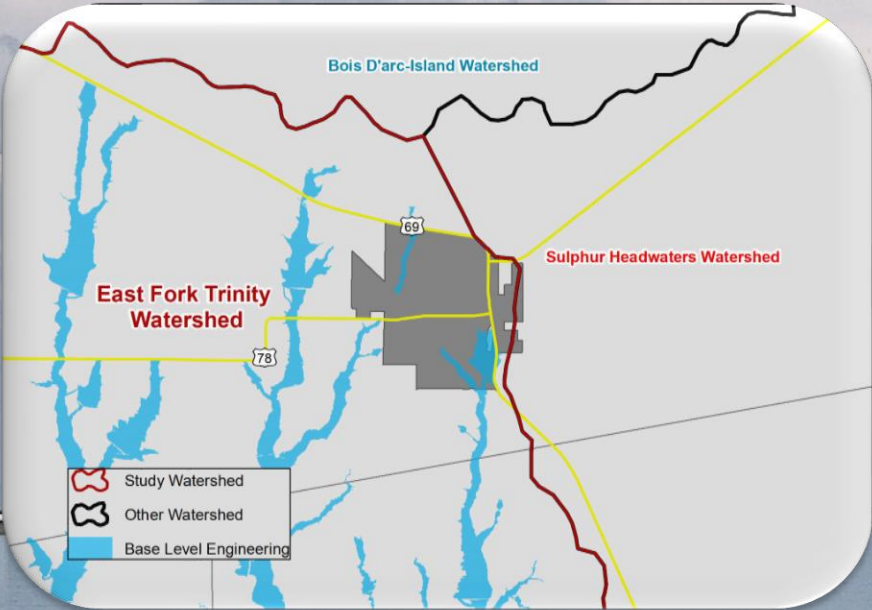
1. <https://www.fema.gov/hazard-mitigation-assistance>.

2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF LEONARD

KNOW YOUR RISK



1.9
Sq. Miles

of the community is in the watershed

2,068

Population based on 2016 ACS in the watershed

2.6% expected population growth from 2010-2021 in the watershed

4

policies totaling approximately \$909,700 in coverage

100%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

2.2

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

0.0%

9

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF LEONARD

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **September 24, 2020**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. Additionally, these programs fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

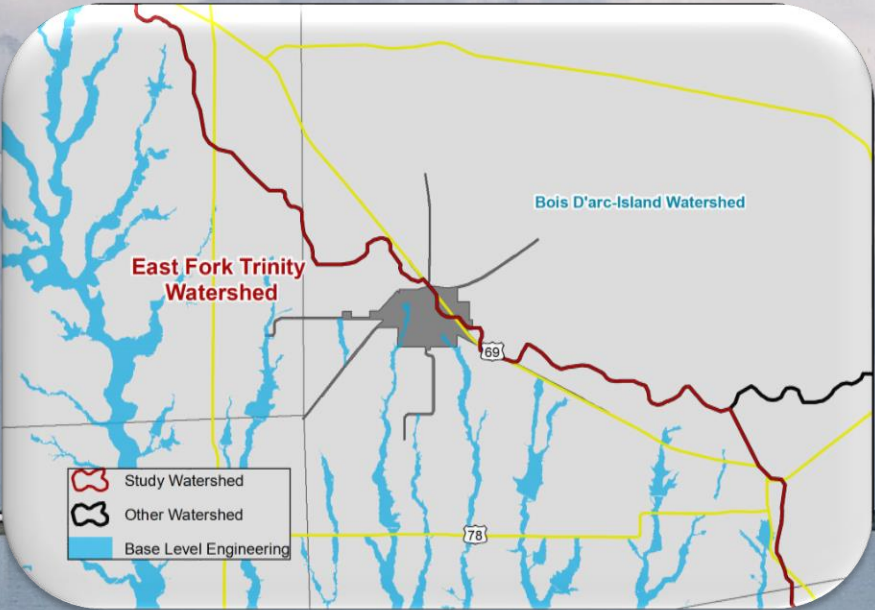
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF TRENTON

KNOW YOUR RISK



1.4
Sq. Miles

of the community is in the watershed

600

Population based on 2016 ACS in the watershed

2.6% expected population growth from 2010-2021 in the watershed

10

policies totaling approximately \$1,585,900 in coverage

98.3%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

1.6

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

0.0%

9

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF TRENTON

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **September 24, 2020**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. Additionally, these programs fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

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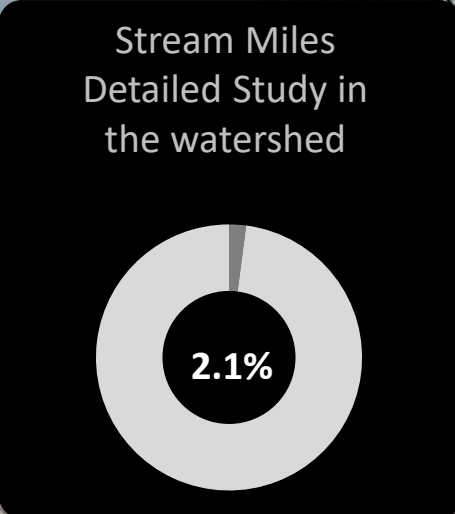
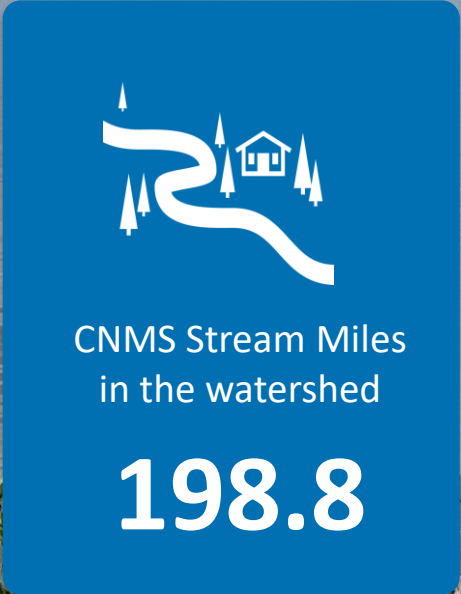
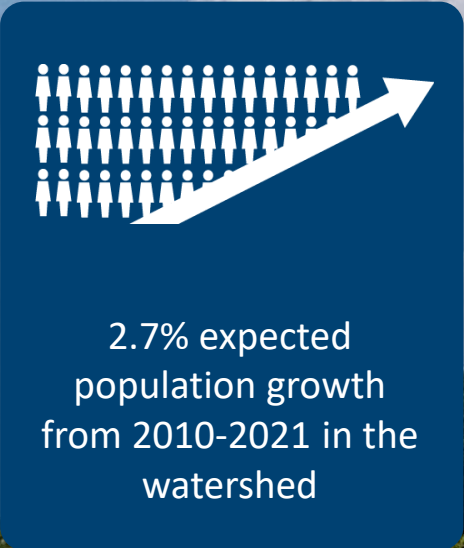
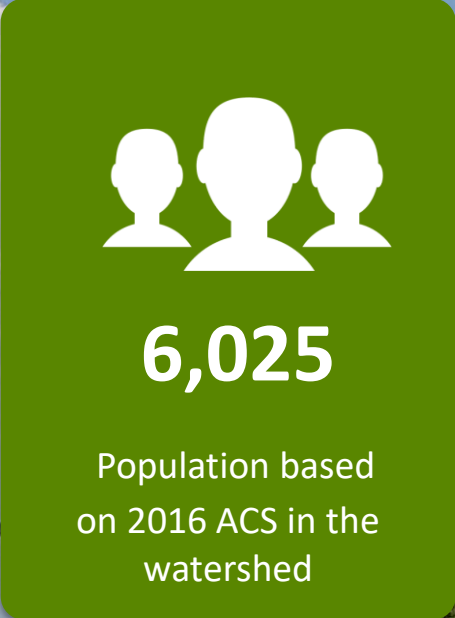
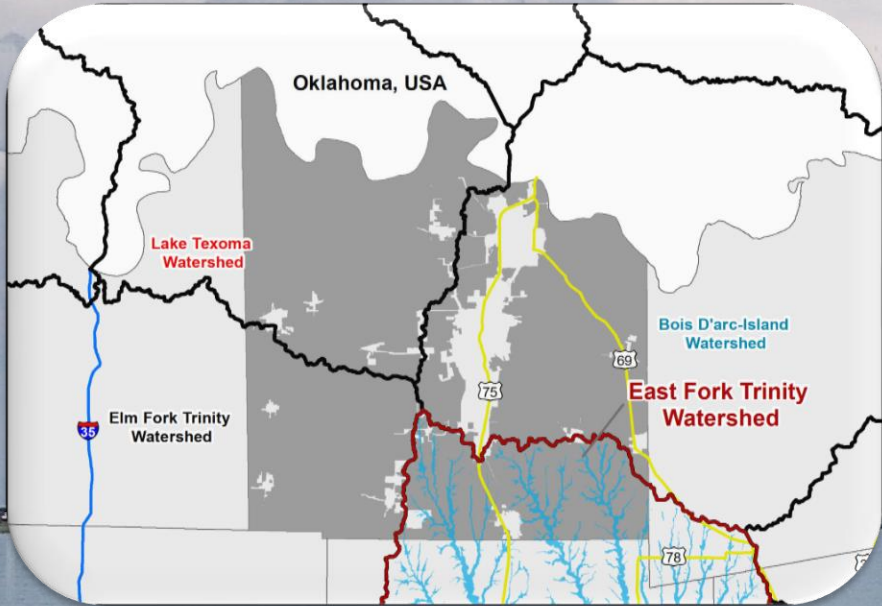
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

GRAYSON COUNTY

KNOW YOUR RISK



GRAYSON COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired.**

The hazard mitigation goals identified projects for:

- Create low-water crossings
- Stream bank erosion reduction
- Create and implement buyout program for repetitive loss structures
- Implement public awareness program, including “Turn Around Don’t Drown” campaign
- Further research dam safety and create Emergency Action Plan

FEMA’s Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB’s Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. PDM grants also are able to fund stream restoration projects. Information about [FEMA’s HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety’s Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

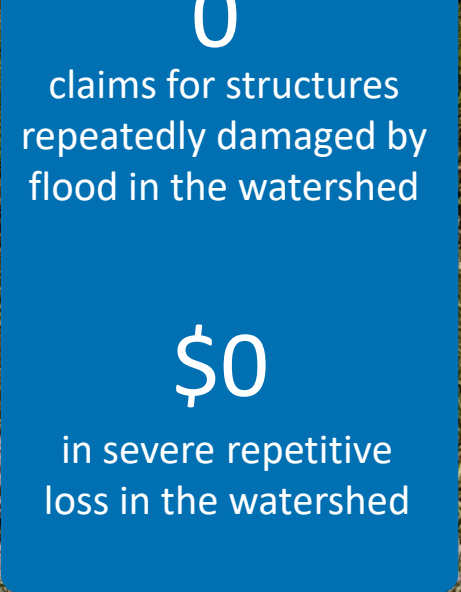
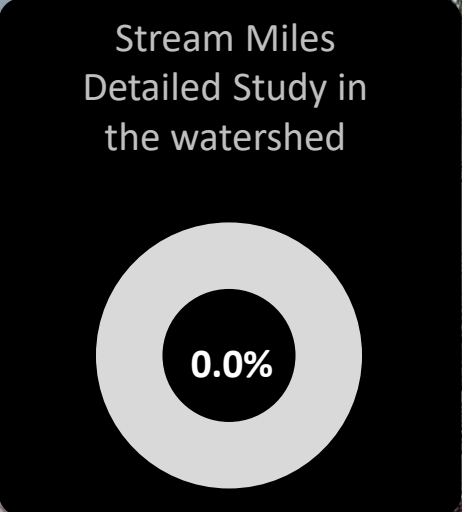
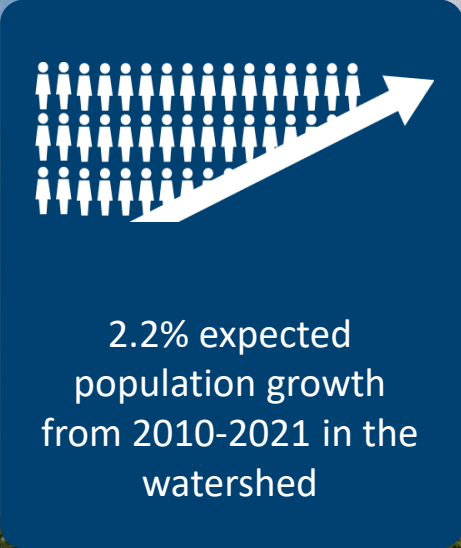
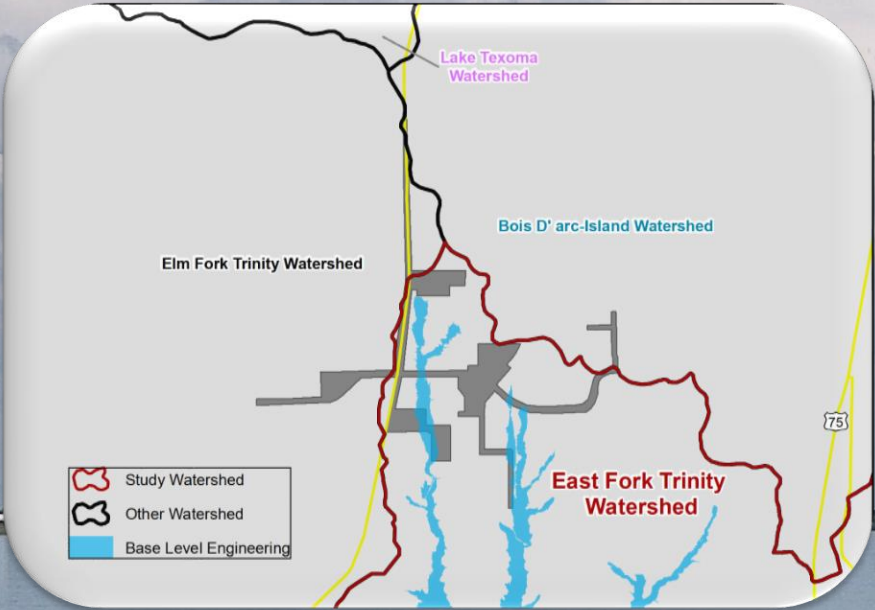
[Texas Water Development Board’s](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure. TWDB also funds the Severe Repetitive Loss (SRL) Grant, which can assist communities in engineering designs, acquisition or water-proofing of sever repetitive loss residential structures.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF DORCHESTER

KNOW YOUR RISK



CITY OF DORCHESTER

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired**.

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Public awareness programs
- Implement a debris removal plan and Stream bank erosion reduction
- Create and adopt construction requirements to minimize flood damage

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. PDM grants also are able to fund stream restoration projects. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP¹](#) can be found on our website. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

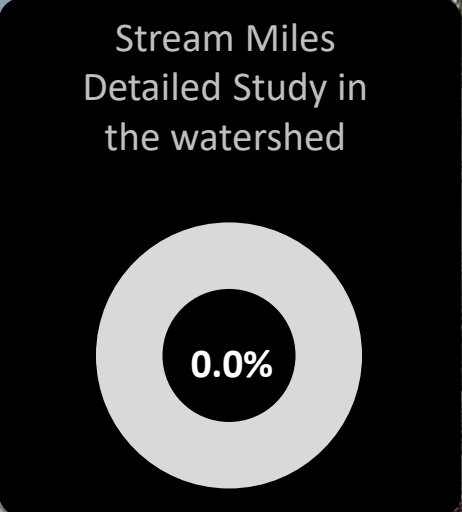
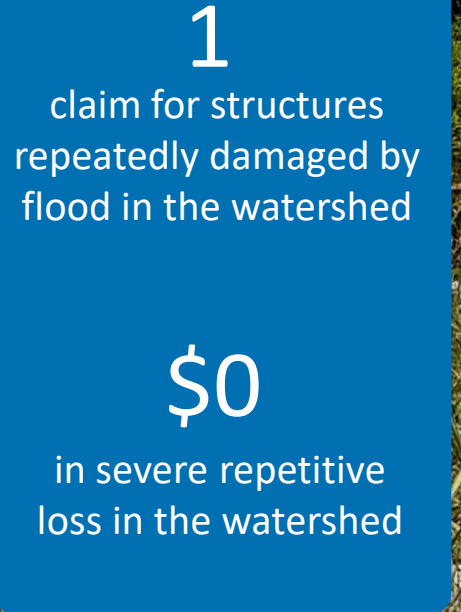
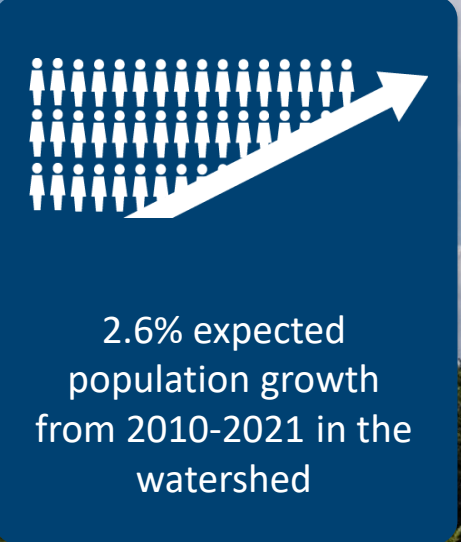
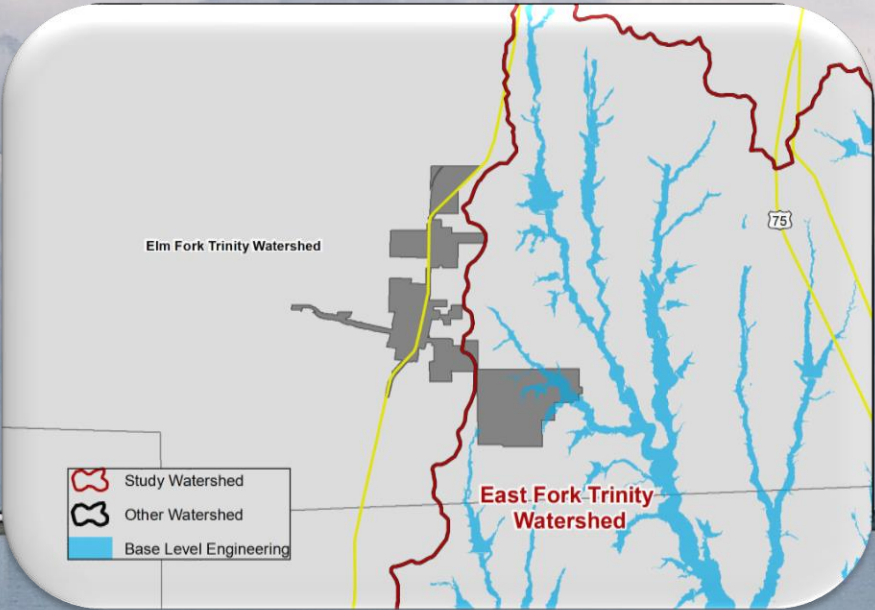
[Texas Water Development Board's³](#) Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning, Emergency Action plans for High Hazard dams, and other planning studies. Both CWSRF and DFund are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF GUNTER

KNOW YOUR RISK



CITY OF GUNTER

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. Additionally, these programs fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

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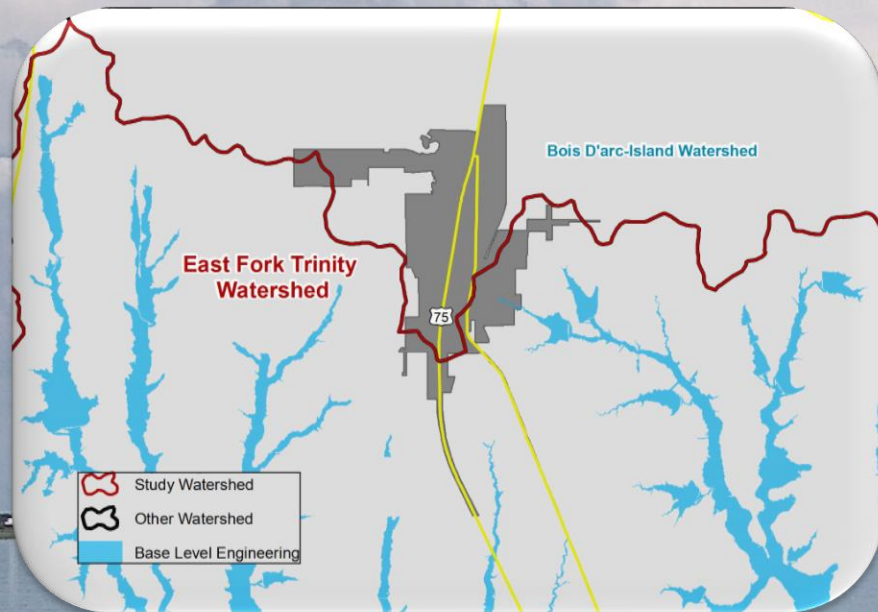
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

TOWN OF HOWE

KNOW YOUR RISK



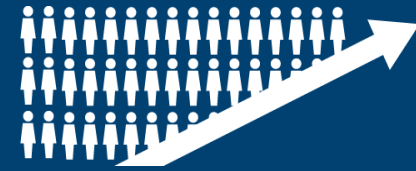
1.2
Sq. Miles

of the community is in the watershed



775

Population based on 2016 ACS in the watershed



2.6% expected population growth from 2010-2021 in the watershed



3

policies totaling approximately \$308,000 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

5.0%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



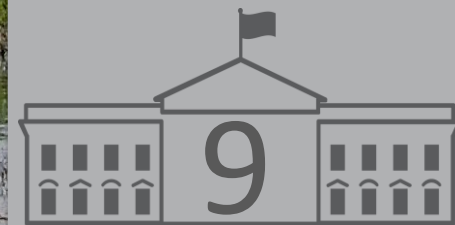
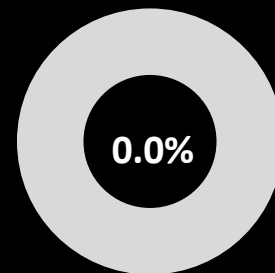
Participating in the National Flood Insurance Program



CNMS Stream Miles in the watershed

0.5

Stream Miles Detailed Study in the watershed



Flood-related presidential disaster declarations in your county

\$0

in severe repetitive loss in the watershed

CITY OF HOWE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Plant vegetation along public stream banks
- Record high water marks

FEMA's Hazard Mitigation Grant Program (HGMP) offers funding for post disaster code enforcement, including debris removal strategies. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. PDM grants also are able to fund stream restoration projects. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

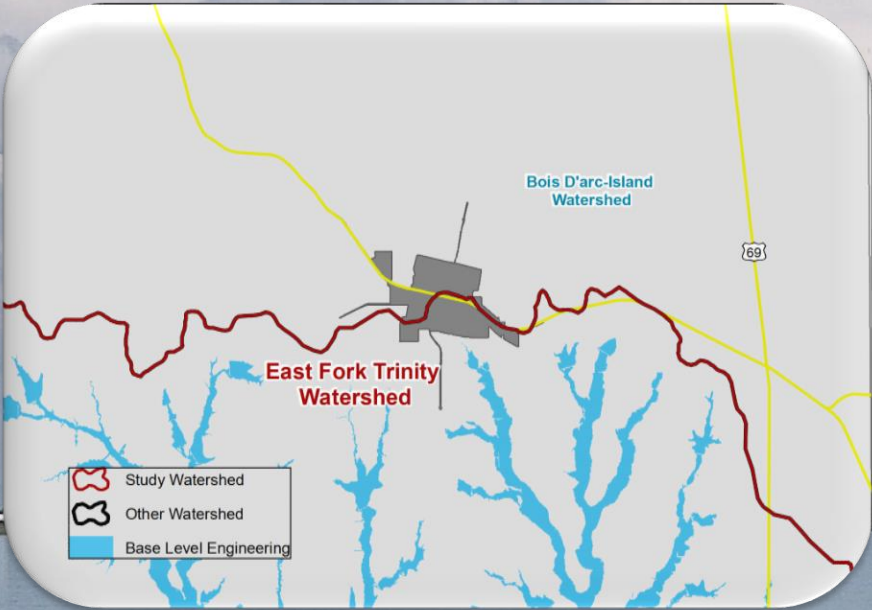
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF TOM BEAN

KNOW YOUR RISK



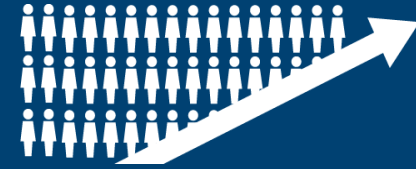
0.7
Sq. Miles

of the community is in the watershed



432

Population based on 2016 ACS in the watershed



2.2% expected population growth from 2010-2021 in the watershed



0

policies totaling approximately \$0 in coverage

0

claims for structures repeatedly damaged by flood in the watershed

0.0%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed



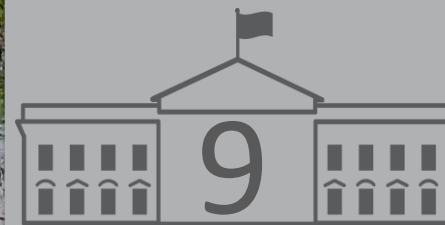
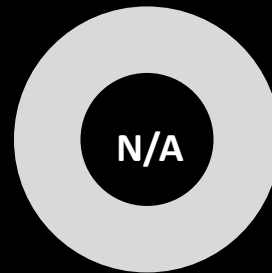
Not participating in the National Flood Insurance Program



CNMS Stream Miles in the watershed

0.0

Stream Miles Detailed Study in the watershed



Flood-related presidential disaster declarations in your county

\$0

in severe repetitive loss in the watershed

CITY OF TOM BEAN

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **expired.**

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Coordinate with all flooding programs for local activities
- Public awareness programs
- Prepare housing in event of flood-damaged homes

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP¹](#) can be found on our website. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

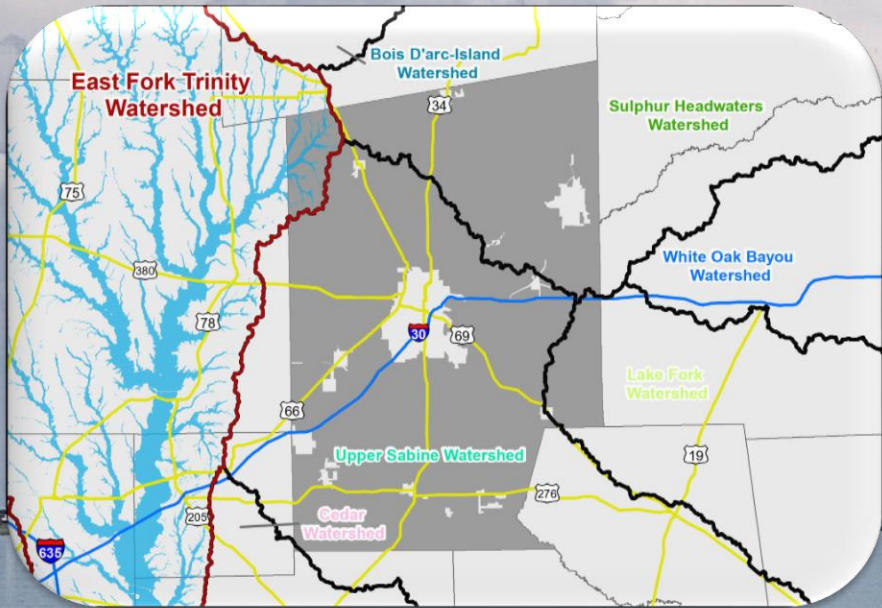
[Texas Water Development Board's³](#) Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

HUNT COUNTY

KNOW YOUR RISK



29.3
Sq. Miles

of the community is in the watershed

1,603

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

140

policies totaling approximately \$33,423,600 in coverage

2.0%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

47.6

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

0.0%

8

Flood-related presidential disaster declarations in your county

4

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

HUNT COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire **August 18, 2020**.

The hazard mitigation goals identified projects for:

- Further research dam safety and inundation data
- Create and implement buyout program for structures within the 100 year floodplain
- Implement public awareness program
- Promote “Turn Around Don’t Drown” campaign and signage at low-water crossings
- Increase early warning system and distribute NOAA radios to vulnerable residents

FEMA’s Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB’s Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, sirens, or barricades at low-water crossings. Information about [FEMA’s HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety’s Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

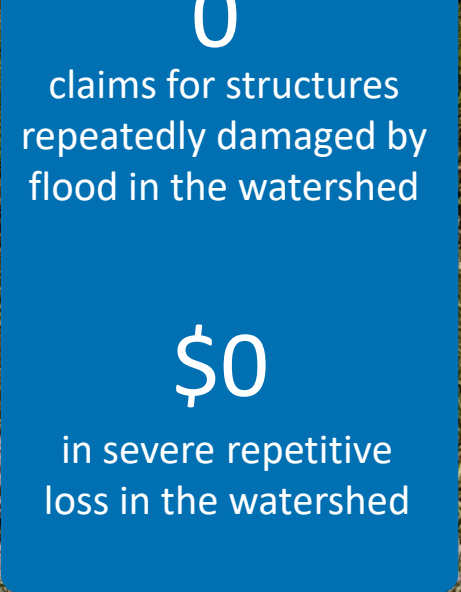
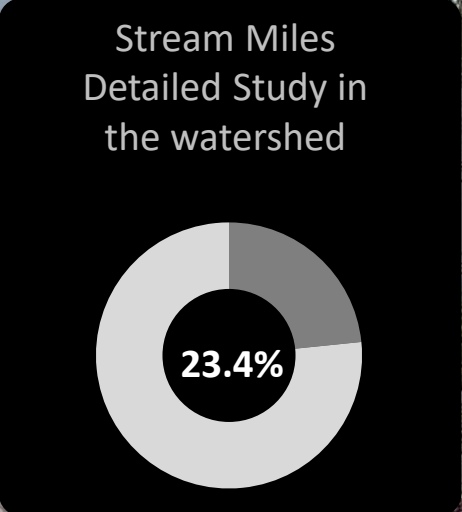
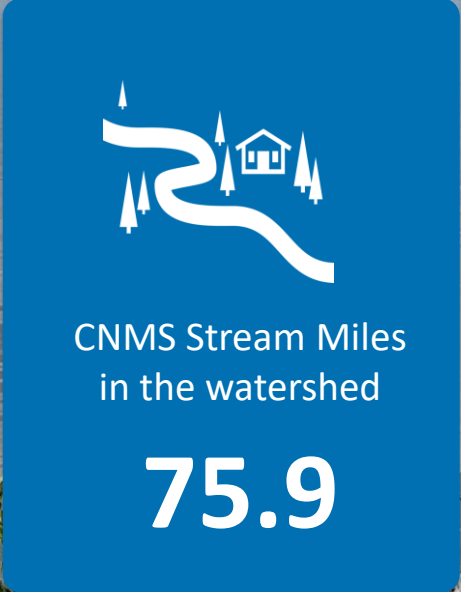
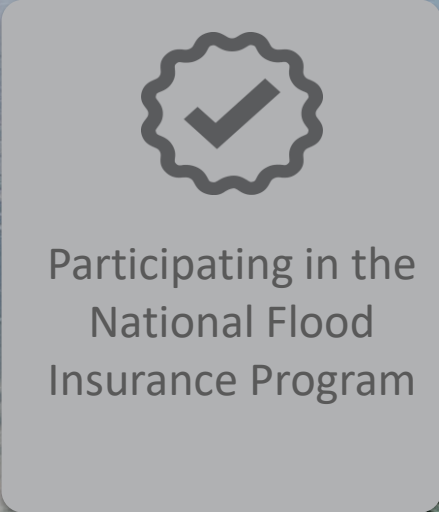
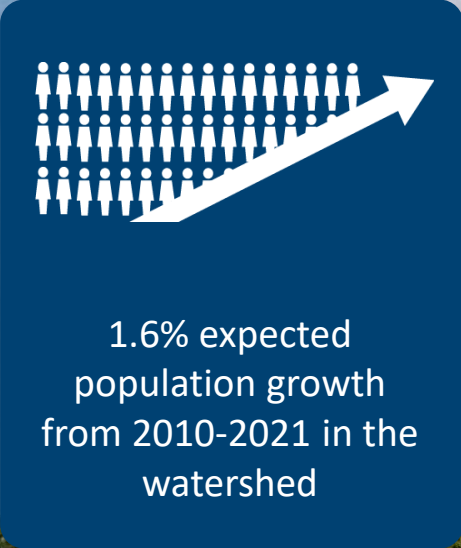
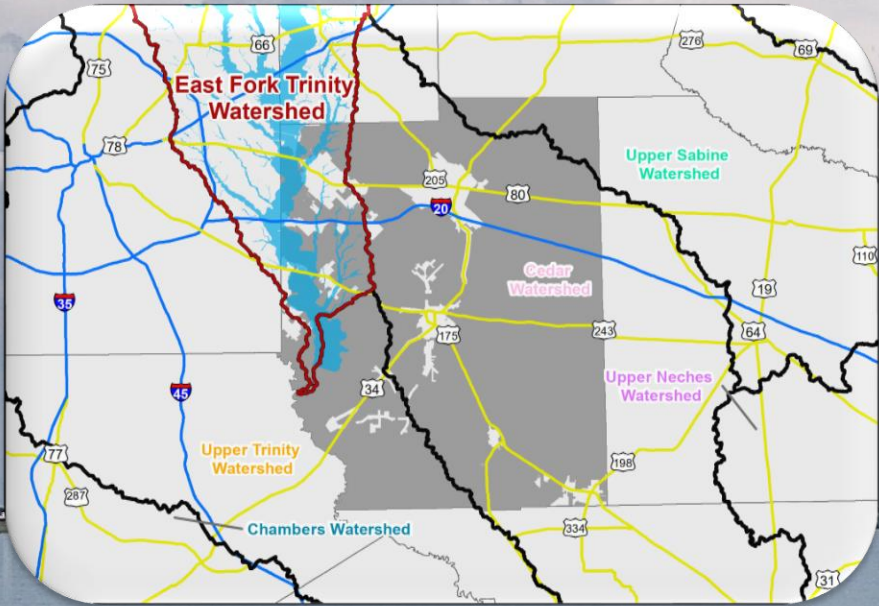
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The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

KAUFMAN COUNTY

KNOW YOUR RISK



KAUFMAN COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Join Community Rating System (CRS) program
- Prohibit further development in open space flood-prone areas
- Create pre-disaster debris removal contracts
- Installation of a warning system, barricades at low-water crossings, and permanent generators

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, sirens, or barricades at low-water crossings. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. Participation in FEMA's [Community Rating System](#)³ (CRS) reduces insurance premiums up to 45%, and FEMA will provide free technical assistance in designing and implementing programs designed to reduce flood damage. The State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)⁴ Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.

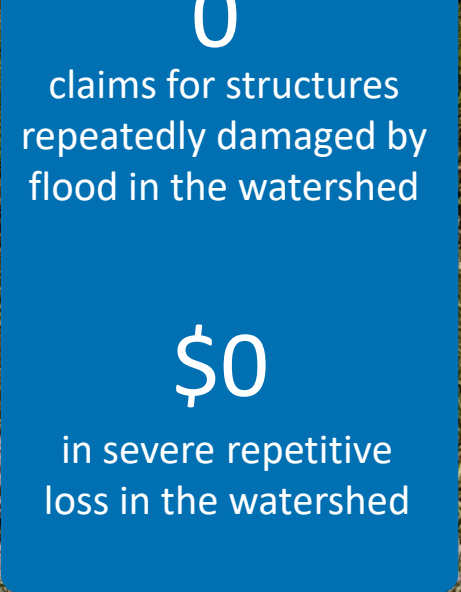
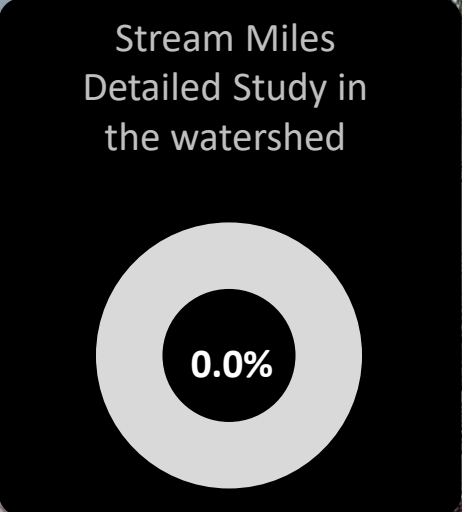
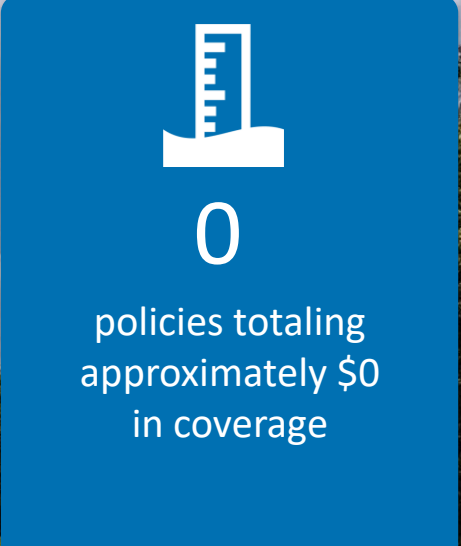
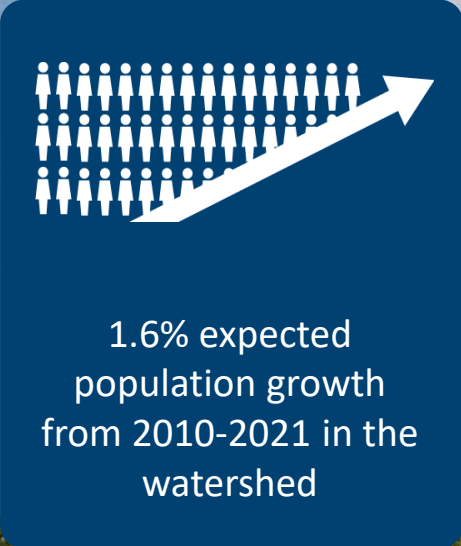
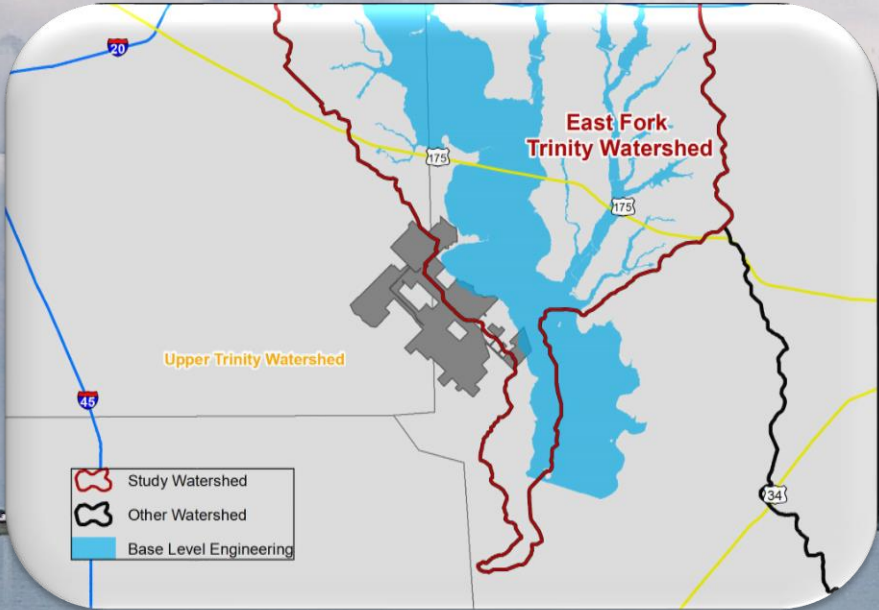
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.fema.gov/community-rating-system>.

4. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF COMBINE

KNOW YOUR RISK



CITY OF COMBINE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Installation of a warning system and permanent generators at critical facilities
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP¹](#) can be found on our website. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

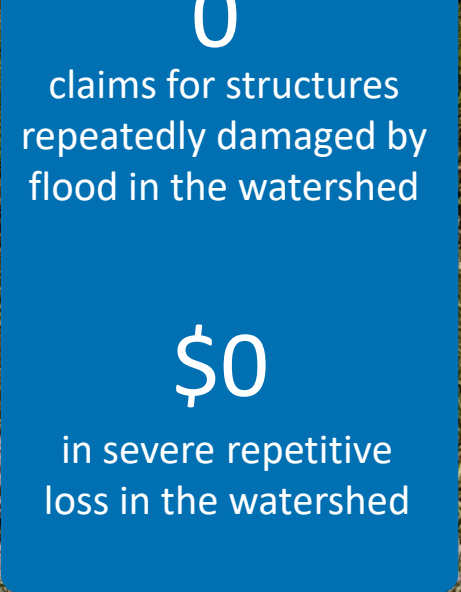
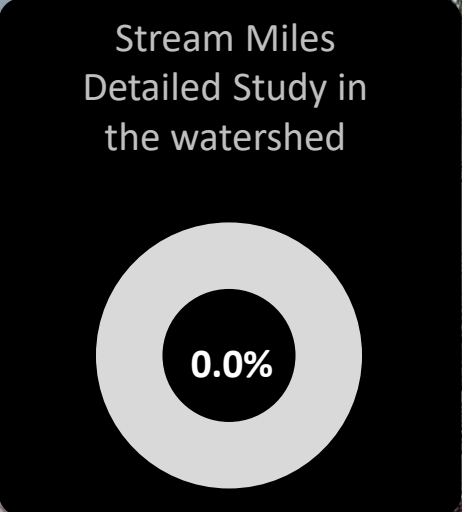
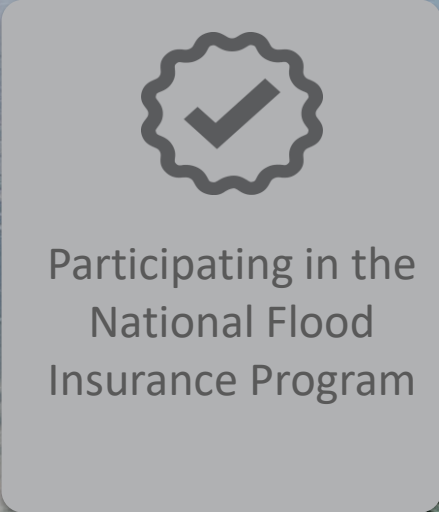
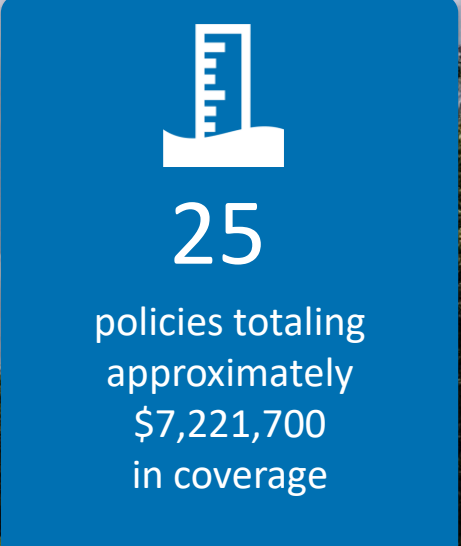
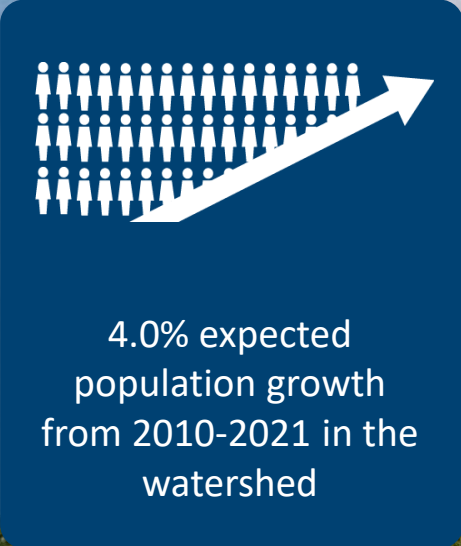
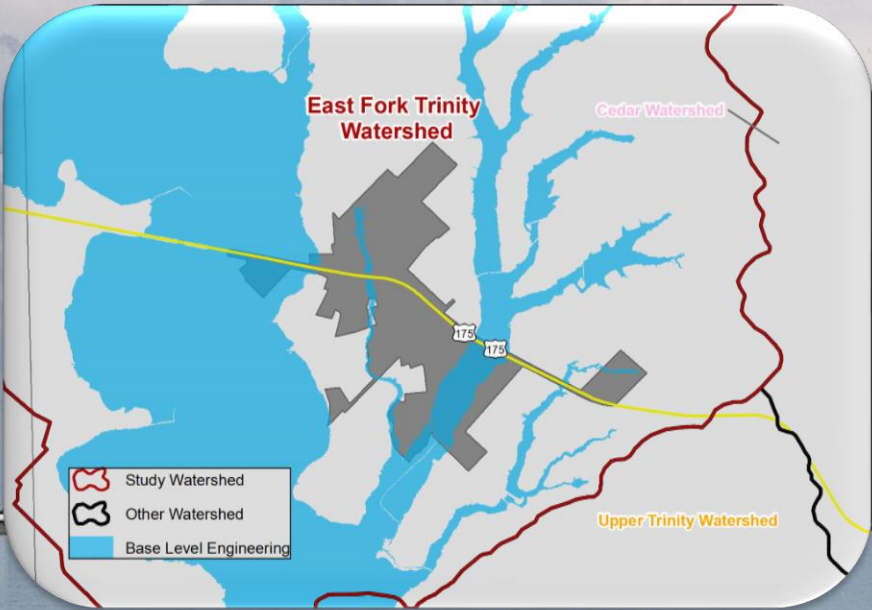
[Texas Water Development Board's³](#) Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF CRANDALL

KNOW YOUR RISK



CITY OF CRANDALL

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Public awareness programs
- Installation of a warning system and generators
- Study and improve drainage utility infrastructure to minimize the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

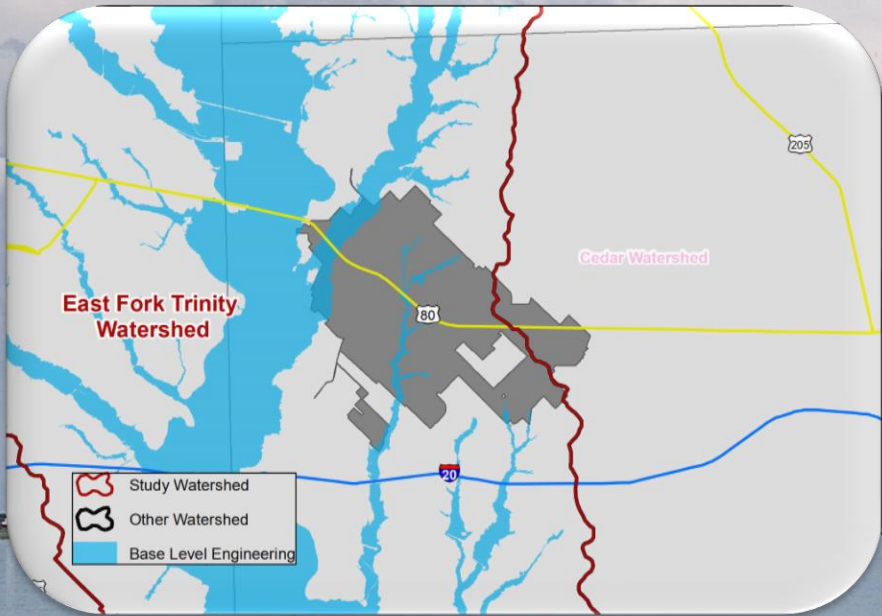
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF FORNEY

KNOW YOUR RISK



12.7
Sq. Miles

of the community is in the watershed

15,076

Population based on 2016 ACS in the watershed

2.7% expected population growth from 2010-2021 in the watershed

23

policies totaling approximately \$6,137,200 in coverage

98.0%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

8.3

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

96.5%

8

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF FORNEY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Prohibit further development in open space flood-prone areas
- Installation of a warning system, barricades at low-water crossings, and permanent generators
- Public awareness programs

FEMA's Hazard Mitigation Grant Program (HGMP) and Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, sirens, or barricades at low-water crossings. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs. Both CWSRF and DFund are long term-fixed interest loans which can be used for building water quality and green infrastructure.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

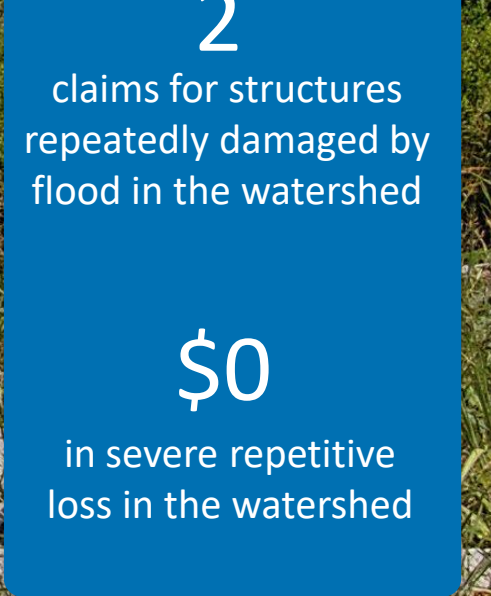
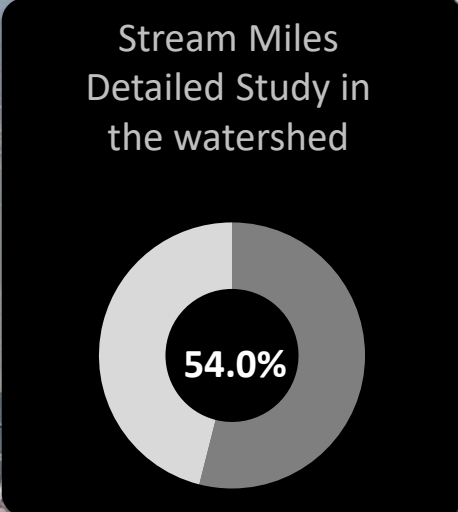
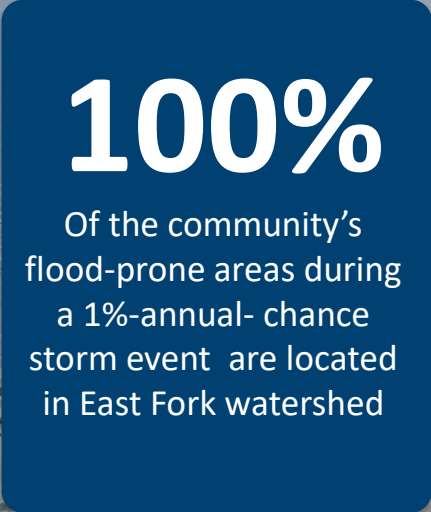
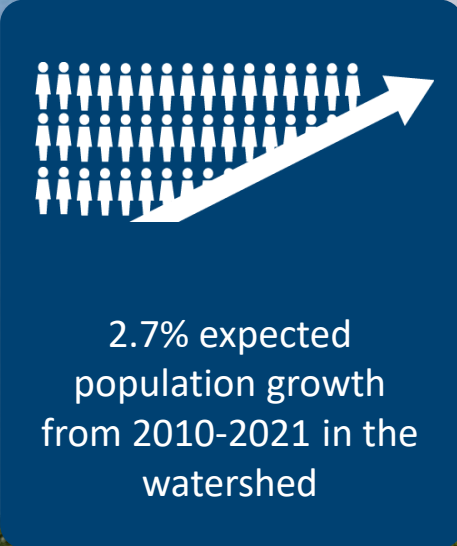
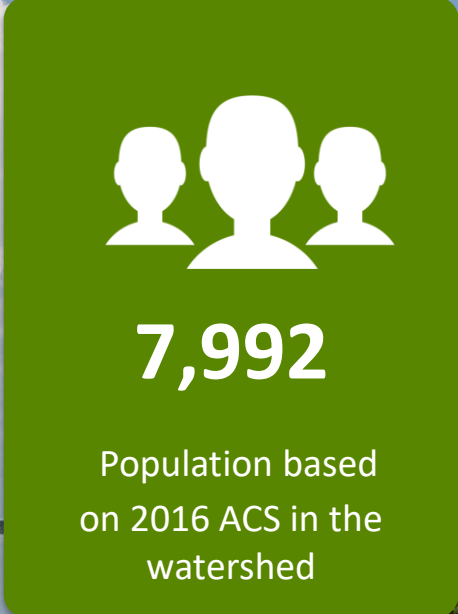
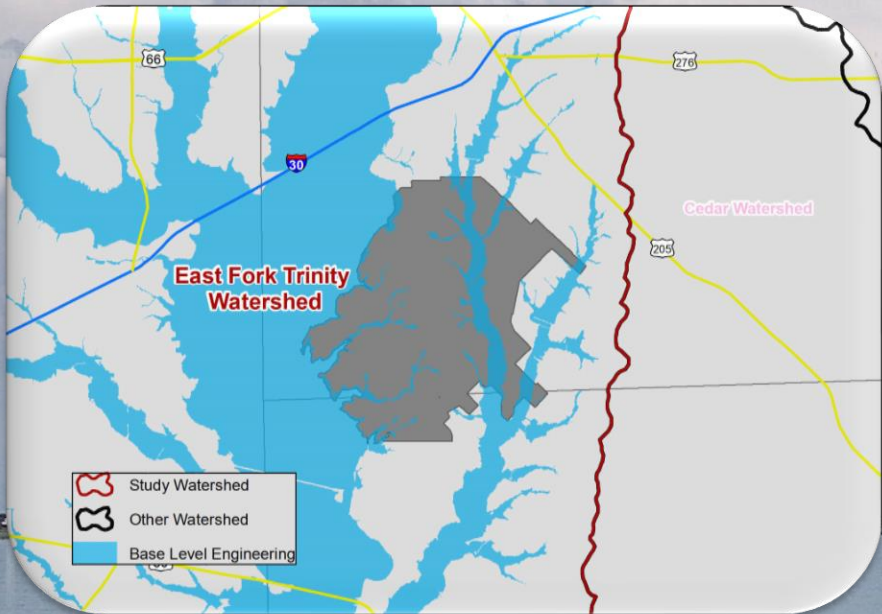
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF HEATH

KNOW YOUR RISK



CITY OF HEATH

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Implement tree trimming program
- Floodproof electronic controls of city infrastructure
- Installation of a warning system, flood control structures, and permanent generators
- Public awareness programs

FEMA's Hazard Mitigation Grant Program (HGMP) and Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities or retrofits to existing structures and infrastructure. There may be eligibility, benefit cost analysis, and cost-share requirements. HMGP and PDM allow for the funding of structural hazards control, such as gabion walls and levees. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, sirens, or barricades at low-water crossings. HMGP also offers funding for post disaster code enforcement, including community-wide tree trimming strategies. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

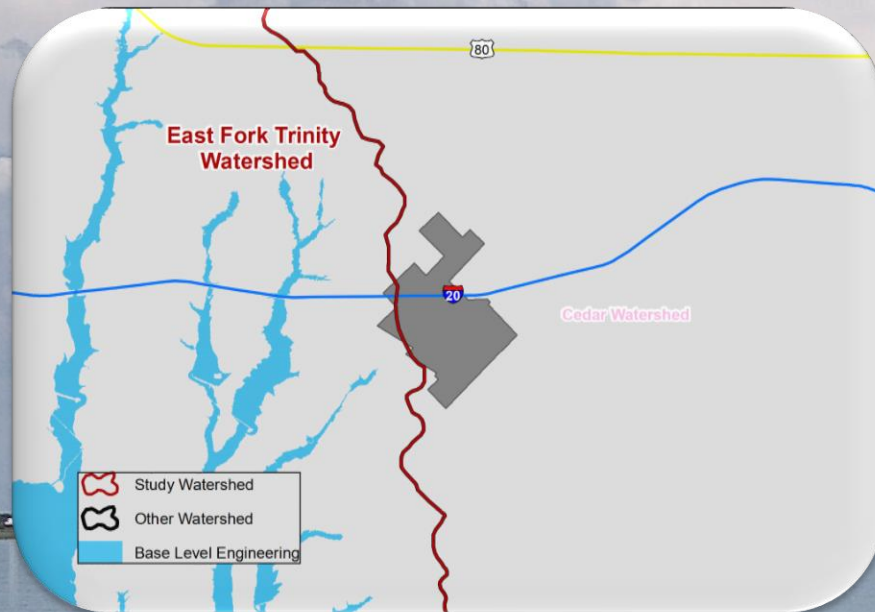
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

TOWN OF TALTY

KNOW YOUR RISK



0.1
Sq. Miles

of the community is in the watershed

68

Population based on 2016 ACS in the watershed

2.6% expected population growth from 2010-2021 in the watershed

3

policies totaling approximately \$1,050,000 in coverage

X

The community does not contain flood-prone areas during a 1%-annual- chance storm event

Participating in the National Flood Insurance Program

0.0

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

N/A

8

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

TOWN OF TALTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is **awaiting adoption.**

The hazard mitigation goals identified projects for:

- Higher floodplain management standards
- Public awareness programs.
- Installation of a warning system and generators
- Acquisition of flood prone structures
- Design, engineering, and installation of drainage utility infrastructure to minimize or reduce the impact of stormwater

FEMA's Hazard Mitigation Grant Program (HGMP), the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all allow for acquisition, demolition, relocation, or retrofits to existing structures and infrastructure. Additionally, these programs fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) are long term-fixed interest loans which can be used for acquisition or flood-proofing insured structures, and building water quality and green infrastructure. TWDB also funds the Severe Repetitive Loss (SRL) Grant, which can assist communities in engineering designs, acquisition or water-proofing of severe repetitive loss residential structures.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

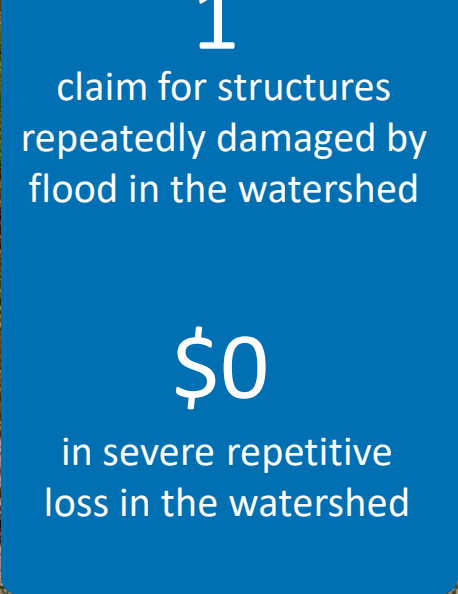
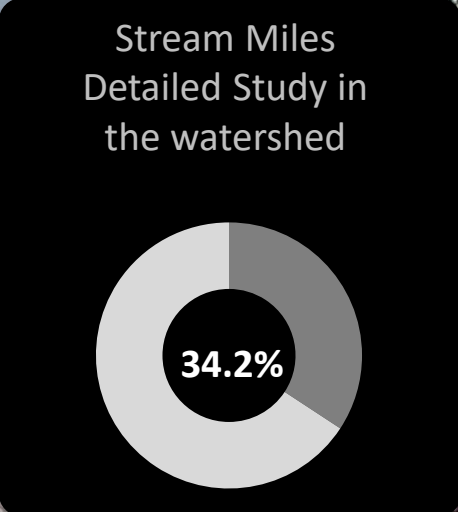
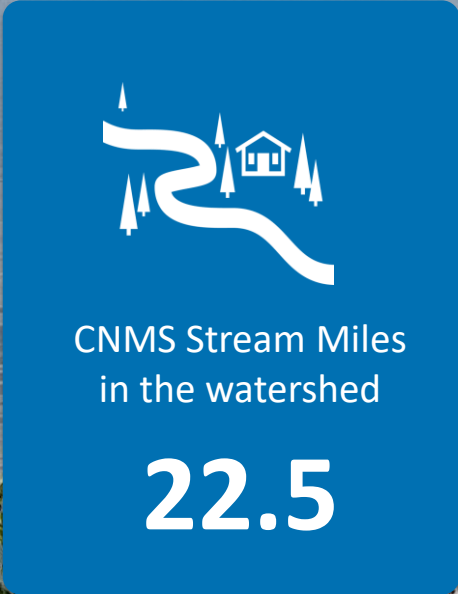
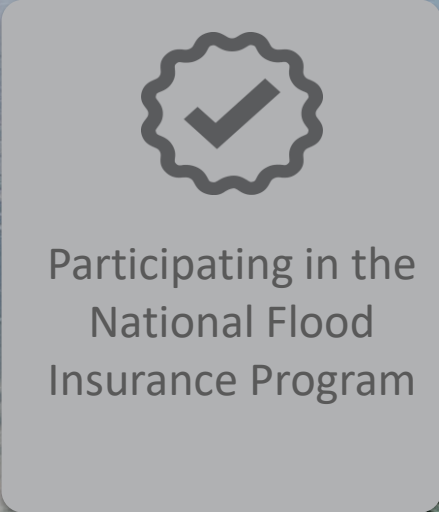
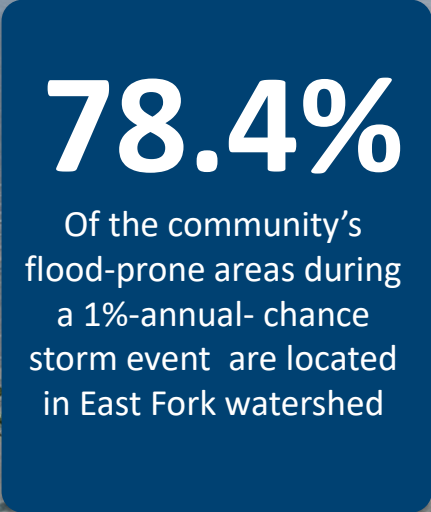
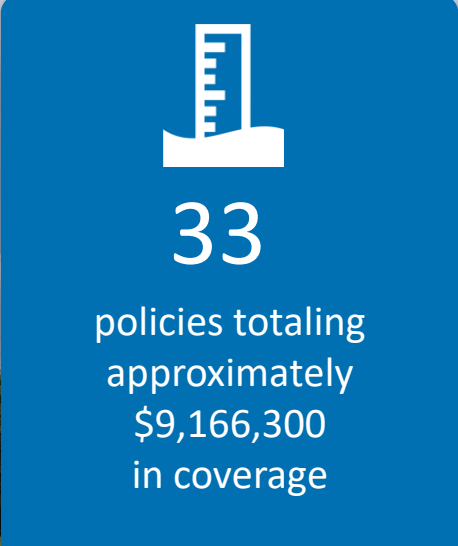
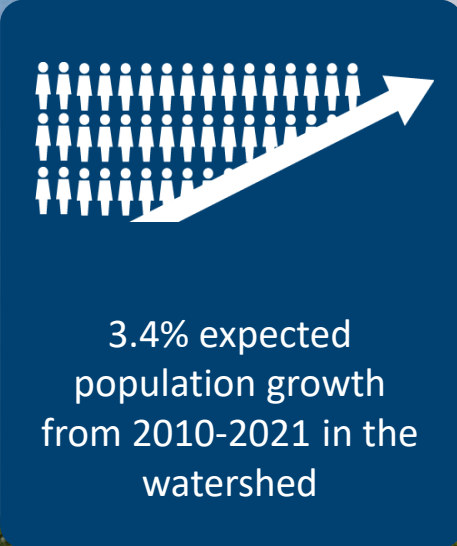
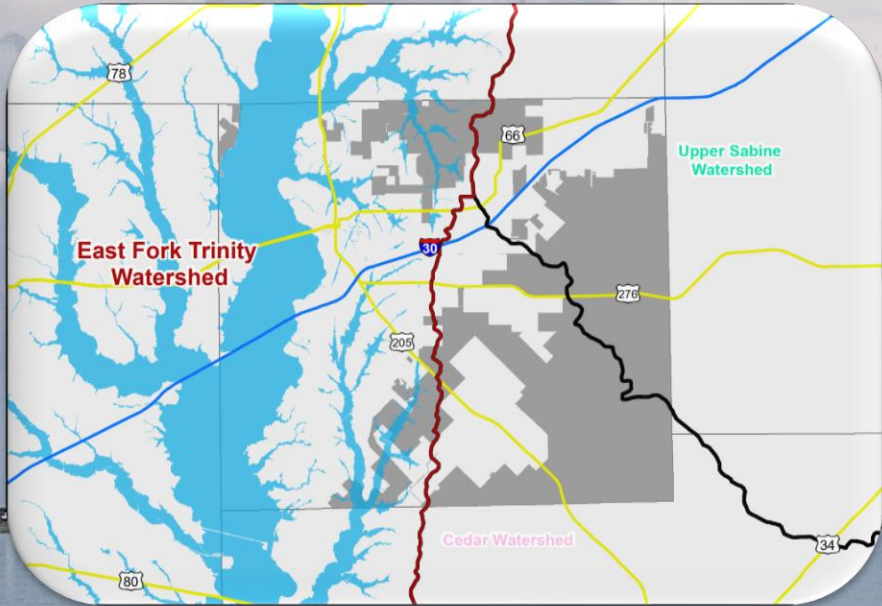
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

ROCKWALL COUNTY

KNOW YOUR RISK



ROCKWALL COUNTY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **July 31, 2022**.

The hazard mitigation goals identified projects for:

- Create a “Continuity of Operations” plan to limit county service interruptions in a natural hazard event
- Implement a debris removal plan before and after flood events
- Public awareness programs
- Installation of a warning system and generators

FEMA’s Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. Information about [FEMA’s HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety’s Emergency Management Forms and Publications](#)² website. The State Hazard Mitigation Officer may be contacted for additional information.

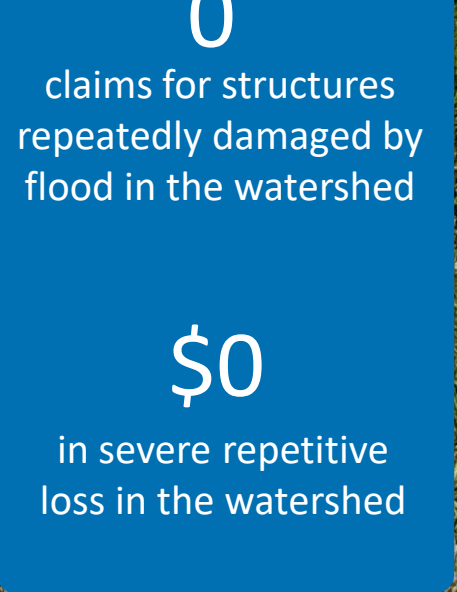
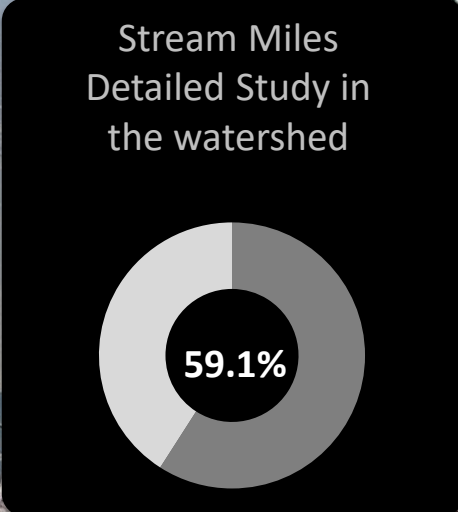
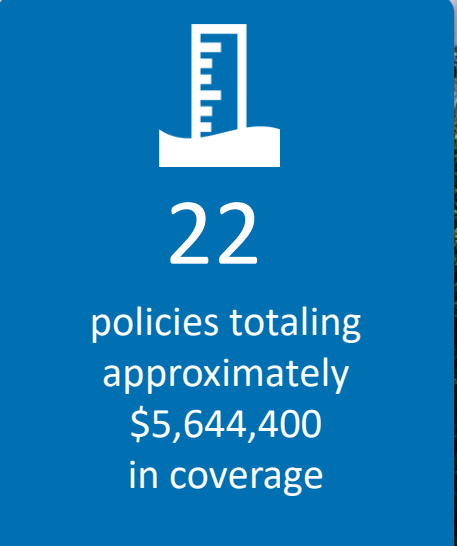
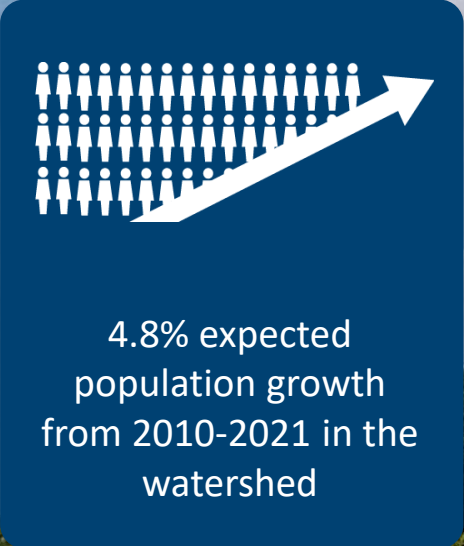
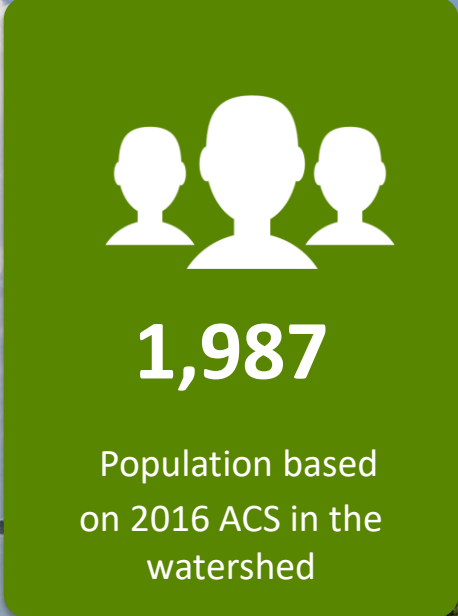
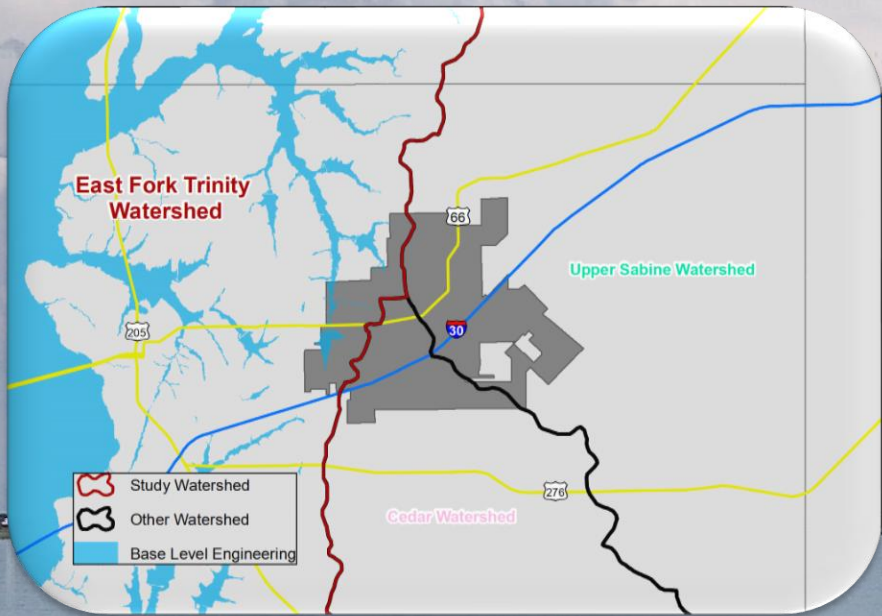
“Continuity of Operations” planning aims to limit interruptions to critical government functions during and following a natural hazard event. Resources for creating this plan are available on the [State Office of Risk Management’s website](#)³.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/hazard-mitigation-assistance>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.sorm.state.tx.us/coop/texas-coop>

CITY OF FATE

KNOW YOUR RISK



CITY OF FATE

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **July 31, 2022**.

The hazard mitigation goals identified projects for:

- Reduce development in open spaces of floodplain
- Enforce dual entry points in new construction
- Public awareness programs
- Installation of a warning system and generators

FEMA's Hazard Mitigation Grant Program (HGMP) and the Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs. Both CWSRF and DFund are long term-fixed interest loans.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

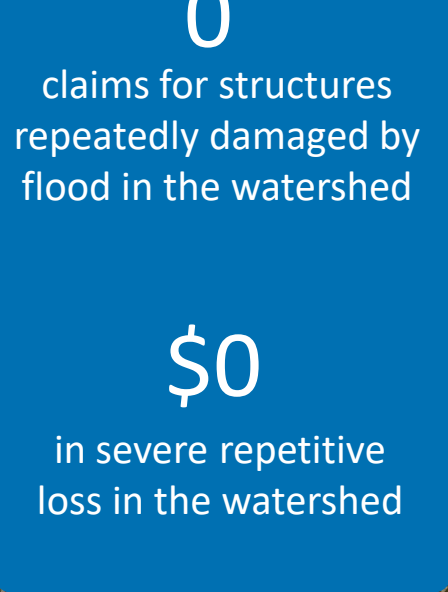
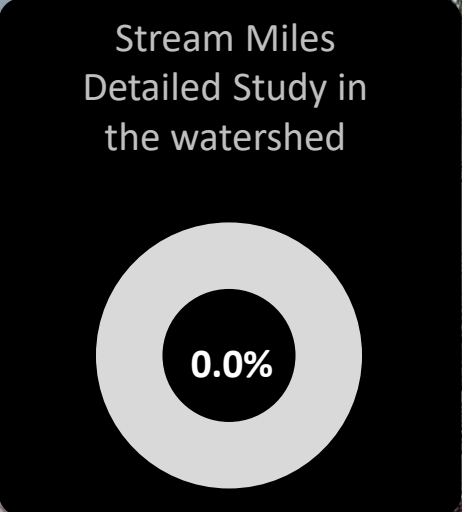
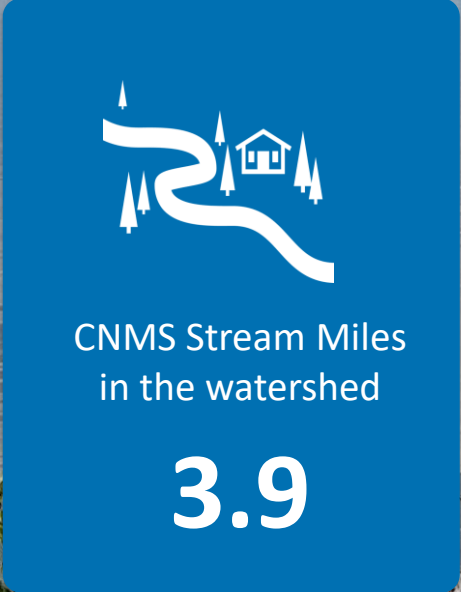
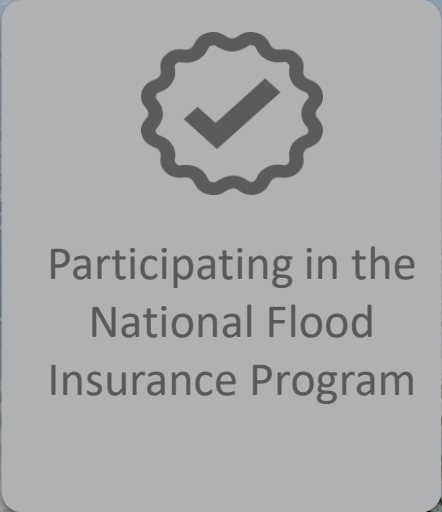
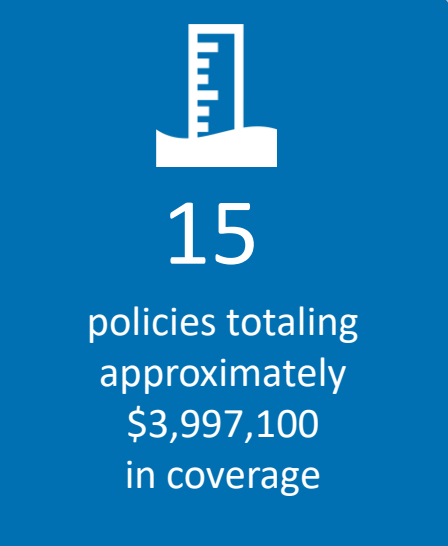
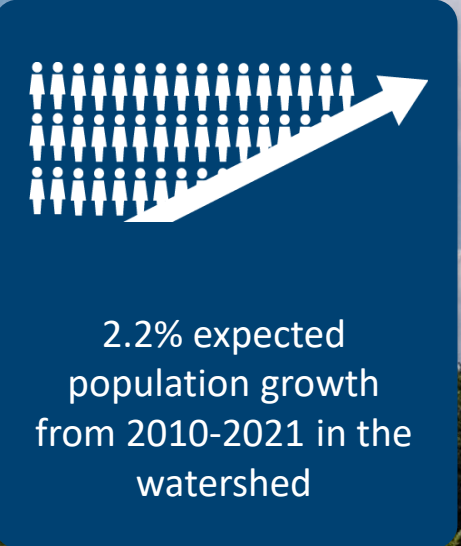
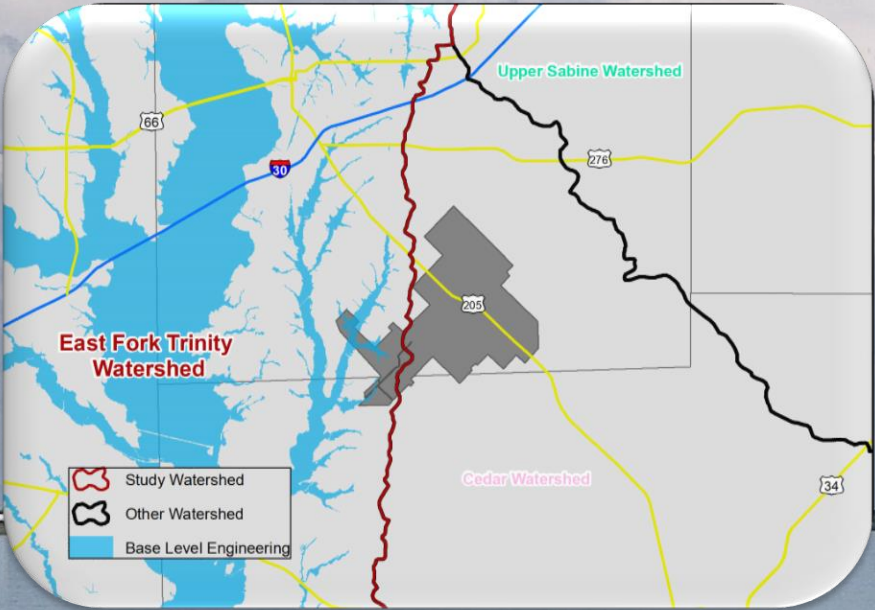
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MCLENDON-CHISHOLM

KNOW YOUR RISK



CITY OF MCLENDON-CHISHOLM

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **July 31, 2022**.

The hazard mitigation goals identified projects for:

- Public awareness programs
- Installation of a warning system and generators

FEMA's Hazard Mitigation Grant Program (HGMP) and the Pre-Disaster Mitigation Grant (PDM) allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. Information about [FEMA's HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety's Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board's](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs. Both CWSRF and DFund are long term-fixed interest loans.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

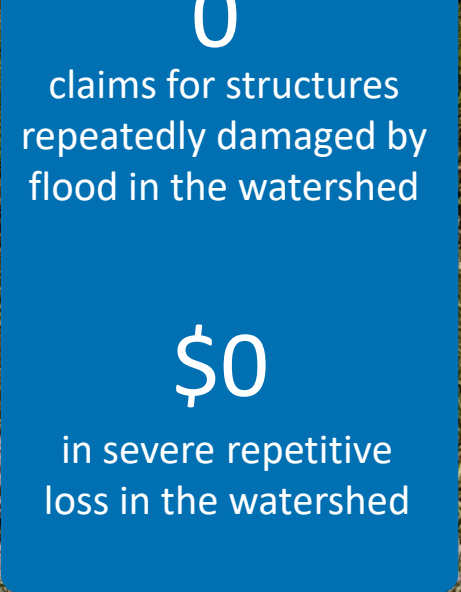
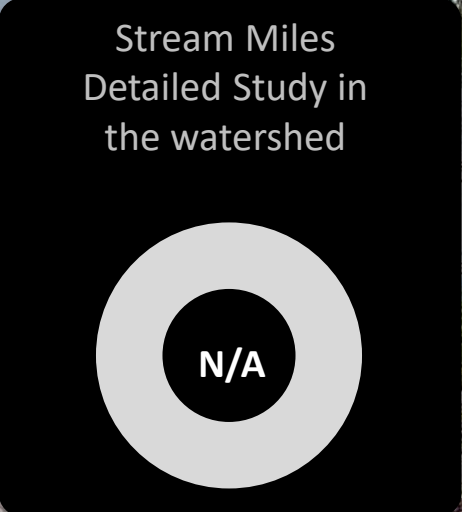
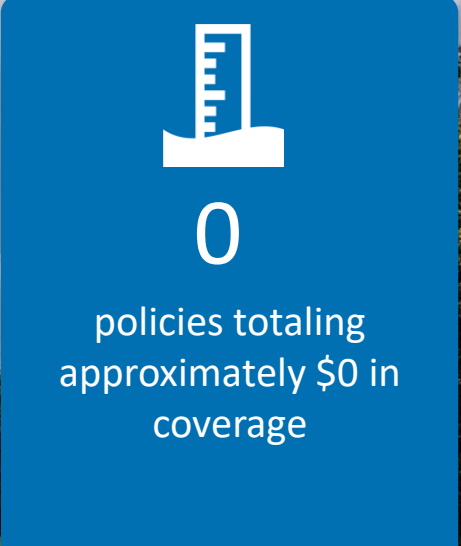
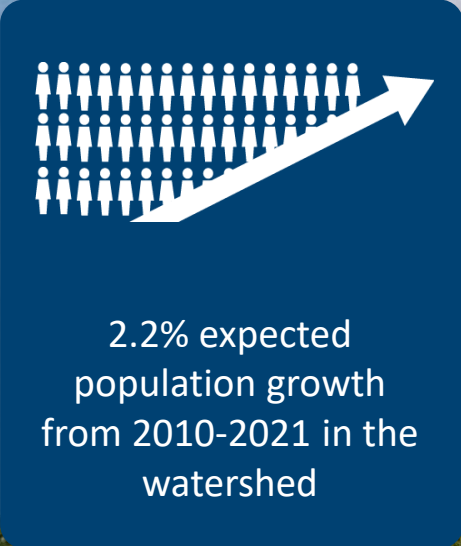
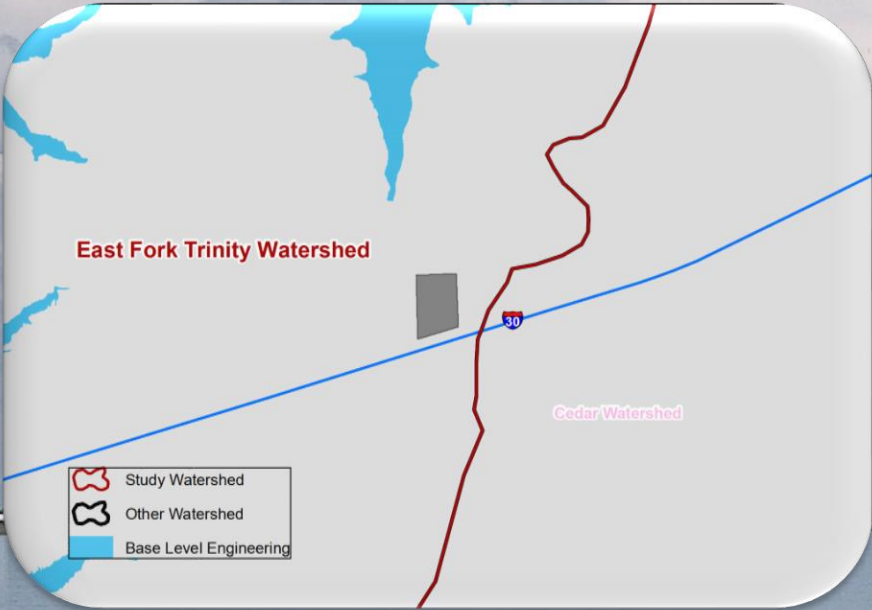
1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF MOBILE CITY

KNOW YOUR RISK



CITY OF MOBILE CITY

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **July 31, 2022**.

The hazard mitigation goals identified projects for:

- Join National Flood Insurance Program (NFIP)
- Public awareness programs
- Implement a debris removal plan

FEMA's Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Grant (PDM), and TWDB's Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including debris removal strategies. The National Flood Insurance Program (NFIP) insures structures within the Special Flood Hazard Area, provides post-disaster assistance, and encourages local community regulation. More information about and about [joining the NFIP¹](#) can be found on our website. Grant information is available on the [Texas Department of Public Safety's Emergency Management Forms and Publications²](#) website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

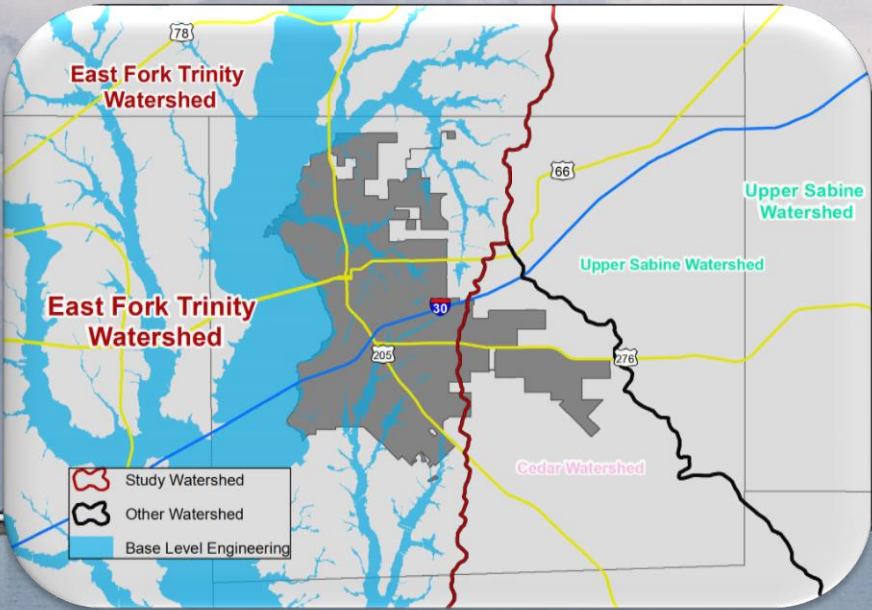
[Texas Water Development Board's³](#) Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for hazard mitigation planning and engineering designs. Both CWSRF and DFund are long term-fixed interest loans.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1. <https://www.fema.gov/media-library/assets/documents/13610>.
2. <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.
3. <https://www.twdb.texas.gov/financial/programs/>.

CITY OF ROCKWALL

KNOW YOUR RISK



24.8
Sq. Miles

of the community is in the watershed

31,193

Population based on 2016 ACS in the watershed

4.0% expected population growth from 2010-2021 in the watershed

120

policies totaling approximately \$33,605,200 in coverage

16.6%

Of the community's flood-prone areas during a 1%-annual-chance storm event are located in East Fork watershed

Participating in the National Flood Insurance Program

50.4

CNMS Stream Miles in the watershed

Stream Miles Detailed Study in the watershed

23.4%

5

Flood-related presidential disaster declarations in your county

0

claims for structures repeatedly damaged by flood in the watershed

\$0

in severe repetitive loss in the watershed

CITY OF ROCKWALL

TAKE ACTION: Potential Next Step



Your Hazard Mitigation Plan is set to expire on **July 31, 2022.**

The hazard mitigation goals identified projects for:

- Public awareness programs
- Installation of a warning system and generators
- Study and improve drainage utility infrastructure to minimize the impact of stormwater
- Channelize or restore streams
- Achieve “Stormready” Community certification
- Implement tree trimming program

FEMA’s Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant (PDM), and TWDB’s Flood Mitigation Assistance (FMA) Grant Program all fund localized Flood Risk Reduction Projects including reconstruction of culverts and drainage channels to limit the impact of stormwater on existing infrastructure. HMGP and PDM allow for the funding of generators at critical facilities. There may be eligibility, benefit cost analysis, and cost-share requirements. The 5% Initiative in the HMGP is used for projects for which it may be difficult to conduct a standard BCA to prove cost-effectiveness, such as emergency notification, public awareness, or sirens. HMGP also offers funding for post disaster code enforcement, including community-wide tree trimming strategies. The HMGP also provides financial assistance for flood reduction projects including stream channelization and restoration. Information about [FEMA’s HMA grants](#)¹ can be found on our website, as well as on the [Texas Department of Public Safety’s Emergency Management Forms and Publications](#)² website. County emergency managers or the State Hazard Mitigation Officer may be contacted for additional information.

[Texas Water Development Board’s](#)³ Flood Protection (FP) Grant, Clean and Drinking Water State Revolving Fund (CWSRF), and Texas Water Development Fund (DFund) provide additional funding or loans for engineering designs. Both CWSRF and DFund are long term-fixed interest loans which can be used for building water quality and green infrastructure. CWSRF and Dfund, offers grant money for flood reduction projects including FIS updates.

The minimum requirements for floodplain regulations are outlined in 44 Code of Federal Regulations 60.3, and local communities may choose to adopt more restrictive codes. FEMA Regional Office VI offers assistance in developing stricter codes, such as regulating construction or elevational changes in the floodplain.

1 <https://www.fema.gov/hazard-mitigation-assistance>.

2 <https://www.dps.texas.gov/dem/downloadableforms.htm#hmgpgrants>.

3. <https://www.twdb.texas.gov/financial/programs/>.

Appendix II: Base Level Engineering Report



East Fork Trinity Watershed, TX Base Level Engineering (BLE) Results

June 2019

Prepared for:

North Central Texas Council of Governments
616 Six Flags Dr
Arlington, TX 76011

Submitted by:

AECOM
9400 Amberglen Blvd
Austin, Texas 78729



DOCUMENT HISTORY

DOCUMENT LOCATION

EAST FORK TRINITY WATERSHED

K:/FY2018/18-06-0014S

REVISION HISTORY

| Version Number | Version Date | Summary Changes | Team/Author |
|----------------|--------------|--------------------------------|-------------|
| 1.0 | June 2019 | Initial Base Level Engineering | AECOM |

APPROVALS

This document requires the approval of the following persons:

| Role | Name | Phone Extension | Title (CLIN/RMC) | Review Date | Approved Date |
|-----------------|---------------|-----------------|------------------|--------------|---------------|
| Technical Lead | Luke Lunsford | 512.684.1923 | Engineer | June 5, 2019 | June 6, 2019 |
| Project Manager | April Smith | 512.457.7818 | Project Manager | June 6, 2019 | June 7, 2019 |

CLIENT DISTRIBUTION

| Name | Title/Organization | Location |
|--|---|---|
| North Central Texas Council of Governments | Director of Environment and Development | 616 Six Flags Drive, Arlington, Texas, 76005-5888 |
| Edith Marvin | Director | |

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Executive Summary

FEMA Region VI contracted AECOM through Halff Associates, Inc.'s prime contract to complete a Base Level Engineering (BLE) analysis for one watershed, East Fork Trinity, in central Texas, to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Areas (SFHAs). The BLE process involves using best available data and incorporating automated techniques with traditional model development procedures to produce regulatory quality flood hazard boundaries for the 1-percent annual chance event as well as estimates of flood hazard boundaries for multiple recurrence intervals.

The source digital terrain data used for surface model development in support of hydrologic and hydraulic analysis as well as mapping activities were leveraged from various local, State and Federal partners. Details regarding the different datasets used are provided below in Section 1.1.

Flood discharges for this study were calculated using both United States Geological Survey (USGS) regression equations and gage analyses, where stream gages with sufficient records exist. Regression equations obtained from the USGS Scientific Investigations Report (SIR) 2009-5087, Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watersheds in Texas Using an L-moment-Based, Press-Minimized, Residual-Adjusted Approach. The United States Army Corp of Engineers (USACE) Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) version 2.0 was used to perform Flood Frequency Analysis (FFA) for the three gages within in this study.

The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program version 5.0.5 was used to compute water surface elevations on a stream by stream basis. All hydraulic models were computed using 1-D steady state analysis.

The stream mile network that was validated for this watershed was compiled using FEMA's Community Needs Management Strategy (CNMS) inventory. CNMS is an inventory of flood hazard studies and flood hazard mapping needs for areas where a study is needed. This data is helpful for community officials in analyzing and depicting flood hazards to enhance the understanding of flood risks. Communities may use this information to make informed decisions on their planning and flood mitigation efforts.

The inventory of Zone A studies in the East Fork Trinity Watershed includes 25.1 miles that are part of an ongoing detailed study that were not validated. It also includes 2.1 miles that were classified in CNMS based on recent Letters of Map Change (LOMR). Total miles validated in CNMS are summarized in [Error! Reference source not found.](#) and illustrated in Figure ES - 1 below.

Table ES - 1: BLE Validation Results

| Zone | Validation Status | Stream Miles |
|--------------------|-------------------|--------------|
| A | VALID | 555.6 |
| A | UNVERIFIED | 414.1 |
| AE | VALID | 418.6 |
| AE | UNKNOWN | 0.3 |
| AE | UNVERIFIED | 51.7 |
| AO | VALID | 0.4 |
| X | ASSESSED | 39.5 |
| Total Miles | | 1,480.2 |

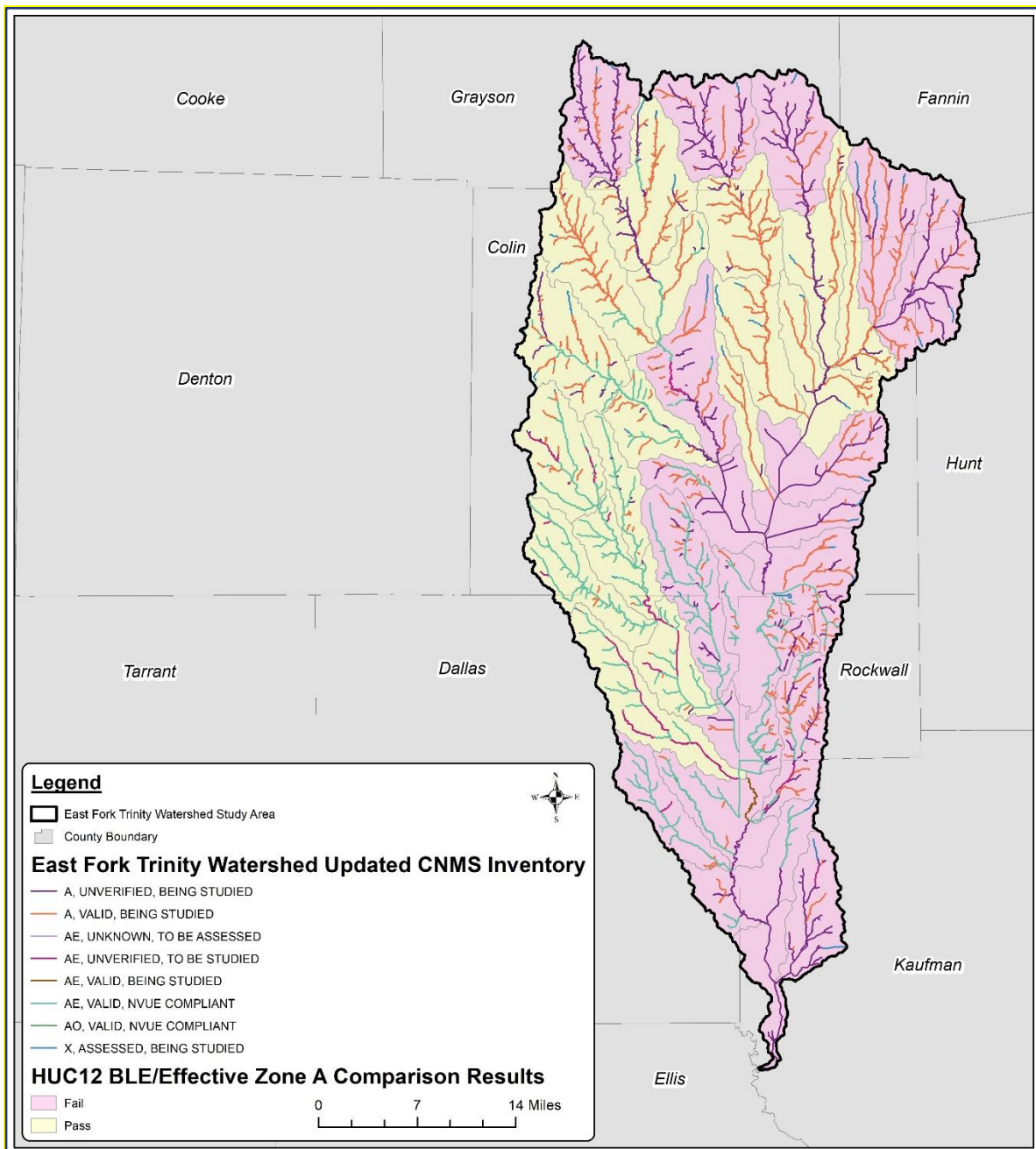


Figure ES - 1: East Fork Trinity River Watershed CNMS Validation Results

An overall risk for the East Fork Trinity River Watershed was calculated using the National Flood Risk Percentages Dataset and its proportional area. The weighted risk was multiplied by the percentage of points in the watershed that failed the CNMS comparison to effective to determine the priority score. Figure ES - 2 below shows the range of the East Fork Trinity River HUC-8 priority scores which can be used to initiate discussions during the Discovery phase.

The White House Ridge - East Fork Trinity River HUC-12 was determined to have the highest priority score of 62.6 and the most need while North Mesquite Creek, Rowlett Creek, and South Mesquite Creek all share the lowest score of 0.

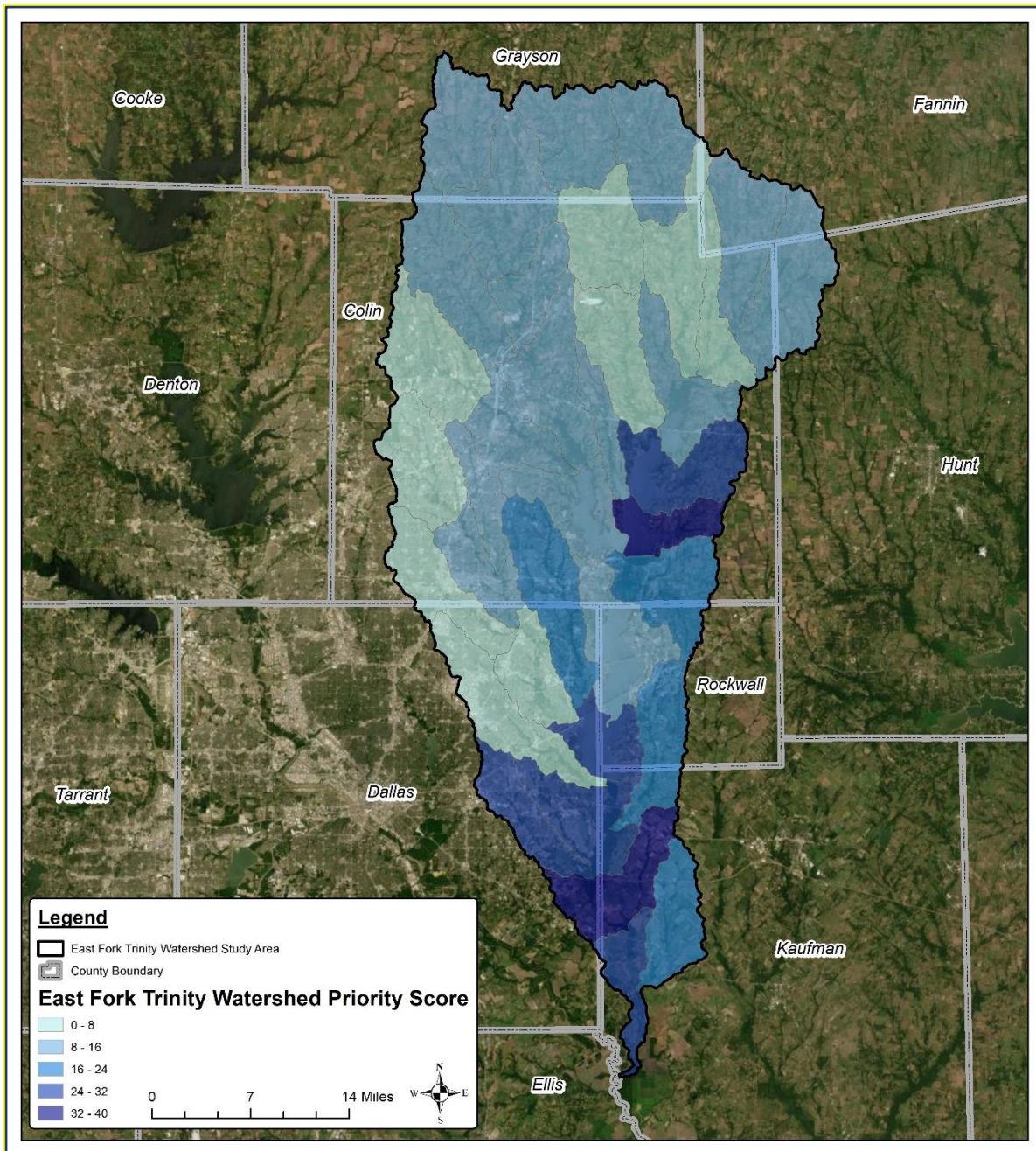


Figure ES - 3: Ranking of East Fork Trinity River Watershed HUC-12s

Base Level Engineering (BLE) Methodology

Recent innovations and efficiencies in floodplain mapping have allowed the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) to develop a process called Base Level Engineering (BLE), which can be used to address current program challenges, including the validation of Zone A studies and the availability of flood risk data in the early stages of a Flood Risk Project. The BLE process involves using best available data and incorporating automated techniques with traditional model development procedures to produce regulatory quality flood hazard boundaries for the 1-percent annual chance event as well as estimates of flood hazard boundaries for multiple recurrence intervals. The cost for developing the data and estimates resulting from the BLE process are lower than standard flood study production costs. The BLE results may be used for eventual production of regulatory and non-regulatory products.

As described in Title 42 of the Code of Federal Regulations, Chapter III, Section 4101(e), once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks in floodprone areas. FEMA makes this determination of flood hazard data validity by examining flood study attributes and change characteristics, as specified in the Validation Checklist of the Coordinated Needs Management Strategy (CNMS) Technical Reference. The CNMS Validation Checklist provides a series of critical and secondary checks to determine the validity of flood hazard areas studied by detailed methods (e.g., Zone AE, AH, or AO). While the critical and secondary elements in CNMS provide a comprehensive method of evaluating the validity of Zone AE studies, a cost-effective approach for evaluating Zone A studies has been lacking.

In addition to the need for Zone A validation guidance, FEMA standards require flood risk data to be provided in the early stages of a Flood Risk Project. FEMA Program Standard SID #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping that may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared and results should be discussed with stakeholders.

An important goal of the BLE process is the scalability of the results. Scalability means that the results of a BLE analysis can not only be used for CNMS evaluations of Zone A studies, but can also be leveraged throughout the Risk MAP program. The data resulting from a BLE analysis can be updated as needed and used for the eventual production of regulatory and non-regulatory products, outreach and risk communication, and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

FEMA Region VI contracted AECOM through Halff Associates, Inc.'s prime contract to complete a BLE analysis for one HUC-8 watershed, East Fork Trinity River, in North Central Texas, to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Areas (SFHA).

The East Fork Trinity Watershed study area consisted of five HUC-10 basins: Duck Creek, Lake Ray Hubbard, Lavon Lake, Indian Creek, and Pilot Grove Creek. Figure 1 shows the orientation of the East Fork Trinity Watershed HUC-10 basins with respect to the counties.

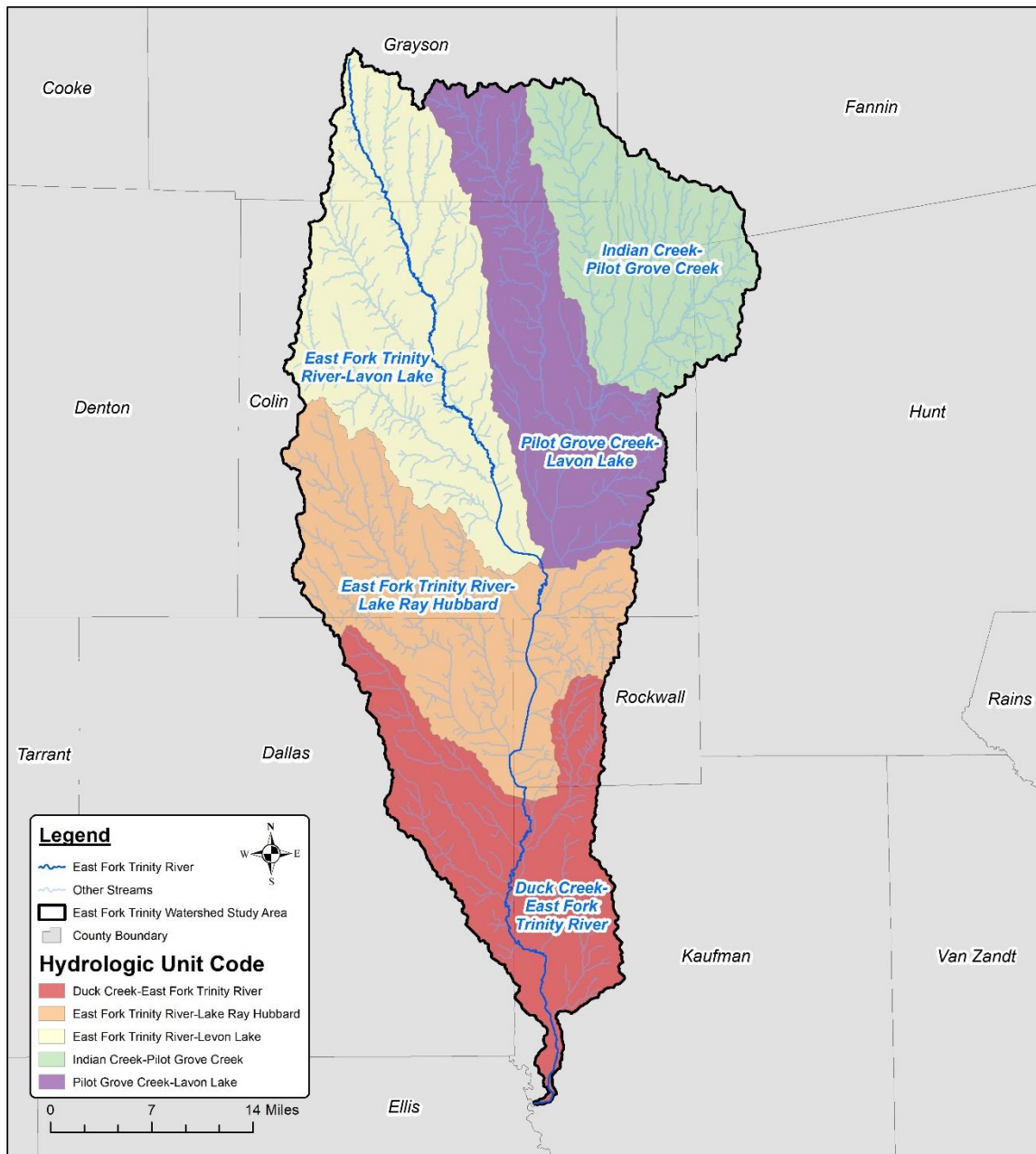


Figure 1: East Fork of the Trinity River Watershed HUC-10 Basins

AECOM studied approximately 1,600 miles of stream reaches within the East Fork of the Trinity River Watershed with a minimum drainage area tolerance of one square mile outside of population centers and one half square mile inside of population centers. Population centers were identified as having a population of greater than 1,000 people. The selection and extent of stream reaches studied was based upon the number of stream miles with minimum drainage area of one square mile (or one half square mile) and not the number of effective Zone A stream miles. Study reaches were extended above this threshold as appropriate to ensure all effective Zone A floodplain received an updated analysis. Topographic data available from the United States

Geologic Survey (USGS) was used to determine the hydrologic and hydraulic characteristics of the watershed. The following sections will summarize the BLE process and will discuss the results along with their recommended use.

1.1 Topographic Data

Documentation regarding leverage data and process including coverage, accuracy, acquisition dates, and source contact/agency are presented in the figures, tables and text within this section. All vertical accuracy specifications were obtained from the metadata or survey reports provided with the leverage datasets. All available metadata, survey reports, and other leverage documentation are included in the FEMA Data Capture Technical Reference compliant submittal. Figure 2 shows the extents of the source Digital Terrain Model (DTM) data used for the HUC-8 watershed studied.

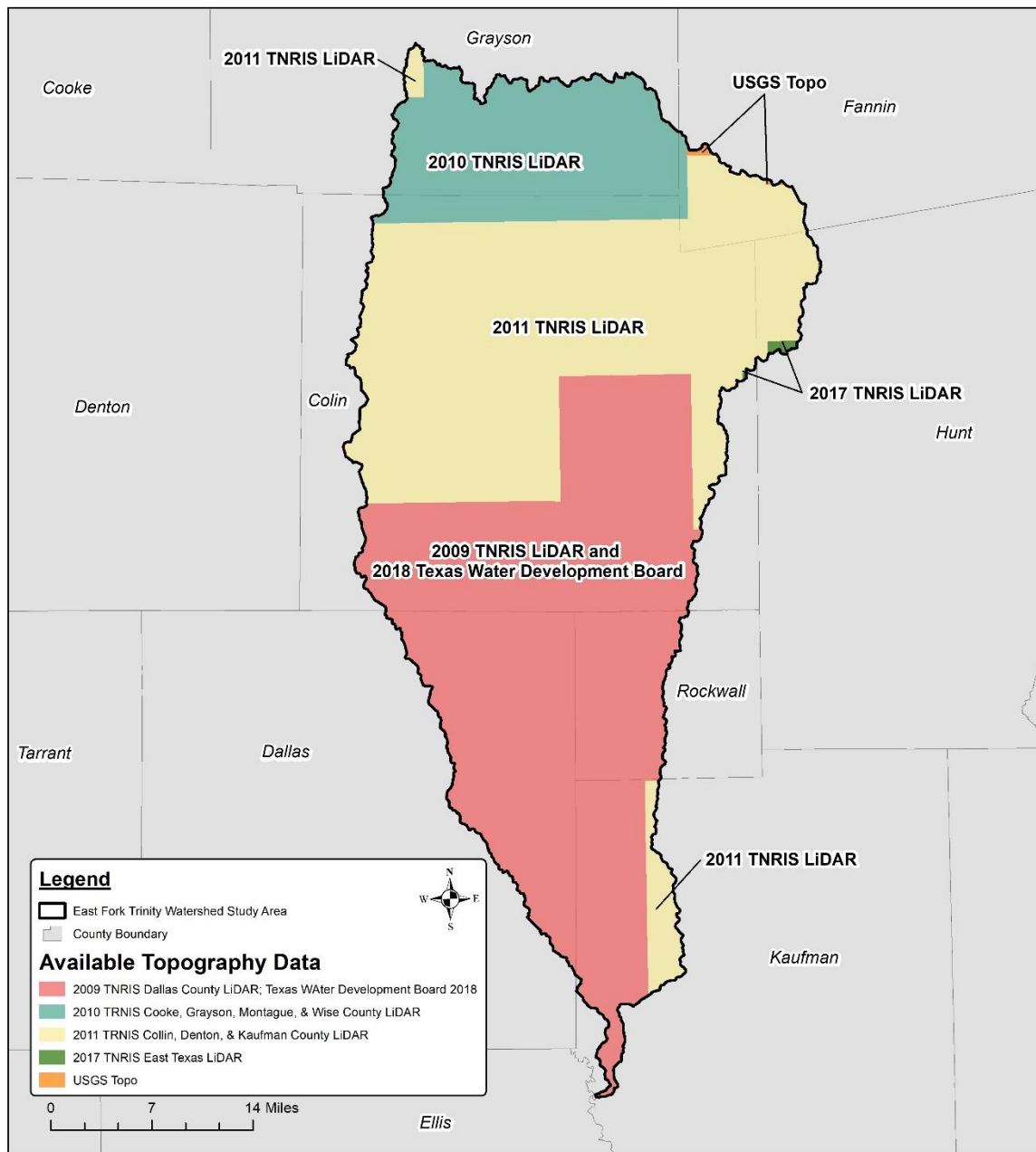


Figure 2: Extent of LiDAR Data for East Fork of the Trinity River Watershed

1.1.1 Source Terrain Data

1.1.1.1 2009 StratMap Dallas LiDAR

This dataset was developed by Texas Natural Resource Information System (TNRIS) in the Spring of 2009 as part of the High Priority Imager and Data Sets (HPIDS) contract. It covers the Dallas metroplex at 1 meter spacing. The RMSEz reported for the dataset was 14.6 cm at the 95%

confidence level which meets project accuracy specifications of the National Standard for Spatial Data Accuracy (NSSDA).

1.1.1.2 2010 StratMap Cooke

This dataset was developed by Texas Natural Resource Information System (TNRIS) Counties as part of the High Priority Imager and Data Sets (HPIDS) contract. It was collected from May to August of 2010 and covers portions of Cooke, Grayson, and Wise at 4 points/meter. The RMSEz reported for the dataset was 8.1 cm at the 95% confidence level which meets project accuracy specifications of the National Standard for Spatial Data Accuracy (NSSDA).

1.1.1.3 2011 TNRIS LiDAR: North Central Texas

This LiDAR was collected between January and April of 2011, and includes portions of Denton, Collin, Cooke, Grayson, and Kaufman Counties. The LiDAR acquisition area covers 2,373 square miles at 0.4m point spacing. The RMSEz reported for the dataset was 6 cm at the 95% confidence level which meets project accuracy specifications of the NSSDA.

1.1.1.4 2017 TNRIS LiDAR: East Texas

This LiDAR was collected between December and March of 2017, and includes portions of Denton, Collin, Cooke, Grayson, and Kaufman Counties. The LiDAR acquisition area covers 2373 square miles at 0.4m point spacing. The RMSEz reported for the dataset was 6 cm at the 95% confidence level which meets project accuracy specifications of the NSSDA.

1.1.2 Terrain Data Processing

The Watershed Information System (WISE) software platform was utilized in order to create a digital surface model for the East Fork Trinity project area. This module allows source data from a variety of sources to be prioritized based on level of accuracy or preference of the user, and these datasets were used as the data sources for creating the 10-foot and 50-ft DEMs.

The 10-foot DEMs created from the LiDAR datasets described above were compiled in order of vertical accuracy into a mosaic dataset using ArcMap. From this mosaic, a tile index was created for the project area and the mosaic was clipped into 50,000-foot tiles, converted to ASCII and imported into Wise Terrain Analyst (WTA). Visual inspection of the 10-foot DEMs was performed to ensure no voids and/or artifacts were present. The DEM surface model was affirmed to be suitable for hydraulic takeoffs and supporting other hydraulic analyses.

Stream centerlines were manually digitized using the 10-foot DEMs as a source for horizontal alignment and vertical elevation. These stream centerlines are created for use in the hydraulic analysis and hydro-enforcement of the 50-foot DEMs. Several routines were then used to take localized elevations from the source topographic data and apply them to the streams. This gave the stream vertices elevation information along the Z axis. The resulting elevations ensure that the streams are lower in elevation than any overbank sumps. A separate routine was then used to ensure that the elevations of these vertices descend in height down to an outfall. The final streams file is then "burned" into the 50-foot DEMs to force flow through structures while preventing it from jumping out of the channel banks.

After the DEM was imported, an additional 50-foot DEM was created from the same mosaic and tile index used for the 10-foot DEM. This 50-foot DEM was used for hydro-enforcement of the project area. Proprietary software was used to identify natural sinks, peaks and flat areas in the 50-foot DEM surface. Elevations of the cells in the DEM were algorithmically calculated and the best path to route flow was determined without filling sinks in the DEM. Once all calculations were completed, the flow was checked confirming that all drainage flowed downstream correctly and routed to outside of the project area.

In addition to the quantitative assessment of the source digital terrain, a qualitative visual inspection of the composite DEM was performed using a hillshade derived from the 10-foot DEM. The visual inspection indicated no unusual or non-terrestrial features were observed in the composite DEM assuring the surface files used for hydrologic and hydraulic analyses and floodplain mapping activities are sufficient for BLE analysis.

1.2 Hydrology

Flood discharges for this study were calculated using both USGS regression equations and gage analysis, where stream gages with sufficient records exist. Regression equations obtained from the USGS Scientific Investigations Report (SIR) 2009-5087 Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watersheds in Texas Using an L-moment-Based, PRESS-Minimized, Residual-Adjusted Approach (2009) were used for this study.

The WISE computer program was used to delineate drainage basins in shapefile format using the 50-foot DEM. WISE was also used to calculate the main-channel slope and main-channel length for each basin. The basin shapefile attribution was automated by WISE with drainage area, main-channel slope, and precipitation.

The USACE HEC-SSP version 2.0 was used to perform Flood Frequency Analysis (FFA) for three gages within the East Fork Trinity River Watershed.

Table 1 shows the published equations for unregulated streams. In these equations, Q_i represents peak streamflow for i -recurrence interval (annual chance exceedance (a.c.e.)) in cubic feet per second (cfs), CONTDA is the cumulative drainage area in square miles, S represents the main-channel slope measured between two points along the channel, one at 10 percent of the channel length and the other at 85 percent of the channel length, and PRECIP represents mean annual precipitation in inches. Ω is a regression specific parameter that represents generalized terrain and climate indices.

The mean annual precipitation values for the Texas regression equations were determined based on gridded coverage obtained from the PRISM Climate Group, and available for download from the following location: <http://www.prism.oregonstate.edu/explorer/>

The annual precipitation values reflect data for the climatological period 1981-2000 as recorded in the USGS National Water Information System.

Table 1: Summary of Regression Equations in for Undeveloped Watersheds in Texas (SIR 2009-5087)

| Recurrence Interval | Equation ¹ |
|--|--|
| Q _{10%} | $PRECIP^{1.203} S^{0.403} * 10^{[0.908 * \Omega + 13.62 - 11.97 * CONTDA^{(-0.0289)]}$ |
| Q _{4%} | $PRECIP^{1.140} S^{0.446} * 10^{[0.945 * \Omega + 11.79 - 9.819 * CONTDA^{(-0.0374)]}$ |
| Q _{2%} | $PRECIP^{1.105} S^{0.476} * 10^{[0.961 * \Omega + 11.17 - 8.997 * CONTDA^{(-0.0424)]}$ |
| Q _{1%} | $PRECIP^{1.071} S^{0.507} * 10^{[0.969 * \Omega + 10.82 - 8.448 * CONTDA^{(-0.0467)]}$ |
| Q _{0.2%} | $PRECIP^{0.988} S^{0.569} * 10^{[0.976 * \Omega + 10.40 - 7.605 * CONTDA^{(-0.0554)]}$ |
| ¹ Variables: Q _i peak flow for i recurrence interval (a.c.e.), in cubic feet per second; CONTDA, Contributing Drainage Area in square miles; S, Main-channel Slope (dimensionless); PRECIP, Mean Annual Precipitation in inches; Ω, OmegaEM parameter | |

Discharges for the 1-percent plus and 1-percent minus a.c.e. were calculated as well. These values were computed by multiplying the Q_{1%} discharges by 1.995 and 0.501 respectively, which account for the log10 format residual standard error of 0.30 associated with the Q_{1%} regression equation.

Drainage area for each sub-basin was determined based on automated basin delineations performed in WISE. Basin break points were set by the user with a sub-basin target of one square mile (outside population centers) in size. This criterion was adjusted for streams with larger drainage areas in order to avoid excessive and unnecessary discharge breaks. Break points were also set just upstream of stream confluences. Cumulative drainage area was determined based on these automated delineations performed by WISE, in combination with a stream connectivity routine that defined the stream reach segments with upstream and downstream neighbors.

The sub-basin shapefile was attributed with the computed discharges as part of the automated script. From the sub-watershed basin shapefile the discharges were incorporated into the HEC-RAS models using an automated routine in WISE. Discharges, as well as water surface elevation results, were associated with the hydraulic cross sections prior to generation of floodplain boundaries and grid mapping. Those results are available in GIS format as part of this BLE submittal package.

The USGS stream gages in the East Fork of the Trinity River HUC-8 watershed listed in Table 2 and shown in Figure 3, were used to locally adjust regression flows.

Table 2: USGS Stream Gages Used in Analyses

| HUC-8 Watershed | Gage ID | Flooding Source and Location | Computed Drainage Area (mi ²) | Published Drainage Area (mi ²) | Period of Record |
|--------------------------------|----------|-------------------------------|---|--|------------------|
| East Fork of the Trinity River | 08061540 | Rowlett Ck nr Sachse | 121.5 | 121 | 1969-2017 |
| | 08061700 | Duck Ck nr Garland | 32.0 | 31.6 | 1958-1992 |
| | 08059400 | Sister Grove Ck nr Blue Ridge | 83.0 | 83.1 | 1976-2017 |

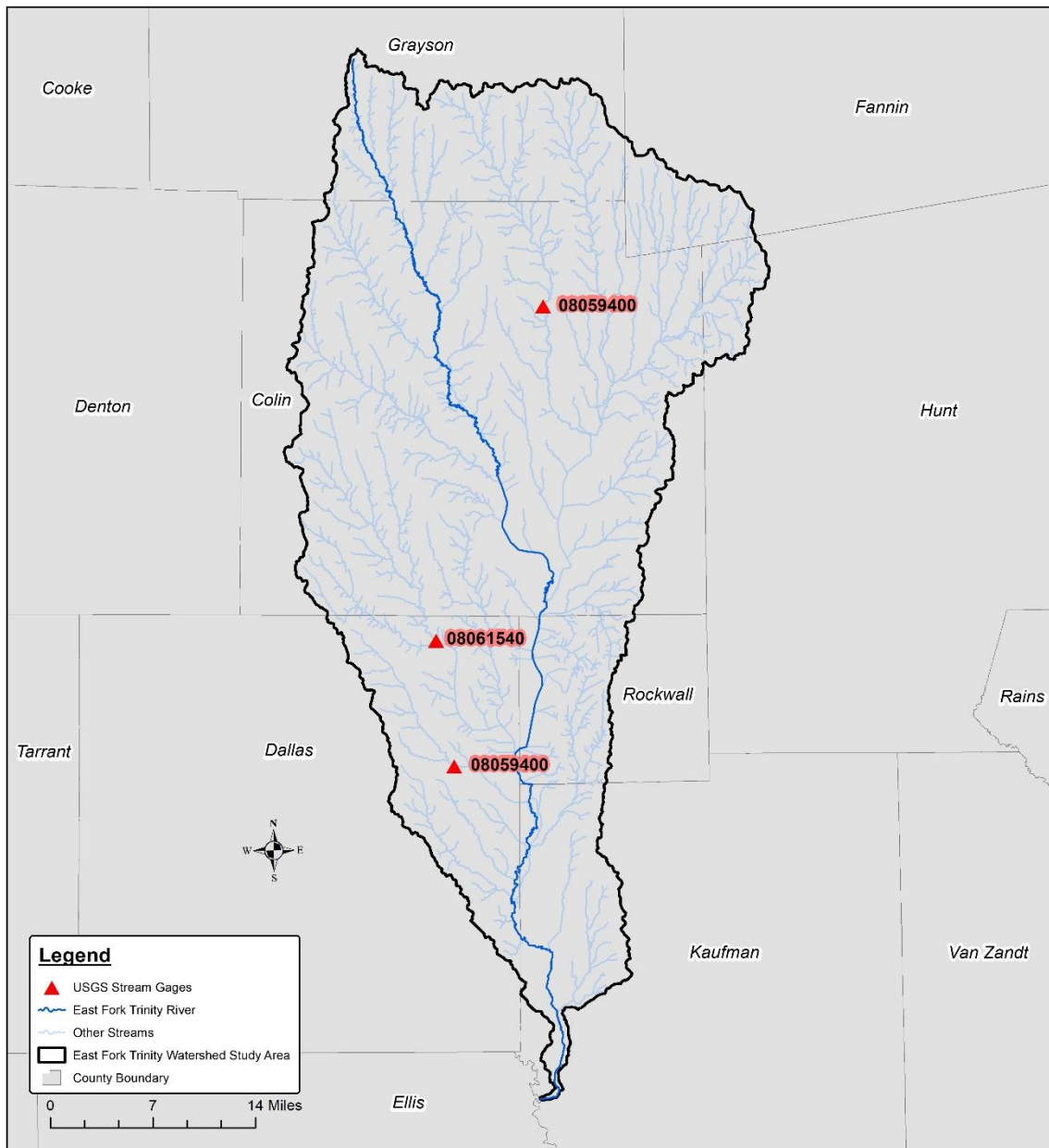


Figure 3: USGS Gage Stations incorporate within the East Fork of the Trinity River Watershed

FFA was performed in accordance with Bulletin 17B guidelines for the gages on Rowlett Creek near Sachse (08061540), on Duck Creek near Garland (08061700) and on Sister Grove Creek near Blue Ridge (08059400). Similar to the regression analysis results, the discharges used on these streams are associated with the hydraulic cross sections in the GIS shapefiles.

1.2.1 Special Considerations

It is important to note the location of the two large reservoirs, Lavon Lake and Lake Ray Hubbard, on the main stem of the East Fork of the Trinity River. Not only do these flood control structures impact main stem flow rates, but their use of independent gates means that a general regression equation approximation of elevation discharge data cannot be used to accurately estimate discharges.

For the purpose of this study main stem flows in this area were provide by the USACE as shown in the table below:

Table 3 - East Fork of the Trinity River Main Stem Flows

| Model XS Station | R6 FY17 RTO - East Fork - Preliminary Discharges | | | | | | | |
|--|--|-------|-------|-------|-----------|-------|----------|--------|
| | Stream Location | 10YR | 25YR | 50YR | 1p_minus* | 100YR | 1p_plus* | 500YR |
| 148476.629 | Downstream of Lake Ray Hubbard | 26000 | 38000 | 48700 | 31012 | 61900 | 123491 | 107200 |
| 139368.038 | At US-80 | 30100 | 43800 | 56200 | 35771 | 71400 | 142443 | 123400 |
| 125096.439 | At Union Pacific Railroad | 28300 | 43100 | 57800 | 37525 | 74900 | 149426 | 131100 |
| 103269.765 | At IH-20 | 25300 | 38100 | 52900 | 35721 | 71300 | 142244 | 126500 |
| 63355.408 | At US-175 | 23500 | 33700 | 46900 | 31262 | 62400 | 124488 | 109200 |
| 20542.241 | At Confluence with Trinity Main | 20600 | 29100 | 39100 | 25902 | 51700 | 103142 | 80800 |
| Note: Discharges represent preliminary HMS results from uniform rainfall simulation from USACE. | | | | | | | | |

* 1p_minus and 1p_plus flows were calculated from the provided 100YR recurrence interval using the 0.501/1.995 Standard Error ratios described in the previous section

1.3 Hydraulics

The hydraulic approach used for this BLE analysis for the East Fork of the Trinity River Watershed consisted of using the terrain model described in Section 1.1 in combination with the developed hydrologic inputs described in Section 1.2 to establish water surface elevations using 1-D steady state analysis. The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program version 5.0.5 was selected to compute water surface elevations for each stream. The WISE computer program was used to establish model stream orientation, initial hydraulic cross section layout and stationing, assign n-values to cross sections, and to develop all input files for the HEC-RAS program. ESRI's ArcMap program was used to review and refine cross section layout orientation.

An initial cross section layout was performed using an automated routine in WISE based on the drainage area at the cross section location. A draft model was developed using this initial cross section layout and draft boundaries were developed. Next, cross sections were inspected and refined. To improve the hydraulic models, additional cross sections were added as needed to better define the BLE floodplain boundary and extended where overtopping occurred. Orientation of cross sections was also improved if parallel to flow. Additional cross sections were added at floodplain constrictions and at downstream portions of tributaries to ensure a proper tie-in with receiving streams. Cross sections were also adjusted to remove hydraulic crossings in the floodplain. It is estimated that 95 percent of cross-sections were adjusted in some work areas while other areas did not require as much editing.

Cross sections were not drawn on top of roadways or railroads but were placed at the upstream and downstream face of major roads and railroads. Ineffective flow stations were placed in the hydraulic models as appropriate to account for flow constrictions as well as at locations deemed by the engineer to be ineffective at conveying flow downstream.

Cross sections were drawn on dam tops for flood control identified dams in order to better represent ponded water upstream of the structures. It was assumed in doing this that the vast majority of the flow during a flood event would pass through the spillway and that the hydraulic model would reasonably estimate flow across the spillway as represented in the hydraulic cross section.

Significant effort was made to start all tributaries below the receiving water surface elevations but this was not always achieved, particularly in wide, flat floodplains where small tributaries ran parallel to large streams or where road crossings or dams interfered with cross section alignments. In some cases, tributary slopes or roughness coefficients were adjust to develop a tie in difference of less than 0.5 feet.

The relationship between drainage area and assigned channel geometry is shown in Table 4. These default values for dimensions and spacing are subject to change based on the details noted above as well as the judgment of the responsible engineer.

Table 4: Cross Section Parameters for East Fork of the Trinity River

| Drainage area (upper limit) | Channel Top Width | Channel Bottom Width | Channel Depth |
|--------------------------------|----------------------|-------------------------|---------------|
| 1 | 9 | 7.2 | 0.5 |
| 2 | 10.2 | 8.4 | 0.5 |
| 4 | 12 | 10.2 | 0.5 |
| 8 | 13.8 | 12.6 | 0.5 |
| 10 | 15 | 13.2 | 0.5 |
| 15 | 16.4 | 14.6 | 0.5 |
| 20 | 19.2 | 17.4 | 0.5 |
| 25 | 21.2 | 19.5 | 0.5 |
| 30 | 24 | 22.3 | 0.5 |
| 40 | 26.5 | 24.9 | 0.5 |
| 50 | 29 | 25.7 | 1 |
| 75 | 31.4 | 27.9 | 1 |
| 100 | 34 | 31.1 | 1 |

| Drainage area (upper limit) | Channel Top Width | Channel Bottom Width | Channel Depth |
|--------------------------------|----------------------|-------------------------|---------------|
| 150 | 42 | 39.0 | 1 |
| 250 | 58 | 54.5 | 2 |
| 500 | 66 | 62.4 | 2 |
| 1000 | 66 | 62.4 | 3 |
| 2000 | 150 | 140 | 3 |
| 5000 | 1575 | 1565 | 3 |
| 999999 | 2000 | 1990 | 4 |

Manning's roughness coefficients (n-values) were determined using the 2011 National Land Cover Data (NLCD) dataset in combination with n-values from Chow (1959) and Calenda, et al. (2005). The association between the n-values and the NLCD Classification is shown in Table 5. Manning's n-value takeoffs were performed by WISE and the n-values were adjusted in some locations based on engineering judgment. N-values within channel banks were limited by the automated routine to a range of 0.030 to 0.070.

Table 5: Manning's "n" Roughness Based on 2011 NLCD Classification (Moore, 2011)

| NLCD Classification | Minimum | Normal | Maximum | Source |
|-----------------------------|---------|--------|---------|----------------------|
| Open Water | 0.025 | 0.03 | 0.033 | Chow 1959 |
| Developed, Open Space | 0.01 | 0.013 | 0.016 | Calenda, et al. 2005 |
| Developed, Low Intensity | 0.038 | 0.05 | 0.063 | Calenda, et al. 2005 |
| Developed, Medium Intensity | 0.056 | 0.075 | 0.094 | Calenda, et al. 2005 |
| Developed, High Intensity | 0.075 | 0.1 | 0.125 | Calenda, et al. 2005 |
| Barren Land | 0.025 | 0.03 | 0.035 | Chow 1959 |
| Deciduous Forest | 0.1 | 0.12 | 0.16 | Chow 1959 |
| Evergreen Forest | 0.1 | 0.12 | 0.16 | Chow 1959 |
| Mixed Forest | 0.1 | 0.12 | 0.16 | Chow 1959 |
| Scrub/Shrub | 0.035 | 0.05 | 0.07 | Chow 1959 |
| Grassland/Herbaceous | 0.025 | 0.03 | 0.035 | Chow 1959 |
| Pasture/Hay | 0.03 | 0.04 | 0.05 | Chow 1959 |
| Cultivated Crops | 0.025 | 0.035 | 0.045 | Chow 1959 |
| Woody Wetlands | 0.08 | 0.1 | 0.12 | Chow 1959 |
| Emergent Herbaceous Wetland | 0.075 | 0.1 | 0.15 | Chow 1959 |

The boundary condition used for the majority of the study streams was normal depth with a default value of 0.005 ft/ft. For streams with large drainage areas (generally greater than 8 square miles), the normal depth slope was calculated based on the HEC-RAS profile invert.

1.3.1 Special Considerations

Using the above Manning's "n" values, gave exaggerated velocities for a number of streams in the East Fork of the Trinity River Watershed, which calculated the 10-percent water surface elevation (WSEL) to be higher than the 1-percent WSEL and/or the 1-percent WSEL to be higher than the 0.2-percent WSEL. To compensate for these inaccuracies, the Manning's "n" values were adjusted, as necessary, to ensure the 10-percent WSEL produced were less than the 1-percent WSEL and the 1-percent WSEL were less than the 0.2-percent WSEL.

Rather than attempting to model the Lavon Lake and Lake Ray Hubbard structures hydraulically, or forcing models to match existing flood pool elevations, this study only incorporates the dam structures hydraulically with top of dam cross section approximations. At the time of writing, January of 2019, a detailed study is being developed of the main stem of the East Fork of the Trinity River downstream of Lake Ray Hubbard. This BLE study incorporated draft cross sections developed for that detailed study for the portion of the East Fork of the Trinity River downstream of Lake Ray Hubbard. This detailed study should also incorporate detailed structural information for both dams, and must be relied on for more accurate main stem water surface elevations.

1.4 Quality Control

Initial mapping results were reviewed by separate consultants to identify areas of inconsistency or places where the models could be improved. In some cases this quality control (QC) review indicated models should be extended to cover the scope of effective flood hazard data. Those streams were extended farther upstream to match the extents of the SFHA data. Other potential improvements included adding cross-sections, adjusting orientation of cross sections, trimming cross sections and reduction of the default “V” angle of cross sections. Examples of default “V” angled cross sections are shown in Figure 4.

A major component of the QC process was an automated check that identified locations where the 1-percent a.c.e profile was crossed by another frequency or by the 1-percent plus or 1-percent minus profile. Significant effort was made to reasonably resolve these crossings. Another automated check identified locations with a 1-percent a.c.e. water surface profile drawdown of greater than 0.5 foot. An associated check was performed by isolated all areas of slope change in the 1-percent a.c.e. water surface profile greater than 5 percent. Again, significant effort was made to reasonably resolve these drawdown situations.

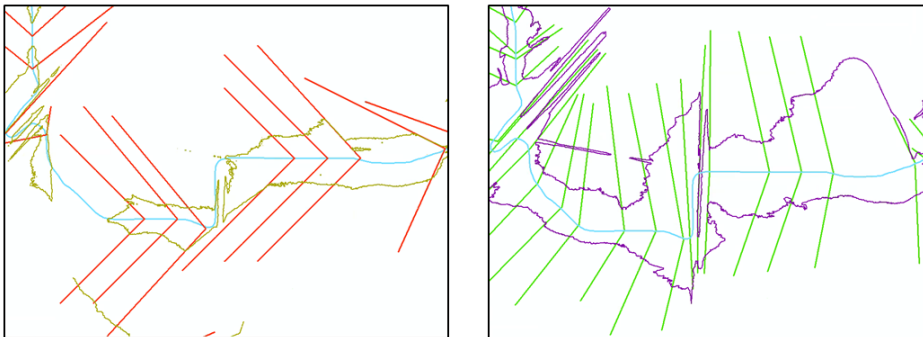


Figure 4: Default “V” angle cross-sections automated by WISE (left). Manually edited cross-sections to more accurately capture terrain (right). Resulting flood boundaries shown in gold (left) or purple (right) for clarity.

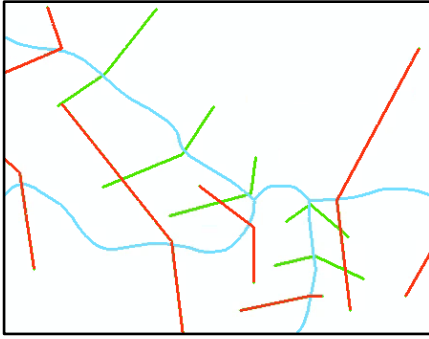


Figure 5: Manually added cross-sections (green) to improve accuracy of tie-ins at confluences.

1.5 One-percent Special Flood Hazard Area Delineation

The 1-percent and 0.2-percent boundaries were mapped using a routine that develops water surface elevation grids based on the 10-foot cell size DEM developed from the LiDAR dataset used for this project (See Section 1.1). This product was converted to a polygon for cleaning. The cleaning routine involved manual inspection of the polygons to identify and remove areas of disconnected flooding. In general, areas with a size of less than 5,000 square feet were removed and all others were investigated to determine whether they should be considered as potentially part of the SFHA. This investigation was aided by the ground DEM and aerial imagery. Manual adjustments to the polygons were made to account for spillways on dams which could not be accurately modeled using HEC-RAS as well as disconnected areas along the flooding source that should reasonably be connected.

Following the removal of disconnected flooding areas and other boundary adjustments, the small islands in the floodplain were filled. Islands with a size between roughly 5,000 and 30,000 square feet were inspected and, in general, islands that were less than 10,000 square feet were filled.

Once the island filling process was complete, the water surface raster mapping routine was run and set to conform to the polygon boundary. This ensures that the water surface raster and the floodplain boundary are consistent with each other. The depth raster product was created at the end of the process by performing a raster subtraction with the water surface elevation raster and the ground DEM.

Challenges

Challenges encountered during BLE analyses will vary based on available data on which to run the analysis. The watershed analysis presented challenges as summarized in the following paragraphs.

As noted in Section 1.3 above, significant effort was made to start all tributaries below the receiving water surface elevations but this was not always achieved, particularly in wide, flat floodplains where small tributaries ran parallel to large streams or where road crossings or dams interfered with cross section alignments.

Parallel streams with shared floodplains were modeled by moving the combined discharge upstream to the cross section that begins the shared floodplain.

An effort was made to bend cross-sections to follow basin boundaries. Some areas around tributaries of the East Fork of the Trinity River appeared to overflow into other basins and indicate an overestimation of conveyance, the modeling of which is beyond the scope of this BLE project. Cross-sections for these areas were revised to avoid overflow and will require further analysis for more detailed studies.

Significant effort was made to contain the flooding events, but this was not always achieved due to particularly wide, flat floodplains and where small tributaries ran parallel to large streams or where road crossings interfered with cross section alignments. If cross sections were extended past the basin boundary in an attempt to contain the flooding, the flooding often shifted completely off of the streamline due to the flat terrain and/or parallel streams. Cross sections were drawn to basin boundaries in an effort to accurately map flooding.

Results and Recommendations

The BLE results for this study produced a SFHA that compares reasonably well with the effective SFHA. Differences are attributed to the updated topographic data used as well as the approximate methods used. BLE boundaries also provide an additional estimated SFHA in areas that do not currently have a SFHA mapped. These results provide context for flood risk communication as part of the Discovery process, and should be verified through community work map meetings before being applied to a regulatory product.

A map showing the BLE results is included as Appendix A.

3.1 CNMS Validation of Effective Zone A SFHA

The majority of the inventory of Zone A studies (555.6 miles) in the East Fort Trinity HUC-8 was classified in CNMS with a validation status of "VALID" and status type of "BEING STUDIED." The following is a summary of the results of the CNMS validation assessment for the effective Zone A studies in the study area. Initial Assessment checks A1-A3 were evaluated for the CNMS inventory of Zone A studies.

INITIAL ASSESSMENT A1 – SIGNIFICANT TOPOGRAPHY UPDATE CHECK

This check involves determining whether a topographic data source is available that is significantly better than what was used for the effective Zone A modeling and mapping. For the study area in East Fork Trinity Watershed, the effective Zone A topographic data leveraged varied from county to county based upon when the effective study was performed. In most cases, the topography listed in Section 1.1 of this report represents a significant improvement from the assumed effective Zone A topographic source. Therefore, this element was set to FAIL for these reaches. However, the studies in the southern half of the watershed were set to PASS this element. The LiDAR available in this area is a significant improvement over the topography used in the effective studies, but it does not meet Quality Level 2 (QL2) standards.

INITIAL ASSESSMENT A2 – CHECK FOR SIGNIFICANT HYDROLOGY CHANGES

This check involves determining whether new regression equations have become available from the USGS since the date of the effective Zone A analysis. If newer regression equations exist for the area of interest, then an engineer must determine whether these regression equations would significantly affect the 1-percent annual chance flow.

Generally, the hydrologic methods used for the effective studies are not provided in the FIS Reports and are unknown. Therefore, this element was set to PASS for these reaches. In reaches included in LOMR updates where the effective hydrologic methods are known, none of the known methods included regression equations. Therefore, this element was set to PASS for these reaches as well.

INITIAL ASSESSMENT A3 – CHECK FOR SIGNIFICANT DEVELOPMENT

This check involves using the National Urban Change Indicator (NUCI) dataset to assess increased urbanization in the watershed of the Zone A study. If the percentage of urban area within the HUC-12 watershed containing the effective Zone A study is 15% or more, and has increased by 50% or more since the effective analysis, the study would fail this check. Although the NUCI data provide year-to-year changes in urbanization, the NLCD also is needed to establish a baseline of urban land cover for this analysis. The check for significant development in this watershed was completed by evaluating percentage of urban change at the HUC-12 level.

The HUC-12 watersheds in the study area are classified as rural and urban. For reaches located in rural HUC-12 watersheds, this element was set to PASS. The urban areas are generally located near Dallas, TX and are located in Collin, Dallas, Rockwall and Kaufman Counties. The percent increase of impervious area within the urban HUC-12 watersheds varied. For watersheds that increased by greater than 50%, this element was set to FAIL. For watersheds that did not increase by greater than 50%, this element was set to PASS.

Table 6: Zone A Initial Assessment Results

| Assessment Check | Pass / Fail | Notes |
|------------------|-------------|---|
| A1 – Topography | Pass/Fail | New LiDAR available does not meet QL2 standards/LiDAR available is a significant improvement from effective topo source |
| A2 – Hydrology | Pass | Not known if regression used in effective study or regression known not to be used in effective study |
| A3- Development | Pass/Fail | Rural or less than 50% IA increase HUC-12/Greater than 50% IA increase HUC-12 |

VALIDATION CHECK A4 – CHECK OF STUDIES BACKED BY TECHNICAL DATA

Zone A studies that pass all initial assessment checks described above may be categorized as “Valid” in the CNMS Inventory only if the effective Zone A study is supported by modeling or sound engineering judgment and all regulatory products are in agreement. If the effective Zone A study passes all initial assessment checks, but is not supported by modeling or if the original engineering method used is unsupported or undocumented, the Refined Zone A Engineering comparison is performed.

The streams within Rockwall County (CO_FIPS = 48397) were included in post-Map Modernization studies (2003 or newer) and are assumed to be backed by technical data. Therefore, this element was set to PASS for these reaches. The streams included in LOMR updates were included in post-Map Modernization studies (2003 or newer) and are known to be model-backed. Therefore, this element was set to PASS for these reaches as well. The streams that were not included in LOMR updates and fall within Grayson, Farrin, Collin, Dallas, or Kaufman Counties are not model-backed or supported by technical data. Therefore, this element was set to FAIL for these reaches.

VALIDATION CHECK A5 – COMPARISON OF BLE AND EFFECTIVE ZONE A

The BLE /effective Zone A comparison method leverages the existing Floodplain Boundary Standard (FBS) certification procedures described in FEMA SID #113, but with a slight

modification. This modified FBS comparison approach uses the 1-percent plus and 1-percent minus flood profiles and horizontal and vertical tolerances described in FEMA's Automated Engineering guidance document dated May 2016. For the comparison of BLE and effective Zone A in the Texas study area, the following vertical and horizontal tolerances were used to conduct the modified FBS procedure. One point was placed every 200 feet along the floodplain boundaries for comparison.

Vertical Tolerance: +/- 10 feet (one-half contour interval of assumed effective topographic source).

Horizontal Tolerance: +/- 75 feet (standard horizontal tolerance for BLE comparison testing).

Comparison results for these streams were grouped at the HUC-12 level and are summarized in Table 7 below to better understand the general health of the HUC-12 watershed, but the validation check was performed at the stream level. Streams where the percentage of passing FBS sample points is greater than or equal to 85% are marked as "Pass", otherwise marked as "Fail".

Table 7: BLE Comparison Results

| HUC-12 Watershed | | Total FBS points | Fail | Pass | %Pass | BLE Comparison Pass? (>85%) | Priority Score |
|--|------------------|------------------|-------|--------|--------|-----------------------------|----------------|
| Watershed Name | Watershed Number | | | | | | |
| East Fork Trinity | All Streams | 53,661 | 8,220 | 45,441 | 84.7% | Fail | |
| Anthony Branch-Buffalo Creek | 120301060506 | 1652 | 471 | 1181 | 71.5% | Fail | 20.5 |
| Arnold Creek | 120301060102 | 3404 | 624 | 2780 | 81.7% | Fail | 10.7 |
| Bear Creek-Indian Creek | 120301060101 | 2996 | 363 | 2633 | 87.9% | Pass | 8.8 |
| Brown Branch Rowlett Creek | 120301060406 | 60 | 6 | 54 | 90.0% | Pass | 9.5 |
| Camp Creek-Lake Ray Hubbard | 120301060401 | 3627 | 662 | 2965 | 81.7% | Fail | 16.6 |
| Clemons Creek-East Fork Trinity River | 120301060205 | 3155 | 536 | 2619 | 83.0% | Fail | 15.0 |
| Cottonwood Creek-East Fork Trinity River | 120301060402 | 2127 | 365 | 1762 | 82.8% | Fail | 15.3 |
| Desert Creek-Pilot Grove Creek | 120301060105 | 2161 | 195 | 1966 | 91.0% | Pass | 6.0 |
| Duck Creek | 120301060501 | 12 | 0 | 12 | 100.0% | Pass | 0.0 |
| Elm Creek-Lavon Lake | 120301060305 | 2595 | 755 | 1840 | 70.9% | Fail | 26.2 |
| Headwaters Pilot Grove Creek | 120301060104 | 2920 | 564 | 2356 | 80.7% | Fail | 9.7 |
| Headwaters Rowlett Creek | 120301060404 | 387 | 7 | 380 | 98.2% | Pass | 7.9 |
| Headwaters Sister Grove Creek | 120301060302 | 2690 | 227 | 2463 | 91.6% | Pass | 6.7 |
| Honey Creek | 120301060204 | 5520 | 525 | 4995 | 90.5% | Pass | 8.3 |
| Long Branch-Buffalo Creek | 120301060502 | 3935 | 715 | 3220 | 81.8% | Fail | 16.5 |

| HUC-12 Watershed | | Total FBS points | Fail | Pass | %Pass | BLE Comparison Pass? (>85%) | Priority Score |
|--|------------------|------------------|------|------|--------|-----------------------------|----------------|
| Watershed Name | Watershed Number | | | | | | |
| Lower Wilson Creek | 120301060207 | 1188 | 153 | 1035 | 87.1% | Pass | 12.4 |
| Muddy Creek-Lake Ray Hubbard | 120301060403 | 1422 | 244 | 1178 | 82.8% | Fail | 17.6 |
| Mustang Creek-East Fork Trinity River | 120301060505 | 1474 | 615 | 859 | 58.3% | Fail | 36.5 |
| North Mesquite Creek-East Fork Trinity River | 120301060503 | 612 | 189 | 423 | 69.1% | Fail | 27.2 |
| Pittman Creek-Spring Creek | 120301060407 | 124 | 5 | 119 | 96.0% | Pass | 3.8 |
| Pot Rack Creek-Indian Creek | 120301060103 | 1999 | 112 | 1887 | 94.4% | Pass | 4.9 |
| Price Creek-Lavon Lake | 120301060307 | 1399 | 549 | 850 | 60.8% | Fail | 35.3 |
| Rowlett Creek-East Fork Trinity River | 120301060409 | 531 | 181 | 350 | 65.9% | Fail | 27.8 |
| Rowlett Creek-Lake Ray Hubbard | 120301060408 | 70 | 0 | 70 | 100.0% | Pass | 0.0 |
| Sister Grove Creek-Pilot Grove Creek | 120301060304 | 1839 | 199 | 1640 | 89.2% | Pass | 9.7 |
| South Mesquite Creek | 120301060504 | 88 | 23 | 65 | 73.9% | Fail | 24.8 |
| Squirrel Creek-East Fork Trinity River | 120301060201 | 3623 | 724 | 2899 | 80.0% | Fail | 13.4 |
| Stiff Creek-Sister Grove Creek | 120301060303 | 1607 | 66 | 1541 | 95.9% | Pass | 3.8 |
| Throckmorton Creek-East Fork Trinity River | 120301060203 | 1143 | 100 | 1043 | 91.3% | Pass | 8.7 |
| Ticky Creek-Lavon Lake | 120301060306 | 922 | 125 | 797 | 86.4% | Pass | 13.8 |
| Town of Allen-Cottonwood Creek | 120301060405 | 150 | 13 | 137 | 91.3% | Pass | 8.3 |
| Upper Wilson Creek | 120301060206 | 2062 | 147 | 1915 | 92.9% | Pass | 7.0 |
| West Prong Sister Grove Creek | 120301060301 | 2925 | 543 | 2382 | 81.4% | Fail | 10.5 |
| White House Ridge-East Fork Trinity River | 120301060507 | 638 | 305 | 333 | 52.2% | Fail | 29.9 |
| White Rock Creek-Levon Lake | 120301060208 | 3379 | 554 | 2825 | 83.6% | Fail | 13.3 |
| Whites Creek-East Fork Trinity River | 120301060202 | 3835 | 516 | 3319 | 86.5% | Pass | 10.3 |

VALIDATION RESULTS

Based on the validation assessments and BLE comparison results described above, the CNMS inventory of Zone A studies in the East Fork Trinity Watershed has been updated as summarized in Table 8 and illustrated in Figure 6: below.

Table 8: BLE Validation Results

| Zone | Validation Status | Stream Miles |
|--------------------|-------------------|--------------|
| A | VALID | 555.6 |
| A | UNVERIFIED | 414.1 |
| AE | VALID | 418.6 |
| AE | UNKNOWN | 0.3 |
| AE | UNVERIFIED | 51.7 |
| AO | VALID | 0.4 |
| X | ASSESSED | 39.5 |
| Total Miles | | 1,480.2 |

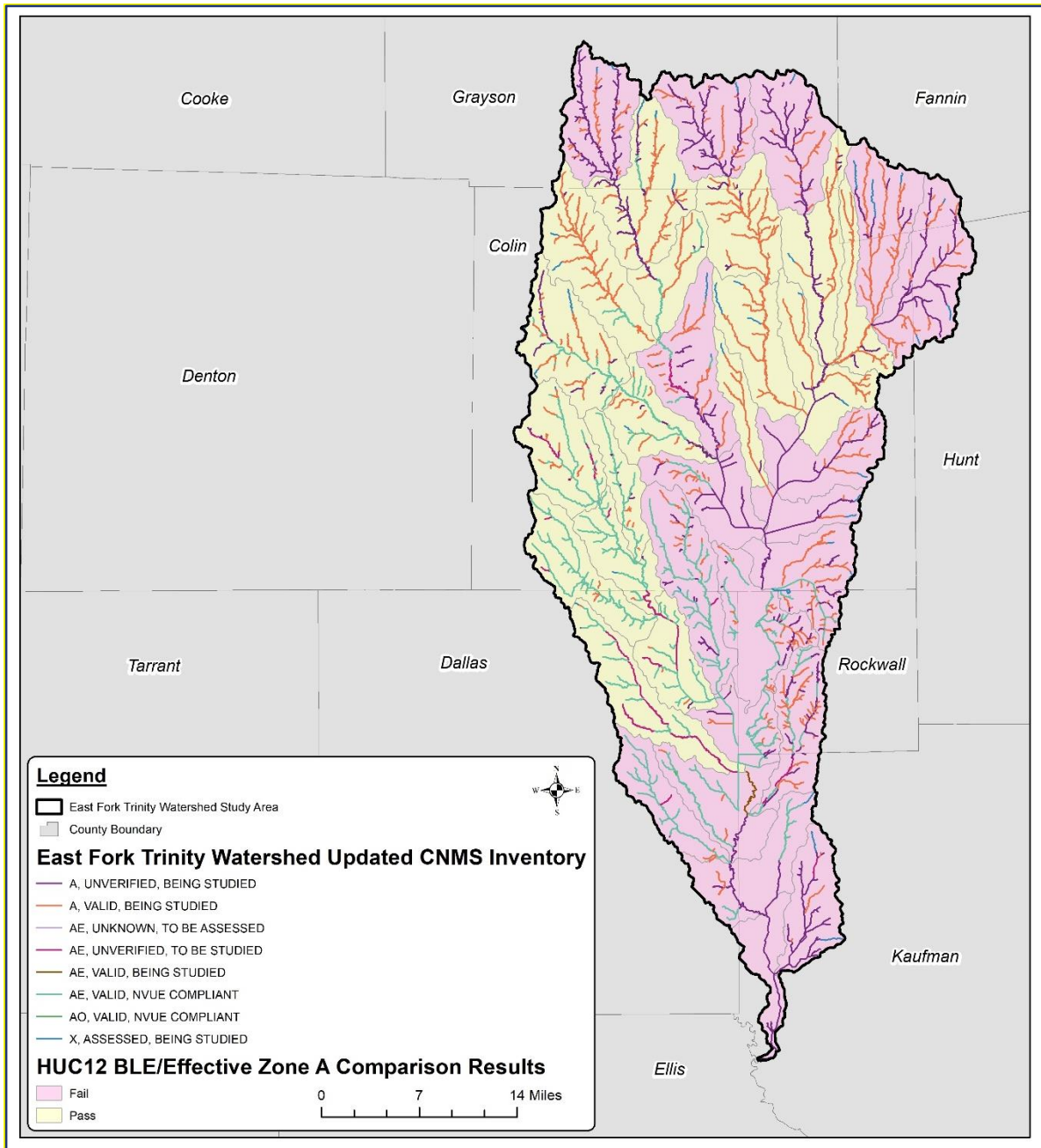


Figure 6: East Fork Trinity Watershed CNMS Validation Results

An overall risk for the HUC-12 watershed was calculated using the National Flood Risk Percentages Dataset and its proportional area. The weighted risk was multiplied by the percentage of points in the watershed that failed the CNMS comparison to effective to determine the priority score. Figure 7: below shows the range of the East Fork Trinity HUC-12 priority scores which can be used to initiate discussions during the Discovery phase.

The White House Ridge - East Fork Trinity River HUC-12 was determined to have the highest priority score of 62.6 and the most need while North Mesquite Creek, Rowlett Creek, and South Mesquite Creek all share the lowest score of 0.

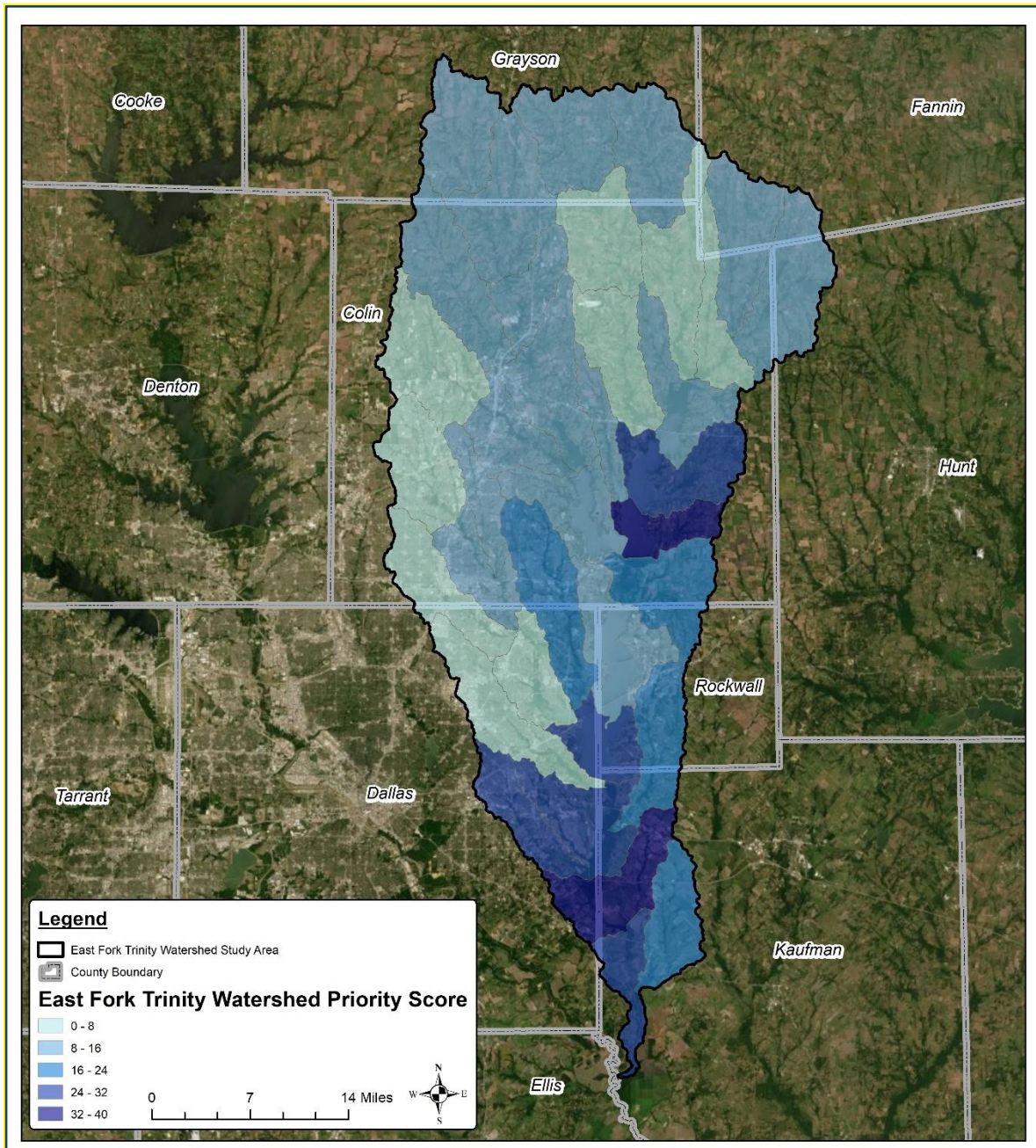


Figure 7: Ranking of East Fork Trinity Watershed HUC-12s

3.2 Flood Risk Analysis

An advanced flood risk analysis was performed using the updated 1-percent-annual-chance grid (known as 'refined' grid) created for this project. The loss analysis uses 2010 census data and the subsequent results are stored in the L_RA_Results table.

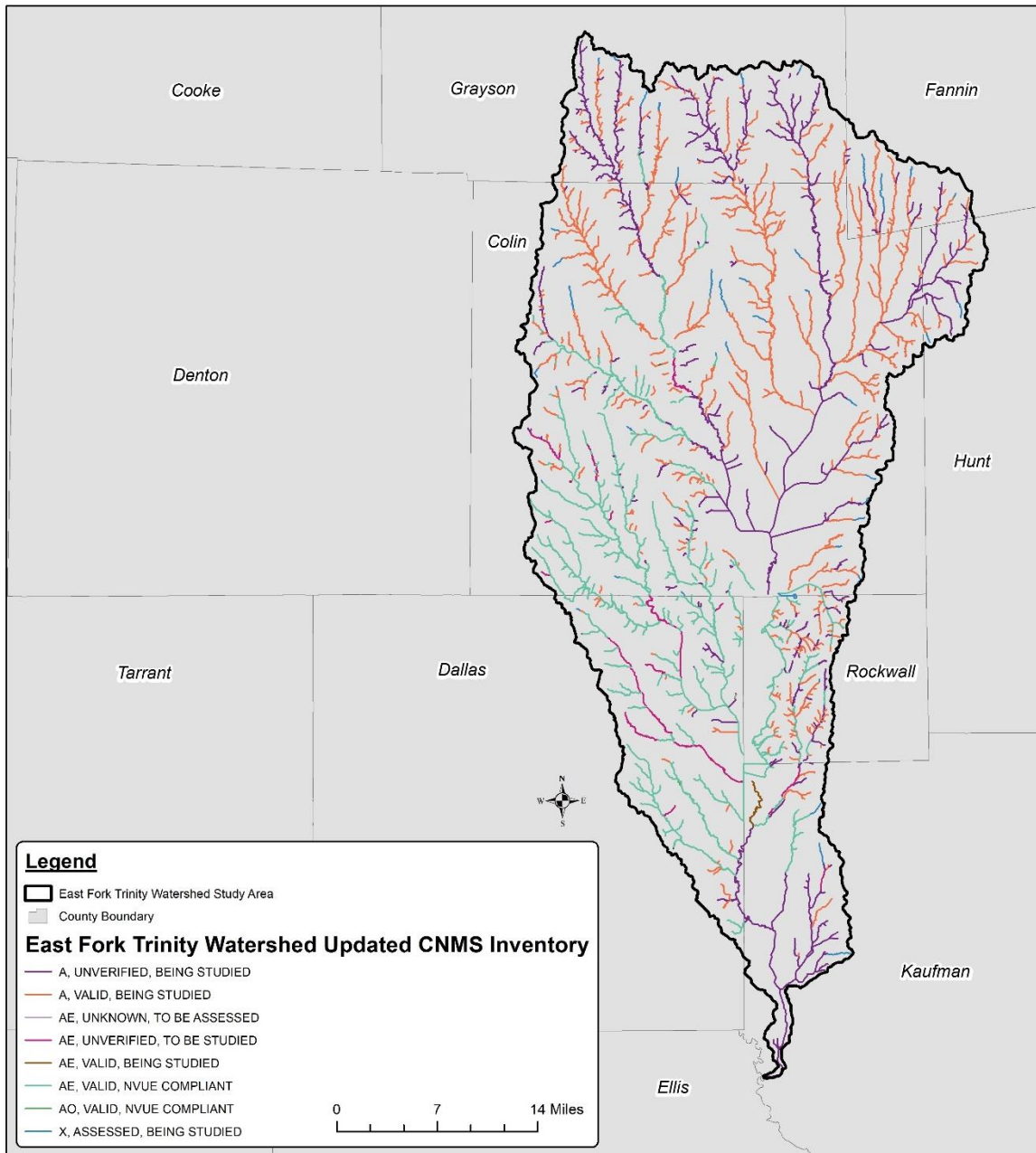
Hazus version 4.0 was used for the loss analysis.

The losses are reported via census blocks. It is important to note that Hazus version 4.0 uses dasymetric census blocks. Dasymetric mapping removes undeveloped areas (such as areas covered by other bodies of water, wetlands, or forests) from the Census blocks, changing their shape and reducing their size in these areas. For more information on dasymetric data visit FEMA's [Media Library](#) for the [Hazus-MH Data Inventories: Dasymetric vs. Homogenous](#), or [Hazus 3.0 Dasymetric Data Overview](#).

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10. Calenda, G.C., C.P. Mancini, and E. Volpi. "Distribution of Extreme Peak Floods of the Tiber River from the XV Century." *Advances in Water Resources*. 2005: 615-625.

Appendix A BLE Maps



Appendix III: Additional Data

Discovery Figures

Figure 01: HUC Locator Map

Figure 02: Federal House Congressional Districts

Figure 03: State House Congressional Districts

Figure 04: State Senate Congressional Districts

Figure 05: Population Density

Figure 06: Land Use

Figure 07: Urban Cover

Figure 08: Population Change

Figure 09: Flood Hazard Map

Figure 10: Topographic Data

Figure 11: High Water Marks and Low Water Crossings

Figure 12: Repetitive Loss (RL) and Severe Repetitive Loss (SRL) Claims

Figure 13: Flood Risk – Potential Losses

Figure 14: Population Vulnerability

Figure 15: HUC-12 Watershed Prioritizations

Figure 16: Community Rating System (CRS) Eligible Communities Map

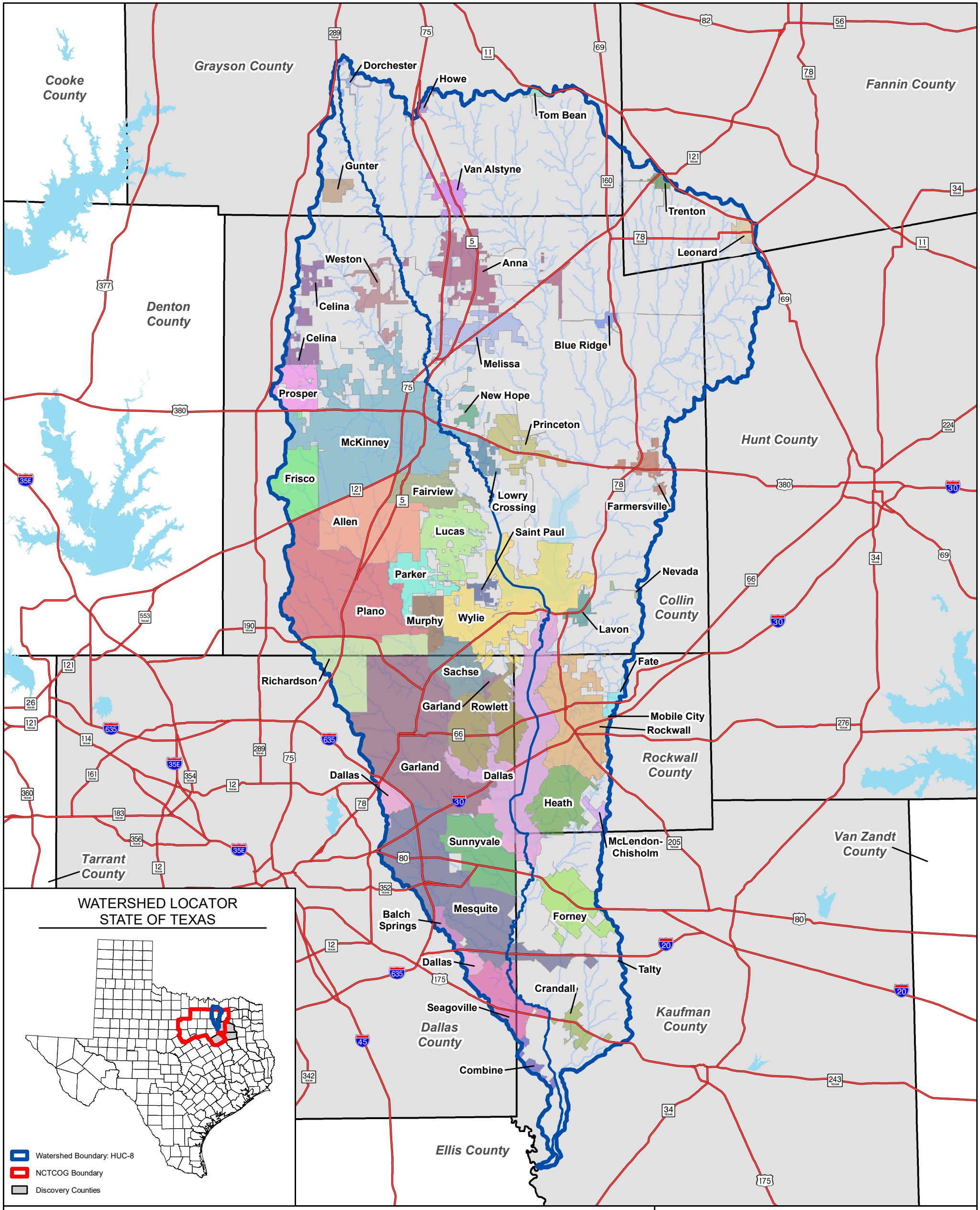
Figure 17: Stream Study Request

Figure 18: Pre-Discovery Map

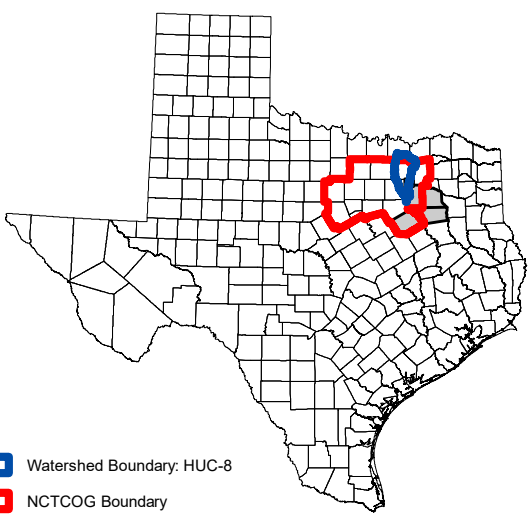
Figure 19: Discovery Map

Figure 20: Post-Discovery Map

Figure 21: HUC-12 Watershed Prioritizations and Potential Projects



WATERSHED LOCATOR STATE OF TEXAS



- Watershed Boundary: HUC-8
- NCTCOG Boundary
- Discovery Counties

Map Symbology

- | | | | |
|---------------------------|----------------|-------------------|-------------|
| East Fork Trinity River | Dallas | Lucas | Rockwall |
| Other Streams | Dorchester | McKinney | Rowlett |
| Major Highways | Fairview | McLendon-Chisholm | Sachse |
| Watershed Boundary: HUC-8 | Farmersville | Melissa | Saint Paul |
| Lakes | Fate | Mesquite | Seagoville |
| Discovery Counties | Forney | Mobile City | Sunnyvale |
| County Boundaries | Frisco | Murphy | Talty |
| Allen | Garland | Nevada | Tom Bean |
| Anna | Gunter | New Hope | Trenton |
| Balch Springs | Heath | Parker | Van Alstyne |
| Blue Ridge | Howe | Plano | Weston |
| Celina | Lavon | Princeton | Wylie |
| Combine | Leonard | Prosper | |
| Crandall | Lowry Crossing | Richardson | |

Figure 1:

HUC Locator Map

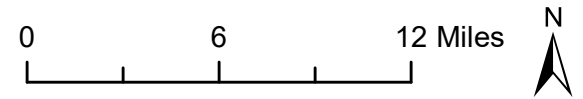
EAST FORK TRINITY WATERSHED
September 30, 2019

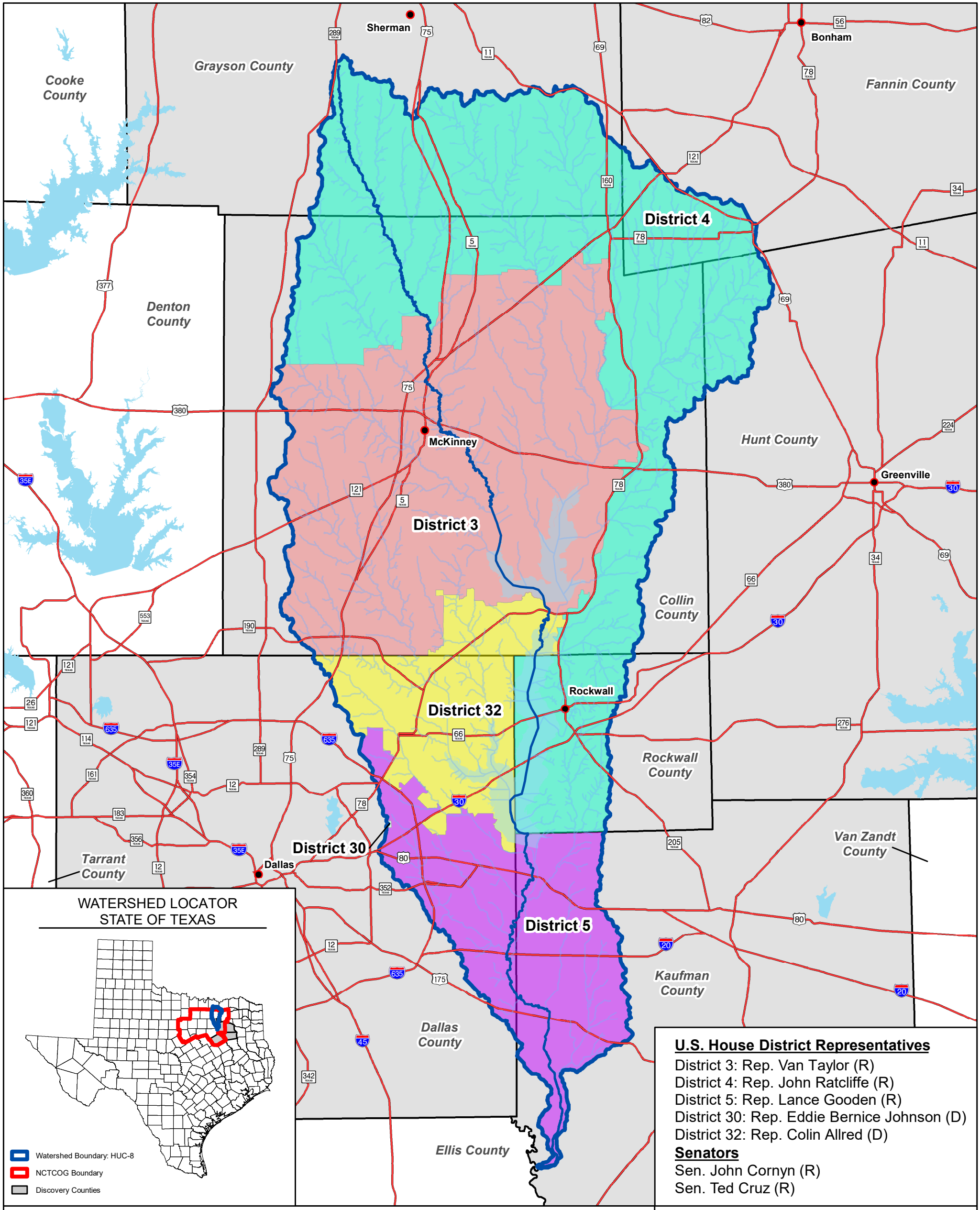


FEMA



North Central Texas Council of Governments





Map Symbolology

- County Seat
- ~ East Fork Trinity River
- ~ Other Streams
- Major Highways
- ⊕ Watershed Boundary: HUC-8
- ⊕ Lakes
- ⊕ Discovery Counties
- ⊕ County Boundaries

- Federal House Districts (2018)**
- District 3
 - District 4
 - District 5
 - District 30
 - District 32

Figure 2:

Federal House Districts

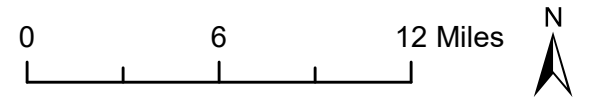
EAST FORK TRINITY WATERSHED
 September 30, 2019

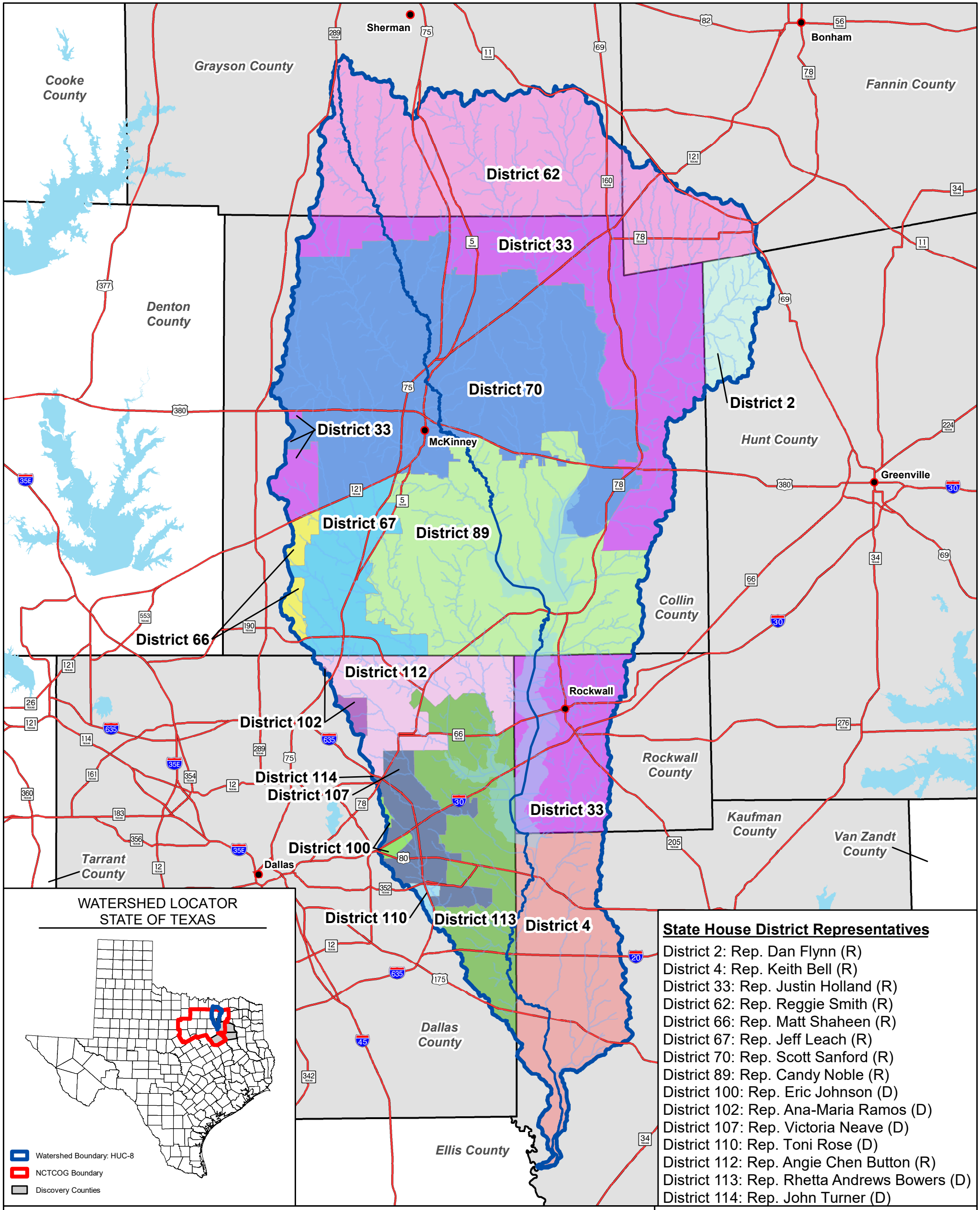


FEMA



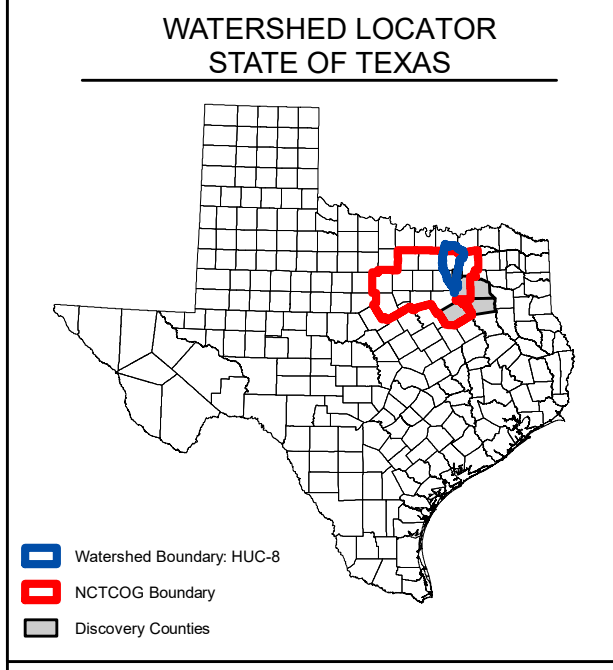
North Central Texas
 Council of Governments





State House District Representatives

| | |
|---------------|--------------------------------|
| District 2: | Rep. Dan Flynn (R) |
| District 4: | Rep. Keith Bell (R) |
| District 33: | Rep. Justin Holland (R) |
| District 62: | Rep. Reggie Smith (R) |
| District 66: | Rep. Matt Shaheen (R) |
| District 67: | Rep. Jeff Leach (R) |
| District 70: | Rep. Scott Sanford (R) |
| District 89: | Rep. Candy Noble (R) |
| District 100: | Rep. Eric Johnson (D) |
| District 102: | Rep. Ana-Maria Ramos (D) |
| District 107: | Rep. Victoria Neave (D) |
| District 110: | Rep. Toni Rose (D) |
| District 112: | Rep. Angie Chen Button (R) |
| District 113: | Rep. Rhetta Andrews Bowers (D) |
| District 114: | Rep. John Turner (D) |



Map Symbolology

- County Seat
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

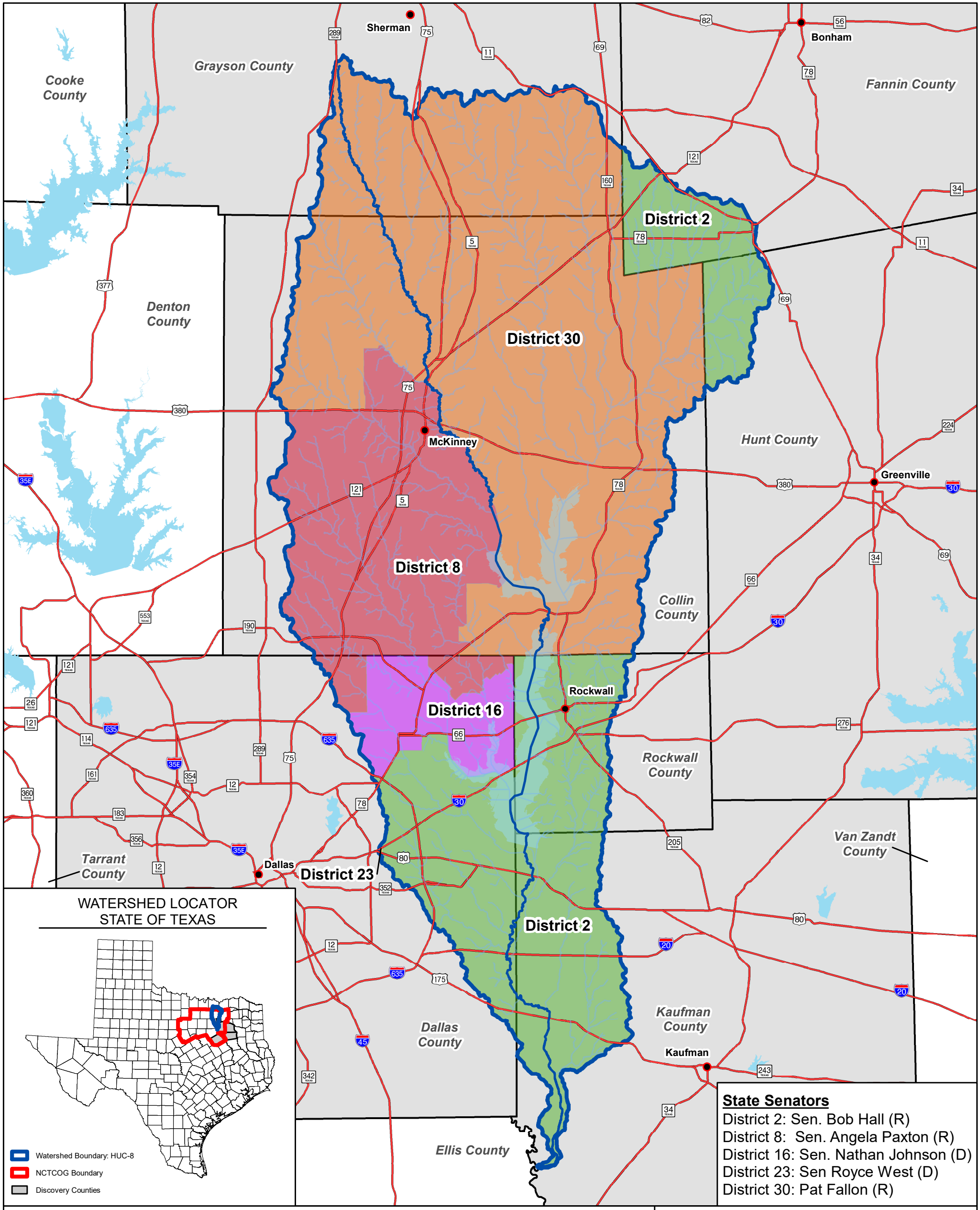
State House District (2018)

- District 2
- District 4
- District 33
- District 62
- District 66
- District 67
- District 70
- District 89
- District 100
- District 102
- District 107
- District 110
- District 112
- District 113
- District 114

Figure 3: State House Congressional Districts

EAST FORK TRINITY WATERSHED
September 30, 2019

The figure includes the FEMA logo and the North Central Texas Council of Governments logo. A scale bar at the bottom indicates 0, 6, and 12 miles, with a north arrow pointing upwards.



Map Symbolology

- County Seat
- ~ East Fork Trinity River
- ~ Other Streams
- Major Highways
- ⊕ Watershed Boundary: HUC-8
- ⊕ Lakes
- ⊕ Discovery Counties
- ⊕ County Boundaries

- State Senate District (2018)**
- District 2
 - District 8
 - District 16
 - District 23
 - District 30

**Figure 4:
State Senate
Congressional Districts**

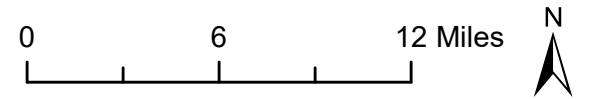
EAST FORK TRINITY WATERSHED
September 30, 2019

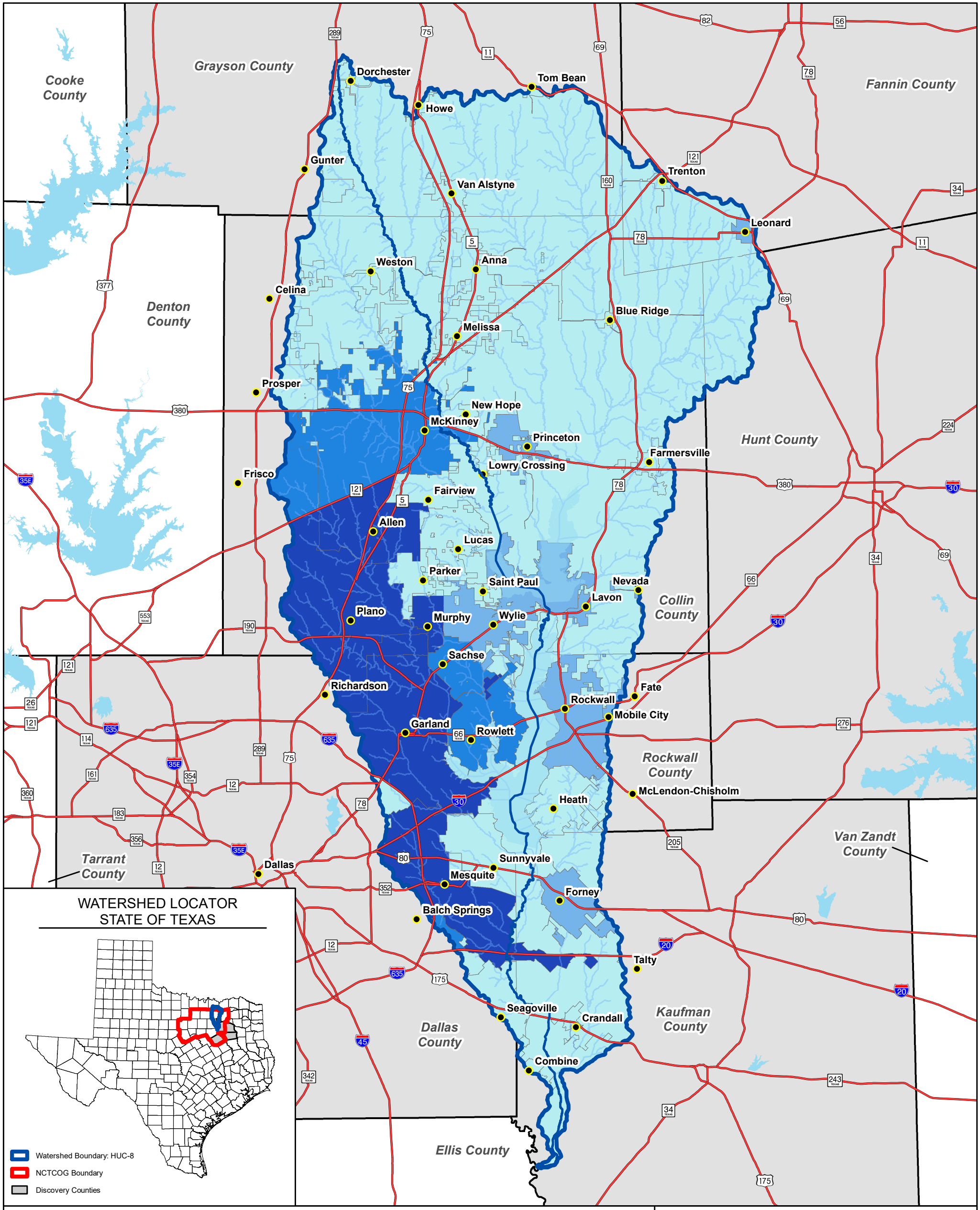


FEMA

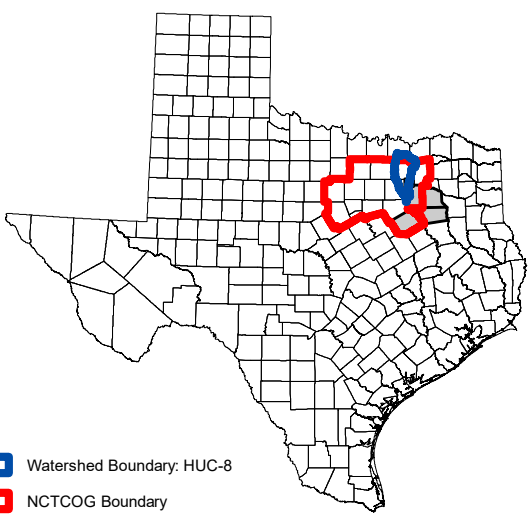


North Central Texas
Council of Governments





**WATERSHED LOCATOR
STATE OF TEXAS**



- Watershed Boundary: HUC-8
- NCTCOG Boundary
- Discovery Counties

Map Symbolology

- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

Population Density (2016)

- Very Low
- Low
- Medium
- High

*Source: 2010 U.S. Census, 2016 American Community Survey

Figure 5:

Population Density

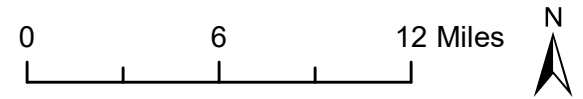
EAST FORK TRINITY WATERSHED
September 30, 2019



FEMA



**North Central Texas
Council of Governments**



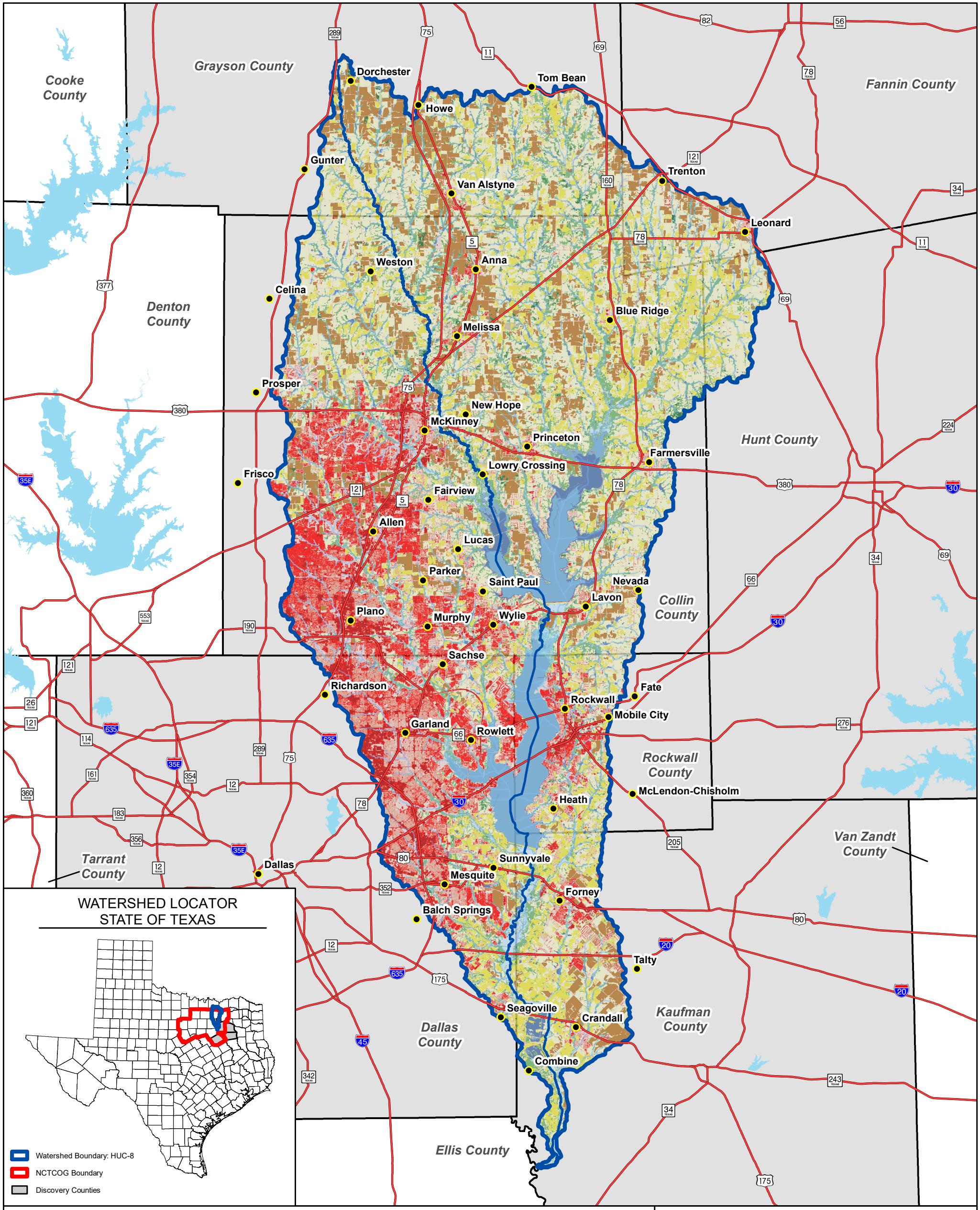


Figure 6:

Land Use

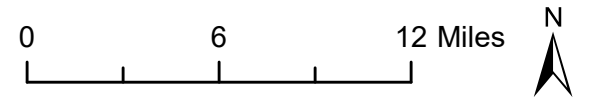
EAST FORK TRINITY WATERSHED
September 30, 2019



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North Central Texas Council of Governments



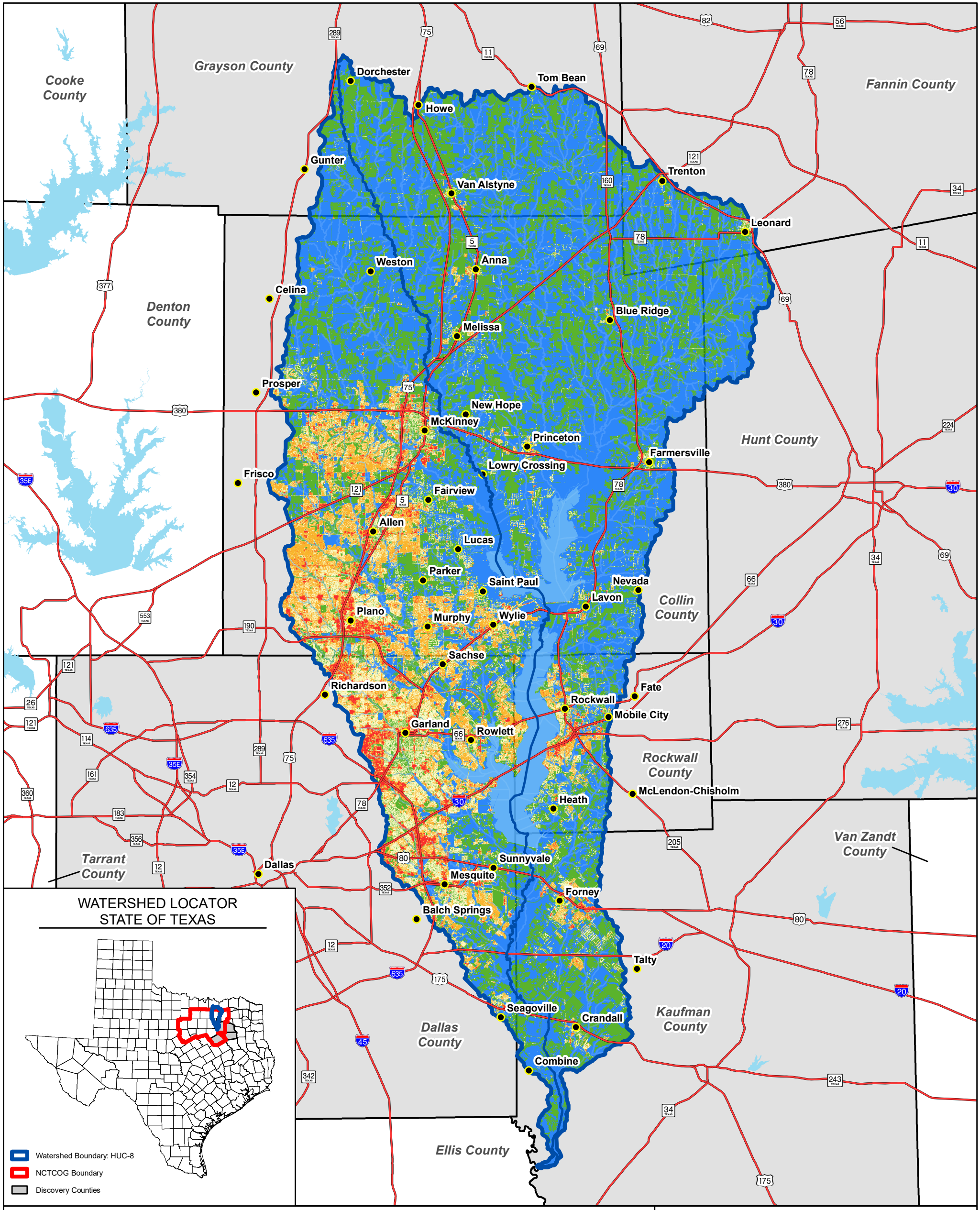


Figure 7:

Urban Cover

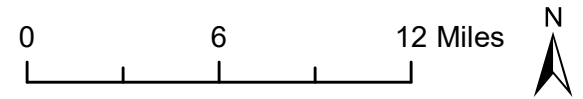
EAST FORK TRINITY WATERSHED
September 30, 2019

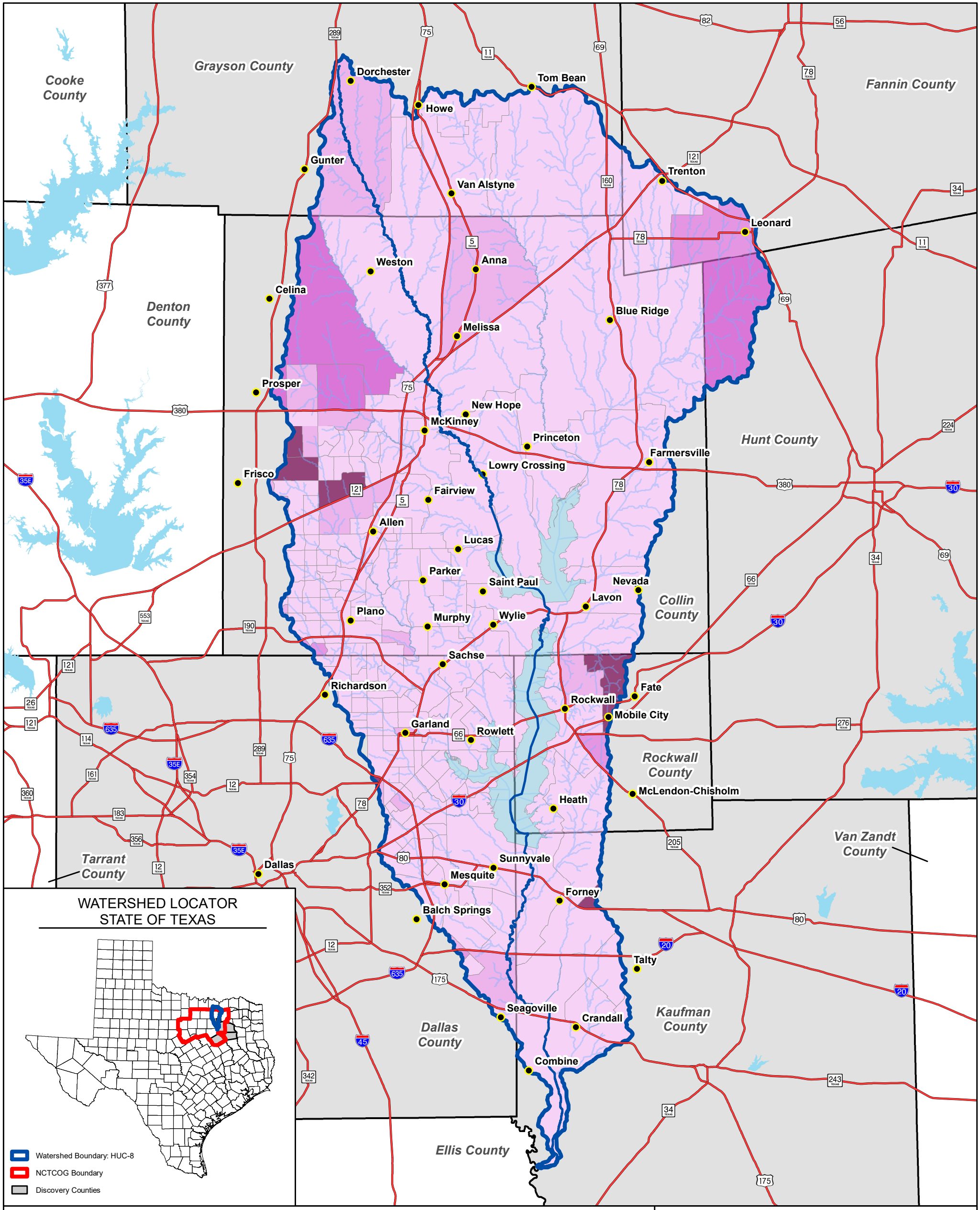


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North Central Texas
Council of Governments





Map Symbology

- Cities
- ~ East Fork Trinity River
- ~ Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

Percent Population Change (2010-2016)*

- 0 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%
- More than 100%

*Source: 2010 U.S. Census, 2016 American Community Survey

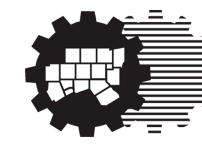
Figure 8:

Population Change

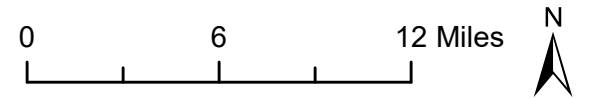
EAST FORK TRINITY WATERSHED
September 30, 2019

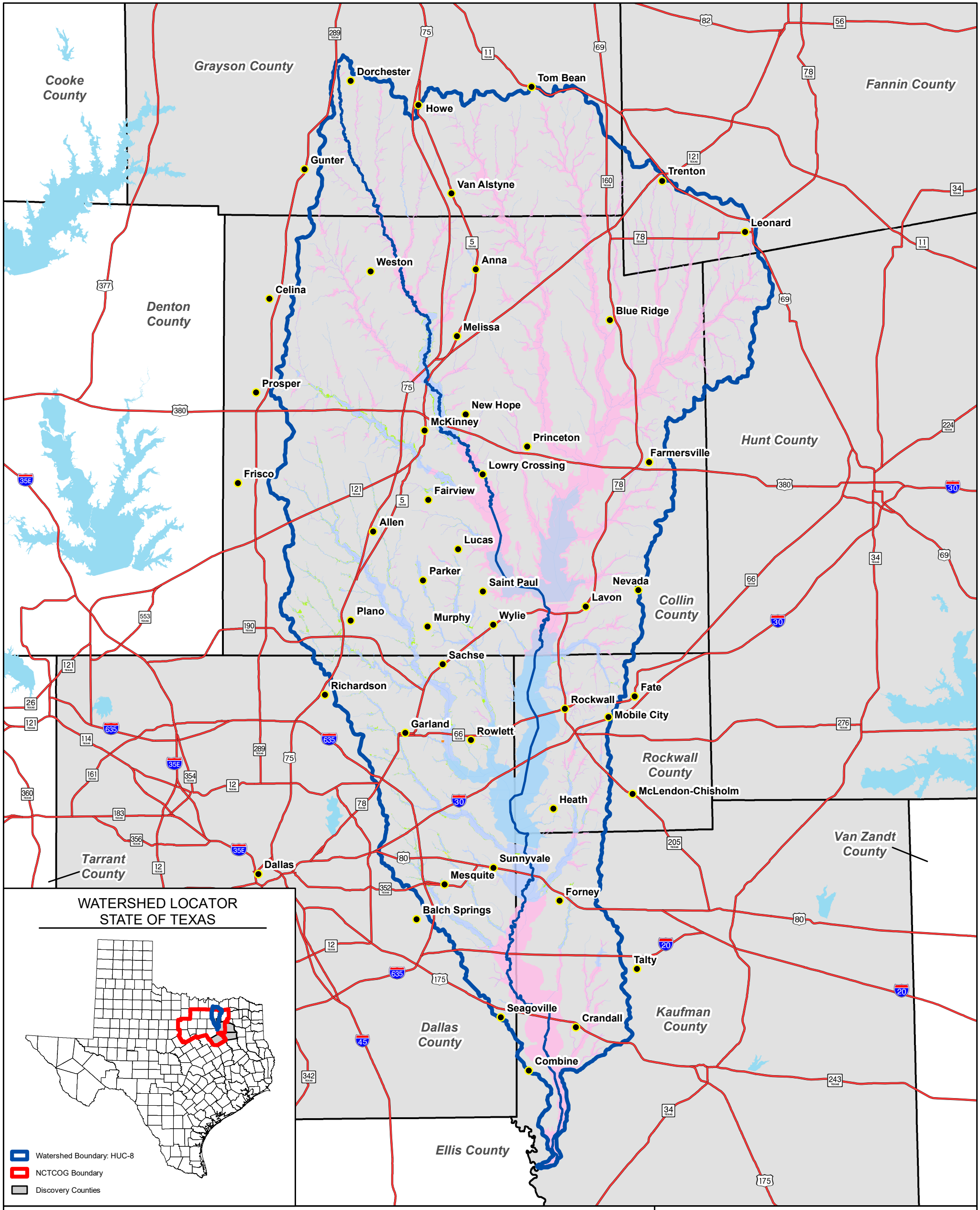


FEMA

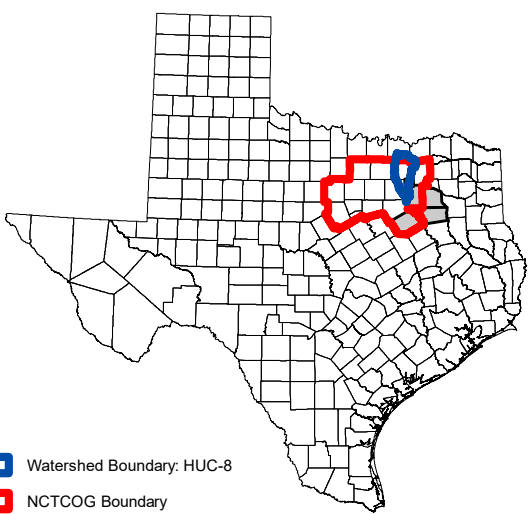





North Central Texas Council of Governments













**WATERSHED LOCATOR
STATE OF TEXAS**



-  Watershed Boundary: HUC-8
-  NCTCOG Boundary
-  Discovery Counties

Map Symbolology

-  Cities
-  East Fork Trinity River
-  Other Streams
-  Major Highways
-  Watershed Boundary: HUC-8
-  Lakes
-  Discovery Counties
-  County Boundaries






- Effective FEMA Floodplains (2019)**
-  Zone A (100-Year, Approximate)
 -  Zone AE (100-Year, Detailed)
 -  Zone AO (100-Year, Detailed)
 -  Zone X (500-Year, Detailed)
 -  Area With Reduced Flood Risk Due to Levee

Figure 9:

Flood Hazard Map

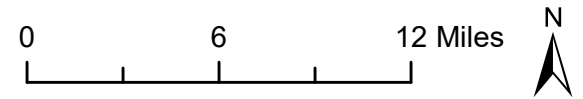
EAST FORK TRINITY WATERSHED
September 30, 2019

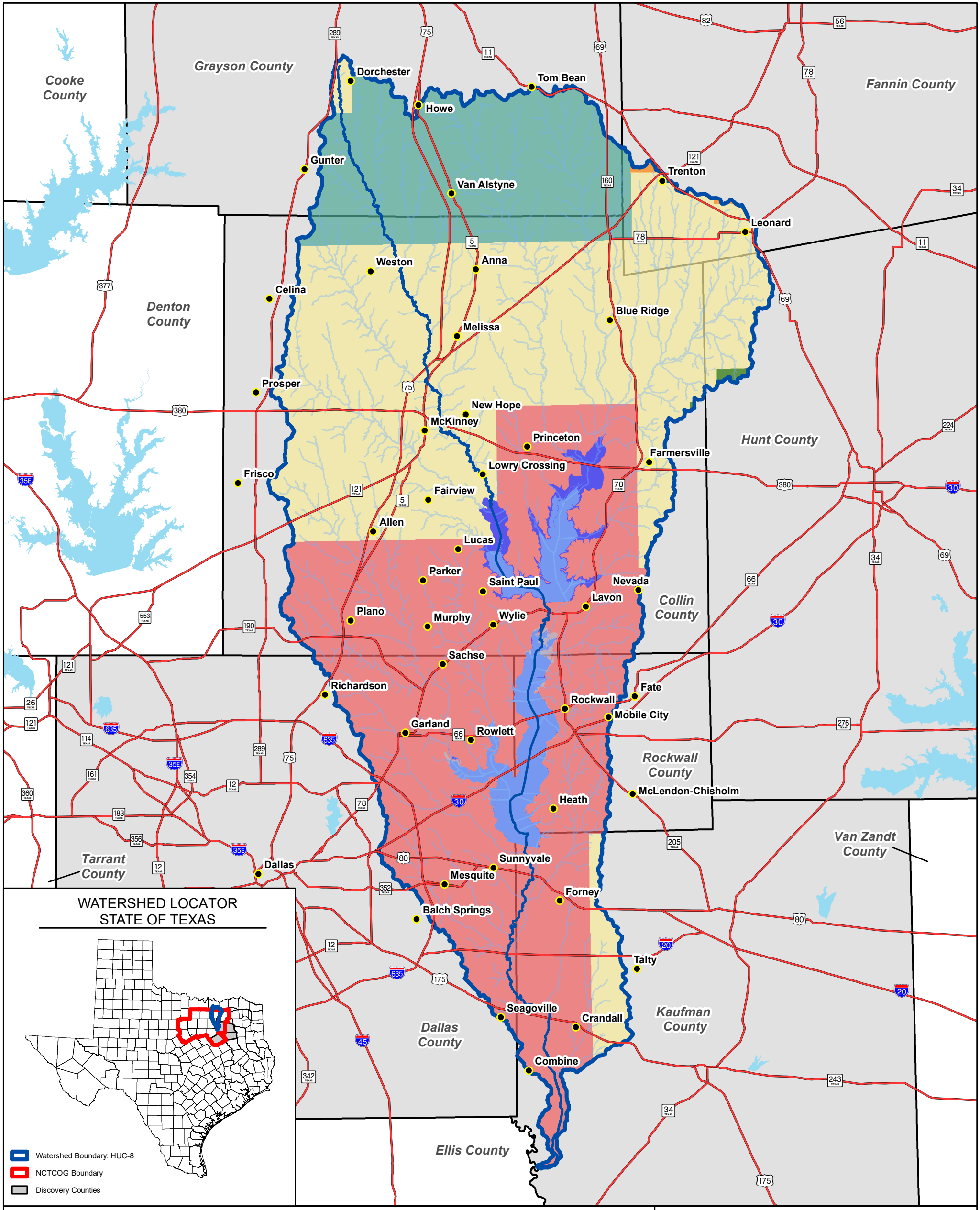


FEMA

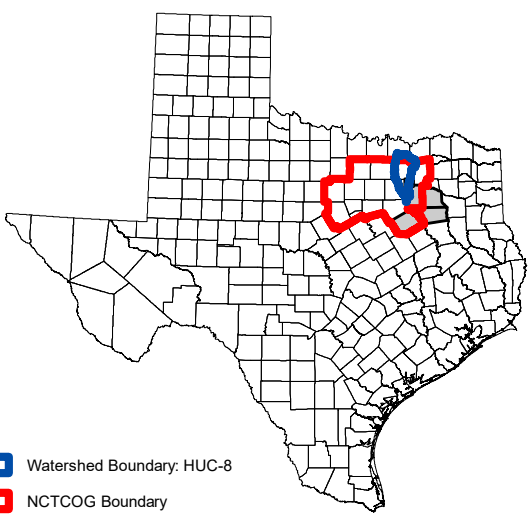


**North Central Texas
Council of Governments**





**WATERSHED LOCATOR
STATE OF TEXAS**



Map Symbology

- Cities
- ~ East Fork Trinity River
- ~ Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- ☾ Lakes
- Discovery Counties
- County Boundaries

- Available Topography Data**
- 2009 TNRIS Dallas County LiDAR
 - 2010 TRNIS Cooke, Grayson, Montague, & Wise County LiDAR
 - 2011 TRNIS Collin, Denton, & Kaufman County LiDAR
 - 2017 TNRIS East Texas
 - USGS Topo
 - 2018 Texas Water Development Board

Figure 10:

Topographic Data

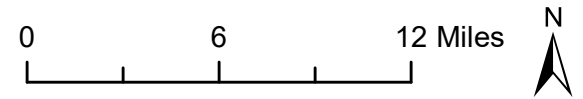
EAST FORK TRINITY WATERSHED
September 30, 2019

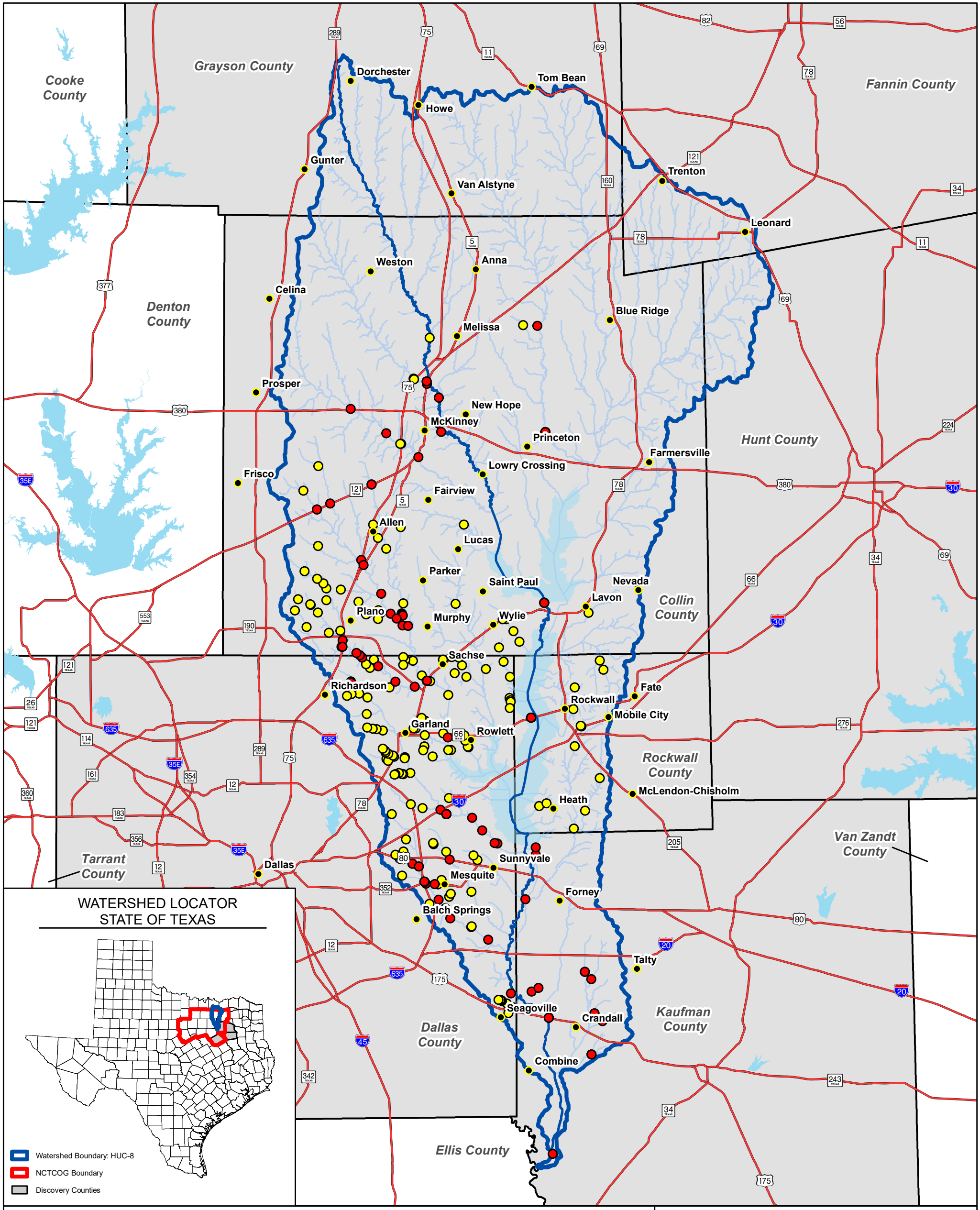


FEMA

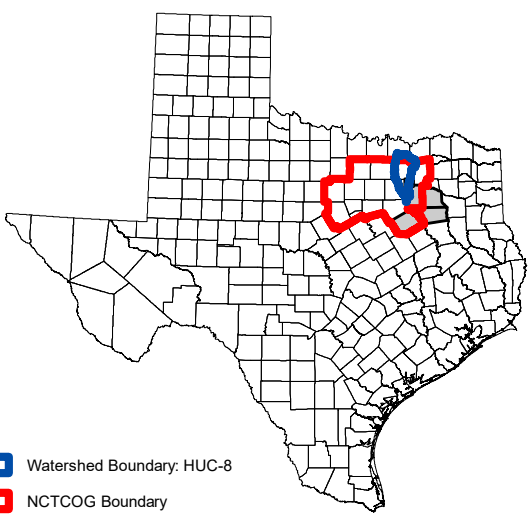





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










**WATERSHED LOCATOR
STATE OF TEXAS**



-  Watershed Boundary: HUC-8
-  NCTCOG Boundary
-  Discovery Counties

Map Symbology

-  Cities
-  High Water Marks
-  Low Water Crossings
-  East Fork Trinity River
-  Other Streams
-  Major Highways
-  Watershed Boundary: HUC-8
-  Lakes
-  Discovery Counties
-  County Boundaries

**Figure 11:
High Water Marks &
Low Water Crossings**

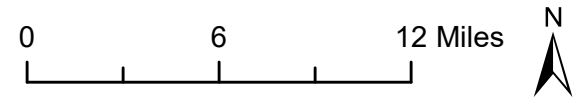
EAST FORK TRINITY WATERSHED
September 30, 2019

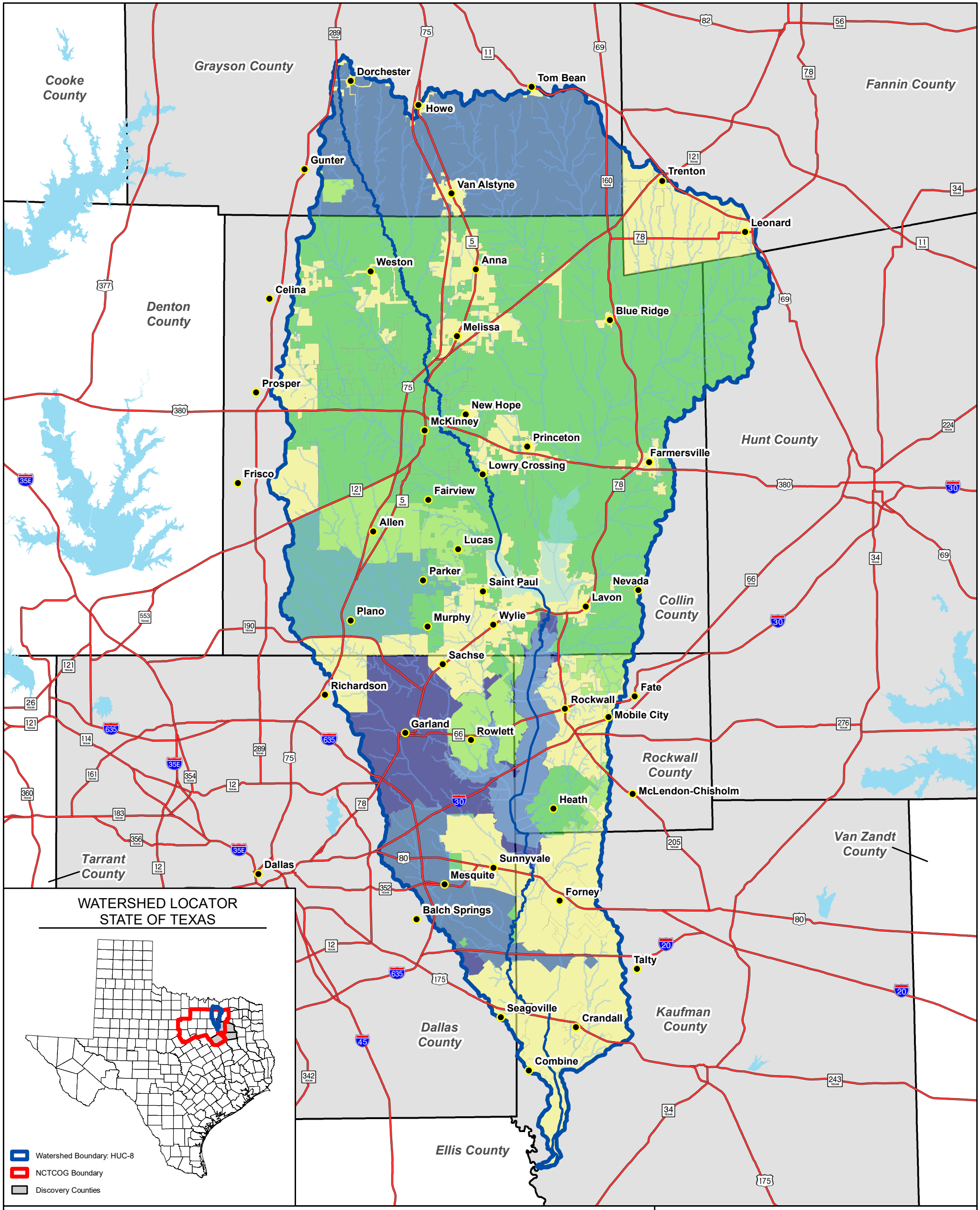


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Map Symbology

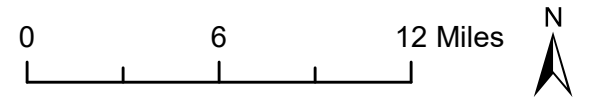
- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

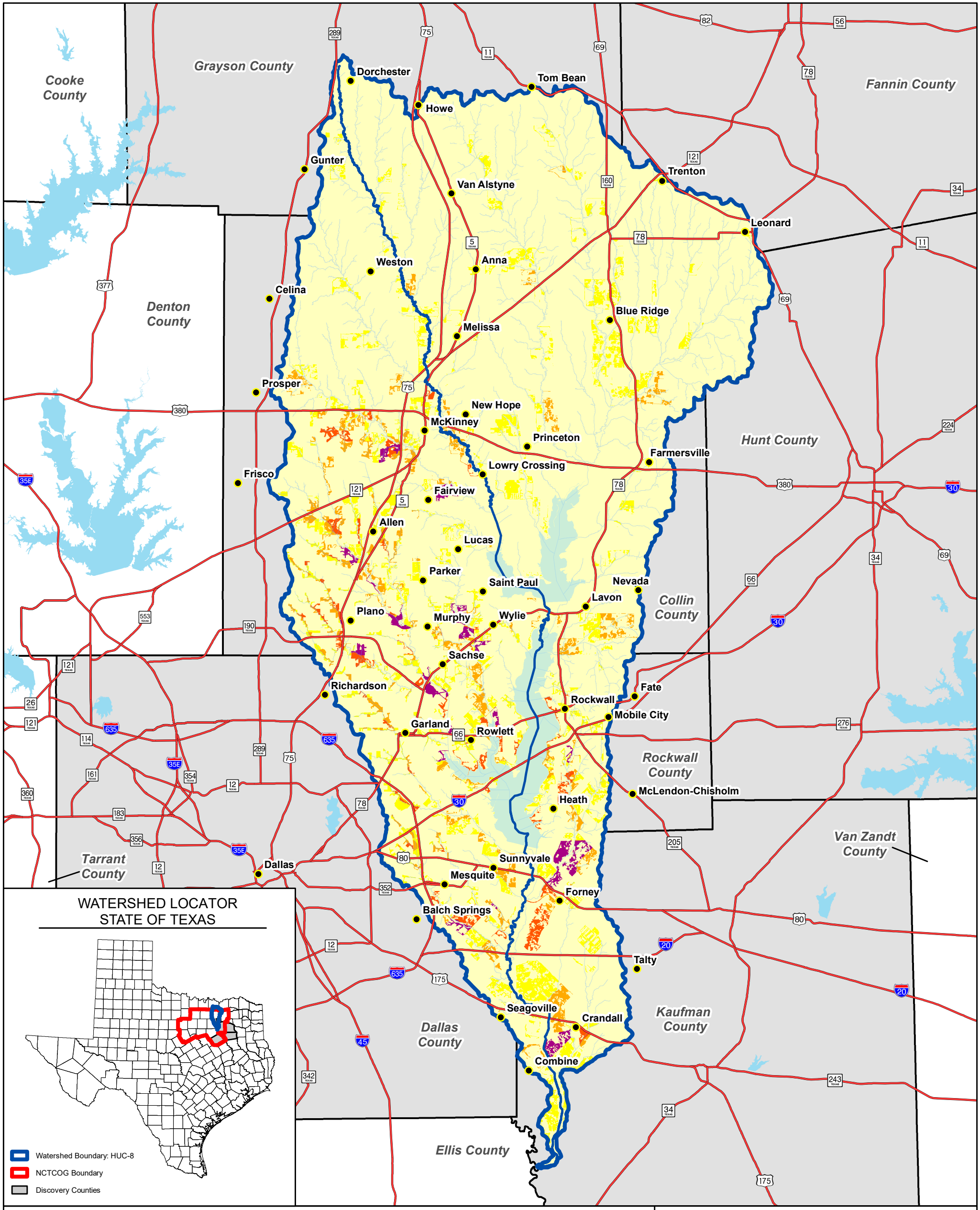
RL/SRL Claims (2018 FEMA)

| | |
|--|----------|
| | 0 |
| | 1 |
| | 2 - 4 |
| | 5 - 6 |
| | 7 - 18 |
| | 74 - 100 |

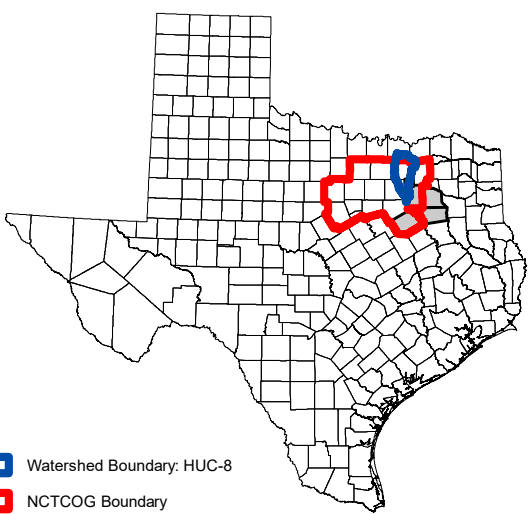
**Figure 12:
Repetitive Loss (RL) & Severe
Repetitive Loss (SRL) Claims**

EAST FORK TRINITY WATERSHED
September 30, 2019





**WATERSHED LOCATOR
STATE OF TEXAS**



- Watershed Boundary: HUC-8
- NCTCOG Boundary
- Discovery Counties

Map Symbology

- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

- Flood Risk***
- Very Low
 - Low
 - Medium
 - High
 - Very High

*Note: Flood Risk data source is FEMA 2016 HAZUS Average Annualized Loss (AAL) Study

**Figure 13:
Flood Risk-
Potential Losses**

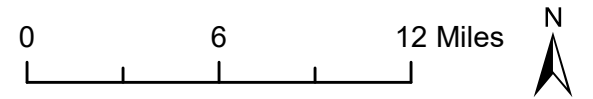
EAST FORK TRINITY WATERSHED
September 30, 2019

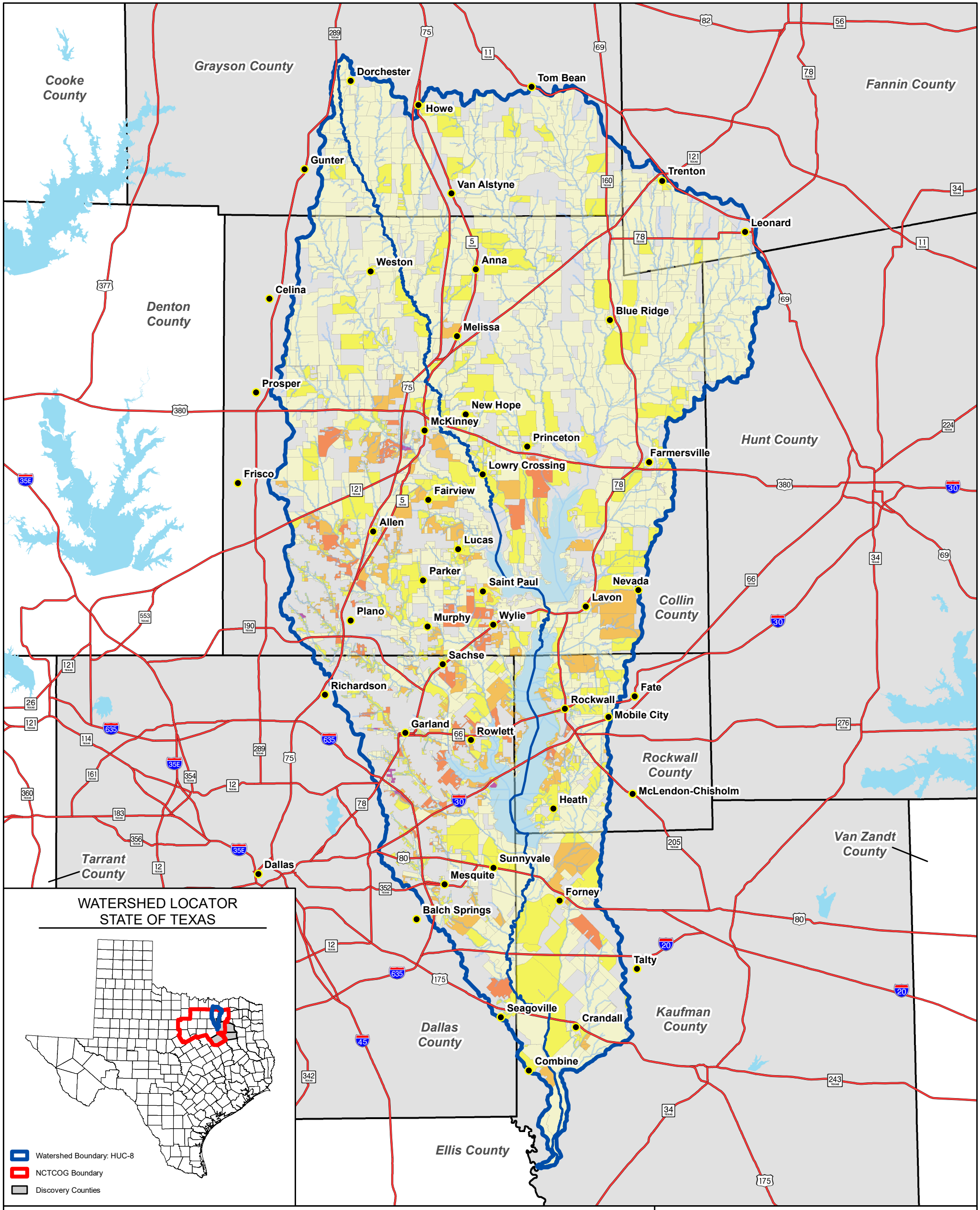


FEMA



**North Central Texas
Council of Governments**





Map Symbology

- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

Population Vulnerability to 1% Flood (2012 Texas Hazard Mitigation Package)

- Very Low
- Low
- Medium
- High
- Very High

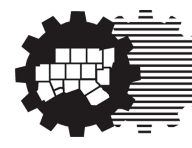
Figure 14:

Population Vulnerability

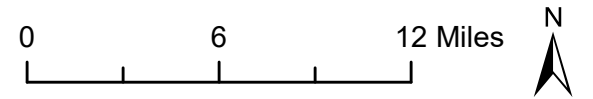
EAST FORK TRINITY WATERSHED
September 30, 2019

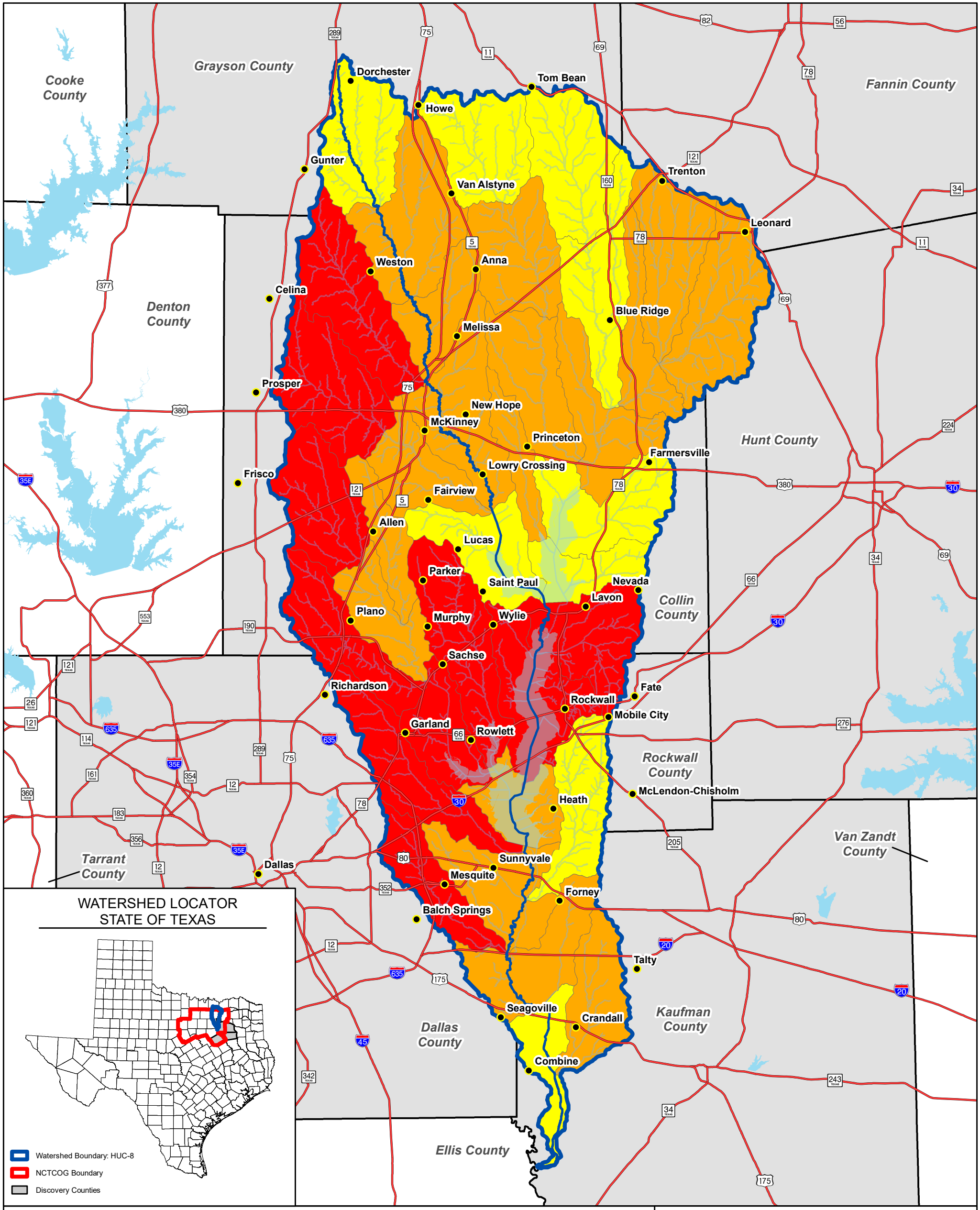


FEMA

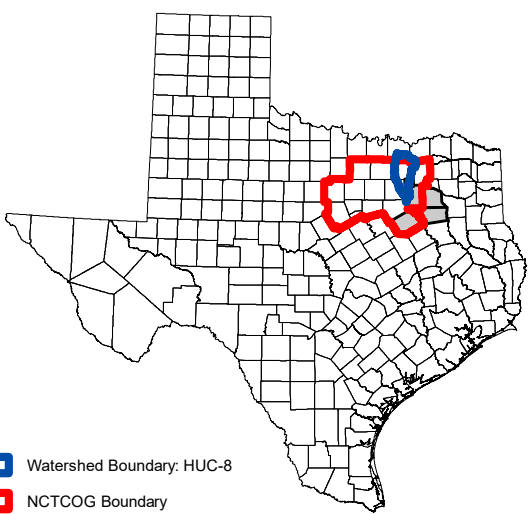


North Central Texas Council of Governments





WATERSHED LOCATOR STATE OF TEXAS



- Watershed Boundary: HUC-8
- NCTCOG Boundary
- Discovery Counties

Map Symbolology

- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

Huc-12 Watershed Prioritization*

- Moderate Risk
- Elevated Risk
- High Risk

*Based on TWDB MNA Criteria.

**Figure 15:
HUC-12 Watershed
Prioritizations**

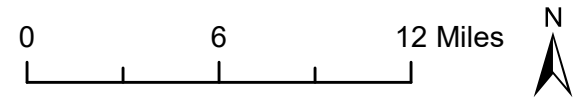
EAST FORK TRINITY WATERSHED
September 30, 2019

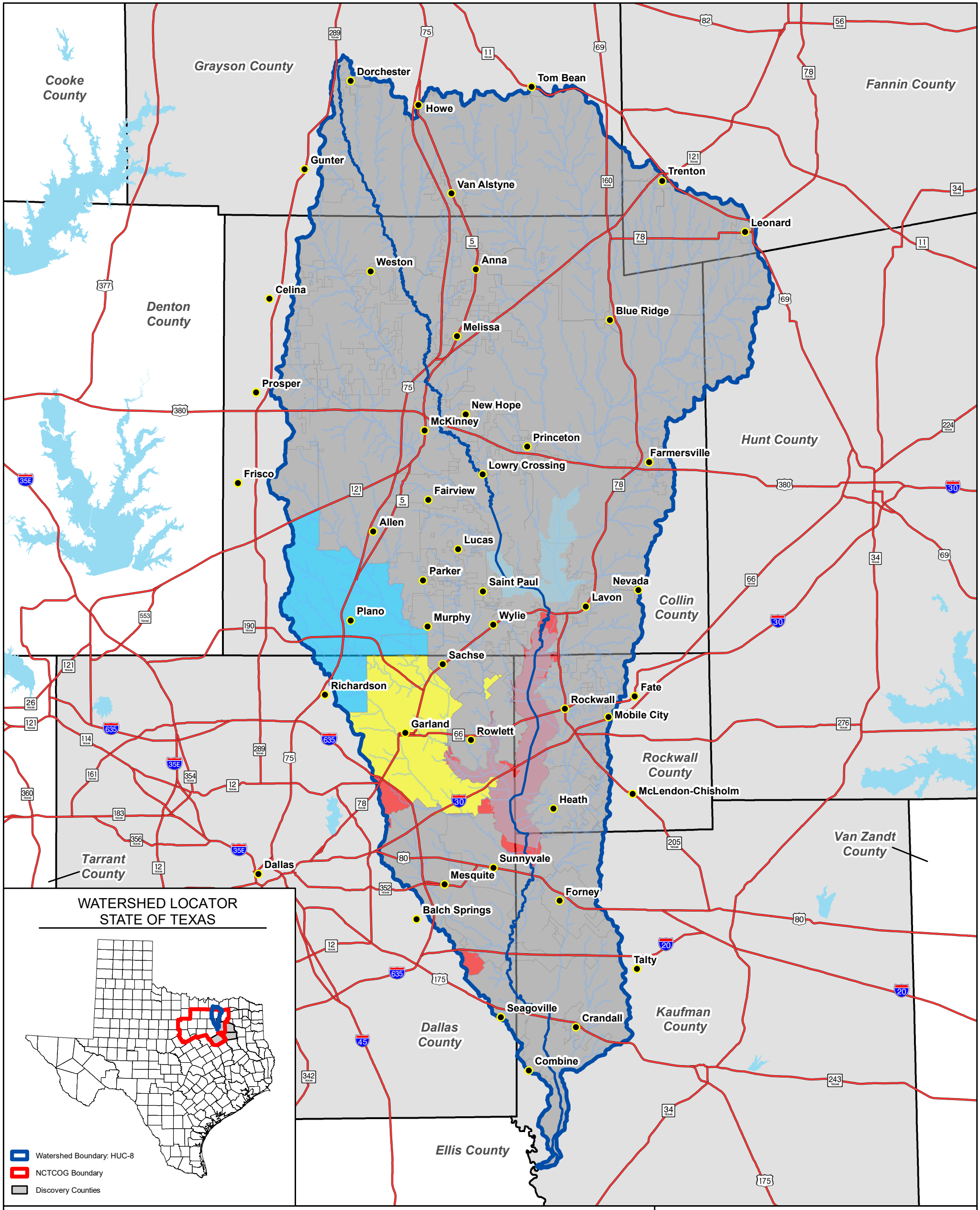


FEMA

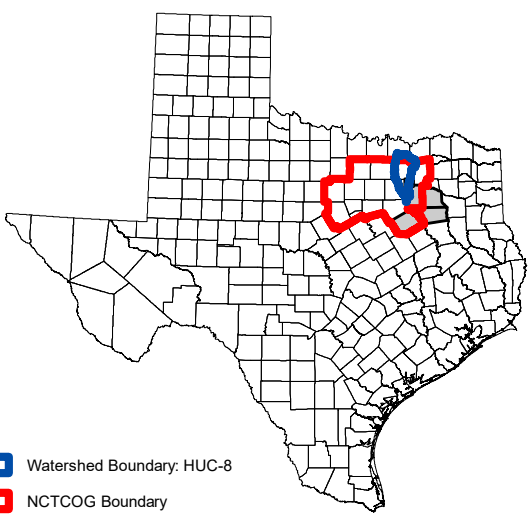


**North Central Texas
Council of Governments**





**WATERSHED LOCATOR
STATE OF TEXAS**



- Watershed Boundary: HUC-8
- NCTCOG Boundary
- Discovery Counties

Map Symbology

- Cities
- East Fork Trinity River
- Other Streams
- Major Highways
- Watershed Boundary: HUC-8
- Lakes
- Discovery Counties
- County Boundaries

- CRS Class (As of 6/1/2019)**
- Community Not Participating
 - 5
 - 7
 - 8

**Figure 16:
Communities Rating System
(CRS) Eligible Communities Map**

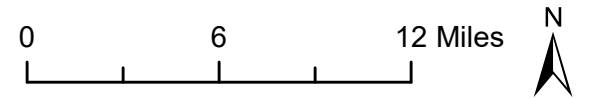
EAST FORK TRINITY WATERSHED
August 31, 2019

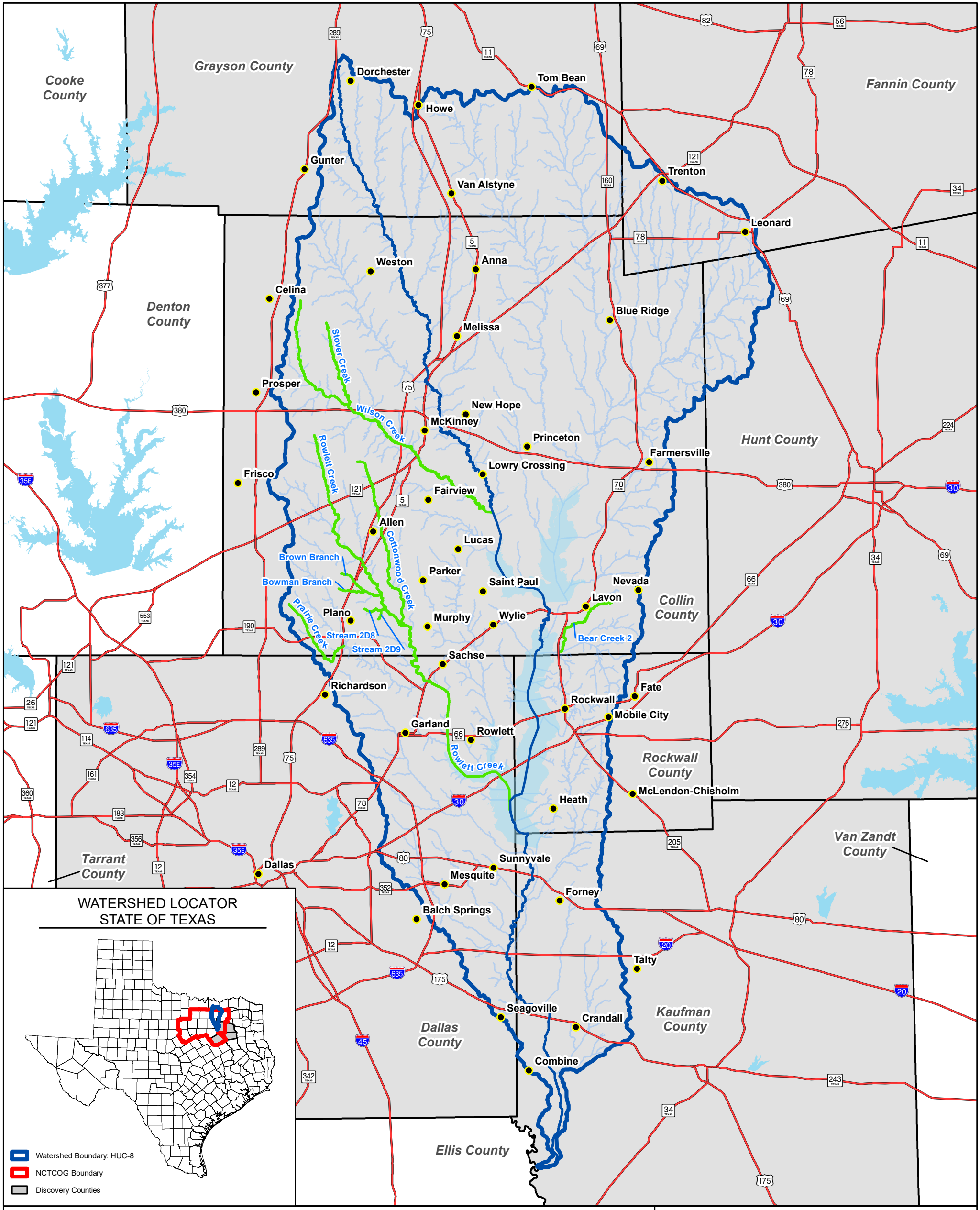


FEMA

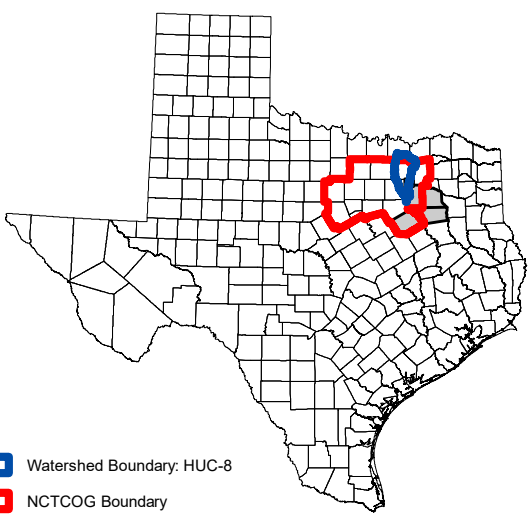





North Central Texas
Council of Governments





**WATERSHED LOCATOR
STATE OF TEXAS**



-  Watershed Boundary: HUC-8
-  NCTCOG Boundary
-  Discovery Counties

Map Symbolology










-  Cities
-  Stream Study Request
-  East Fork Trinity River
-  Other Streams
-  Major Highways
-  Watershed Boundary: HUC-8
-  Lakes
-  Discovery Counties
-  County Boundaries

Figure 17:

Stream Study Requests

EAST FORK TRINITY WATERSHED
September 30, 2019



FEMA



**North Central Texas
Council of Governments**

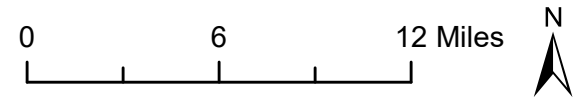
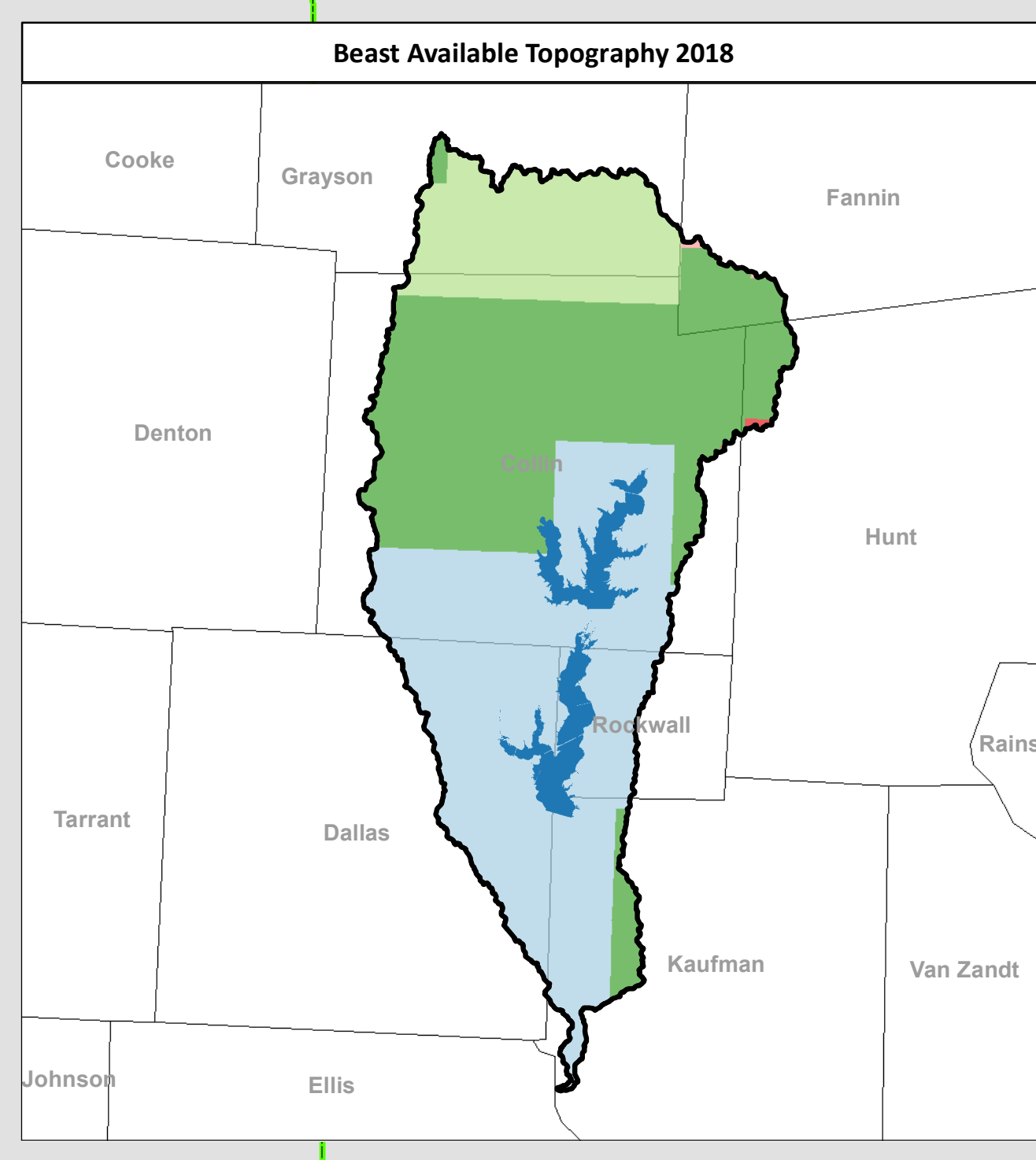
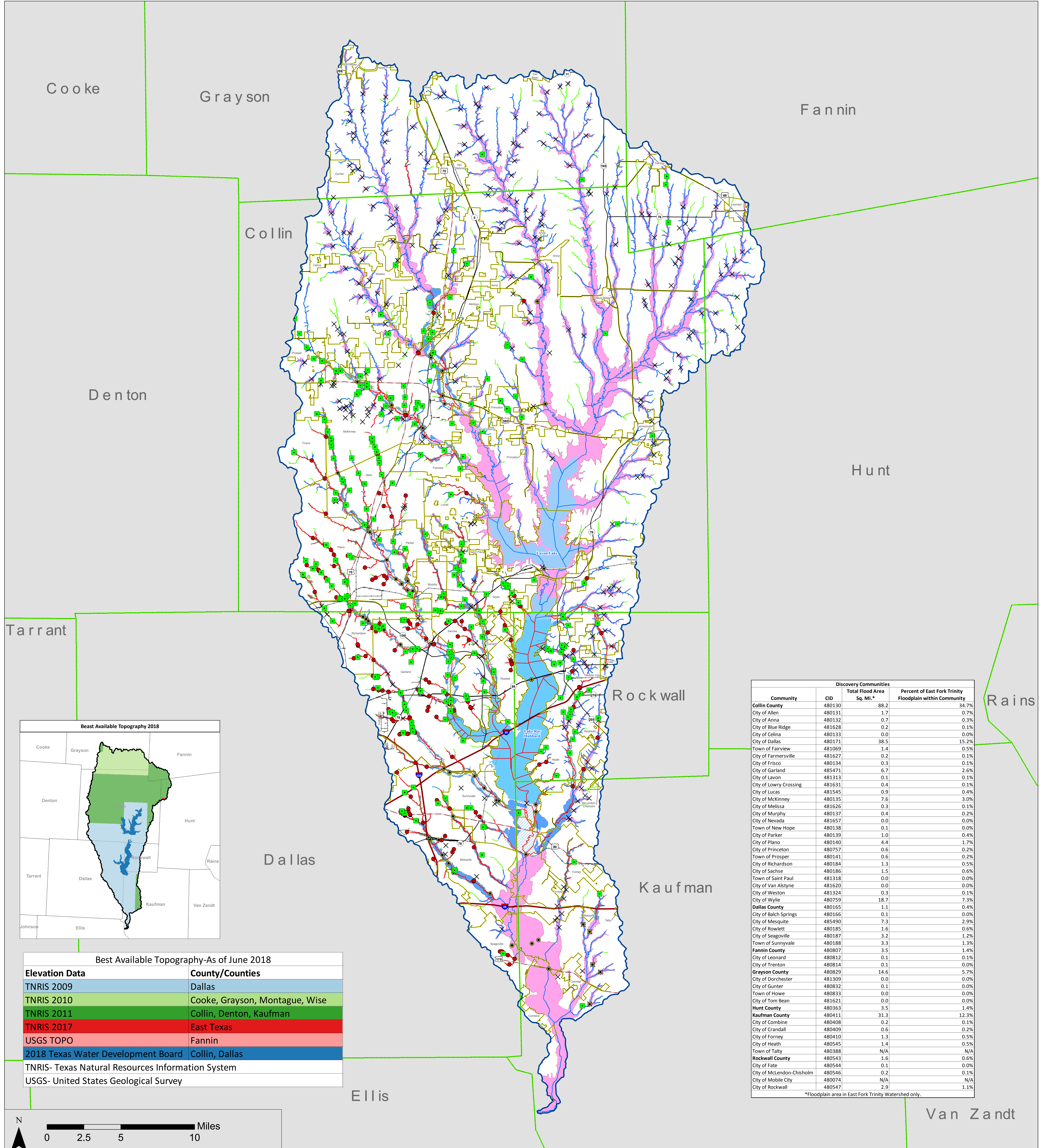


Figure 18: Pre-Discovery Map

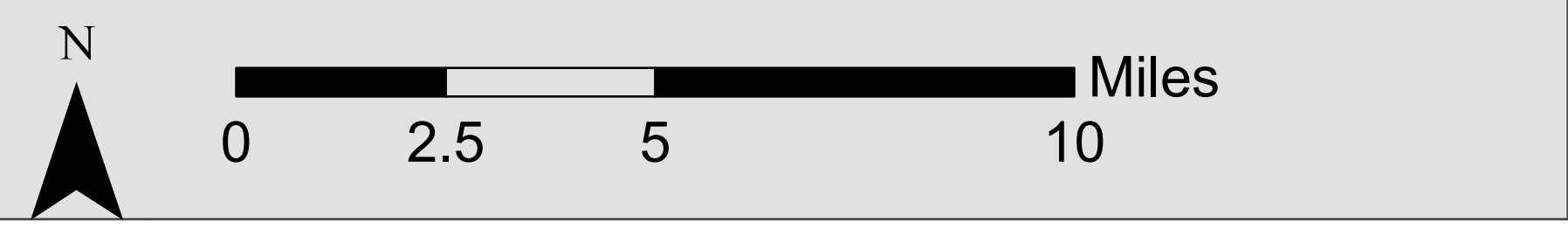


| Best Available Topography-As of June 2018 | |
|---|--------------------------------|
| Elevation Data | County/Countries |
| TNRIS 2009 | Dallas |
| TNRIS 2010 | Cooke, Grayson, Montague, Wise |
| TNRIS 2011 | Collin, Denton, Kaufman |
| TNRIS 2017 | East Texas |
| USGS TOPO | Fannin |
| 2018 Texas Water Development Board | Collin, Dallas |

TNRIS- Texas Natural Resources Information System
 USGS- United States Geological Survey

| Discovery Communities | | | |
|---------------------------|--------|---------------------------|--|
| Community | CID | Total Flood Area Sq. Mi.* | Percent of East Fork Trinity Floodplain within Community |
| Collin County | 480130 | 88.2 | 34.7% |
| City of Allen | 480131 | 1.7 | 0.7% |
| City of Anna | 480132 | 0.7 | 0.3% |
| City of Blue Ridge | 481628 | 0.2 | 0.1% |
| City of Celina | 480133 | 0.0 | 0.0% |
| City of Dallas | 480171 | 38.5 | 15.2% |
| Town of Fairview | 481069 | 1.4 | 0.5% |
| City of Farmersville | 481627 | 0.2 | 0.1% |
| City of Frisco | 480134 | 0.3 | 0.1% |
| City of Garland | 485471 | 6.7 | 2.6% |
| City of Lavon | 481313 | 0.1 | 0.1% |
| City of Lowry Crossing | 481631 | 0.4 | 0.1% |
| City of Lucas | 481545 | 0.9 | 0.4% |
| City of McKinney | 480135 | 7.6 | 3.0% |
| City of Melissa | 481626 | 0.3 | 0.1% |
| City of Murphy | 480137 | 0.4 | 0.2% |
| City of Nevada | 481657 | 0.0 | 0.0% |
| Town of New Hope | 480138 | 0.1 | 0.0% |
| City of Parker | 480139 | 1.0 | 0.4% |
| City of Plano | 480140 | 4.4 | 1.7% |
| City of Princeton | 480757 | 0.6 | 0.2% |
| Town of Prosper | 480141 | 0.6 | 0.2% |
| City of Richardson | 480184 | 1.3 | 0.5% |
| City of Sachse | 480186 | 1.5 | 0.6% |
| Town of Saint Paul | 481318 | 0.0 | 0.0% |
| City of Van Alstyne | 481620 | 0.0 | 0.0% |
| City of Weston | 481324 | 0.3 | 0.1% |
| City of Wylie | 480759 | 18.7 | 7.3% |
| Dallas County | 480165 | 1.1 | 0.4% |
| City of Balch Springs | 480166 | 0.1 | 0.0% |
| City of Mesquite | 485490 | 7.3 | 2.9% |
| City of Rowlett | 480185 | 1.6 | 0.6% |
| City of Seagoville | 480187 | 3.2 | 1.2% |
| Town of Sunnyvale | 480188 | 3.3 | 1.3% |
| Fannin County | 480807 | 3.5 | 1.4% |
| City of Leonard | 480812 | 0.1 | 0.1% |
| City of Trenton | 480814 | 0.1 | 0.0% |
| Grayson County | 480829 | 14.6 | 5.7% |
| City of Dorchester | 481309 | 0.0 | 0.0% |
| City of Gunter | 480832 | 0.1 | 0.0% |
| Town of Howe | 480833 | 0.0 | 0.0% |
| City of Tom Bean | 481621 | 0.0 | 0.0% |
| Hunt County | 480363 | 3.5 | 1.4% |
| Kaufman County | 480411 | 31.3 | 12.3% |
| City of Combine | 480408 | 0.2 | 0.1% |
| City of Crandall | 480409 | 0.6 | 0.2% |
| City of Forney | 480410 | 1.3 | 0.5% |
| City of Heath | 480545 | 1.4 | 0.5% |
| Town of Talty | 480388 | N/A | N/A |
| Rockwall County | 480543 | 1.6 | 0.6% |
| City of Fate | 480544 | 0.1 | 0.0% |
| City of McLendon-Chisholm | 480546 | 0.2 | 0.1% |
| City of Mobile City | 480074 | N/A | N/A |
| City of Rockwall | 480547 | 2.9 | 1.1% |

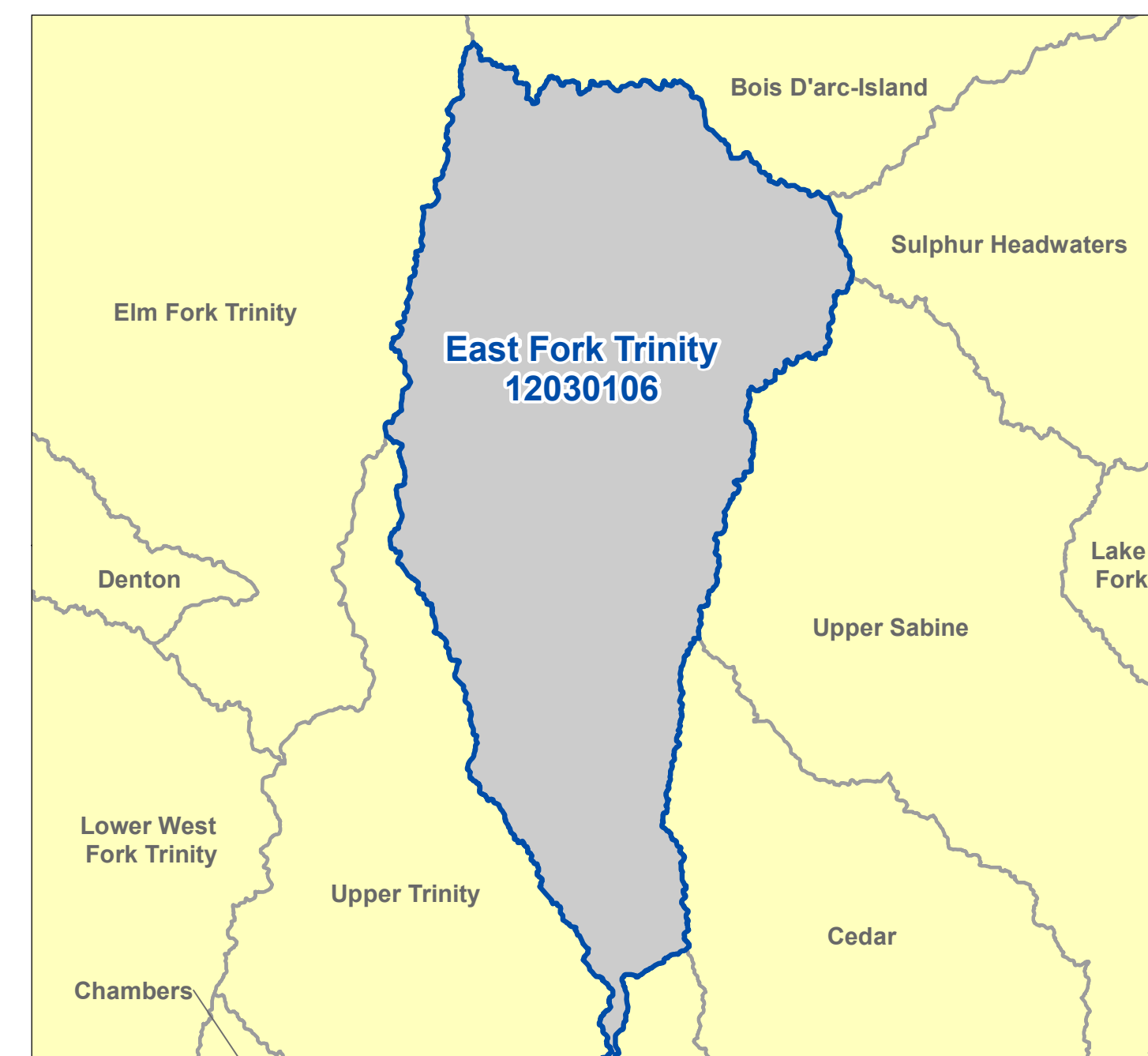
*Floodplain area in East Fork Trinity Watershed only.



Map Symbology

- ▲ USGS Gages
 - LOMC
 - High Water Marks
 - Low Water Marks
 - × Dams
 - ☪ Lake
 - ⬜ City Boundaries
 - ⬜ County Boundaries
 - ⬜ Watershed Boundary
 - Transportation**
 - ↔ Interstate Highway
 - ↔ US Highway
 - ↔ State Highway
 - ↔ Railroad
- Effective FEMA Floodplains***
 - ⬜ Floodway
 - ⬜ Zone AE (100-Year, Detailed)
 - ⬜ Zone A (100-Year, Approximate)
 - ⬜ Zone X500 (500-Year, Detailed)
 - Effective Streams Study Type***
 - ⬜ Zone AE (New/Revised Detailed, SFHA w/ High Risk)
 - ⬜ Zone AO (New/Revised Detailed, SFHA w/ High Risk)
 - ⬜ Zone A (Approximate, SFHA w/ Low Risk)
 - ⬜ Zone X (Unshaded, X-Zones, Areas of Minimal Flood Risk)

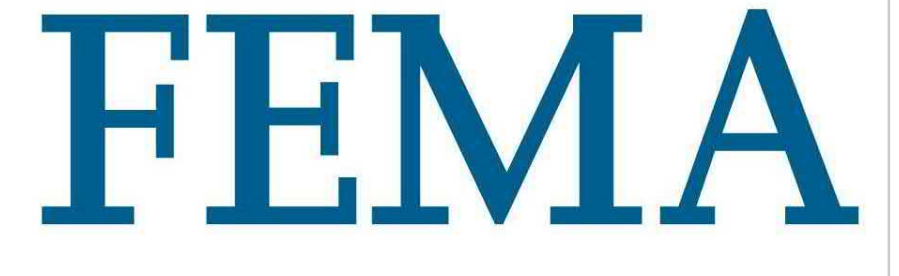
WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map
EAST FORK TRINITY WATERSHED, TEXAS

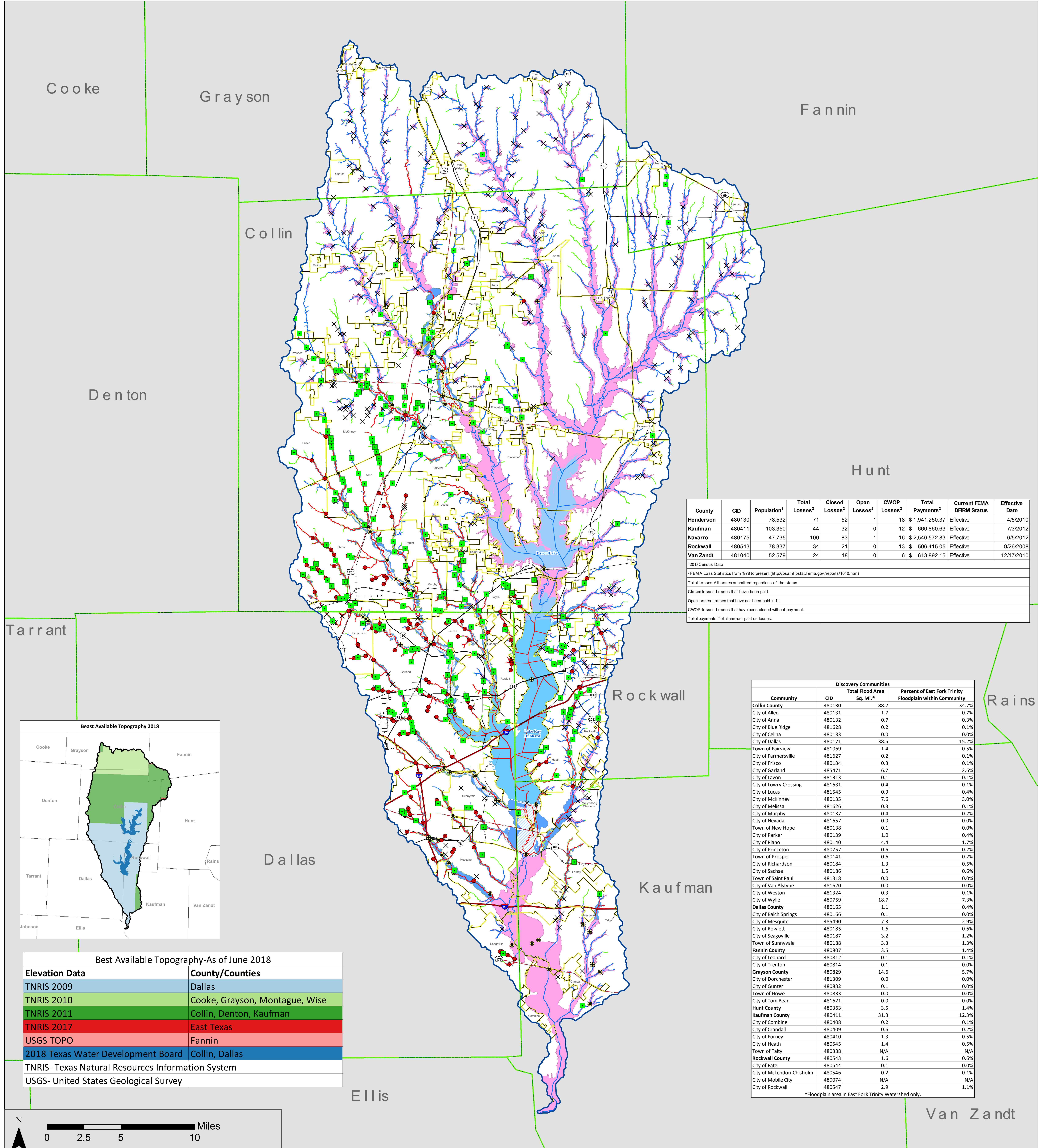
Stream Miles: 1,666
 Zone AE Miles: 496
 Zone A Miles: 1010
 Zone X Miles: 158
 Population: 1,256,757

HUC-8 Code
12030106



*Data as of September 2018

Figure 19: Discovery Map

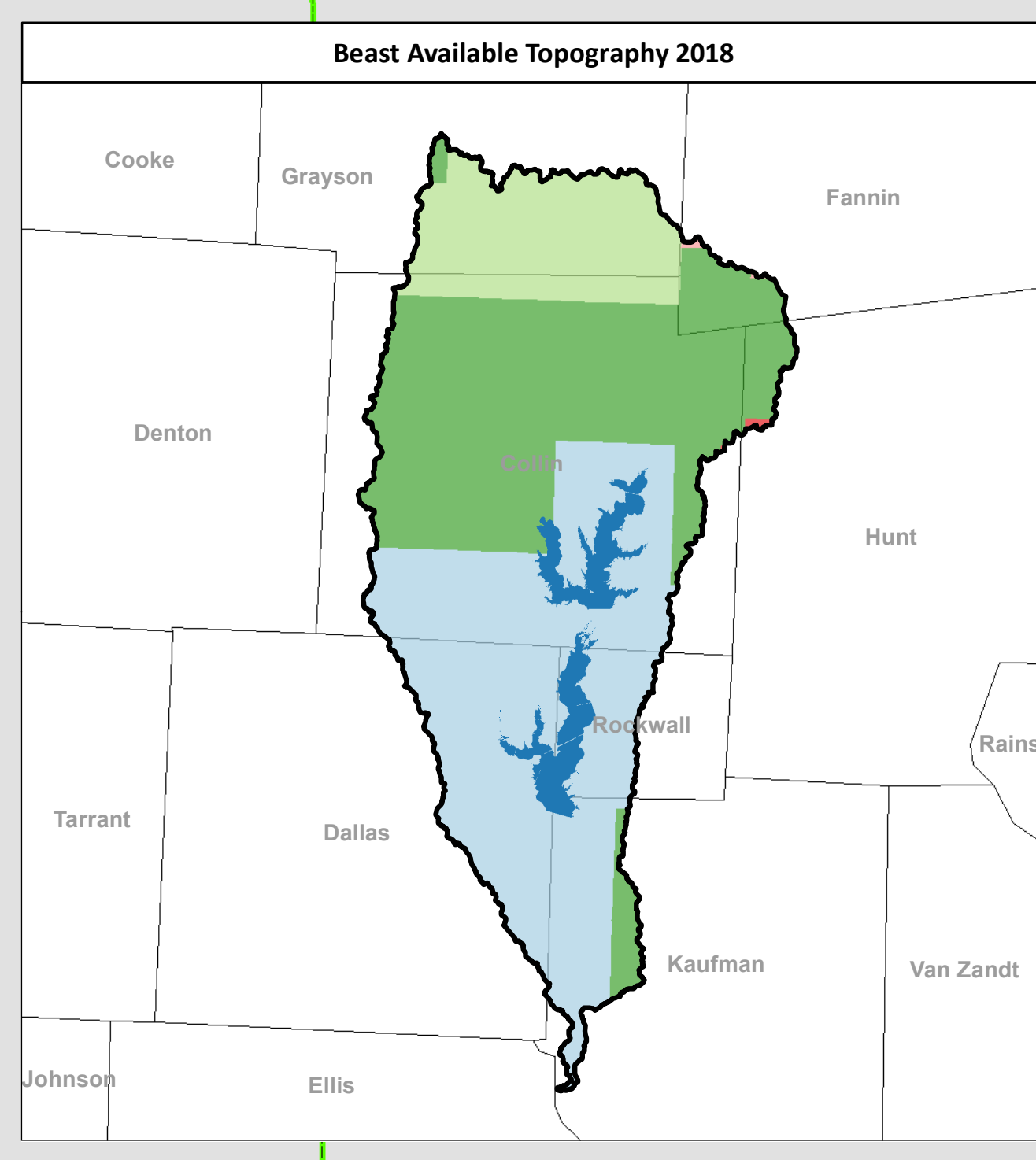


| County | CID | Population ¹ | Total Losses ² | Closed Losses ² | Open Losses ² | CWOP Losses ² | Total Payments ² | Current FEMA D FIRMS Status | Effective Date |
|-----------|--------|-------------------------|---------------------------|----------------------------|--------------------------|--------------------------|-----------------------------|-----------------------------|----------------|
| Henderson | 480130 | 78,532 | 71 | 52 | 1 | 18 | \$ 1,941,250.37 | Effective | 4/5/2010 |
| Kaufman | 480411 | 103,350 | 44 | 32 | 0 | 12 | \$ 660,860.63 | Effective | 7/3/2012 |
| Navarro | 480175 | 47,735 | 100 | 83 | 1 | 16 | \$ 2,546,572.83 | Effective | 6/5/2012 |
| Rockwall | 480543 | 78,337 | 34 | 21 | 0 | 13 | \$ 506,415.05 | Effective | 9/26/2008 |
| Van Zandt | 481040 | 52,579 | 24 | 18 | 0 | 6 | \$ 613,892.15 | Effective | 12/17/2010 |

¹2010 Census Data
²FEMA Loss Statistics from 1978 to present (<http://bba.nfpatal.fema.gov/reports/1040.htm>)
 Total Losses-All losses submitted regardless of the status.
 Closed losses-Losses that have been paid.
 Open losses-Losses that have not been paid in full.
 CWOP losses-Losses that have been closed without payment.
 Total payments-Total amount paid on losses.

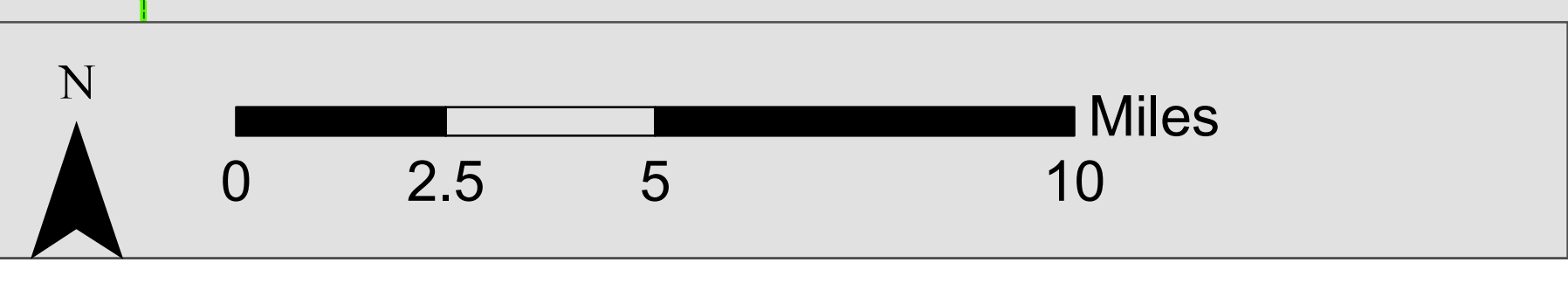
| Community | Discovery Communities | | Percent of East Fork Trinity Floodplain within Community |
|---------------------------|-----------------------|---------------------------|--|
| | CID | Total Flood Area Sq. Mi.* | |
| Collin County | 480130 | 88.2 | 34.7% |
| City of Allen | 480131 | 1.7 | 0.7% |
| City of Anna | 480132 | 0.7 | 0.3% |
| City of Blue Ridge | 481628 | 0.2 | 0.1% |
| City of Celina | 480133 | 0.0 | 0.0% |
| City of Dallas | 480171 | 38.5 | 15.2% |
| Town of Fairview | 481069 | 1.4 | 0.5% |
| City of Farmersville | 481627 | 0.2 | 0.1% |
| City of Frisco | 480134 | 0.3 | 0.1% |
| City of Garland | 485471 | 6.7 | 2.6% |
| City of Lavon | 481313 | 0.1 | 0.1% |
| City of Lowry Crossing | 481631 | 0.4 | 0.1% |
| City of Lucas | 481545 | 0.9 | 0.4% |
| City of McKinney | 480135 | 7.6 | 3.0% |
| City of Melissa | 481626 | 0.3 | 0.1% |
| City of Murphy | 480137 | 0.4 | 0.2% |
| City of Nevada | 481657 | 0.0 | 0.0% |
| Town of New Hope | 480138 | 0.1 | 0.0% |
| City of Parker | 480139 | 1.0 | 0.4% |
| City of Plano | 480140 | 4.4 | 1.7% |
| City of Princeton | 480757 | 0.6 | 0.2% |
| Town of Prosper | 480141 | 0.6 | 0.2% |
| City of Richardson | 480184 | 1.3 | 0.5% |
| City of Sachse | 480186 | 1.5 | 0.6% |
| Town of Saint Paul | 481318 | 0.0 | 0.0% |
| City of Van Alstyne | 481620 | 0.0 | 0.0% |
| City of Weston | 481324 | 0.3 | 0.1% |
| City of Wylie | 480759 | 18.7 | 7.3% |
| Dallas County | 480165 | 1.1 | 0.4% |
| City of Balch Springs | 480166 | 0.1 | 0.0% |
| City of Mesquite | 485490 | 7.3 | 2.9% |
| City of Rowlett | 480185 | 1.6 | 0.6% |
| City of Seagoville | 480187 | 3.2 | 1.2% |
| Town of Sunnyvale | 480188 | 3.3 | 1.3% |
| Fannin County | 480807 | 3.5 | 1.4% |
| City of Leonard | 480812 | 0.1 | 0.1% |
| City of Trenton | 480814 | 0.1 | 0.0% |
| Grayson County | 480829 | 14.6 | 5.7% |
| City of Dorchester | 481309 | 0.0 | 0.0% |
| City of Gunter | 480832 | 0.1 | 0.0% |
| Town of Howe | 480833 | 0.0 | 0.0% |
| City of Tom Bean | 481621 | 0.0 | 0.0% |
| Hunt County | 480363 | 3.5 | 1.4% |
| Kaufman County | 480411 | 31.3 | 12.3% |
| City of Combine | 480408 | 0.2 | 0.1% |
| City of Crandall | 480409 | 0.6 | 0.2% |
| City of Forney | 480410 | 1.3 | 0.5% |
| City of Heath | 480545 | 1.4 | 0.5% |
| Town of Talty | 480388 | N/A | N/A |
| Rockwall County | 480543 | 1.6 | 0.6% |
| City of Fate | 480544 | 0.1 | 0.0% |
| City of McLendon-Chisholm | 480546 | 0.2 | 0.1% |
| City of Mobile City | 480074 | N/A | N/A |
| City of Rockwall | 480547 | 2.9 | 1.1% |

*Floodplain area in East Fork Trinity Watershed only.



| Best Available Topography-As of June 2018 | |
|---|--------------------------------|
| Elevation Data | County/Countries |
| TNRIS 2009 | Dallas |
| TNRIS 2010 | Cooke, Grayson, Montague, Wise |
| TNRIS 2011 | Collin, Denton, Kaufman |
| TNRIS 2017 | East Texas |
| USGS TOPO | Fannin |
| 2018 Texas Water Development Board | Collin, Dallas |

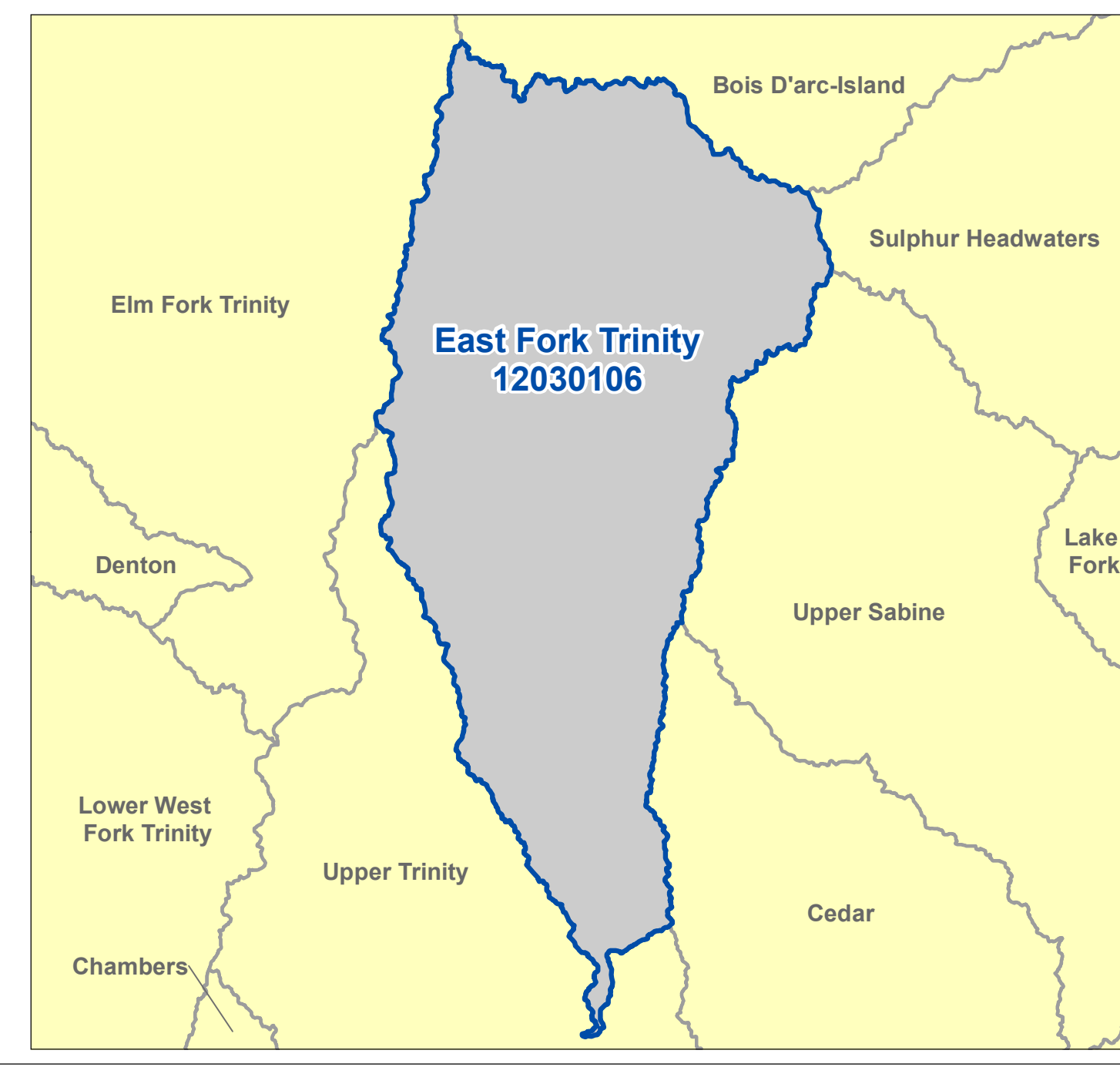
TNRIS- Texas Natural Resources Information System
 USGS- United States Geological Survey



Map Symbology

- ▲ USGS Gages
 - LOMC
 - High Water Marks
 - Low Water Marks
 - × Dams
 - ☪ Lake
 - ⬜ City Boundaries
 - ⬜ County Boundaries
 - ⬜ Watershed Boundary
 - Transportation**
 - ↗ Interstate Highway
 - ↗ US Highway
 - ↗ State Highway
 - ↗ Railroad
- Effective FEMA Floodplains***
- ⬜ Floodway
 - ⬜ Zone AE (100-Year, Detailed)
 - ⬜ Zone A (100-Year, Approximate)
 - ⬜ Zone X500 (500-Year, Detailed)
- Effective Streams Study Type***
- ⬜ Zone AE (New/Revised Detailed, SFHA w/ High Risk)
 - ⬜ Zone AO (New/Revised Detailed, SFHA w/ High Risk)
 - ⬜ Zone A (Approximate, SFHA w/ Low Risk)
 - ⬜ Zone X (Unshaded, X-Zones, Areas of Minimal Flood Risk)

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map
EAST FORK TRINITY WATERSHED, TEXAS

Stream Miles: 1,666
 Zone AE Miles: 496
 Zone A Miles: 1010
 Zone X Miles: 158
 Population: 1,256,757

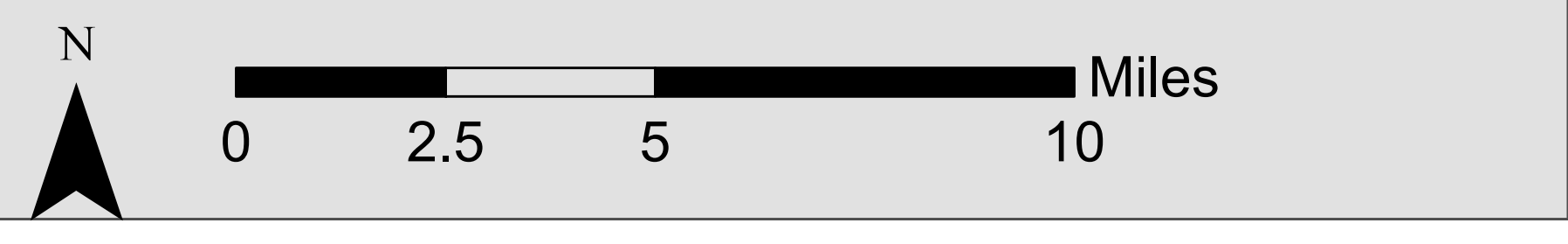
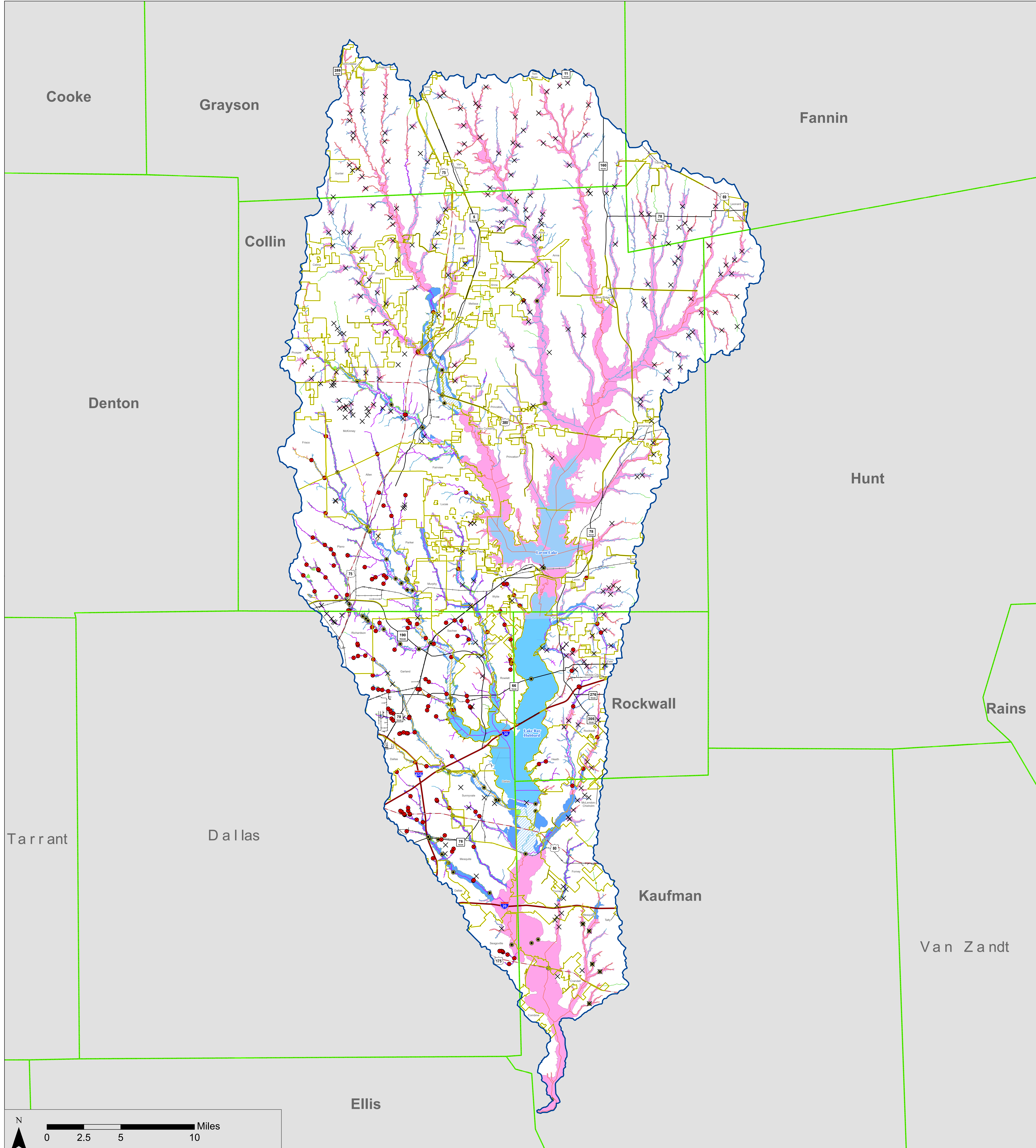
HUC-8 Code
12030106



FEMA

*Data as of January 2018

Figure 20: Post-Discovery Map



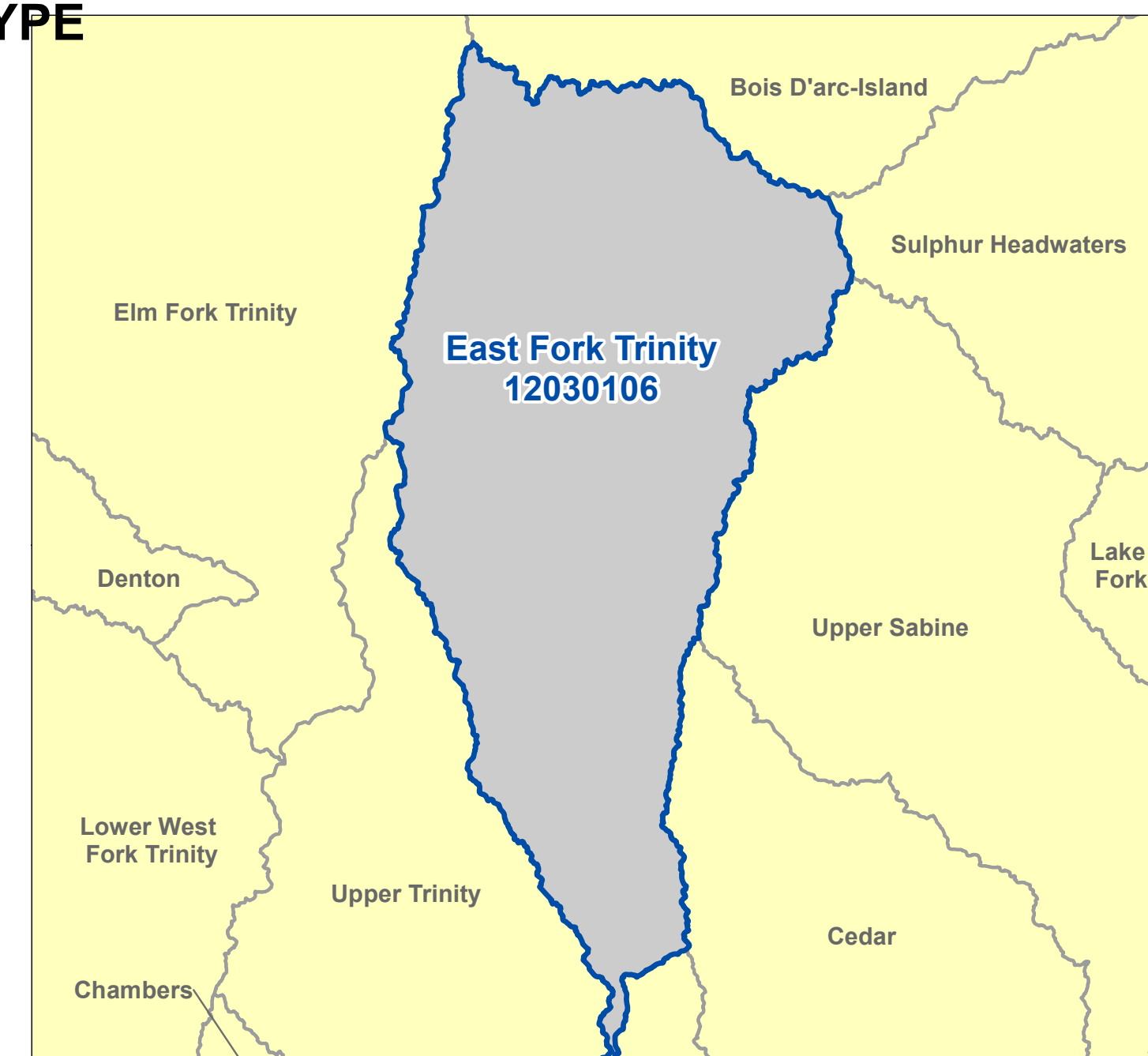
Map Symbology

- ▲ USGS Gages
- LOMC
- High Water Marks
- Low Water Marks
- × Dams
- ☪ Lake
- ⬢ City Boundaries
- ⬢ County Boundaries
- ⬢ Watershed Boundary
- Transportation**
- IH
- SH
- US
- Railroads

- Effective FEMA Floodplains***
- ☑ Floodway
 - ☑ Zone AE (100-Year, Detailed)
 - ☑ Zone A (100-Year, Approximate)
 - ☑ Zone X500 (500-Year, Detailed)
- VALIDATION STATUS, STATUS TYPE**
- Unverified, Being Studied
 - Unverified, To Be Studied
 - Unknown, To Be Assessed
 - Assessed, Being Studied
 - Valid, Being Studied
 - Valid, NVUE Compliant

| CNMS Validation Status Definitions | |
|------------------------------------|--|
| Assessed | Unmapped Streams or streams not part of FEMA's SFHA inventory that have been investigated and considered for study in current and/or future Fiscal Years (FYs). |
| Unverified | Stream has not passed the Critical and Secondary Element checks (At least one critical or four or more secondary change conditions flagged) and may either be assigned resources for restudy in current and/or future FYs. |
| Valid | Streams considered New, Validated, or Updated Engineering (NVUE) compliant (zero critical and fewer than four secondary elements flagged). |
| To Be Studied | Mapped streams that need to be studied and are planned for a future FY or unmapped streams prioritized to be mapped with an SFHA. |

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map
EAST FORK TRINITY WATERSHED, TEXAS

Stream Miles: 1,666
 Zone AE Miles: 496
 Zone A Miles: 1010
 Zone X Miles: 158
 Population: 1,256,757

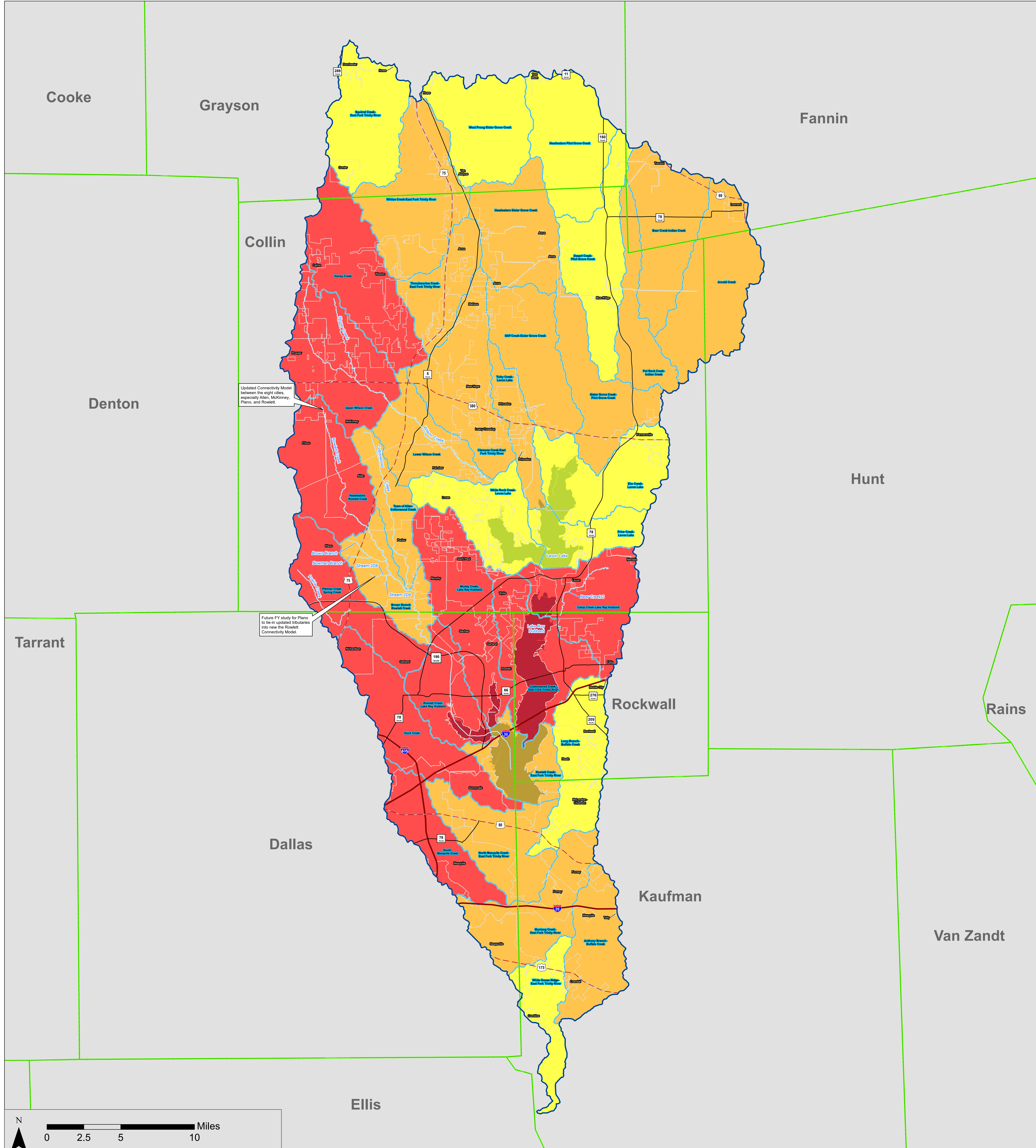
HUC-8 Code
12030107



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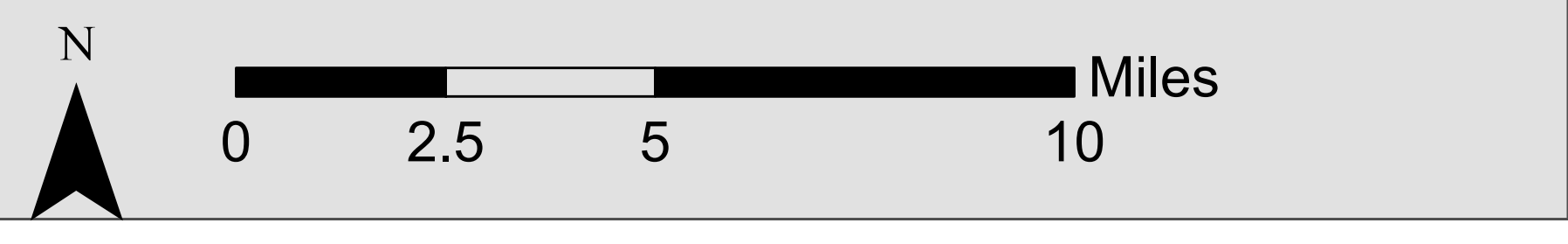
*Data as of August 2019

Figure 21: HUC-12 Watershed Prioritizations and Potential Projects



Updated Connectivity Model between the eight cities, especially Allen, McKinney, Plano, and Rowlett.

Future FY study for Plano to be-in updated tributaries into new the Rowlett Connectivity Model.



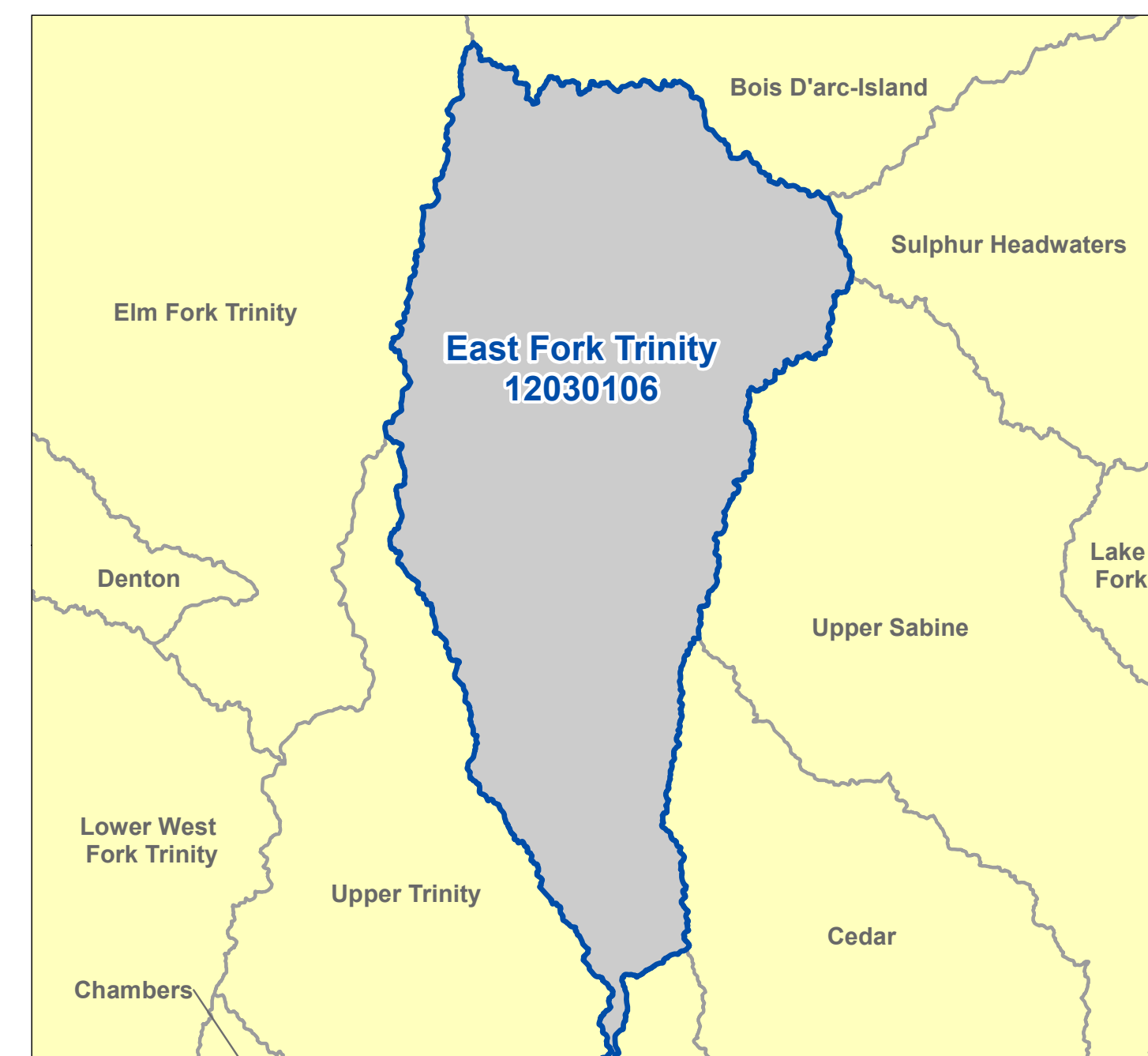
Map Symbolology

- Potential Study Stream
- Lakes
- City Boundary
- County Boundary
- HUC-8 Watershed Study Boundary
- Transportation**
- Interstate Highway
- US Highway
- State Highway

HUC-12s Prioritization Ranking

- Moderate Risk
- Elevated Risk
- High Risk

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Watershed Prioritizations and Potential Projects Map

EAST FORK TRINITY WATERSHED, TEXAS

Total Watershed Area: 1,302.9 mi²
 High Risk Area: 401.3 mi²
 Elevated Risk Area: 582.0 mi²
 Moderate Risk Area: 319.6 mi²

HUC-8 Code
12030106



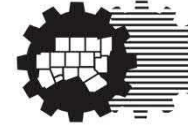
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Pre-Discovery Webinar Slides



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Council of Governments

North Texas Discovery

“Capturing a More Complete Picture of Your Watershed”

Pre-Discovery Webinars

June 26, 2018

June 28, 2018



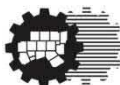
Introduction

- NCTCOG:
 - Edith Marvin – EMarvin@nctcog.org
 - Mia Brown – MBBrown@nctcog.org
- Halff Associates:
 - Jarred Overbey – JOverbey@halff.com
 - Samuel Amoako-Atta – SAmoak-Atta@halff.com
 - Catherine Rowley – CRowley@halff.com
 - Alison Hanson – AHanson@halff.com
- FEMA:
 - Alan Johnson – Alan.Johnson@fema.dhs.gov
- TWDB / TNRIS:
 - Manuel Razo – Manuel.Razo@twdb.texas.gov
 - Michael Segner – Michael.Segner@twdb.texas.gov



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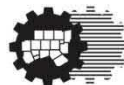
AGENDA

- Overview of Risk MAP
- NCTCOG Discovery Activities
- Discovery Overview
- 2018 NCTCOG Discovery Watershed
 - East Fork Trinity Watersheds
 - Pre-Discovery Activities
 - Discovery Activities
 - Post-Discovery Activities
- Data Gathering Website and Walk-through



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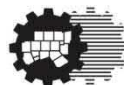
FEMA's Risk MAP Program

- Risk Mapping, Assessment, and Planning
 - Provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens.
 - Risk MAP Vision
 - **ACTION-driven**, not **MAP-driven** through local understanding and ownership of risk



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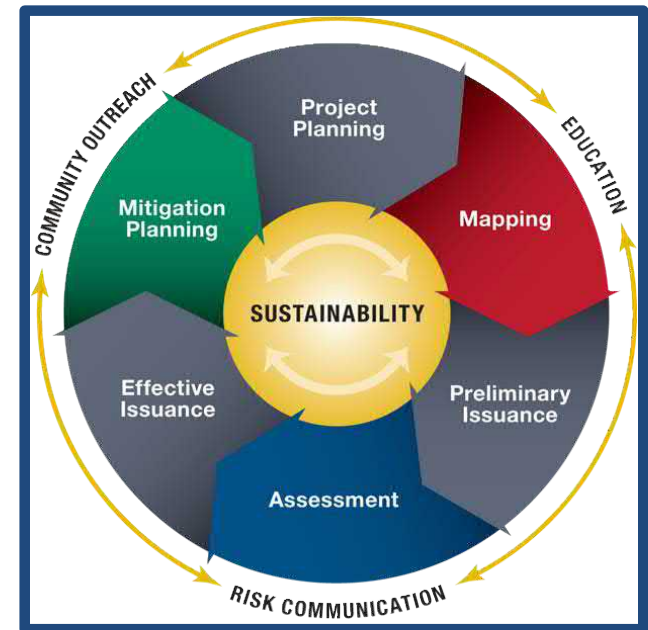
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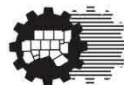
FEMA's Risk MAP Program

- Risk MAP offers opportunities to change the way FEMA and Local communities interact
- Empowering communities
 - Reduce Future Losses
 - Implementing Mitigation Actions
 - Reduce Your Risks
 - All Hazard Mitigation Planning
 - Look for Grant Opportunities
 - Insure Your Risks
 - The National Flood Insurance Program (NFIP)
 - Communicate Effectively about Risk



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Discovery

Overview

- *Capture a more complete picture of your watershed by working closely with local communities...*

Watershed Selected for Discovery

- Selection Criteria:
 - Risk
 - Need
 - Elevation data availability
 - Regional knowledge
 - CTP/State input

Community Engagement / Data Collection

- Develop watershed partnerships
- Discovery Newsletter
- Pre-Discovery community visits
- Gather all available data
 - Data needs
 - Issues / Concerns
 - Areas of Mitigation

Discovery Meeting

- Review / validate watershed for project areas
- Provide information
 - Mapping
 - Mitigation Planning
 - Grants
 - NFIP Compliance
- Comprehensive understanding of risk in the watershed

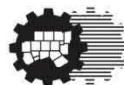
Post-Meeting Coordination / Scope Refinement

- Once data is collected
- FEMA will coordinate with State/NCTCOG on proposed scope refinement
- Selected Projects – move toward Kick off meeting
- Non-Selected Projects – engaged for potential mitigation actions, mitigation plan updates, and/or mitigation technical assistance



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Discovery Community Engagement

Overview

What information are we interested in?

FEMA ENGAGEMENT WITH STAKEHOLDERS AND DATA COLLECTION

Review of all available data begins the process...

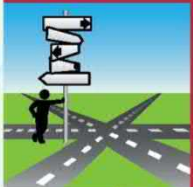
Risk Identification and Communication

- Low water crossings?
- Large areas of fill placement?
- Future development areas?
- Capital improvement projects?
- Channelization projects?
- Large reservoirs? O&M plan?
- Flood risk reduction projects?
- Digital stream inventory?
- Digital building stock?
- High water marks from recent flooding event?
- Elevation data? LiDAR?
- Local flood studies?



Mitigation Planning and Mitigation Actions

- Approved hazard mitigation plan?
- Local evacuation plans?
- Current land use plan?
- Future land use plan?
- Drainage master plan(s)?
- Flood reduction projects?
- Culvert enlargement projects?
- Areas of evacuation during high water?
- Local HAZUS runs?
- Digital parcel boundaries?



Engage:

- U.S. Geological Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- State NFIP coordinator
- State Hazard Mitigation Officer
- State floodplain management associations
- State emergency management associations
- Local elected officials
- Regional authorities
- Local floodplain administrators
- Local emergency management officials
- Local levee districts
- Watershed groups
- Special interest groups
- Local business and commerce entities
- CTPs



NFIP Community Actions

- Participating in the NFIP?
- Community assistance meetings?
- Community Rating System (CRS)?
- Repetitive loss properties?
- Areas of insurance claims?
- Community assistance visits?
- Community assistance calls?
- Active Letters of Map Change (LOMCs)?
- Recent disaster? Declared?
- Data from PDAs?



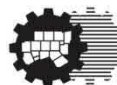
Community Benefits and Grant Opportunities

- Grant administration plan?
- Ongoing grant projects?
- Hard projects? (infrastructure)
- Soft projects? (outreach/education)
- Targeted buy-out areas?
- Elevation projects planned?
- Pre-Disaster Mitigation (PDM) grants?
- Severe Repetitive Loss (SRL) grants?
- Grants in need of engineering info?
- Post-disaster 404 projects?
- Post-disaster 406 projects?



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Discovery Steps

Overview

FEMA Selects
Watershed for
Discovery

Watershed
Stakeholder
Coordination

Data Gathering
and Analysis.
BLE data
development

Discovery
Meeting

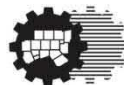
Post Meeting
Coordination

Risk MAP Project
Recommendations
to FEMA



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Discovery Steps

Overview

FEMA Selects
Watershed for
Discovery

Watershed
Stakeholder
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Data Gathering
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development

Discovery
Meeting

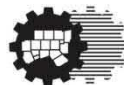
Post Meeting
Coordination

Risk MAP Project
Recommendations
to FEMA



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Base Level Engineering(BLE)

Overview

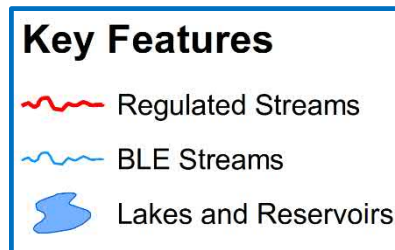


Base Level Engineering(BLE)

Overview

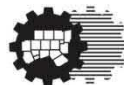
Large Scale Automated Engineering (LSAE) Process

- BLE is best used at a larger scale (HUC8)
- LiDAR must be Available
- Model Review and Adjustments
- Gage Review included in hydrology



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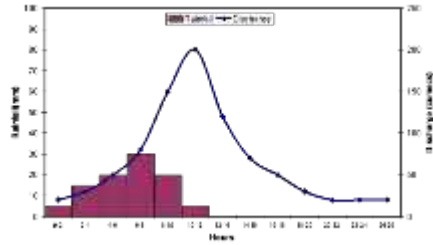
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Base Level Engineering(BLE)

MODELING

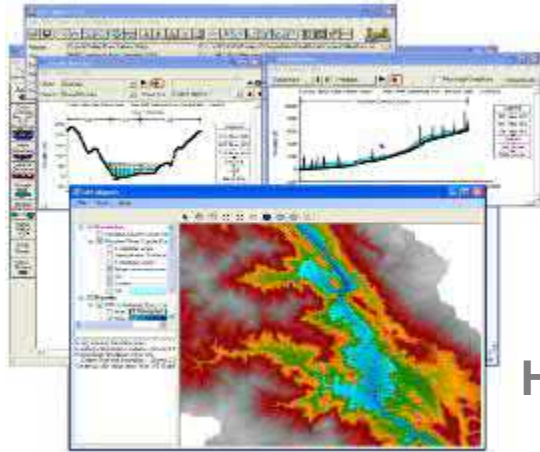


Hydrology

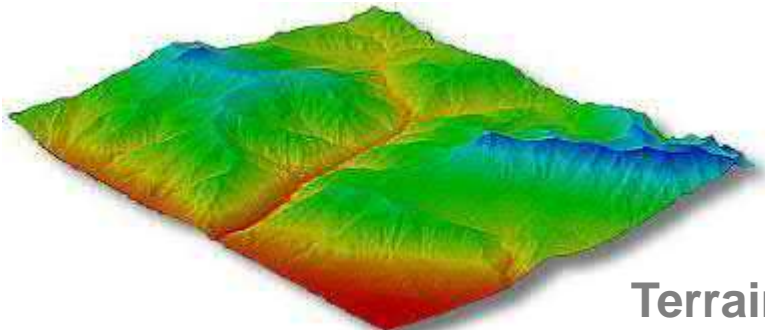
Overview



Mapping



Hydraulics



Terrain

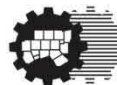
OUTPUTS

- Hydrology modeling (Regression) flows w/gage analysis
- Hydraulic modeling (HEC-RAS) for 10%, 4%, 2%, 1% and 0.2% storm events
- 10%, 1% and 0.2% floodplain boundaries
- Areas of Expanded Flood Risk
- Depth and Analysis Grids
- Flood Risk Assessment



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Base Level Engineering(BLE)

Overview

- Building Block for Future Model Refinement



- Creates a data-based starting point for conversations about existing flood risk



CHEAPER



FASTER



DATA FOR REVIEW

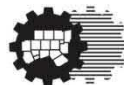


COLLABORATIVE



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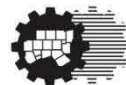
Activities Within the East Fork Trinity Watershed

- USACE Study
 - Hydrology study on USACE reservoirs and Dallas Floodway
 - September 2019
- FEMA RTO Study
 - East Fork Trinity River
 - Trinity River
 - Summer 2019



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NCTCOG Discovery Activities

2004-2008
FEMA Map
Modernization

2009
Map Needs
Assessment

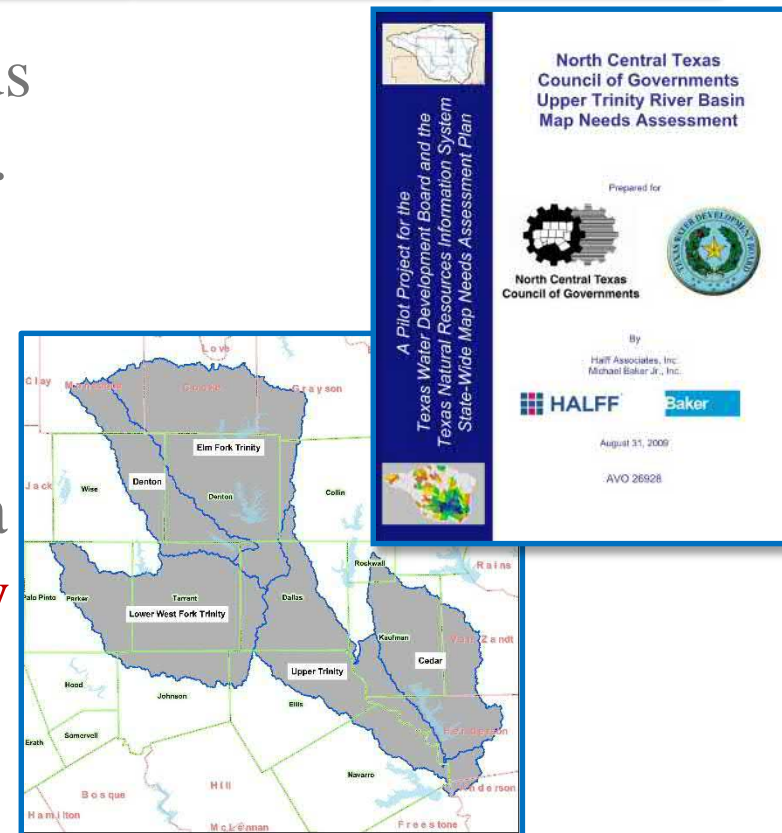
2012
Partnered
with FEMA
for CTP
Grant

2013
Discovery

2017
Discovery

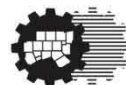
2018
Discovery

- 2009 TWDB/NCTCOG Map Needs Assessment (MNA) documented...
 - 1,291 new mapping needs
 - 2,370 miles of stream
 - \$44 Million in Flood Mapping Needs
- 2013 Discovery utilized MNA data and update results. **2018 Discovery** will do the same.



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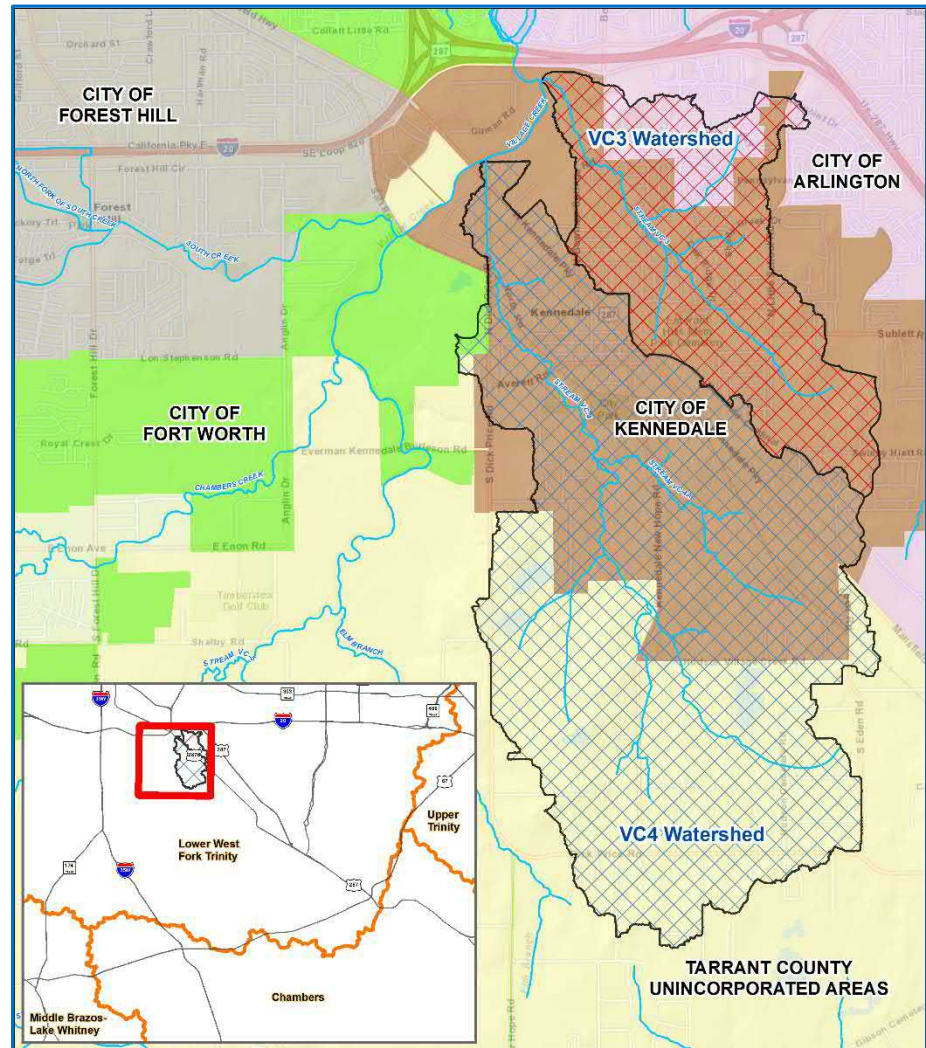
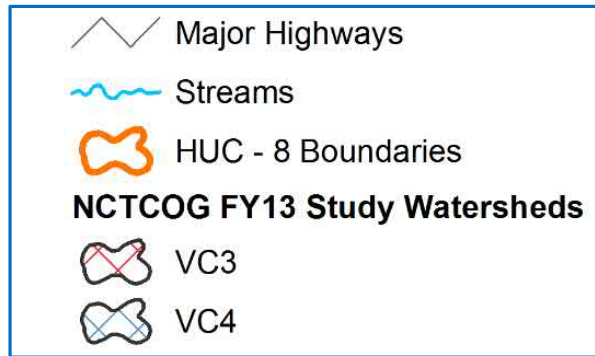
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Example Post-Discovery Projects

2013

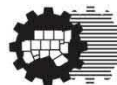
2013 Village Creek Study – Kennedale

- New H&H and Mapping for 13 streams
- Flood Risk Products including Flood Risk Assessment



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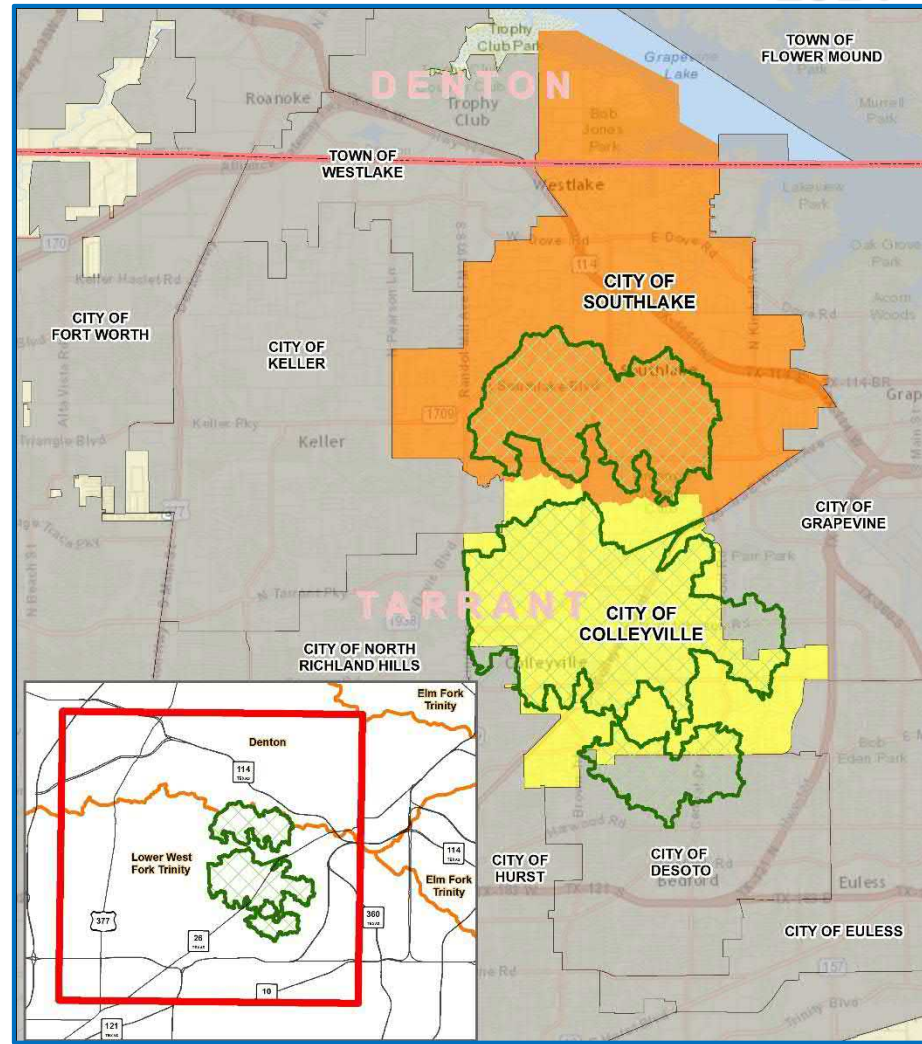
HALFF

Example Post-Discovery Projects

2014

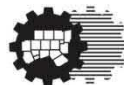
2014 Bear Creek Study – Southlake and Colleyville

- New H&H and Mapping for 19 streams (Colleyville) and 8 streams (Southlake)
- Flood Risk Products including Flood Risk Assessment



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RiskMAP
Increasing Resilience Together



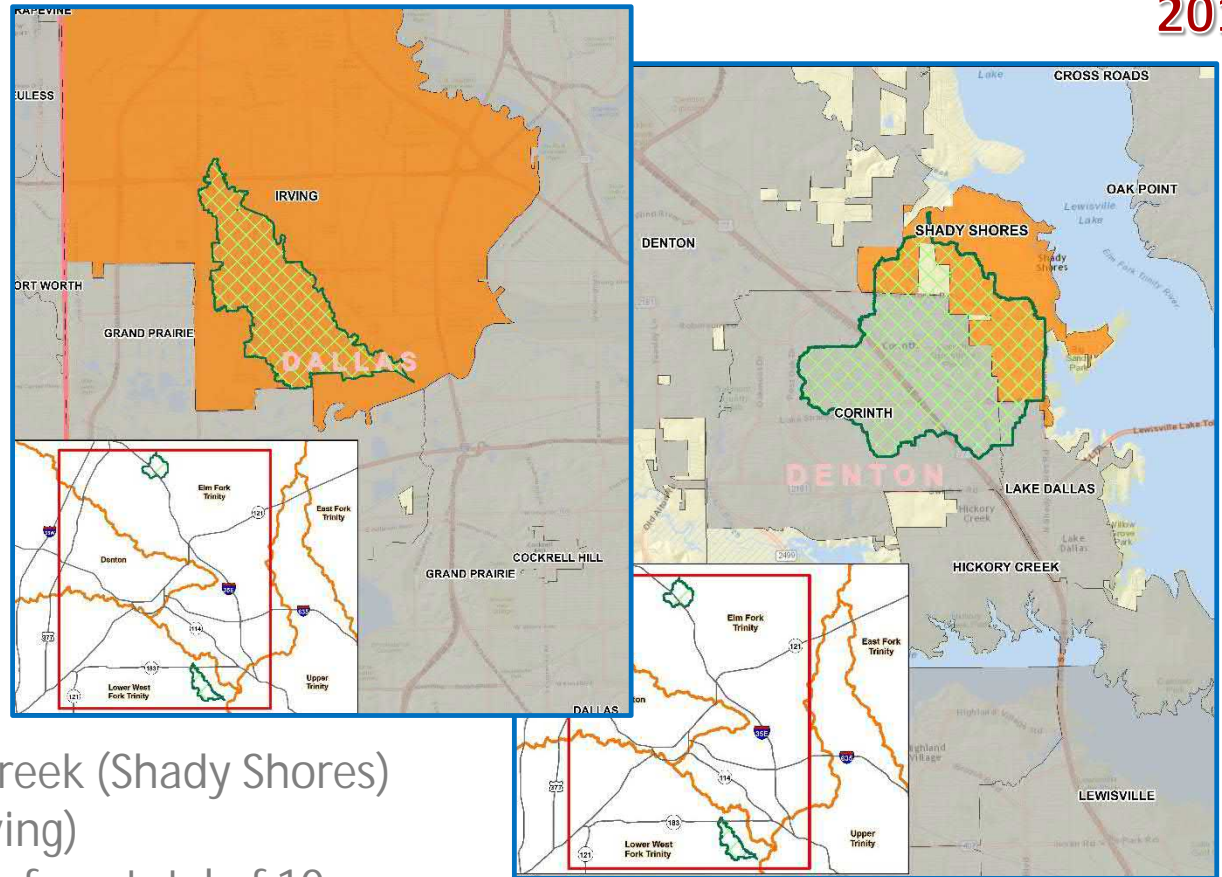
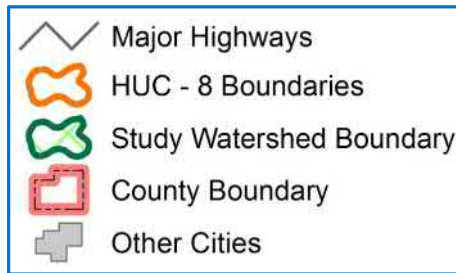
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Example Post-Discovery Projects

2015



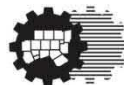
2015 Study – Lynchburg Creek (Shady Shores) and West Irving Creek (Irving)

- New H&H and Mapping for a total of 10 streams
- Flood Risk Products including Flood Risk Assessment



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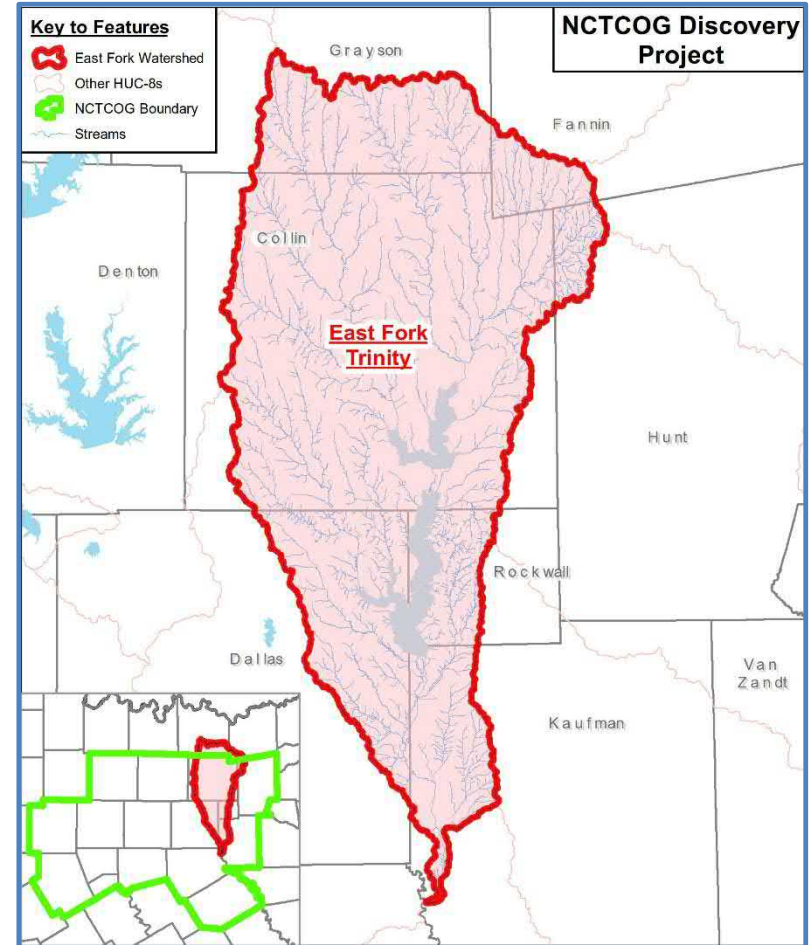
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North Central Texas Council of Governments

2018 North Texas Discovery

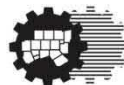
NCTCOG Leading East Fork Trinity Watershed Discovery

- Goals:
 - Provide information
 - Mitigation planning and actions
 - Risk Communication
 - Gather information
 - Local flood risks and hazards
 - Current mitigation



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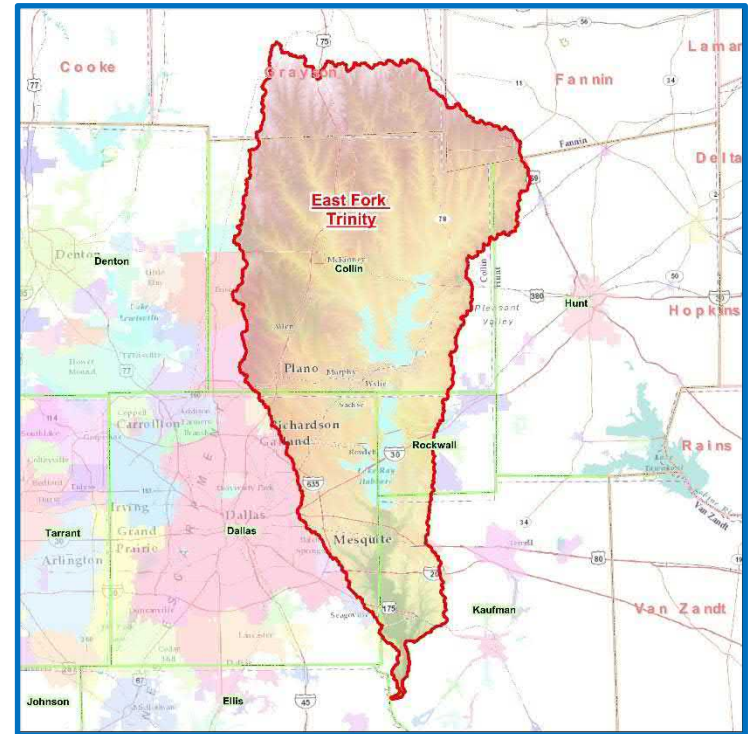
Discover the Data

Pre-Discovery Activities

- Watershed
- Communities
- Geospatial Data

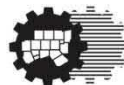
Examples of data to collect:

- Base map: Boundaries, Hydrography, Transportation
- Flood study needs, risk, elevation data
- Flooding issues, historical flooding, disasters
- Mitigation activities, grant projects, plans
- CRS, CAVs
- Local development, floodplain management plans
- Regional watershed plans
- Infrastructure: culverts, dams, bridges, levees
- Building footprints or parcel data



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Discovery Newsletter

Pre-Discovery Activities

Pre-Discovery Newsletter East Fork Watershed



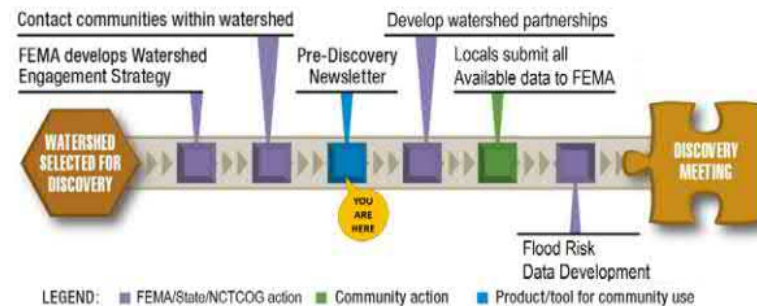
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“Capturing a More Complete Picture of Your Community and Your Watershed” *June 2018*

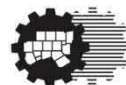
Risk MAP Process and Discovery

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that assists communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Discovery is the first phase of an overall process to achieve mitigation actions for reducing risks. The North Central Texas Council of Governments (NCTCOG) has been awarded a FEMA grant to conduct Discovery in the East Fork Watershed in 2018.



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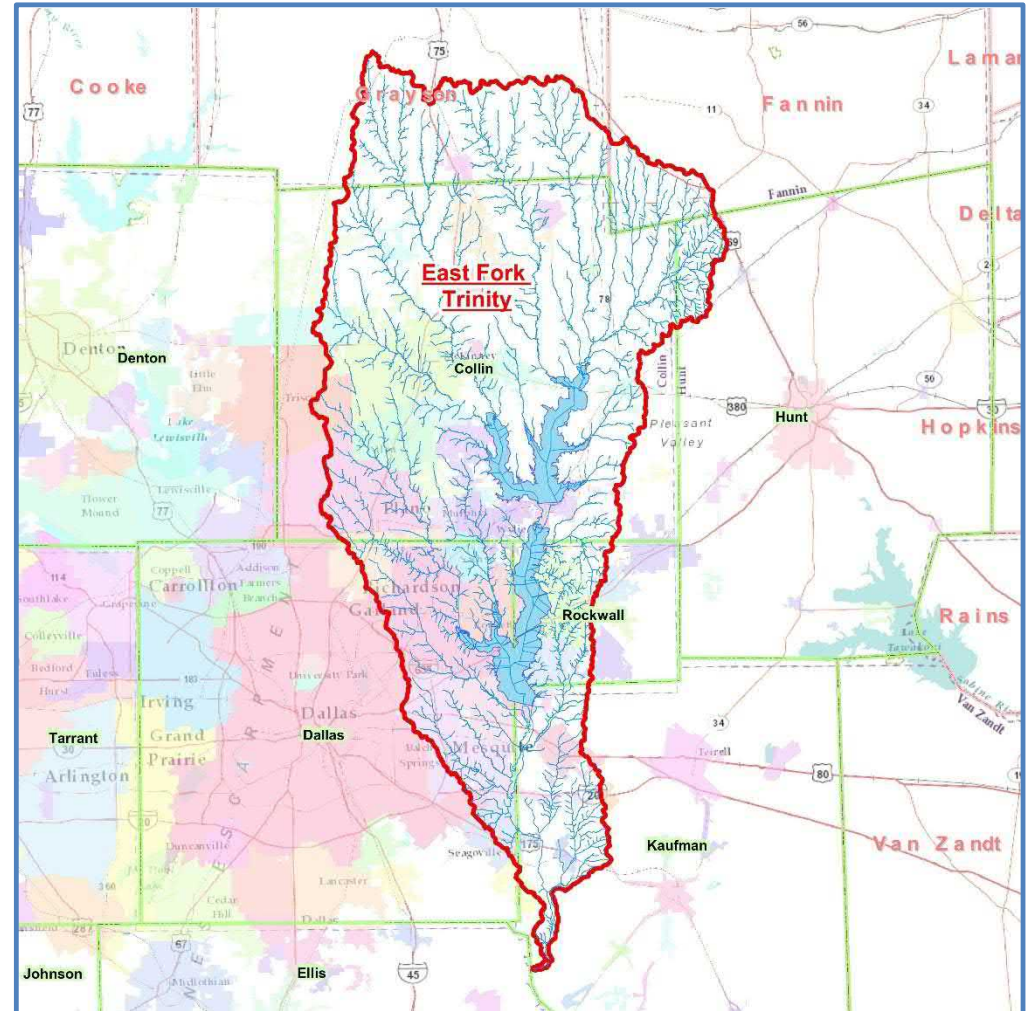


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Discovery Meetings Coming ...

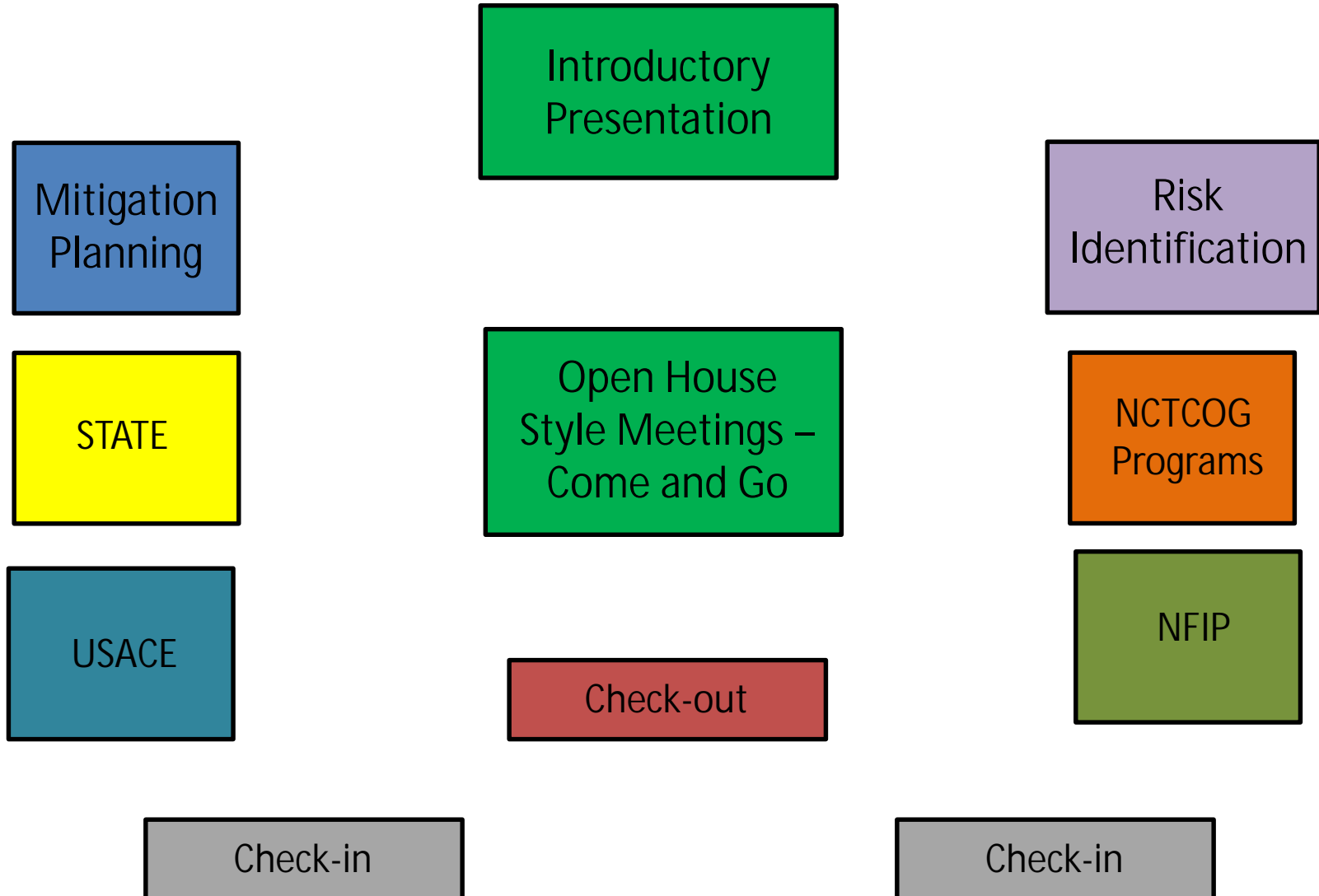
Pre-Discovery Activities

- Discovery Meetings in Fall
- All community stakeholders are encouraged to attend



Discovery Meetings - Open House

Discovery Activities



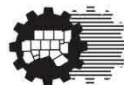
Discovery Meetings – What to Expect

Discovery Activities



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Who Should Come?

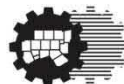
Discovery Activities

- Community Officials Including:
 - Leaders, Floodplain Administrators, City Engineers, Watershed Organizations, Planners, Emergency Managers, and GIS specialists
- Federal, State, and Regional Agencies
- Other locally identified stakeholders concerned with flood risks or hazard mitigation



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What Do I Bring?

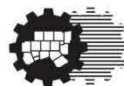
Discovery Activities

- Knowledge of Flood Risks and Past Flooding in your Community
- Hazard Mitigation Projects – Identified, In Progress, or Complete?
- Master Drainage Plan(s), floodplain studies – completed or identified as needs
- Questions or Concerns regarding your current Digital Flood Insurance Rate Maps – Flood Study Needs
- Current Flood Risk Communication Process
- Dams and Levees – Questions or Concerns
- GIS data



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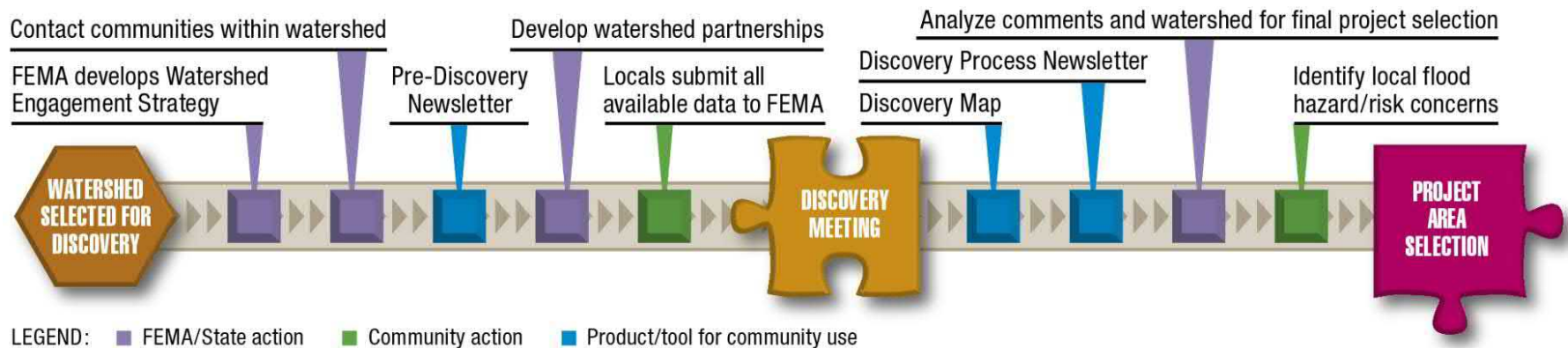
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Post-Discovery Actions

Post-Discovery Activities

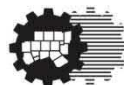
- Post-Discovery Actions

- Analyze data collected
- Review findings with NCTCOG
- Preliminary project selections provided to communities
- Evaluate community input
- Discovery Report



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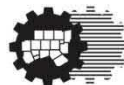
Meeting Info

- Discovery Meeting- Fall 2018
- Findings Meeting- Winter 2018



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Pre-Discovery Data Gathering

<https://nctcogdiscovery.halff.com>

Login: EMAIL ADDRESS

Password: NCTCOG_2018!

NCTCOG Discovery

Overall Progress 0%

Welcome Your Info Backgrounder Questions Maps Meeting Info

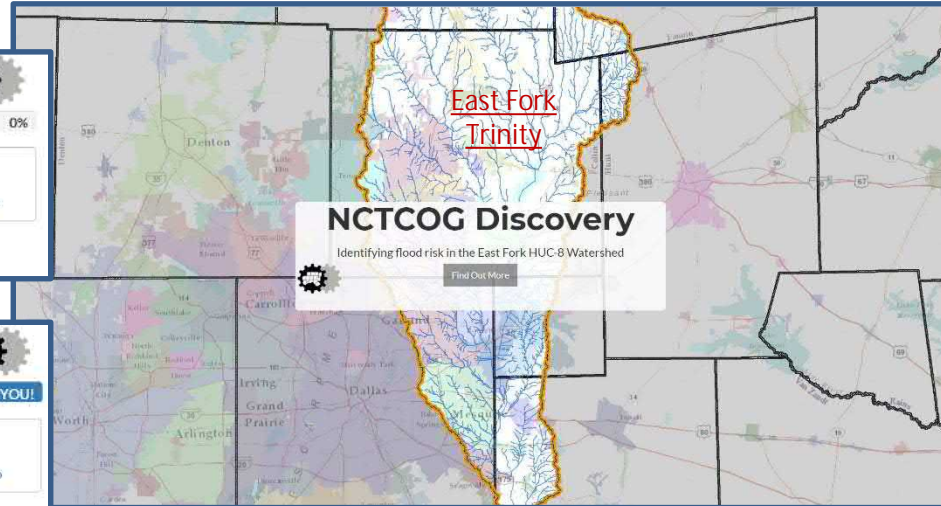
Use the buttons above to navigate

NCTCOG Discovery

Overall Progress 100% THANK YOU!

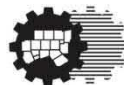
Welcome ✓ Your Info ✓ Backgrounder ✓ Questions ✓ Maps ✓ Meeting Info

Use the buttons above to navigate



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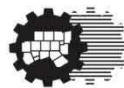
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Questions



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Contact Information

- NCTCOG:
 - Edith Marvin – EMarvin@nctcog.org
 - Mia Brown – MBBrown@nctcog.org
- Halff Associates:
 - Jarred Overbey – JOverbey@halff.com
 - Samuel Amoako-Atta – SAmoak-Atta@halff.com
 - Catherine Rowley – CRowley@halff.com
 - Alison Hanson – AHanson@halff.com
- FEMA:
 - Alan Johnson – Alan.Johnson@fema.dhs.gov
- TWDB / TNRIS:
 - Manuel Razo – Manuel.Razo@twdb.texas.gov
 - Michael Segner – Michael.Segner@twdb.texas.gov



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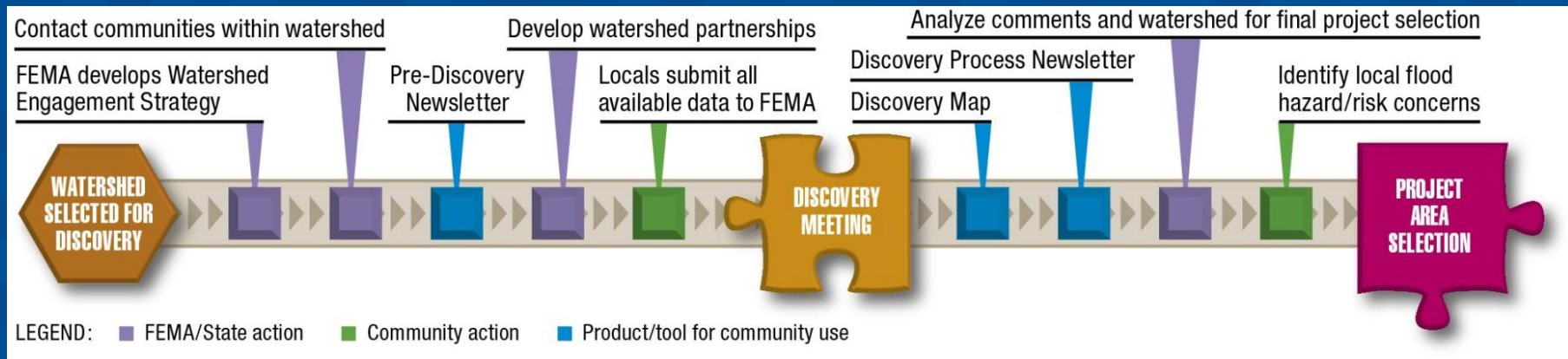


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Discovery Findings Webinar Slides



NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS EAST FORK TRINITY DISCOVERY FINDINGS MEETING

JULY 31, 2019

NCTCOG:

- Edith Marvin – EMarvin@nctcog.org
- Mia Brown – MBBrown@nctcog.org



TWDB:

- Manuel Razo – Manuel.Razo@twdb.texas.gov
- Paul Gutierrez – paul.gutierrez@twdb.texas.gov



Halff Associates:

- Jarred Overbey – jOverbey@halff.com
- Samuel Amoako-Atta – sAmoako-Atta@halff.com
- Alison Hanson – aHanson@halff.com
- Katy Onley – kOnley@halff.com



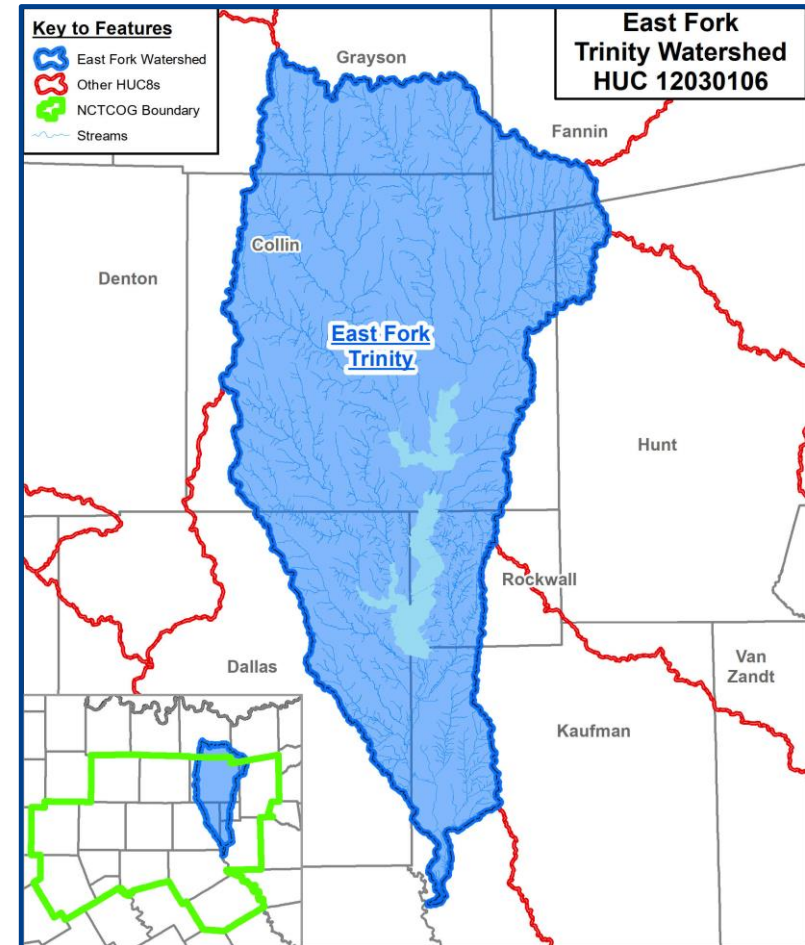
FEMA:

- Alan Johnson – alan.johnson@fema.dhs.gov



DISCOVERY | AGENDA

- NCTCOG Overview
- Risk MAP Overview
- East Fork Trinity Discovery
 - Activities
 - Findings
- Base Level Engineering
- Post Meeting Coordination



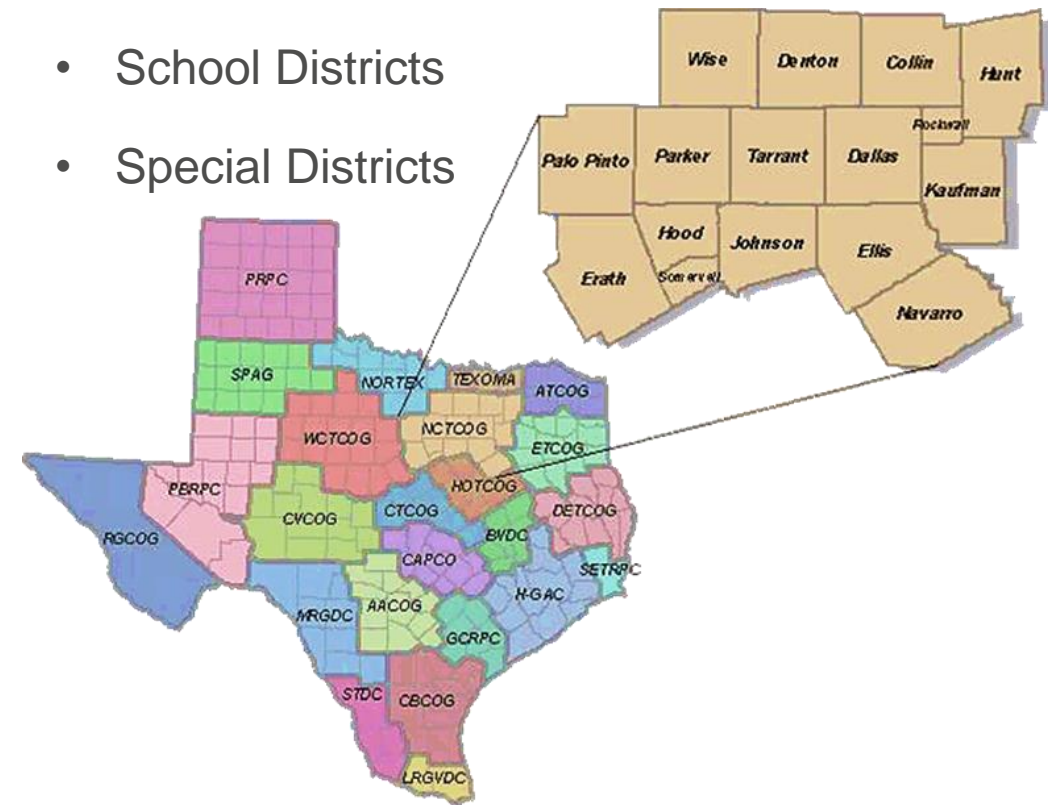
NCTCOG | WHAT IS NCTCOG'S ROLE?

VOLUNTARY ASSOCIATION OF, BY, AND FOR LOCAL GOVERNMENTS, ESTABLISHED IN 1966, TO HELP THEM:

- Plan for common needs
- Strengthen their individual and collective power
- Recognize regional opportunities
- Resolve regional problems
- Make joint decisions/cooperate for mutual benefit

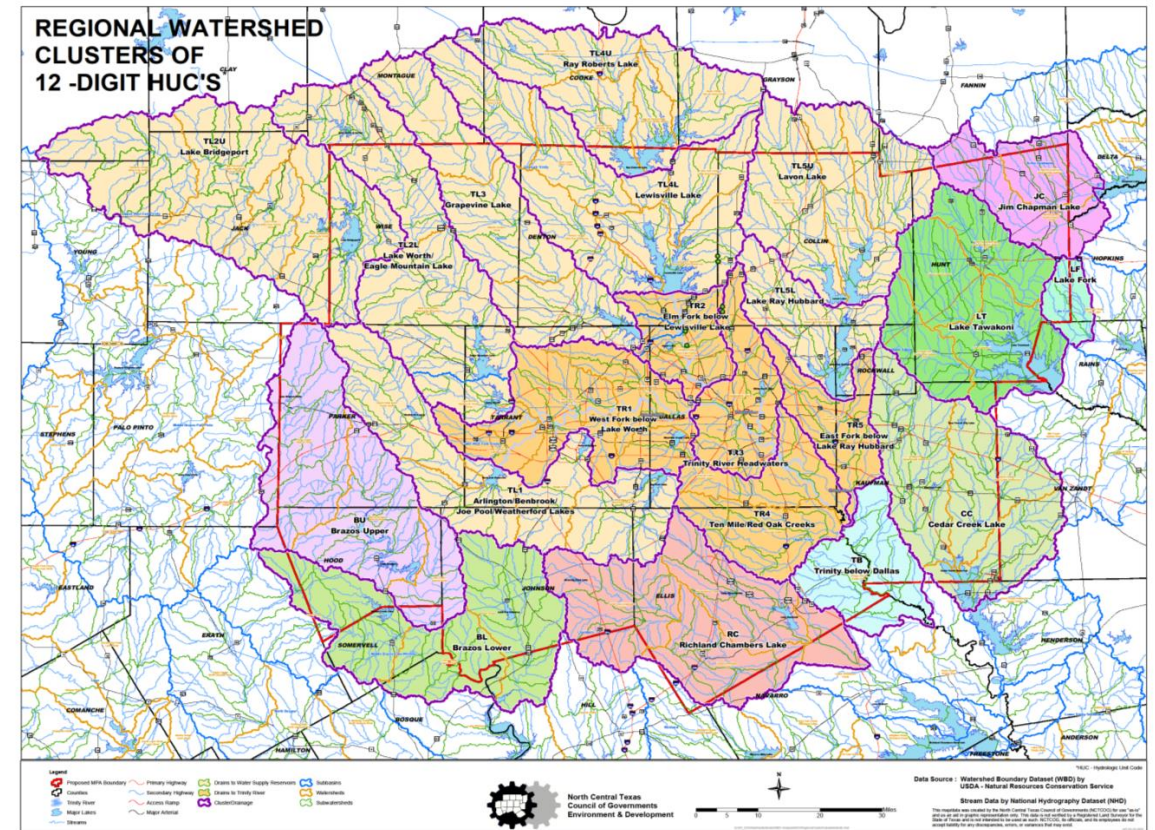
■ 230+ Member Governments

- Cities
- Counties
- School Districts
- Special Districts

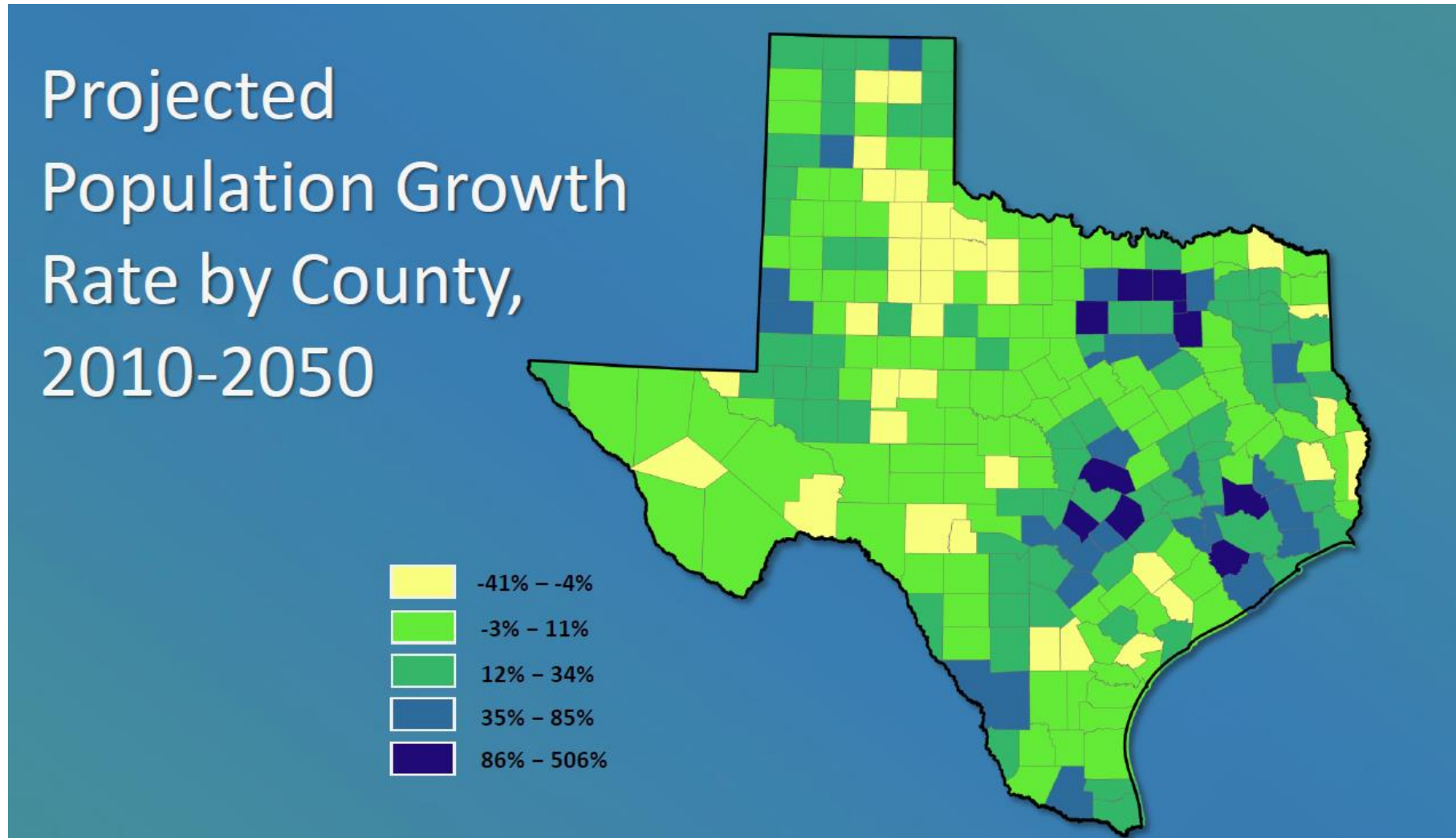


NCTCOG ENVIRONMENT AND DEVELOPMENT WATERSHED MANAGEMENT PROGRAM:

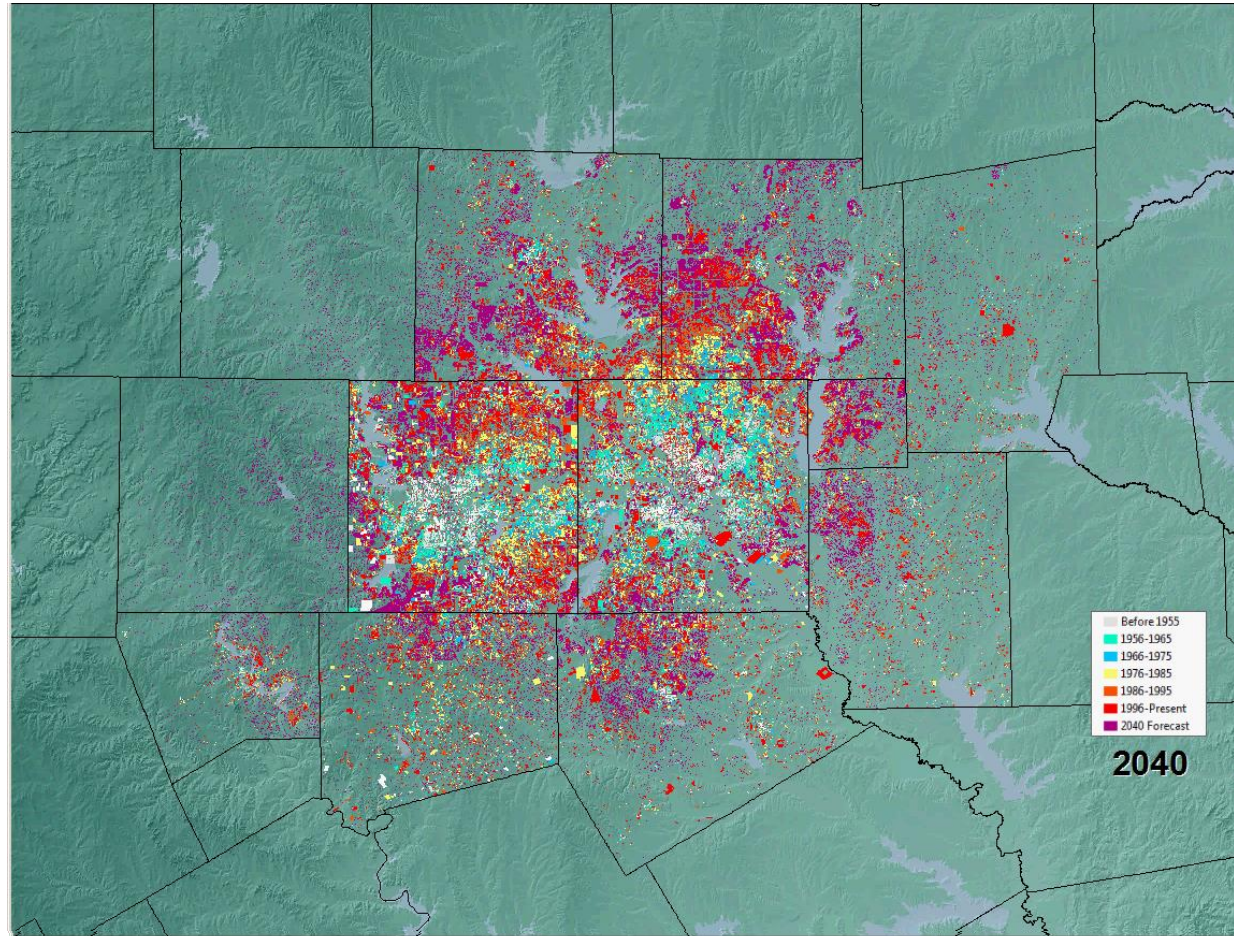
- Focus on water quality, stormwater, and floodplain topics/issues.
- Floodplain
 - NCT region does not have a flood control district. Lots of local/regional entities working in their own jurisdictions.
 - NCTCOG will never replace a flood control district, but as an agency, we work toward regional cooperation on flooding issues to help everyone accomplish common goals together.



Source : Dr. Lloyd Potter, Texas State Demographer



NORTH CENTRAL TEXAS 1950-2040 GROWTH



NCTCOG GOALS AS A COOPERATING TECHNICAL PARTNER

■ Direct Goals:

- Better data for better decision making
- Coordination between communities and local/regional/state/federal organizations (what COGs do best!)
- Partnerships

■ Indirect Goals:

- Higher Standards

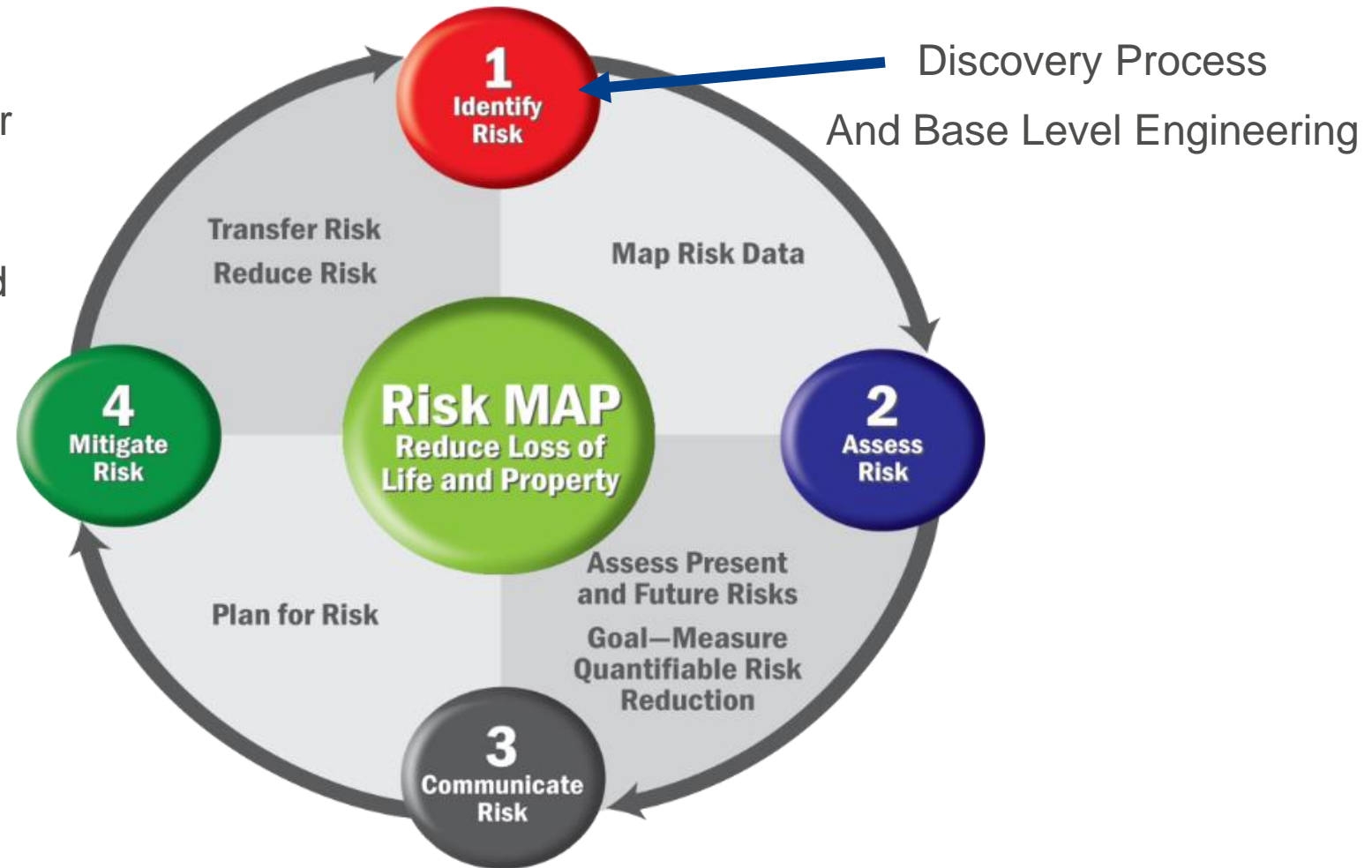
FEMA'S RISK MAPPING, ASSESSMENT, AND PLANNING (MAP) PROGRAM

- Provide flood information and tools for better **protection**
- **Action-Driven** through local understanding and ownership of risk



FEMA'S RISK MAPPING, ASSESSMENT, AND PLANNING (MAP) PROGRAM

- Provide flood information and tools for better **protection**
- **Action-Driven** through local understanding and ownership of risk



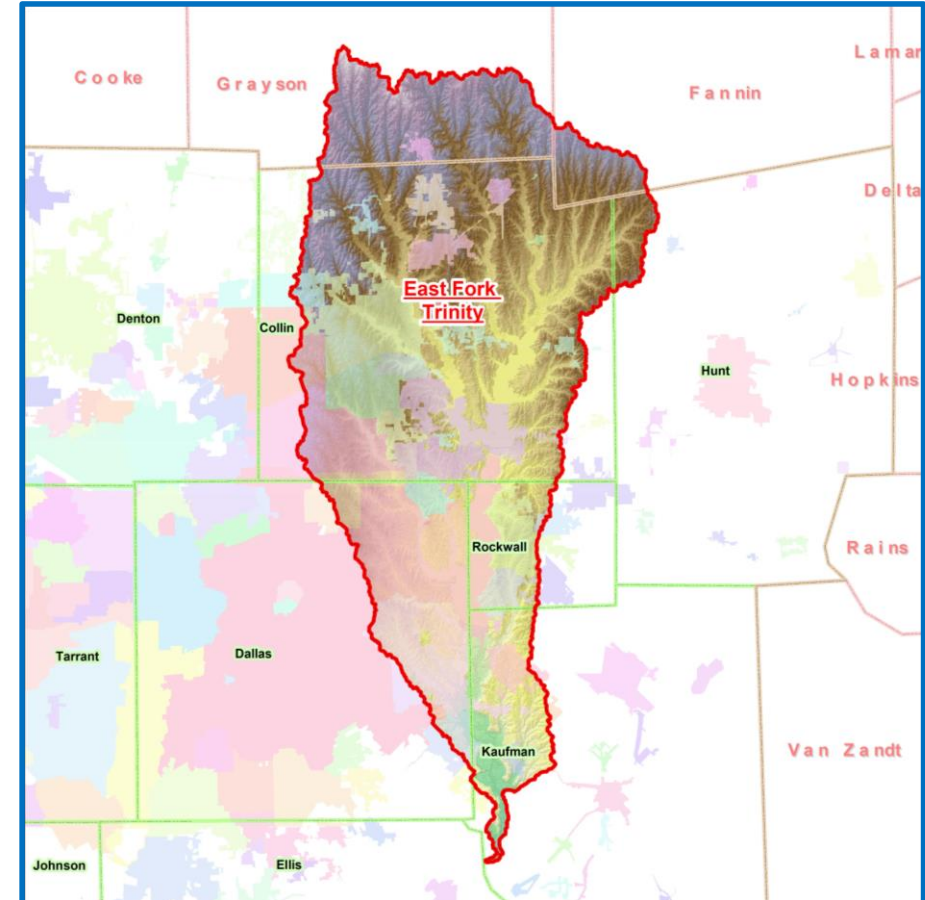
NCTCOG LEADING EAST FORK TRINITY DISCOVERY

■ Gather Information

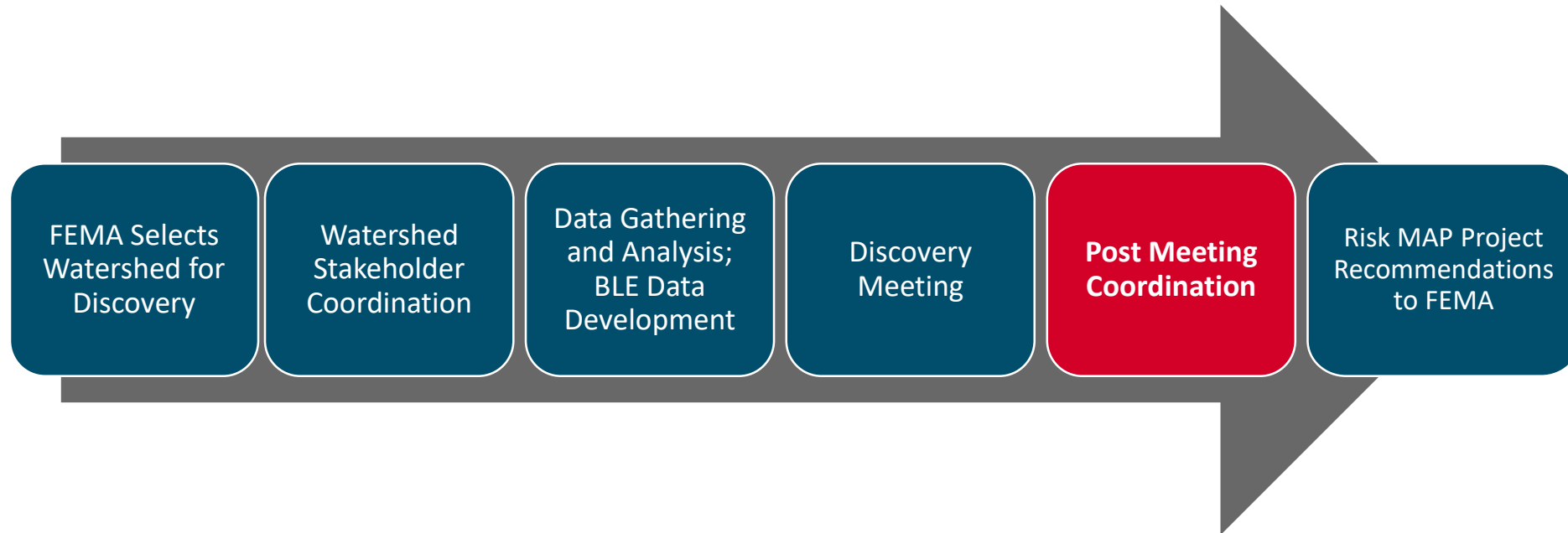
- Local flood risks and hazards
- Current mitigation efforts

■ Provide Information

- Mitigation planning and actions
- Risk communication



DISCOVERY | DISCOVERY PROCESS



PRE-DISCOVERY WEBINARS

- Inform communities of process and timeline

**Pre-Discovery Newsletter
East Fork Watershed**

"Capturing a More Complete Picture of Your Community and Your Watershed" June 2018

Risk MAP Process and Discovery

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that assists communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Discovery is the first phase of an overall process to achieve mitigation actions for reducing risks. The North Central Texas Council of Governments (NCTCOG) has been awarded a FEMA grant to conduct Discovery in the East Fork Watershed in 2018.

The Goal: To work closely with communities to better understand local flood risk, mitigation efforts, and other topics and spark watershed-wide discussions about increasing resilience to flooding.

Pre-Discovery Webinar #1:
Tuesday, June 26th at 2:00 pm
Link: [Tuesday Webinar](#)

Pre-Discovery Webinar #2:
Thursday, June 28th at 10:00 am
Link: [Thursday Webinar](#)

Pre-Discovery Webinars

In preparation for the upcoming Discovery Meetings, NCTCOG will be hosting two Pre-Discovery webinars. These webinars will introduce you to flood risk data being developed in the watershed, inform you about what to expect at the Discovery Meeting, describe who should attend, and communicate the data we need to collect from your community. Invitations to the webinars are currently being sent out. The webinars will be similar in content, so you are welcome to attend the webinar that is most convenient for you. To join us for the Pre-Discovery Webinar, call the number below, and type in the code below for the audio. The web address listed in the email invitation will provide you access to the Webinar at the meeting times indicated.

Phone Number: 1-415-665-0002
Event Number: (June 26) 661 184 499 (June 28) 660 900 973

Discovery Data Collection

Customize Discovery:
Enter your community's data at <http://nctcogdiscovery.halff.com>
Password: NCTCOG_2018

The section to the right lists some of the types of data requested from each community within the watershed. We would greatly appreciate your participation in providing mapping needs and flood risk data for your community.

Requested Data from Communities:

- Areas of flooding
- Historical local flooding locations, mitigation activities and grant projects (ongoing or planned)
- High water marks or flood photos documented from historical flood events
- Local development and floodplain management plans
- Infrastructure information, especially for levees and new bridges, dams, culverts and road improvements
- Flood study needs
- Regional watershed plans
- Stormwater management activities

NCTCOG requests communities to share whatever data they have, to provide as complete a picture as possible.

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by and for local governments, and was established to assist local governments in planning for common needs, cooperating mutual benefit, and coordinating for sound regional development. For more information, please visit www.nctcog.org.

NCTCOG is a FEMA Cooperating Technical Partner (CTP), which allows for them to collaborate with FEMA to help maintain current flood hazard information. The results of the 2009 Map Needs Assessment Study conducted by NCTCOG and the Texas Water Development Board (TWDB) were used to develop a Mapping Activity Statement (MAS) as the basis of the FEMA CTP grant. FEMA awarded a CTP grant to NCTCOG to perform Discovery in this watershed. NCTCOG's MAS is included in the Risk MAP program. Please submit Discovery data or questions to Mia Brown (mbrown@nctcog.org - 817-695-9227).

FEMA **RiskMAP** **North Central Texas Council of Governments**

North Texas Discovery

"Capturing a More Complete Picture of Your Watershed"

Pre-Discovery Webinars
June 26, 2018
June 28, 2018

HALFF

0:01 / 43:02



COMMUNITIES SUBMITTED FLOOD RISKS ONLINE

- Low Water Crossings
- Flooding Concerns
- Significant Land Use Change
- Issues with Effective Mapping

NCTCOG Discovery

Overall Progress 100% THANK YOU!

Welcome ✓ Your Info ✓ Backgrounder ✓ **Questions ✓** Map and Report ✓ Meeting Info ✓

Use the buttons above to navigate

Community Questionnaire for: Mesquite

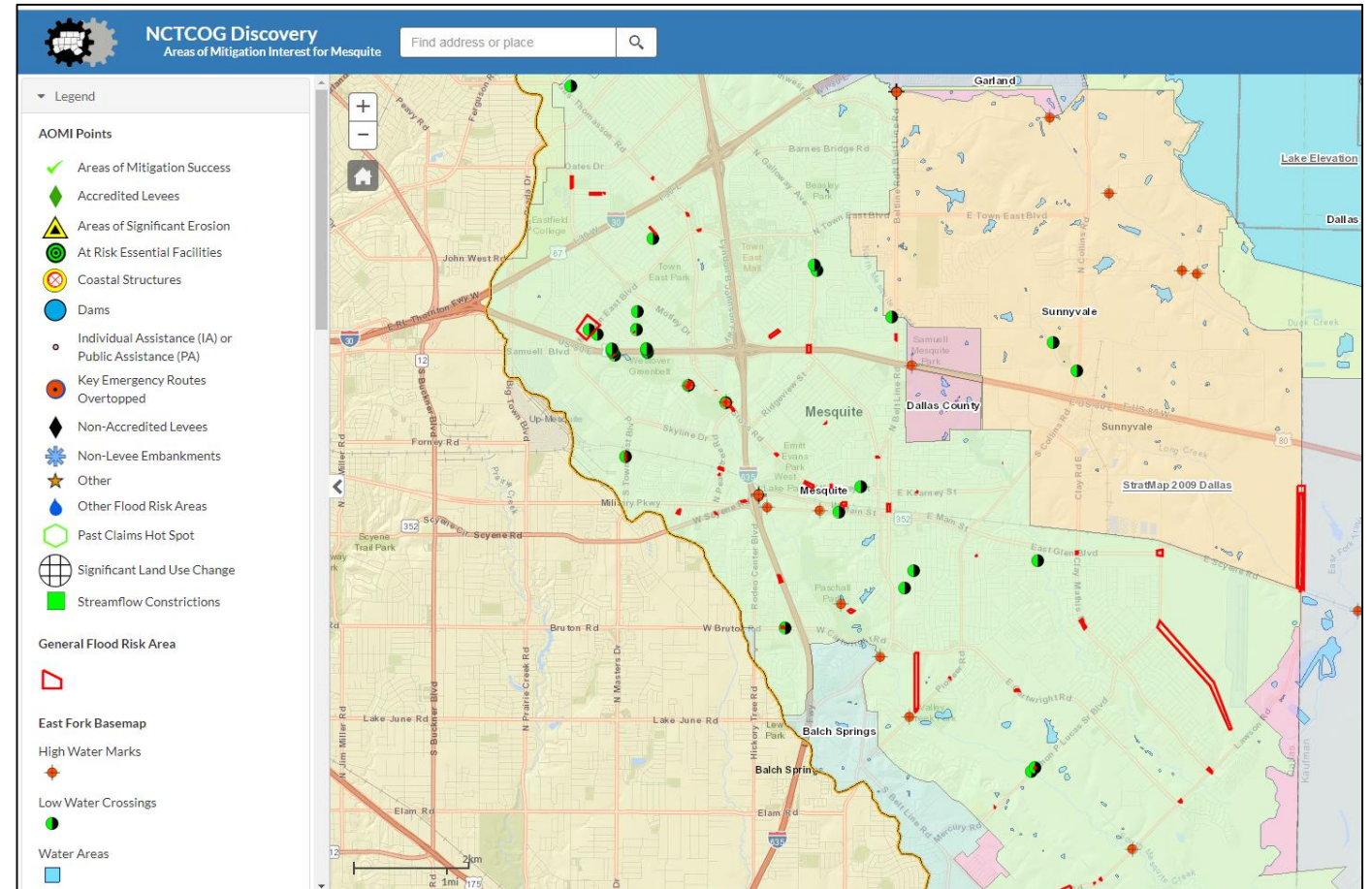
You may continue to edit, if needed, or click the next tab above to proceed.

Why do you need this?

1: Do you have comments on the accuracy of the current floodplain mapping?
Yes # No (If yes, please explain)
Mesquite participated in the Dallas County-wide effort to re-map flood zones by Halff. The new FEMA maps are effective as of July 7, 2014.

2: Are there any Completed or In-Progress Hazard Mitigation Projects within your community?
 Yes No (If yes, please explain)

3: Are there any Completed or In-Progress Capital Improvements Program (CIP) projects that involve flood hazard reduction within your community?
 Yes No (If yes, please explain)



DISCOVERY | ACTIVITIES

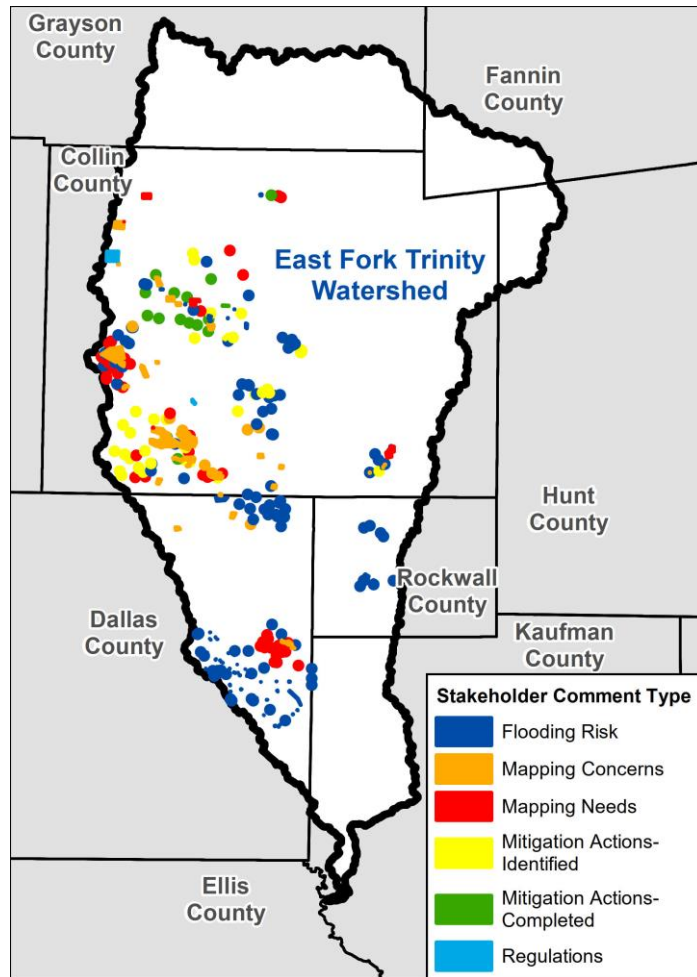


DISCOVERY MEETING - MARCH 1ST

- Receive flooding issues
- Facilitate discussion among stakeholders

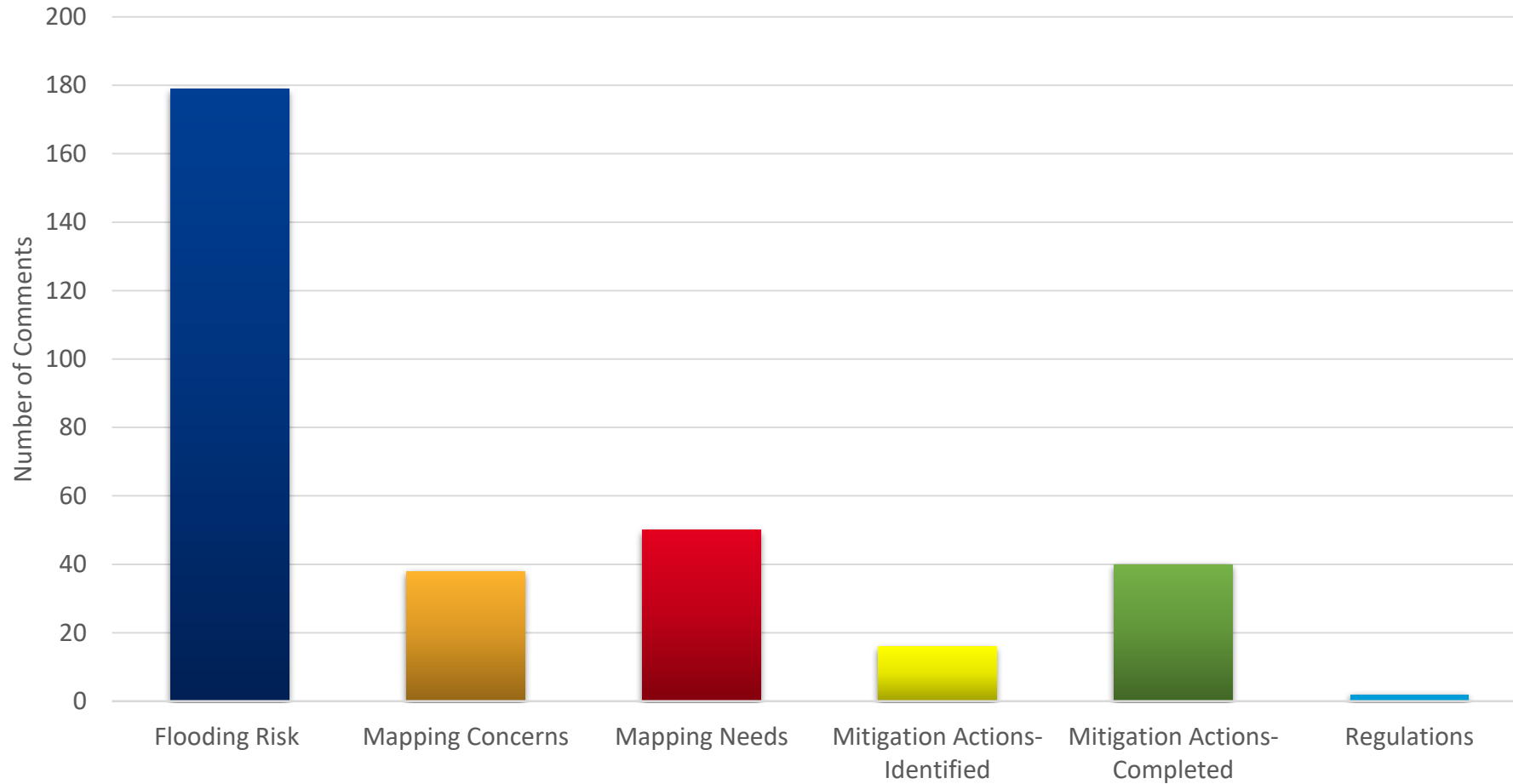


326 STAKEHOLDER COMMENTS SUBMITTED

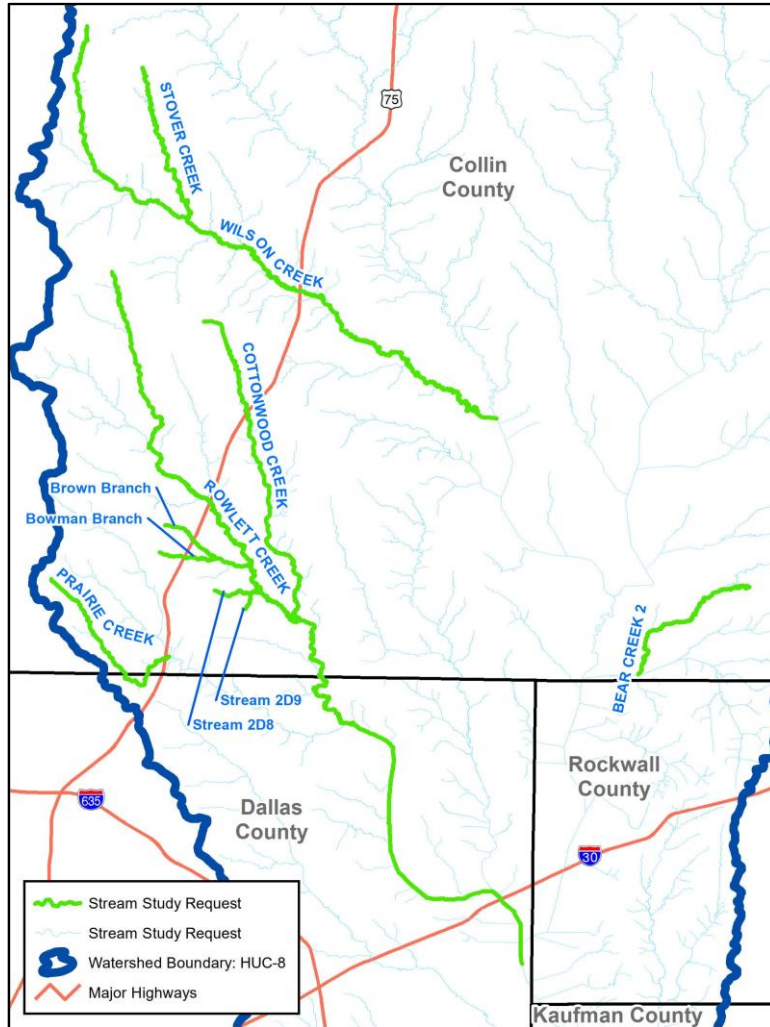


| Number of Comments | Community |
|--------------------|----------------|
| 3 | Allen |
| 4 | Anna |
| 5 | Celina |
| 24 | Collin County |
| 1 | Dallas County |
| 25 | Frisco |
| 7 | Garland |
| 2 | Kaufman County |
| 1 | Heath |
| 13 | Lavon |
| 15 | Lowry Crossing |
| 21 | Lucas |
| 41 | McKinney |
| 79 | Mesquite |
| 1 | Parker |
| 54 | Plano |
| 1 | Prosper |
| 5 | Richardson |
| 9 | Rockwall |
| 1 | Rowlett |
| 16 | Sachse |
| 28 | Sunnyvale |
| 4 | Wylie |

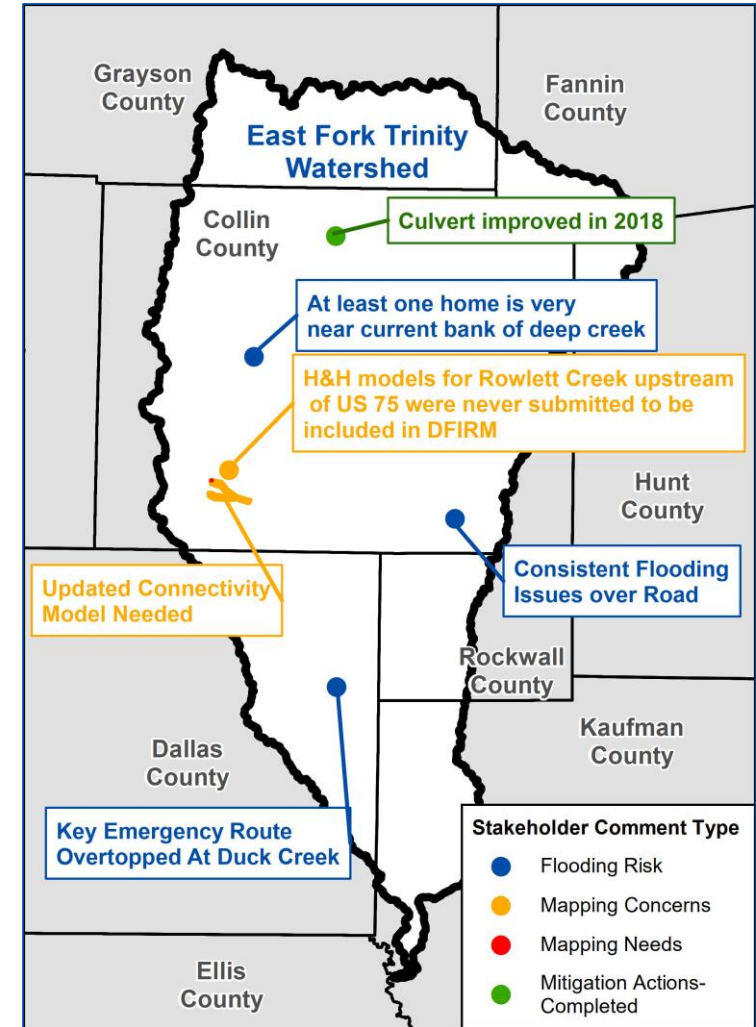
STAKEHOLDER COMMENTS BY TYPE



REQUESTED STUDY STREAMS

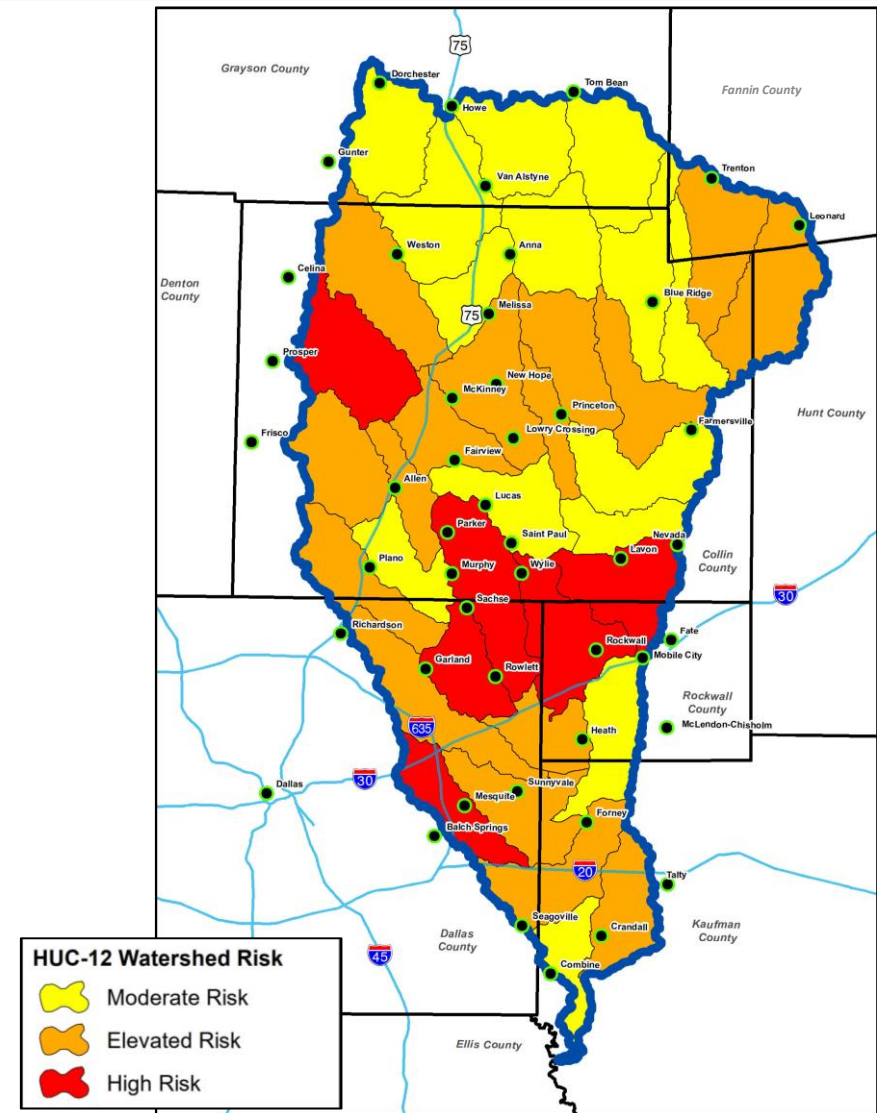


SAMPLE COMMENTS SUBMITTED



HUC-12 WATERSHED PRIORITIZATION

| Criteria No. | Description | Max Weight |
|--------------|--|------------|
| 1 | Population density (whole number) | 10 |
| 2 | Population change (decimal) | 10 |
| 3 | Predicted population growth (whole number) | 10 |
| 4 | History of flood claims (whole number) | 10 |
| 5 | History of flood events (whole number) | 10 |
| 6 | Number of Letters of Map Change (LOMR/LOMA) (whole number) | 5 |
| 7 | Available current topography (Y/N for LiDAR) | 10 |
| 8 | Age of technical data – hydrology (num. of years) | 5 |
| 9 | Age of technical data – hydraulics (num. of years) | 5 |
| 10 | Ability to leverage current studies (Y/N) | 5 |
| 11 | Potential for local funding (Y/N) | 5 |
| 12 | Potential for local “work in kind” (Y/N) | 3 |
| 13 | Previous contribution to a FEMA study (Y/N) | 2 |
| 14 | Stakeholder mapping request (number) | 10 |



BASE LEVEL ENGINEERING

- Requires LiDAR
- Automated hydraulic modeling
- Model Review and Adjustments
- Gage Review included in hydrology



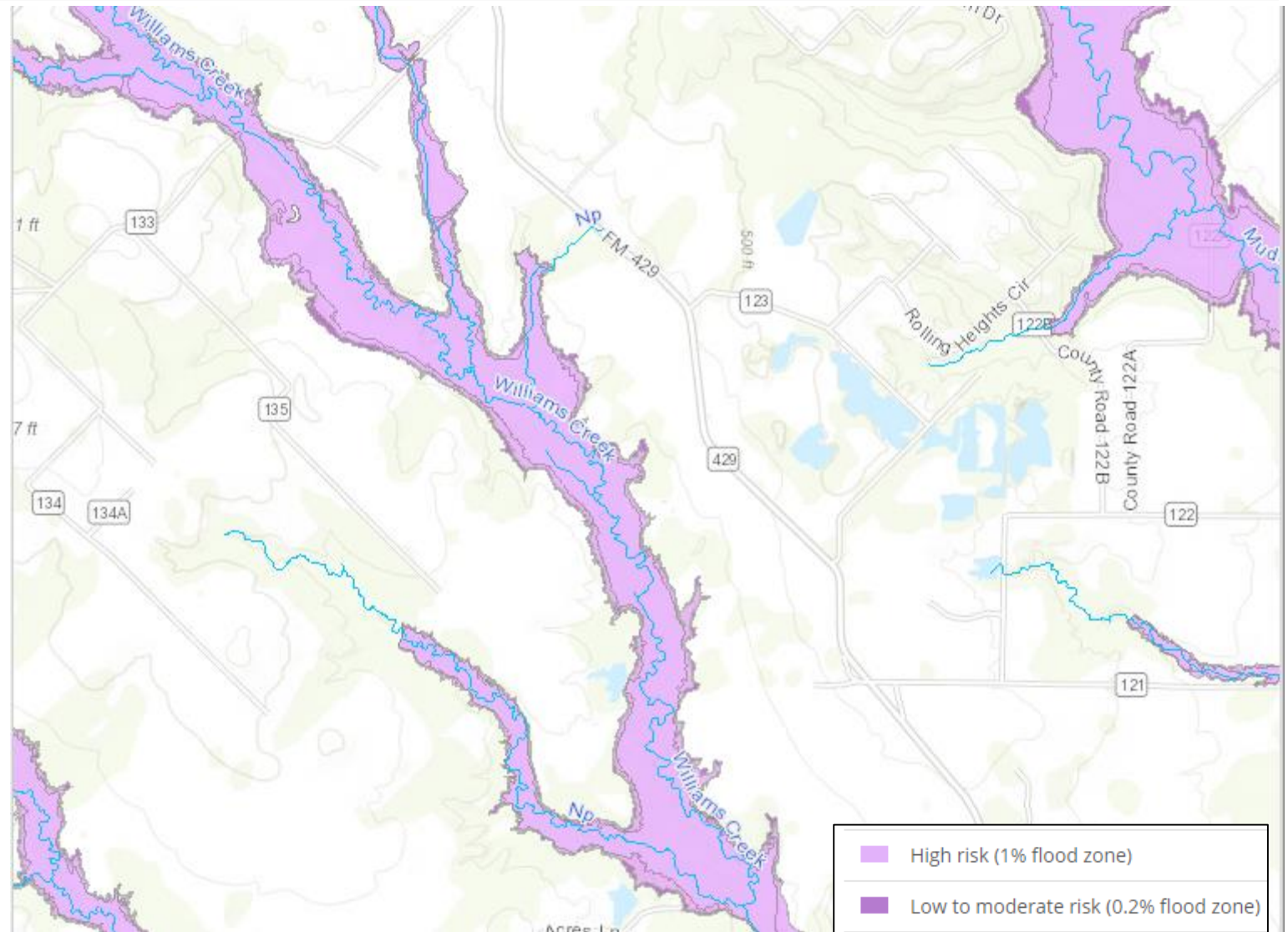
BASE LEVEL ENGINEERING

■ Hydraulic modeling

- 10%, 4%, 2%, 1% and 0.2% storm events

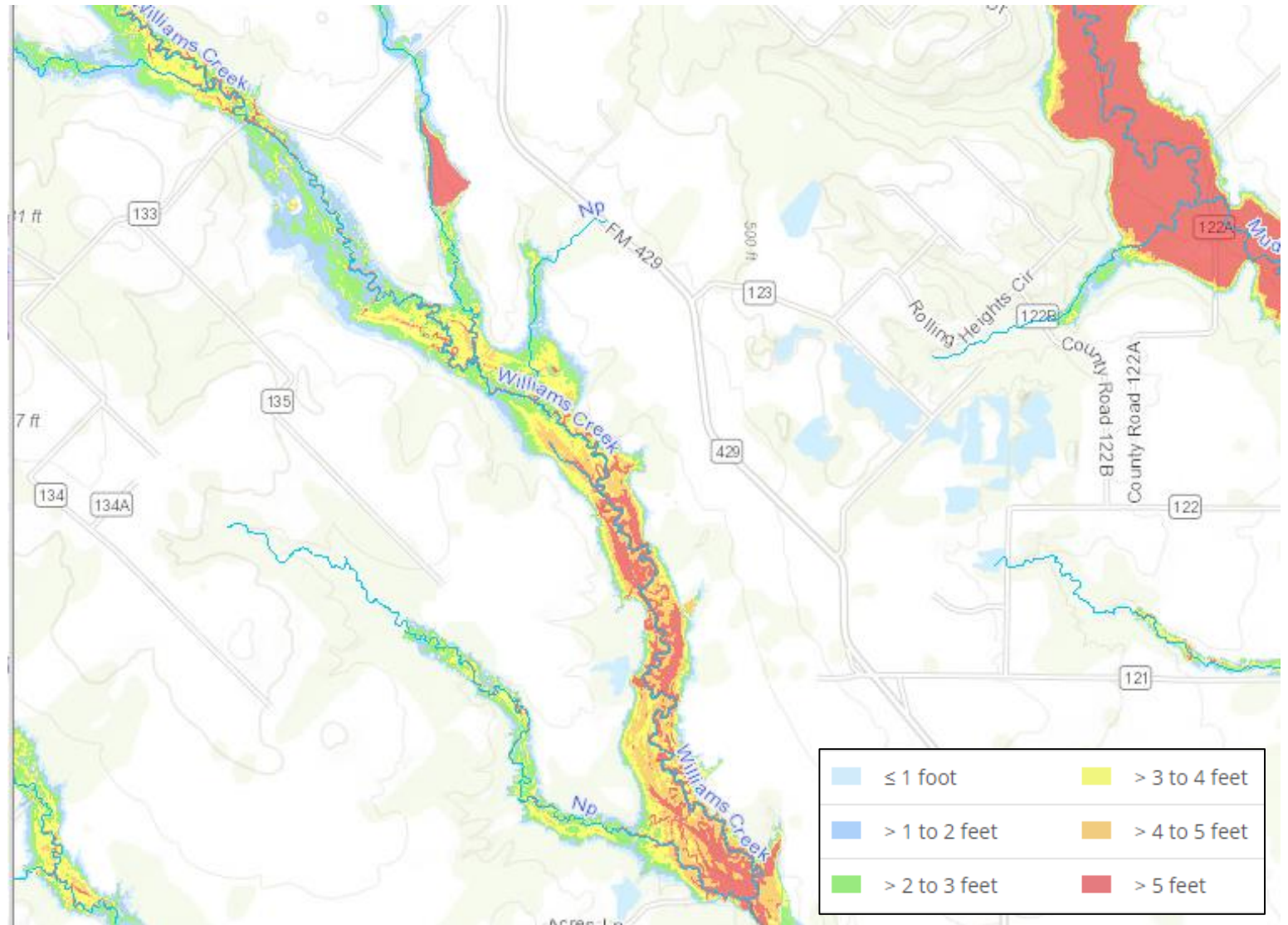
■ Floodplain Boundaries

- 10%, 1% and 0.2%



BASE LEVEL ENGINEERING

- Depth and Analysis Grids
- Areas of Expanded Flood Risk
- Flood Risk Assessment

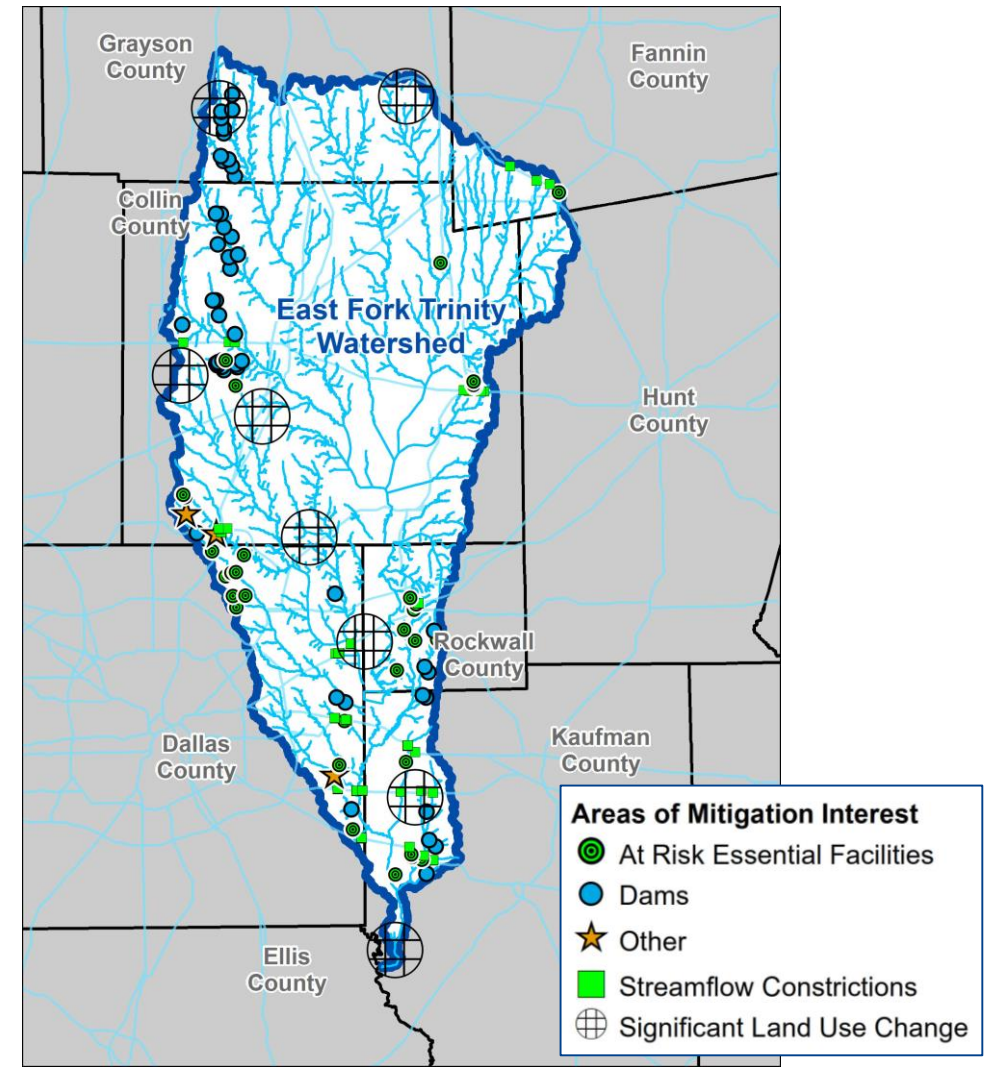


AREAS OF MITIGATION INTEREST (AOMI)

- Structure inventory for future Discovery/Mitigation efforts
- Places with unknown or increased flood risk
- Identified by communities

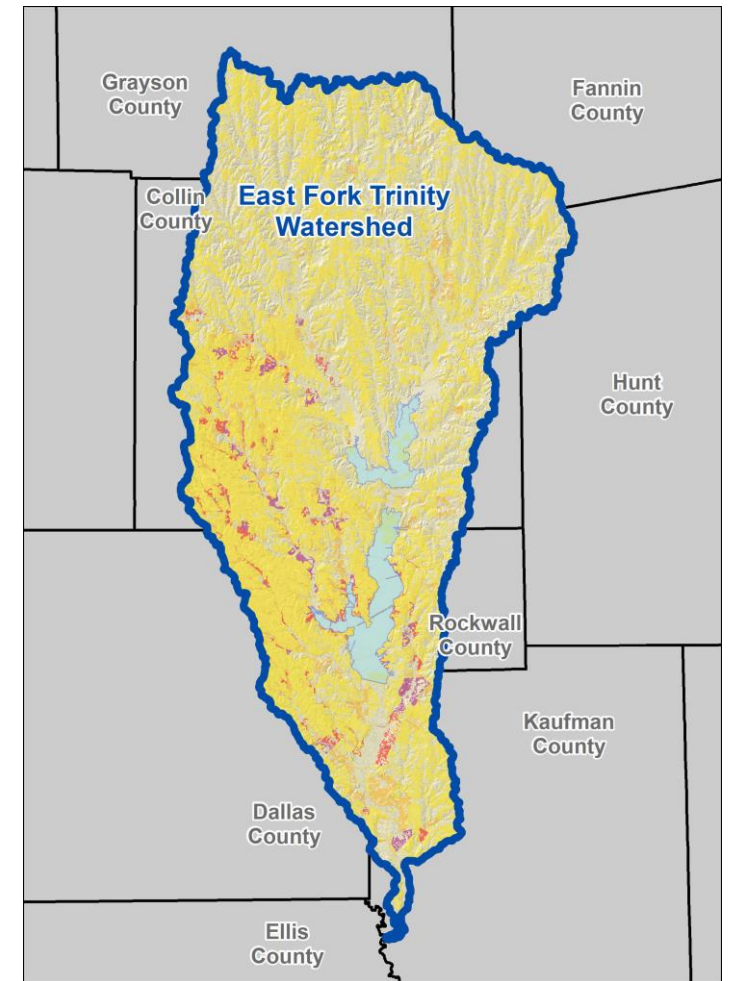
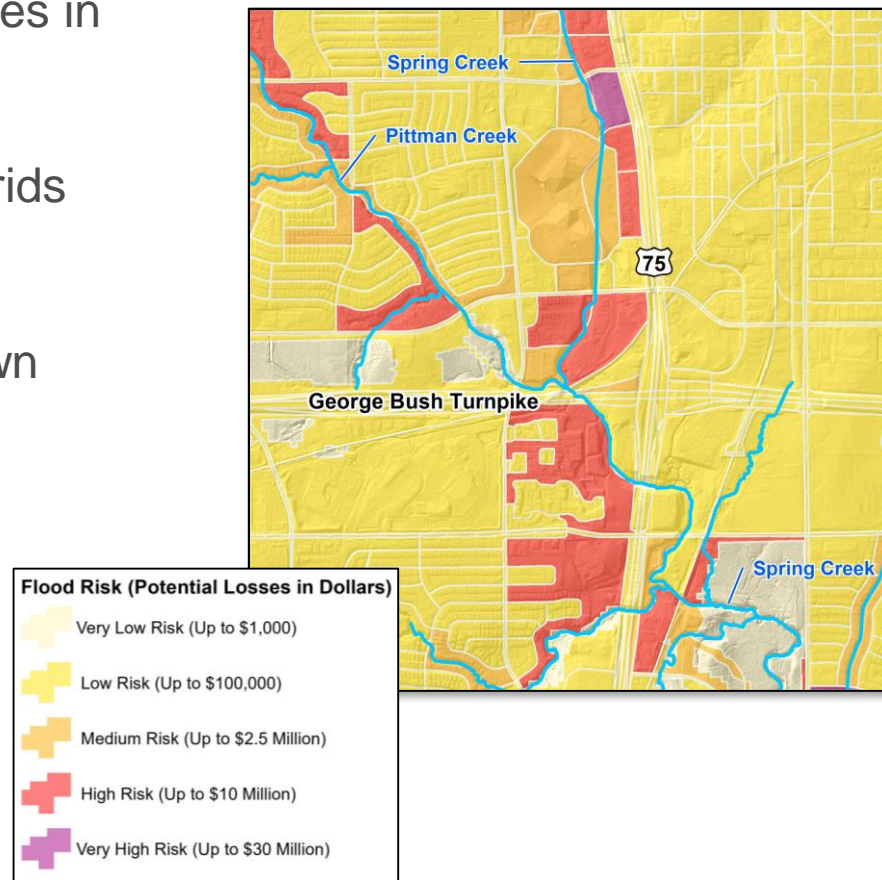
Key to Features

- AOMI Points
- ~ Model Stream
- Mapping: 100-Year



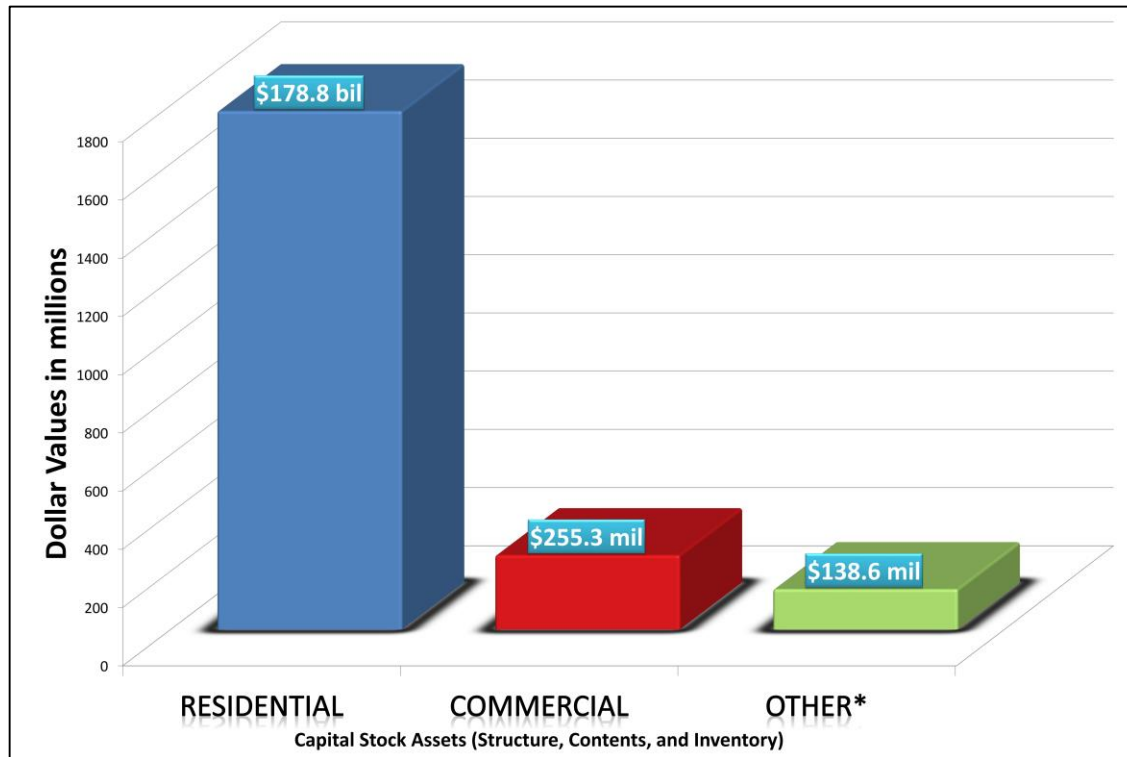
HAZUS-BASED AVERAGE ANNUALIZED LOSS ESTIMATES

- Identify flooding consequences in damages and other losses
- Based on 100 Year Depth Grids and at-risk assets
- Can be further narrowed down

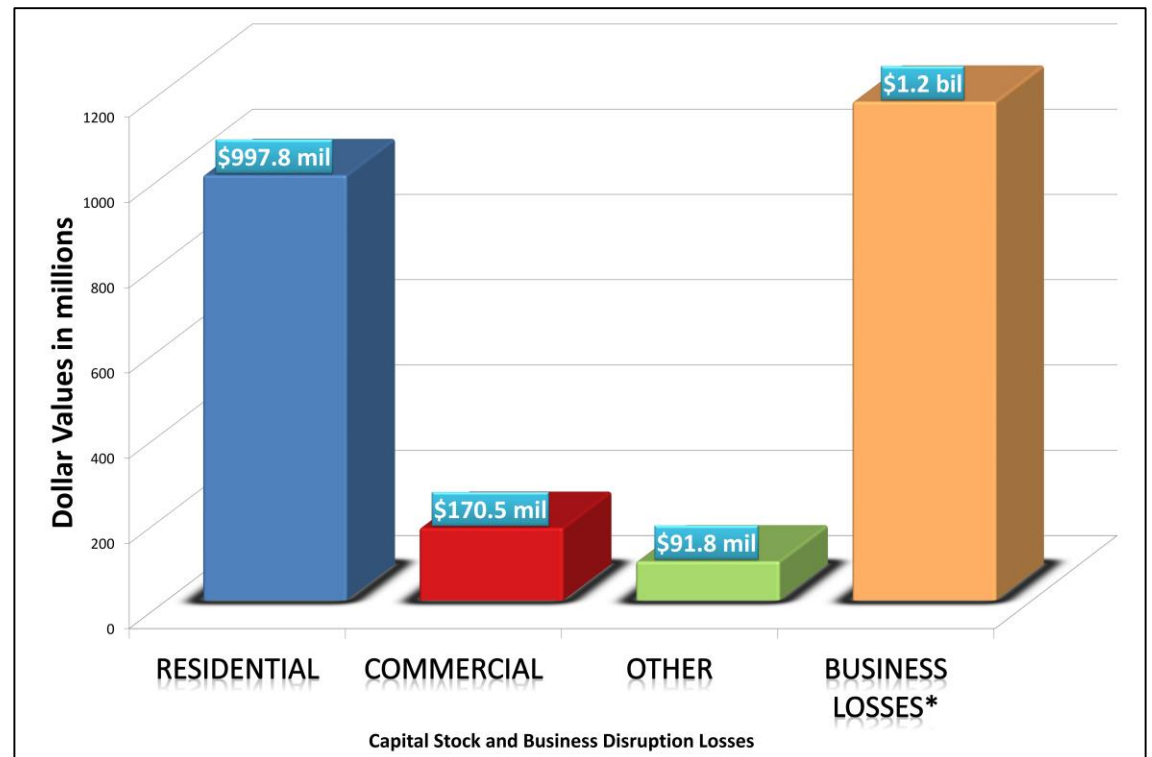


HAZUS-BASED AVERAGE ANNUALIZED LOSS ESTIMATES

Asset Inventory Values



100-Year Flood Event Potential Losses

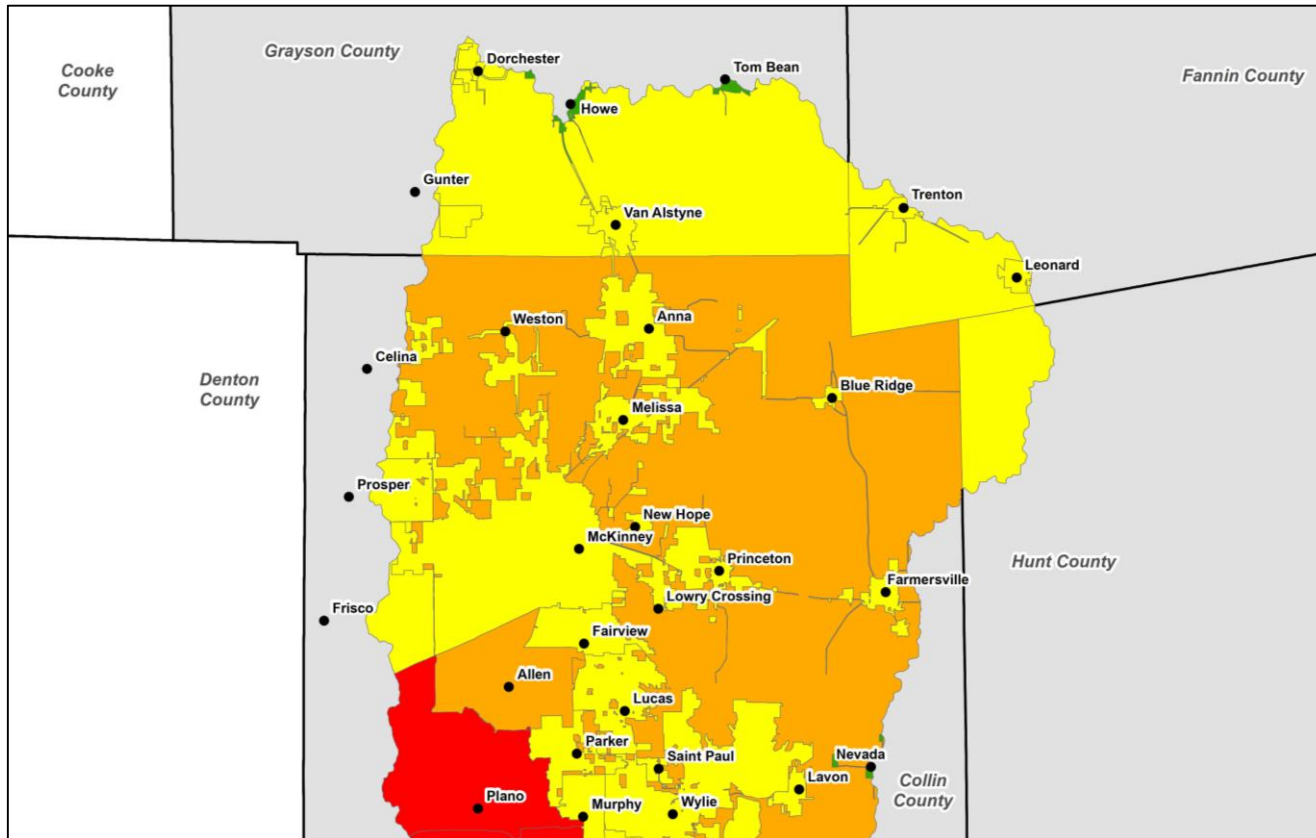


*Other: structure types include Industrial, Agricultural, Education, Religious, and Government structures.

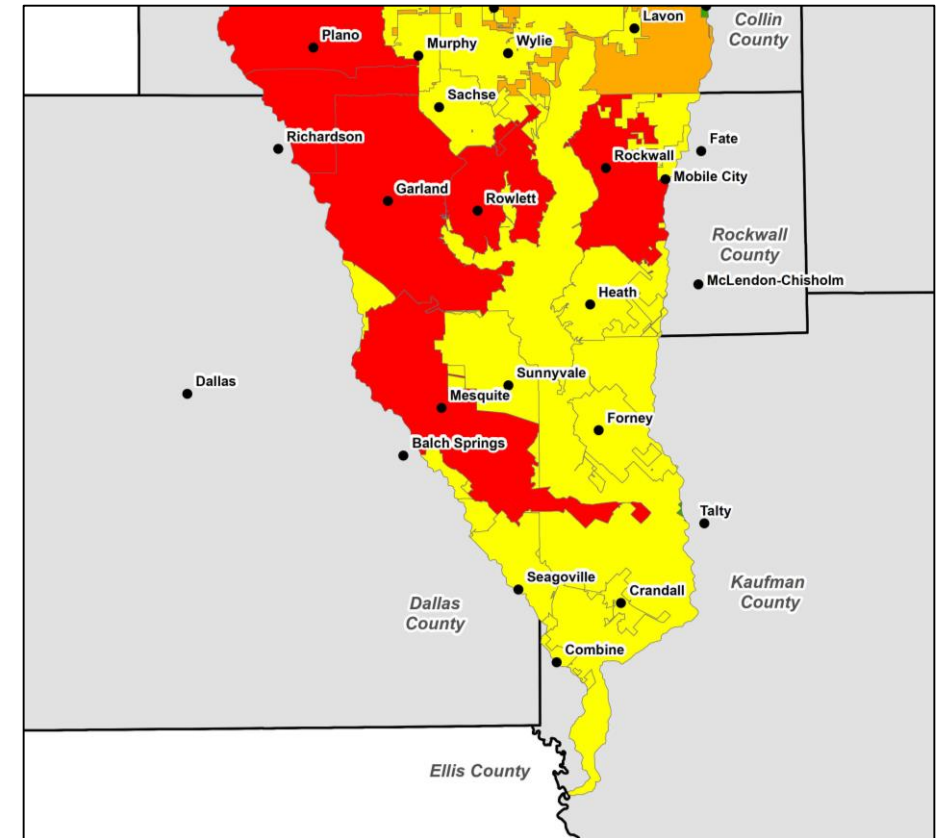
*Business Losses are the sum of Inventory Loss, Relocation Costs, Income Loss, Rental Income Loss, Wage Loss, and Direct Output Loss.

HAZUS-BASED AVERAGE ANNUALIZED LOSS ESTIMATES

Northern Communities

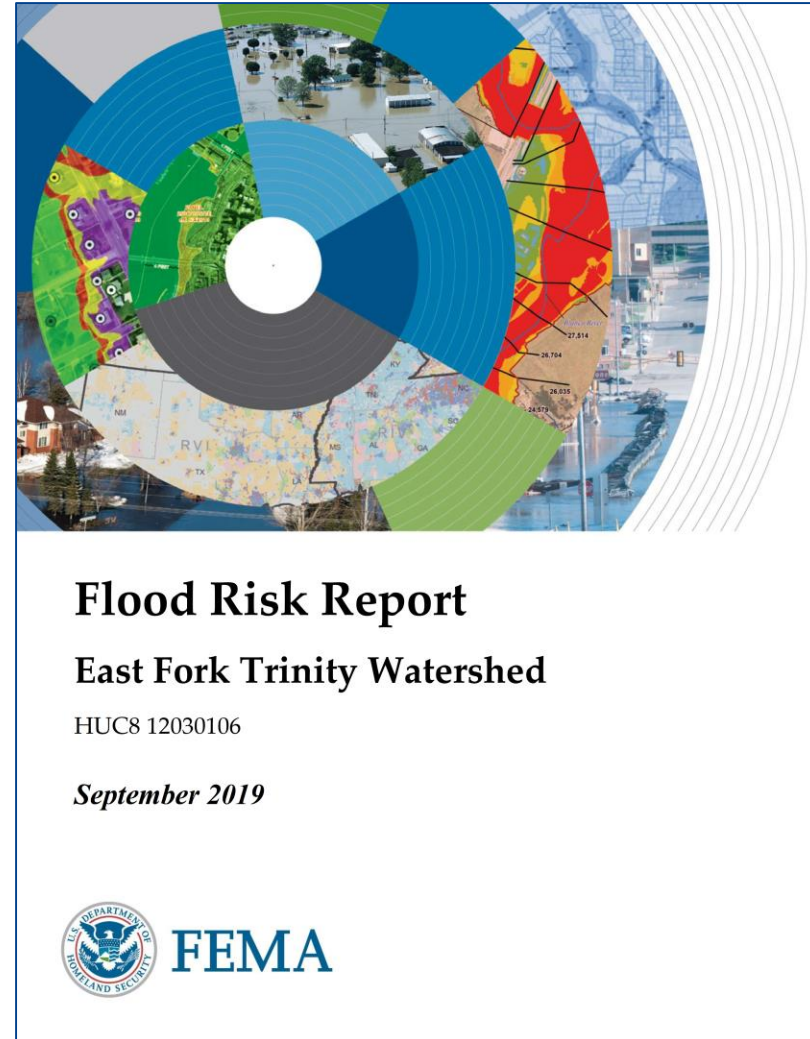


Southern Communities



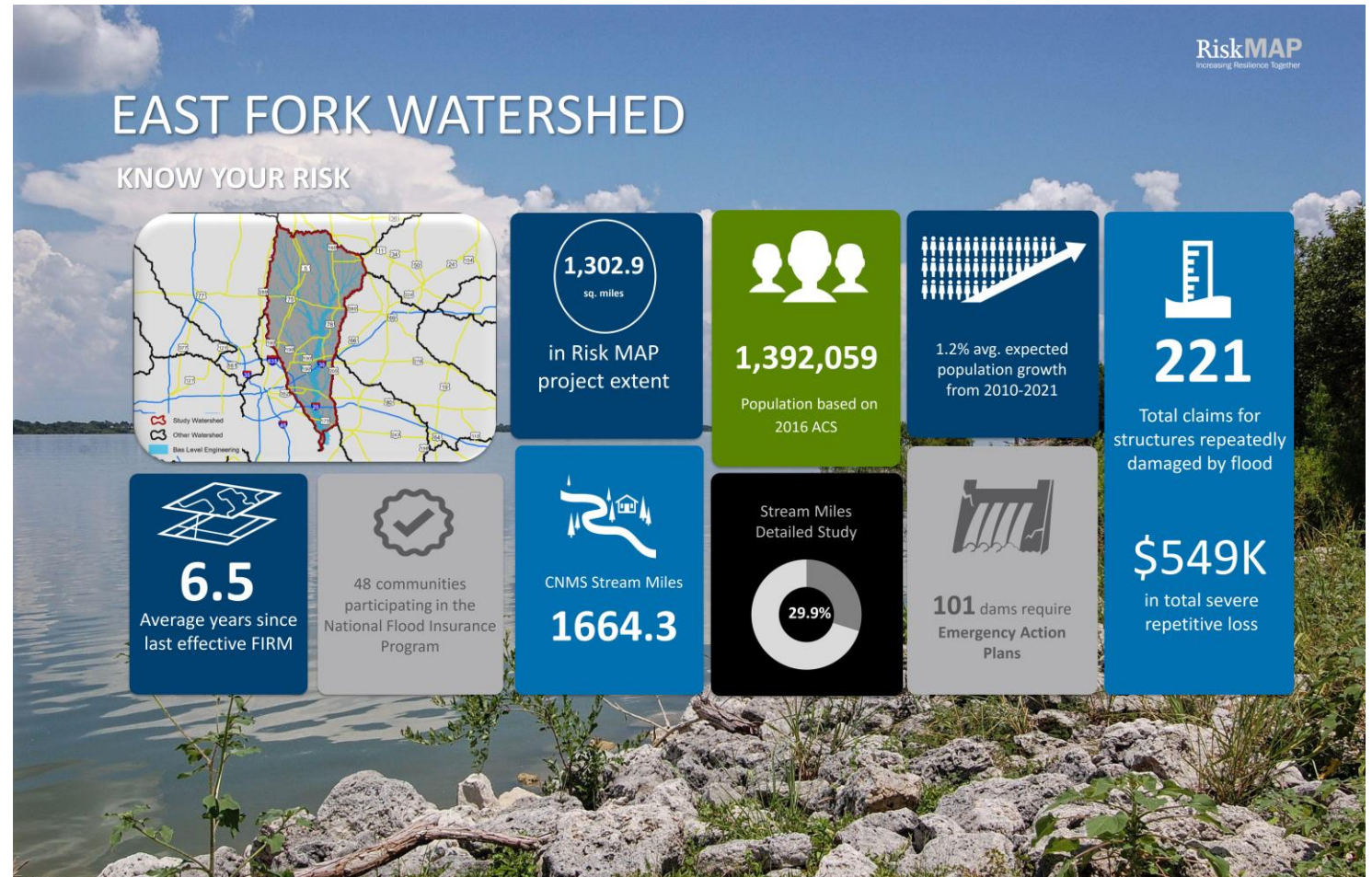
FLOOD RISK REPORT

- Prioritization Results
- Figures and Maps
- Summary of Discovery Activities
- BLE Report

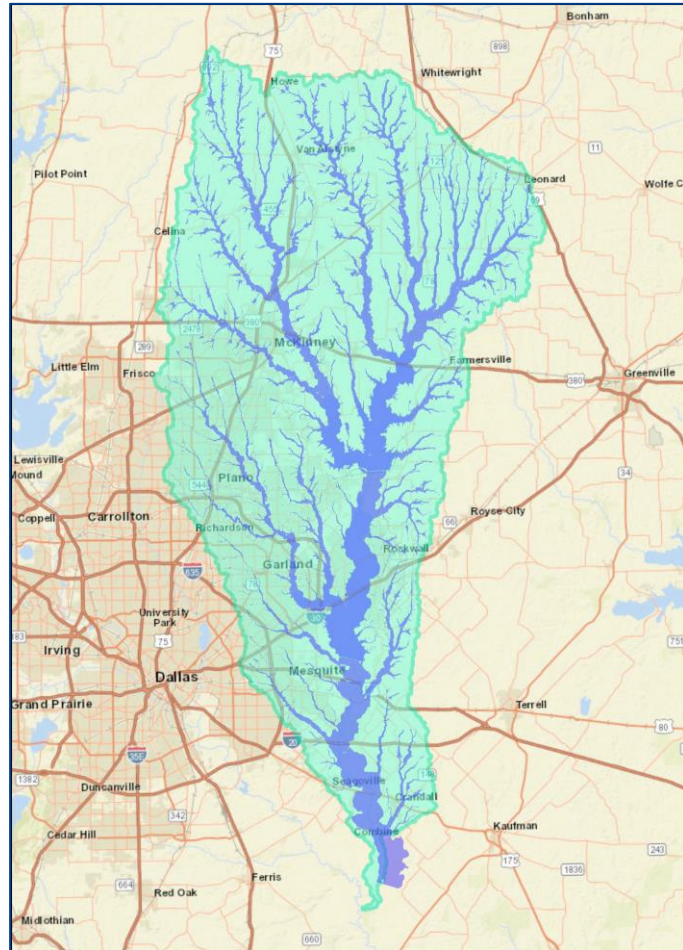


FLOOD RISK REPORT

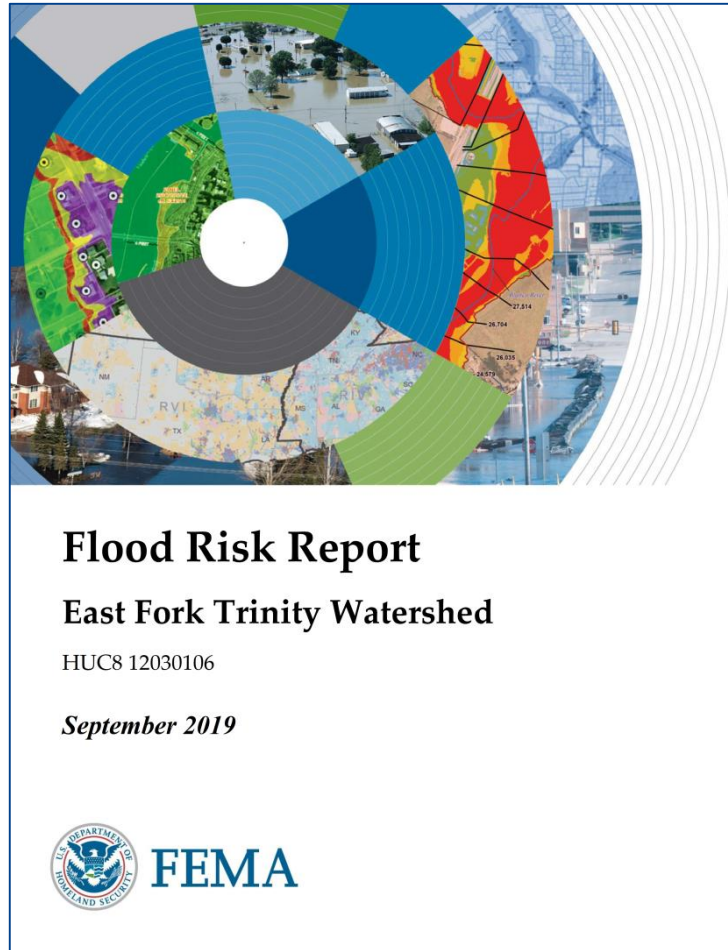
- Community Snapshots
- Historical Flooding
- Stakeholder Comments



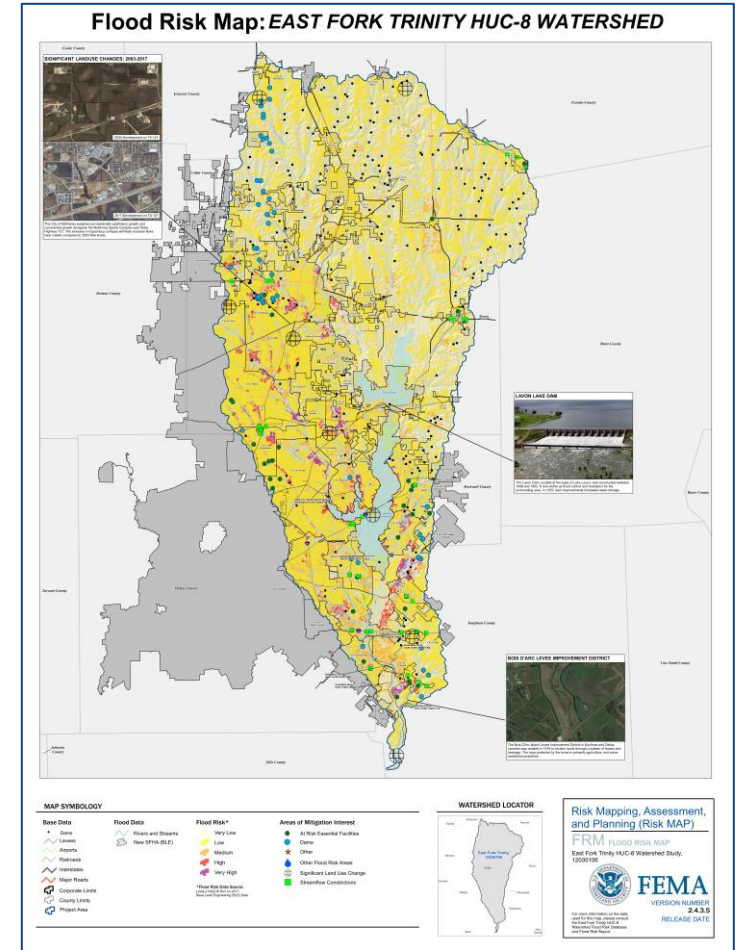
BLE DATASET



FLOOD RISK REPORT



FLOOD RISK MAP



BLE OVERVIEW | BFE VIEWER

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Downloadable Data (BLE) Remove

Base Map: Topographic

Comments: This base map includes administrative boundaries, cities, water features, physiographic features, parks, landmarks, highways, roads, railways, and airports.

Data Source: ESRI ArcGIS Online

Scale: 1 : 9,244,649

U.S. Department of the Interior | DOI Inspector General | White House | E-gov | Open Government | No Fear Act | FOIA

<https://webapps.usgs.gov/infrm/estBFE/>

Welcome to the

Base Level Engineering assessments are produced using high resolution ground data to create technically creditable flood hazard information that may be used to expand and modernize FEMA's current flood hazard inventory.



View Base Level Engineering Data

Access all available Base Level Engineering data without GIS software.

- Click the **DATA LAYERS** button to add or remove map layers.
- Click the **LEGEND** tab to view an explanation of all data shown.
- Click the **MAP VIEW** button to open or close a second viewing window for side-by-side comparisons.

Estimated Base Flood Elevation Viewer



Download Datasets & Models

Download the Base Level Engineering data presented in the viewer.

- Click the **DATA LAYERS** button and add the **DOWNLOADABLE DATA** layer.
- Click shaded areas in the map to open a dialog for choosing datasets to download.



Property Look Up

Where data is available, produce a property-specific report with estimated base flood information.

- Click the **REPORT** tab to create a flood risk report for a specific location.

Click a topic to get started!



BLE OVERVIEW | BFE VIEWER

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Legend

Estimated Flood Extent (1% and 0.2%)

- High risk (1% flood zone)
- Low to moderate risk (0.2% flood zone)

Comments: Properties within high risk areas have a 1 percent (1/100) chance of flooding in any year, while properties within low to moderate risk areas have a 0.2 percent (1/500) chance of flooding in any year.

Flood Depth (1%)

- ≤ 1 foot
- > 1 to 2 feet
- > 2 to 3 feet
- > 3 to 4 feet
- > 4 to 5 feet
- > 5 feet

Comments: Depicts estimated water depths above land surface during a 1% annual chance storm event (a storm that has a 1/100 chance of occurring in any calendar year).

Data Layers

Base Level Engineering (3 shown)

- Estimated flood extent (1% and 0.2%)
- Estimated flood extent (10%)
- Flood depth (1%)
- Flood depth (0.2%)
- Opacity: 50%
- 2D BLE elevations
- 1D BLE cross-sections
- Stream center lines
- Stream center line labels
- Opacity: 100%

Data Layers (1 shown)

- Estimated flood extent (1% and 0.2%)
- Estimated flood extent (10%)
- Flood depth (1%)
- Flood depth (0.2%)
- Opacity: 50%
- 2D BLE elevations
- 1D BLE cross-sections
- Stream center lines
- Stream center line labels
- Opacity: 100%

Map View

U.S. Department of the Interior | DOI Inspector General | White House | E-gov | Open Government | No Fear Act | FOIA

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Report Legend

Create a Flood Risk Report

Search for a place

Enter an address or place of interest in the above search box. A popup will appear at the chosen location and you can create a report if BLE data are available there.

OR

My Location

Click this button to zoom the map to your actual location. A popup will appear and you can create a report if BLE data are available there.

Tip: Your web browser must support and have geolocation enabled.

OR

Map Click

Zoom into your area of interest. Click this button and then the map. A popup will appear and you can create a report if BLE data are available there.

Tip: Click on the center of the roof of your home or the most upstream point of your structure.

Quick Start Glossary About

Map View Base Map

Enter address or city, stream, watershed

Click my location to enable GPS from mobile device

Once Zoomed, use Map Click to place the locator and run a report

U.S. Department of the Interior | DOI Inspector General | White House | E-gov | Open Government | No Fear Act | FOIA

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Report Legend 5

Data Layers

Create a Flood Risk Report

More Info >

Search for a place

Enter an address or place of interest in the above search box. A popup will appear at the chosen location and you can create a report if BLE data are available there.

OR

My Location

Click this button to zoom the map to your actual location. A popup will appear and you can create a report if BLE data are available there.

Tip: Your web browser must support and have geolocation enabled.

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Map Click

Zoom into your area of interest. Click this button and then the map. A popup will appear and you can create a report if BLE data are available there.

Tip: Click on the center of the roof of your home or the most upstream point of your structure.

Quick Start Glossary About

Map Click Location

High Flood Risk

This location is in a 1% (100 year) flood zone.

Report Zoom To Close

Scale: 1 : 72,224

Estimated Base Flood Elevation (estBFE)

FEMA

Flood Risk Information Report

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

Kaufman County, Texas Latitude 32.4576 Longitude -96.2708

Estimated Flood Extent

Estimated 1% Flood Depth

EXPLANATION

- Stream
- 1% flood depth:
 - ≤ 1 foot
 - > 1 to 2 feet
 - > 2 to 3 feet
 - > 3 to 4 feet
 - > 4 to 5 feet
 - > 5 feet
- Stream
- High risk (1% flood zone)
- Low to moderate risk (0.2% flood zone)

| Flood Event | Estimated Flood Depth* | Estimated Base Flood Elevation* |
|------------------------|-----------------------------|---------------------------------|
| 1 Percent (100 Year) | 2.2 feet above land surface | 343.1 feet NAVD 1988 |
| 0.2 Percent (500 Year) | 3.6 feet above land surface | 344.4 feet NAVD 1988 |

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

Information made available from the Estimated BFE Viewer needs to be accepted by local community officials to be used for insurance rating purposes.

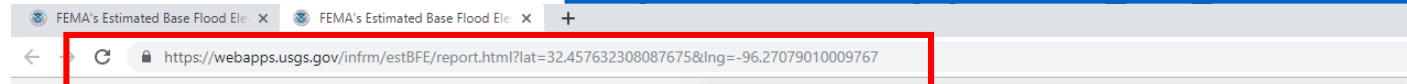
Knowing Your Risk

Base Level Engineering data availability and analysis information is important because it can be used to:

- Inform floodplain management decisions and ordinance administration;
- Identify significant floodplain changes;
- Serve as base modeling for map revisions; and
- Support the Zone A BFE information for a Letter of Map Amendment (LOMA) request.

Graphic is not to scale.

<https://webapps.usgs.gov/infrm/estBFE/>



Print

Tip: The map's zoom level can be adjusted by using the +/- zoom buttons. Users should zoom in and verify the location of the marker prior to printing.

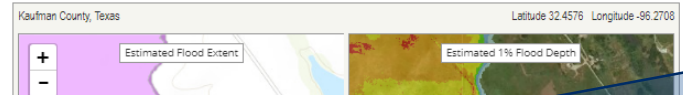
Tip: The web address can be used to share or bookmark the report for this location.

Estimated Base Flood Elevation (estBFE)



Flood Risk Information Report

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



Using This Data



Consult the local floodplain manager and building department in your community before making any building or land modifications. Local officials may use this information to regulate development near flooding sources to create more flood-resilient communities. Local building and permitting requirements vary by community and are based on local decisions and ordinances.

Everyone is at risk. The chances of experiencing a flood can vary due to unevaluated conditions, such as the unstudied effects of community growth and development or intense storms uncharacteristic to historical trends. Maintaining or obtaining a flood insurance policy is essential to ensure a property owner is covered if a flood occurs. Visit <http://FloodSmart.gov> for more information on the costs of flooding and to locate an insurance agent in your area.

Base Level Engineering and the Estimated BFE Viewer tool help identify the BFE in effective Zone As. If a property owner believes that a structure is above or outside of the base flood extent in an effective Zone A, a LOMA request may be submitted and the flood risk report from the Estimated BFE Viewer should be included. To complete an application, use the online web-based tool or download the paper forms (<https://www.fema.gov/letter-map-changes>). Items needed to apply include the following:

- Copy of a plat map that identifies the property and includes the locality's recording information OR
- Copy of the property deed with both locality's recording information and the property's written legal description and a parcel or tax map identifying the location.
- Elevation information indicating the lowest adjacent grade to the building certified by a licensed land surveyor or registered professional engineer, except for buildings clearly shown outside the SFHA. If built recently, building permit files may contain this information. Note the professional may use the estimated BFE (estBFE) results for the BFE value on the elevation form or certificate.
- The Estimated BFE flood risk information report relative to the property indicating the estimated flood level and model.
- A letter of acceptance and support from your local floodplain administrator for the Estimated BFE information included in your report.

Please note other types of development may require additional documentation and possibly an application fee. A LOMA may result in removal of the SFHA designation and the Federal requirement for flood insurance. However, maintaining a flood policy may still be required by the lender. Flood insurance coverage to repair damage caused by flooding is available for areas outside the SFHA.

Pre-Flood Action

Floods can happen anywhere at any time, which is why it is important to be prepared and to take steps before a flood event to protect your property from costly damage. Mitigation measures to consider include the following:

- **Elevating.** Elevating the lowest floor of new or existing buildings above the BFE reduces risk and may lower flood insurance premiums.
- **Interior Modification.** Raising the equipment servicing the building or infilling basements susceptible to flooding.
- **Dry Floodproofing.** Sealing your structure to prevent floodwaters from entering. Residential property insurance is not reduced if dry floodproofing is used. Only commercial properties receive reduced flood insurance when dry floodproofing is used.
- **Wet Floodproofing and Flood Vents.** Making portion of a building more resistant to flood damage or, in some cases, allowing water to enter during a flood to prevent damages by equalizing pressure on walls and foundations.

Depending on the right method to mitigate future damage and loss requires an assessment of various factors: the hazards to your home, permit requirements, the technical limitations of the methods, and cost.

Discuss the potential mitigation options with your local floodplain administrator and building department to determine the next appropriate steps.

Using This Data

Consult the local floodplain manager and building department in your community before making any building or land modifications. Local officials may use this information to regulate development near flooding sources to create more flood-resilient communities. Local building and permitting requirements vary by community and are based on local decisions and ordinances.

Everyone is at risk. The chances of experiencing a flood can vary due to unevaluated conditions, such as the unstudied effects of community growth and development or intense storms uncharacteristic to historical trends. Maintaining or obtaining a flood insurance policy is essential to ensure a property owner is covered if a flood occurs. Visit <http://FloodSmart.gov> for more information on the costs of flooding and to locate an insurance agent in your area.

Base Level Engineering and the Estimated BFE Viewer tool help identify the BFE in effective Zone As. If a property owner believes that a structure is above or outside of the base flood extent in an effective Zone A, a LOMA request may be submitted and the flood risk report from the Estimated BFE Viewer should be included. To complete an application, use the online web-based tool or download the paper forms (<https://www.fema.gov/letter-map-changes>). Items needed to apply include the following:

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- Elevation information indicating the lowest adjacent grade to the building certified by a licensed land surveyor or registered professional engineer, except for buildings clearly shown outside the SFHA. If built recently, building permit files may contain this information. Note the professional may use the estimated BFE (estBFE) results for the BFE value on the elevation form or certificate.
- The Estimated BFE flood risk information report relative to the property indicating the estimated flood level and model.
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Please note other types of development may require additional documentation and possibly an application fee. A LOMA may result in removal of the SFHA designation and the Federal requirement for flood insurance. However, maintaining a flood policy may still be required by the lender. Flood insurance coverage to repair damage caused by flooding is available for areas outside the SFHA.



BLE OVERVIEW | BFE VIEWER

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Create a Flood Risk Report

Search for a place

Enter an address or place of interest in the above search box. A popup will appear at the chosen location and you can create a report if BLE data are available there.

— OR —

My Location

Click this button to zoom the map to your actual location. A popup will appear and you can create a report if BLE data are available there.

Tip: Your web browser must support and have geolocation enabled.

— OR —

Map Click

Zoom into your area of interest. Click this button and then the map. A popup will appear and you can create a report if BLE data are available there.

Tip: Click on the center of the roof of your home or the most upstream point of your structure.

Data Layers

- Base Level Engineering (3 shown)
- Downloadable Data (BLE)
- Detailed Studies (FIRM) (1 shown)

Detailed study available

Opacity: 75%

Tip: Click within a detailed study to launch the FEMA NFHL Viewer where higher resolution FIRM maps can be accessed.

Clear Map Close

Detailed Study

There is a detailed study (Zone AE) shown on the current effective Flood Insurance Rate Map (FIRM) in the area selected. These detailed analyses are the basis of insurance rating within this area and should be reviewed and used.

Leave this viewer and explore more detailed data in the FEMA NFHL Viewer?

Yes No

Scale: 1 : 72,224

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BLE OVERVIEW | BFE VIEWER

<https://webapps.usgs.gov/infrm/estBFE/>

FEMA's National Flood Hazard Layer (NFHL) Viewer with Web AppBuilder

Find address or place

Print Flood Map

1) Click on the pin icon, and click on the map to place the pin.
2) Choose to create a print-size FIRMette or full-size FIRM.
3) Press "Execute" - The process may take up to 1 minute.*

Size*
FIRMETTE

File Format*
PDF

Run

National Flood Hazard Layer FIRMette

FEMA

32°29'14.93"N
96°17'51.98"W

32°28'44.58"N
96°17'51.98"W

0 250 500 1,000 1,500 2,000 Feet 1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS

- Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Digital Data Available
- No Digital Data Available
- Unmapped

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/17/2019 at 11:18:26 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

<https://webapps.usgs.gov/infrm/estBFE/>

Estimated Base Flood Elevation (estBFE) Viewer

Report Legend

Create a Flood Risk Report

More Info

Search for a place

Enter an address or place of interest in the above search box. A popup will appear at the chosen location and you can create a report if BLE data are available there.

OR

My Location

Click this button to zoom the map to your actual location. A popup will appear and you can create a report if BLE data are available there.

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OR

Map Click

Zoom into your area of interest. Click this button and then the map. A popup will appear and you can create a report if BLE data are available there.

Tip: Click on the center of the roof of your home or the most upstream point of your structure.

Quick Start Glossary About

Scale: 1 : 72,224 Lat: 32.4792 Lon: -96.2988

U.S. Department of the Interior | DOI Inspector General | White House | E-Verify | Open Government | No Fear Act | FOIA

Data Layers

- Base Level Engineering
- Downloadable Data (BLE) 1 shown
 - Downloadable data available
 - Opacity: 50%
 - Tip: Click areas to open a download dialog.
- Detailed Studies (FIRM)

Clear Map Close

Download Data

Cedar

| Data Set | File Name | Size | Download this table |
|---------------------------------------|-------------------------|-----------|----------------------|
| HECRAS models | 12030107_Models.zip | 145.70 MB | Description Download |
| 1% event depths, raster | 12030107_Depth01.zip | 209.63 MB | Description Download |
| 0.2% event depths, raster | 12030107_Depth002.zip | 229.76 MB | Description Download |
| 1% event elevations, raster | 12030107_Elev01.zip | 134.65 MB | Description Download |
| 0.2% event elevations, raster | 12030107_Elev002.zip | 144.44 MB | Description Download |
| Vector spatial data, file geodatabase | 12030107_VectorData.zip | 45.19 MB | Description Download |
| Reports and documents | 12030107_Documents.zip | 2.70 MB | Description Download |

Close

BLE OVERVIEW | BFE VIEWER

<https://webapps.usgs.gov/infrm/estBFE/>

| Download | FileName | FileSize | DataSet | Description |
|--------------------------|-------------------------|-----------|---------------------------------------|---|
| Download | 12030107_Models.zip | 145.70 MB | HECRAS models | A folder containing HECRAS models for streams. |
| Download | 12030107_Depth01.zip | 209.63 MB | 1% event depths, raster | A raster representing the estimated depth of floodwaters from a 1% event. |
| Download | 12030107_Depth002.zip | 229.76 MB | 0.2% event depths, raster | A raster representing the estimated depth of floodwaters from a 0.2% event. |
| Download | 12030107_Elev01.zip | 134.65 MB | 1% event elevations, raster | A raster representing the estimated elevation of floodwaters from a 1% event. |
| Download | 12030107_Elev002.zip | 144.44 MB | 0.2% event elevations, raster | A raster representing the estimated elevation of floodwaters from a 0.2% event. |
| Download | 12030107_VectorData.zip | 45.19 MB | Vector spatial data, file geodatabase | A file geodatabase containing vector spatial data representing stream centerlines, study areas, cross sections, flood hazard areas, and more. |
| Download | 12030107_Documents.zip | 2.70 MB | Reports and documents | A folder containing the Base Level Engineering report, and other documents. |



North Central Texas
Council of Governments

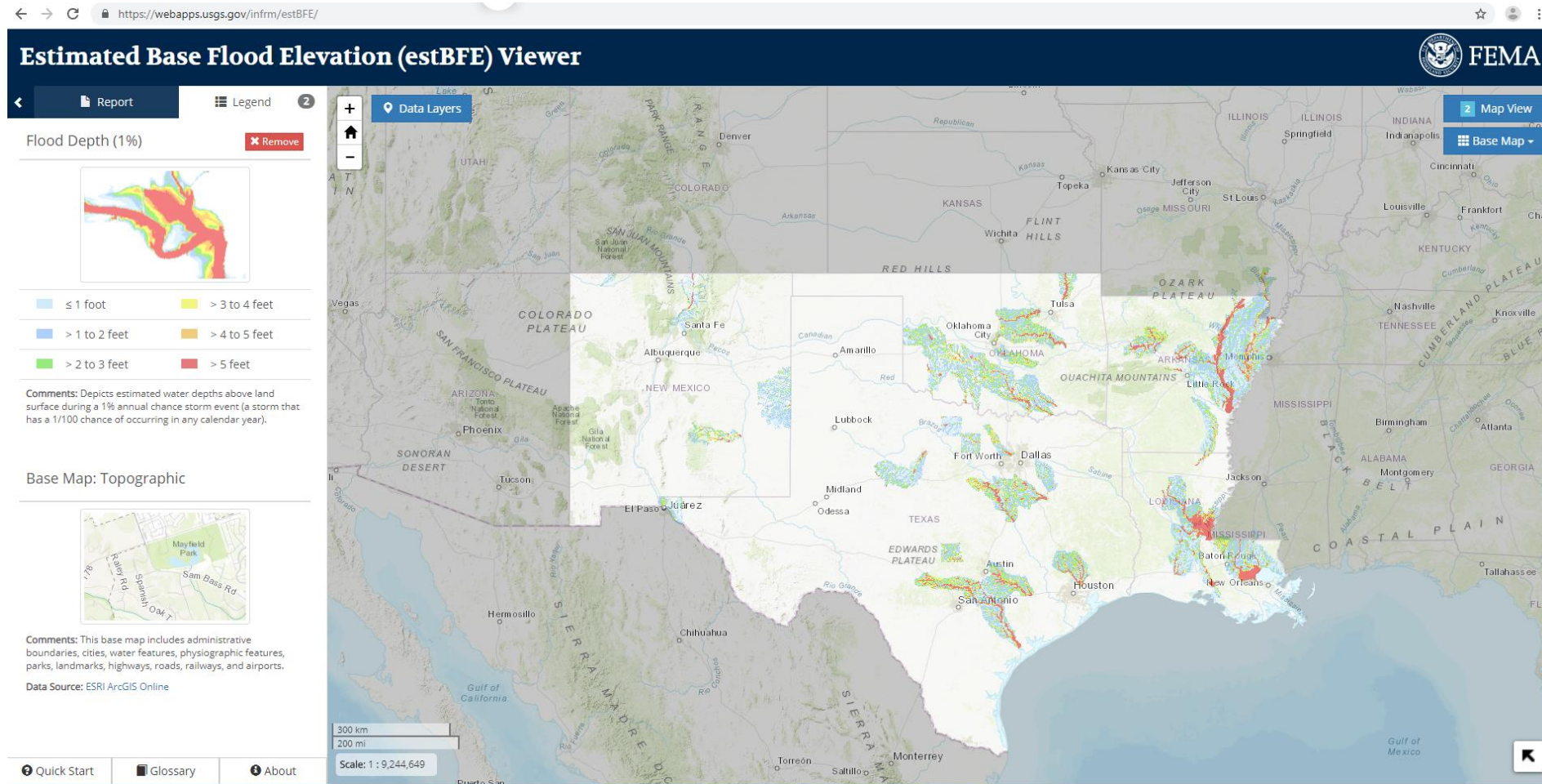


FEMA



DISCOVERY | POST MEETING COORDINATION

[HTTPS://APPS.FEMADATA.COM/ESTBFE](https://apps.fema.gov/estbfe)

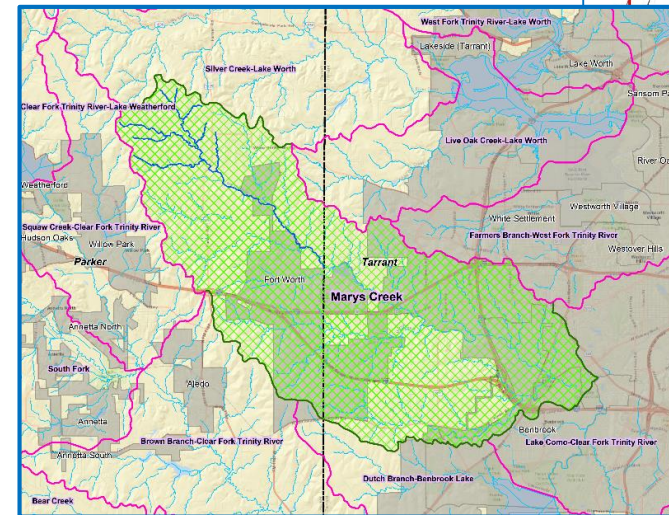
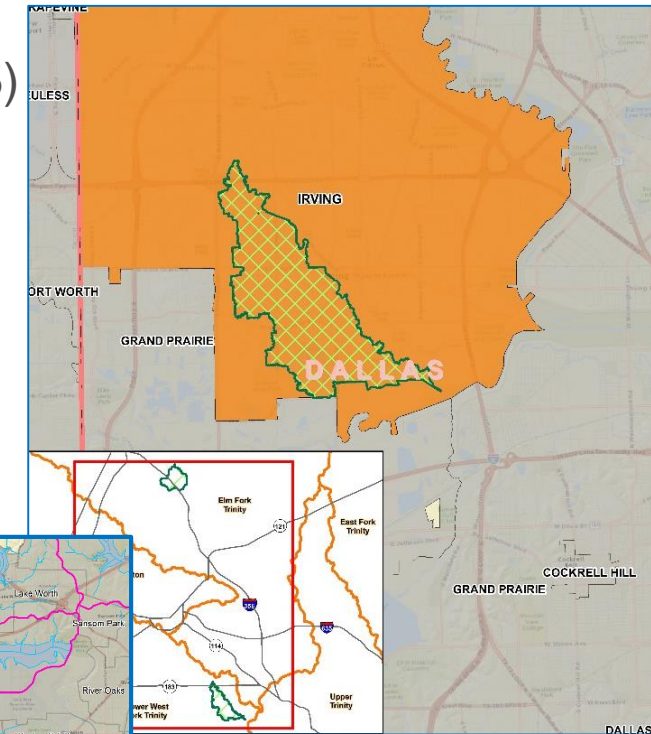


DISCOVERY | RISK MAP PROJECT RECOMMENDATIONS TO FEMA

RECOMMENDED STUDIES FROM DISCOVERY BECOME NEW PROJECTS

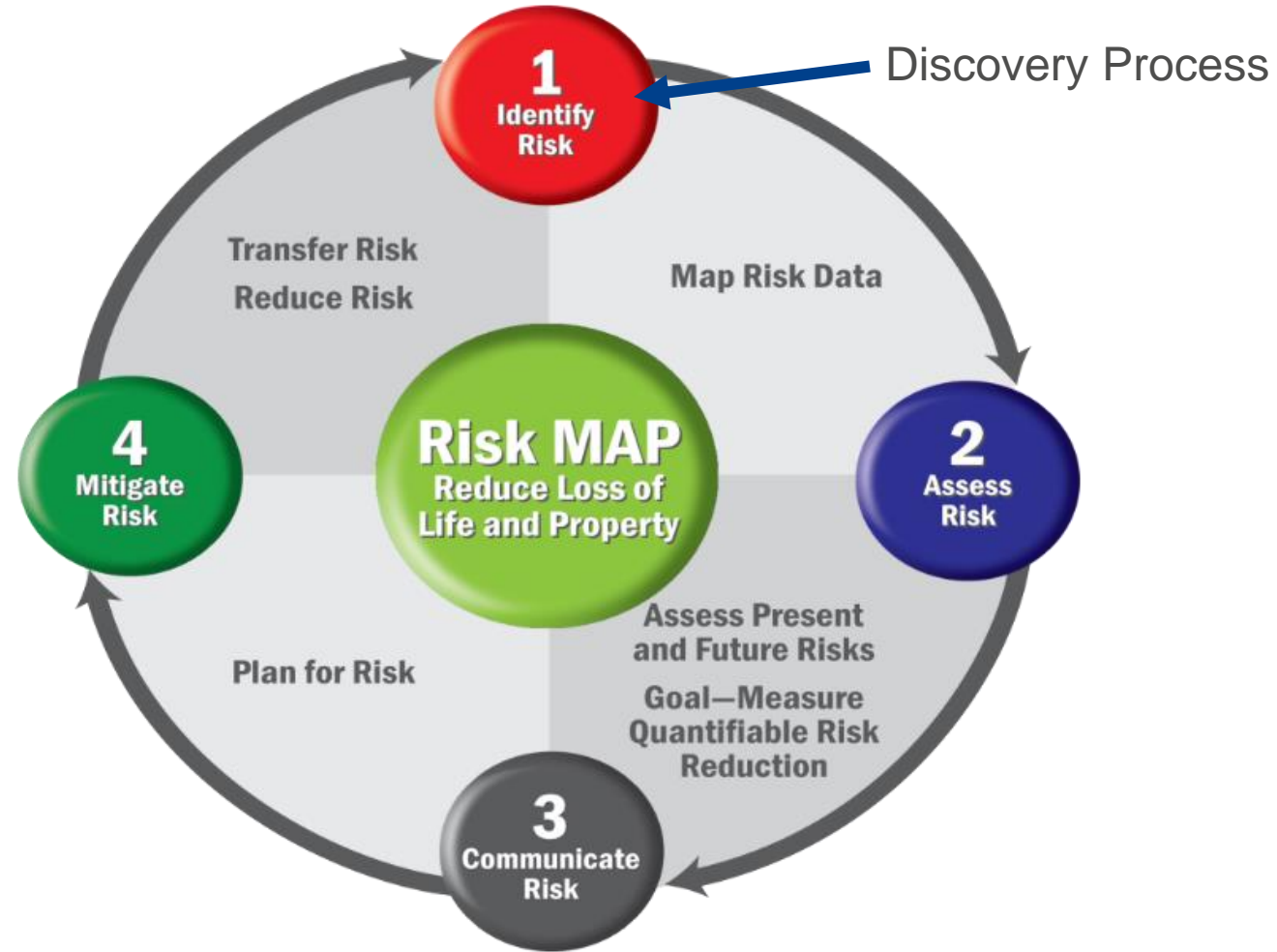
- 2013 Village Creek (Kennedale)
- 2014 Bear Creek (Southlake and Colleyville)
- 2015 Lynchburg Creek (Shady Shores and Corinth)
- 2015 West Irving Creek (Irving)
- 2016 McAnear Creek (Cleburne)
- 2016 Silver Creek (Tarrant County)
- 2017 Town Creek (Weatherford)
- 2017 Clear Fork Tributary 5 (Benbrook)
- 2018 Mary's Creek (Parker County)

West Irving Creek (2015)



Mary's Creek (2018)

FEMA'S RISK MAPPING, ASSESSMENT, AND PLANNING (MAP) PROGRAM



QUESTIONS?



NCTCOG:

- Edith Marvin – EMarvin@nctcog.org
- Mia Brown – MBBrown@nctcog.org



TWDB:

- Manuel Razo – Manuel.Razo@twdb.texas.gov
- Paul Gutierrez – paul.gutierrez@twdb.texas.gov



Halff Associates:

- Jarred Overbey – jOverbey@halff.com
- Samuel Amoako-Atta – sAmoako-Atta@halff.com
- Alison Hanson – aHanson@halff.com



FEMA:

- Alan Johnson – alan.johnson@fema.dhs.gov



Appendix IV: Resources

Watershed Follow-up Points of Contact

| Subject/Topic of Interest | Name | Contact Information |
|--|--|--|
| FEMA Region 6 Risk MAP Lead <i>Project Outreach</i> | Alan Johnson Risk Analysis Branch FEMA Region 6 | Phone: 940-898-5171 Email: alan.johnson@fema.dhs.gov |
| FEMA Technical Monitor | Jennifer Knecht Risk Analysis Branch FEMA Region 6 | Phone: (940) 898-5553 Email: jennifer.knecht@fema.dhs.gov |
| <ul style="list-style-type: none"> • Floodplain Management • Floodplain Ordinance • Community Assistance Visits • Higher Standards | John Bowman | Phone: 840-297-0185 Email: john.bowman@fema.dhs.gov |
| <ul style="list-style-type: none"> • Community Rating System • Flood Insurance | Diedra Mares | Phone: 830-832-3506 Email: dmares@iso.com |
| <ul style="list-style-type: none"> • How to find and read FIRMs • Letters of Map Change and Elevation Certificates • Flood zone disputes • Mandatory insurance purchase guidelines • Map Service Center (MSC) and National Flood Hazard Layer | FEMA Map Information eXchange (FMIX) | Phone: 877-FEMA-MAP (336-2627) Email: FEMAMapSpecialist@riskmapcds.com Live Chat: https://www.floodmaps.fema.gov/fhm/fmx_main.html |

State Partners

| Organization/Title | Name | Partner Location | Contact Information |
|--|----------------------------|--|--|
| Texas Water Development Board (TWDB) State NFIP Coordinator (Interim) | Manuel Razo, CFM | P.O. Box 13231 Austin, TX 78711 | Phone: 512-475-1850 Email: manuel.razo@twdb.texas.gov Web Page: https://www.twdb.texas.gov |
| Texas Division of Emergency Management (TDEM) State Hazard Mitigation Officer | Dave Jackson, CEM | P.O. Box 4087 Austin, TX 78773 | Phone: 512-424-7820 Email: Dave.Jackson@dps.texas.gov Web Page: https://www.dps.texas.gov/dem/ |
| North Central Texas Council of Governments (NCTCOG) <i>Environment & Development Director</i> | Edith Marvin, P.E., CFM | 616 Six Flags Drive Arlington, TX 76005 | Phone: 817-695-9211 Email: emarvin@nctcog.org Web Page: https://www.nctcog.org/envir/index.asp |
| North Central Texas Council of Governments (NCTCOG) <i>Environment & Development Planner</i> | Mia Brown, CFM | 616 Six Flags Drive Arlington, TX 76005 | Phone: 817-695-9227 Email: mabbrown@nctcog.org Web Page: https://www.nctcog.org/envir/index.asp |

Texas Water Development Board

<http://www.twdb.texas.gov/>

Texas is a high-risk state for emergency events and disasters. The Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) is the agency responsible for coordinating the state's efforts throughout the emergency management cycle to prepare for, prevent where possible, respond to, recover from, and mitigate against hazards to lessen the effects of man-made or natural disasters that threaten the state. GOHSEP can save lives and reduce property damage by understanding risks and taking action to address those risks, as well as minimizing disaster impacts and increasing the resiliency in our communities, environment, and economy.



North Central Texas Council of Governments

<http://nctcog.org/>

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by and for local governments, established to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating sound regional development. Serving a 16-county region of North Central Texas, NCTCOG is centered around the two urban centers of Dallas and Fort Worth. NCTCOG has over 230 member governments including 16 counties, numerous cities, school districts, and special districts. NCTCOG has been a Cooperating Technical Partner (CTP) with FEMA since 2004. From providing critical Light Detection and Ranging (LiDAR) data for Map Modernization (Map Mod) activities to offering up-to-date floodplain management training for floodplain managers and community leaders in the region, NCTCOG has served as a key stakeholder for risk reduction in North Texas.



NCTCOG FLOOD INFORMATION AND RESOURCES

NCTCOG is a proactive agency that has a long history of supporting floodplain management activities in the region. NCTCOG led and implemented new strategies over the past decades such as the Corridor Development Certificate for local floodplain permit decision making along the Trinity River Corridor since 1993. NCTCOG has been a Cooperating Technical Partner (CTP) with FEMA since 2004. From providing critical LiDAR data for map modernization activities to offering up-to-date floodplain management training for floodplain managers and community leaders in the region, NCTCOG has served as a key stakeholder for risk reduction in North Texas.

NCTCOG and TWDB worked hard to integrate our efforts with FEMA's Coordinated Needs Management Strategy (CNMS) to ensure that the work aligned with FEMA's Risk MAP goals and procedures.

POINTS OF CONTACT:

Edith Marvin
Director of Environment & Development
Phone: (817) 695-9211
Fax: (817) 640-7806
Email: emarvin@nctcog.org

Mia Brown
Planner II
Phone: (817) 695-9227
Email: mbbrown@nctcog.org

Texas Floodplain Management Association (TFMA)

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, warning and disaster recovery. The Association has become a respected voice in floodplain management practice and policy in Texas. The Association includes flood hazard specialists from local, state, and Federal government; the mortgage, insurance and research communities; and the associated fields of flood zone determination, engineering, hydraulic forecasting, emergency response, water resources, geographic information systems, and others.

| Organization | Contact Information | Website |
|---|---------------------|---|
| Texas Floodplain Management Association | Phone: 512-260-1366 | https://www.tfma.org |

Certified Floodplain Manager (CFM) Certification

The Association of State Floodplain Managers (ASFPM) established a national program for certifying floodplain managers. This program recognizes continuing education and professional development that enhances the knowledge and performance of local, state, Federal, and private-sector floodplain management professionals.

The role of the nation's floodplain managers is expanding due to increases in disaster losses, the emphasis on mitigation to alleviate the cycle of damage-rebuild-damage, and a recognized need for professionals to adequately address these issues. This certification program will lay the foundation for ensuring that highly qualified individuals are available to meet the challenge of breaking the damage cycle and stopping its negative drain on the nation's human, financial, and natural resources.

CFM® is a registered trademark and available only to individuals certified and in good standing under the ASFPM Certified Floodplain Manager Program.

For more information, you may want to review these available CFM Awareness Videos:

- [What is the CFM Program?](#)
- [Who can be a CFM?](#)
- [What are the Benefits of a CFM?](#)

Study materials for those interested in applying for the CFM certification can be found on the ASFPM Website at: <http://www.floods.org/index.asp?menuID=215>

Check the [calendar on TFMA's website](#) for in-person training sessions near you.

For information on becoming a member and the exam application process in the State of Texas visit <http://www.tfma.org/?page=Renewal>.

Interactive Preliminary Data Viewer (maps.riskmap6.com)

To support community review of the study information and promote risk communication efforts, FEMA launched an interactive web tool accessible on-line at <http://maps.RiskMAP6.com> for the project areas.

For more information on the Interactive Preliminary Data Viewer, refer to the Region 6 Fact sheet: [What is your Flood Risk?](#)

Estimated Base Flood Elevation (BFE) Viewer

As a part of the Risk MAP process, FEMA is completing **Base Level Engineering (BLE)** to provide a complete picture of flood hazard throughout a watershed. The BLE analysis uses high resolution ground elevation data, flood flow calculations, and fundamental engineering modeling techniques to define flood extents for streams.

To provide a look at BLE data availability and relative engineering analysis, FEMA developed the through the **Estimated BFE Viewer** for community officials, property owners, and land developers to identify the flood risk (high, moderate, low), expected flood elevation, and estimated flood depth near any property or structure within watersheds where BLE has been prepared.

Visit the Estimated BFE Viewer (<https://apps.femadata.com/estbfe>) application to learn the status of BLE in your area of interest or surrounding communities, to view the flood hazard data developed, or to utilize the tool's flood risk reporting features for a location where BLE has been made available.

Map Service Center – Available Map Data

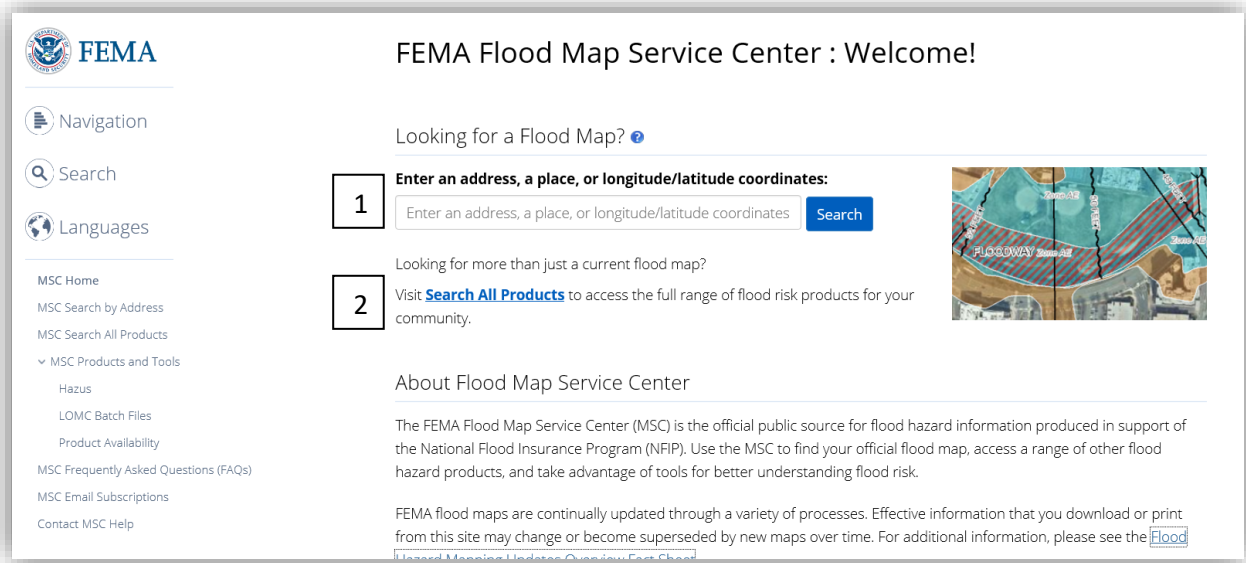
The [FEMA Flood Map Service Center \(MSC\)](#) is the official public source for flood hazard information produced in support of the NFIP. Use the MSC to find your official effective flood map, preliminary flood maps, and access a range of other flood hazard products.

FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the [Flood Hazard Mapping Updates Overview Fact Sheet](#).

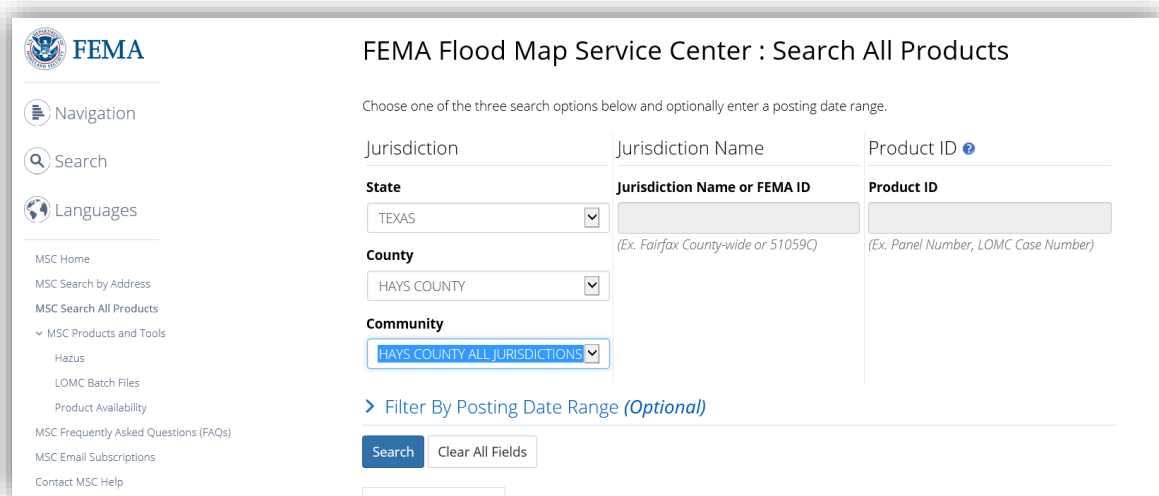
At the MSC, there are two ways to locate flood maps in your vicinity.

1. Enter an address, place name, or latitude/longitude coordinates and click search. This will provide the current effective FIRM panel where the location is shown.

2. Or [Search All Products](#), which will provide access to the full range of flood risk information available.

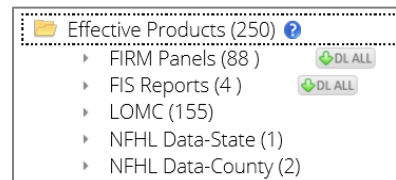


By using the more advanced search option, “Search All Products,” users may access current, preliminary, pending, and historic flood maps. Additionally, GIS data and flood risk products may be accessed through the site with these few steps.

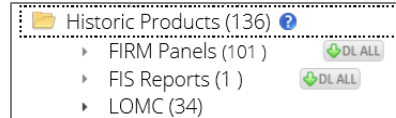


Using the pull down menus, select your state, county, and community of interest. For this example, we selected Hays County - All Jurisdictions. After the search button is selected, the MSC will return all items in the area. There are five types of data available.

Effective Products. The current effective FIS, FIRM, and DFIRM database (if available) is available through the MSC. If users click on the available effective products, they are presented a breakdown of the available products. FIRM panels, FIS reports, LOMRs, statewide National Flood Hazard Layer (NFHL) data, and countywide NFHL data may be available, as indicated in the breakdown on the right of the page.



Historic Products. A range of historic flood hazard maps, FIS texts, and Letters of Map Change are available through the MSC.



Flood Risk Products. The Flood Risk Report, Flood Risk Map, and Flood Risk Database will be made available through the MSC once they have been compiled and completed. These products are made available after the flood study analysis and mapping have been reviewed and community comments incorporated.

