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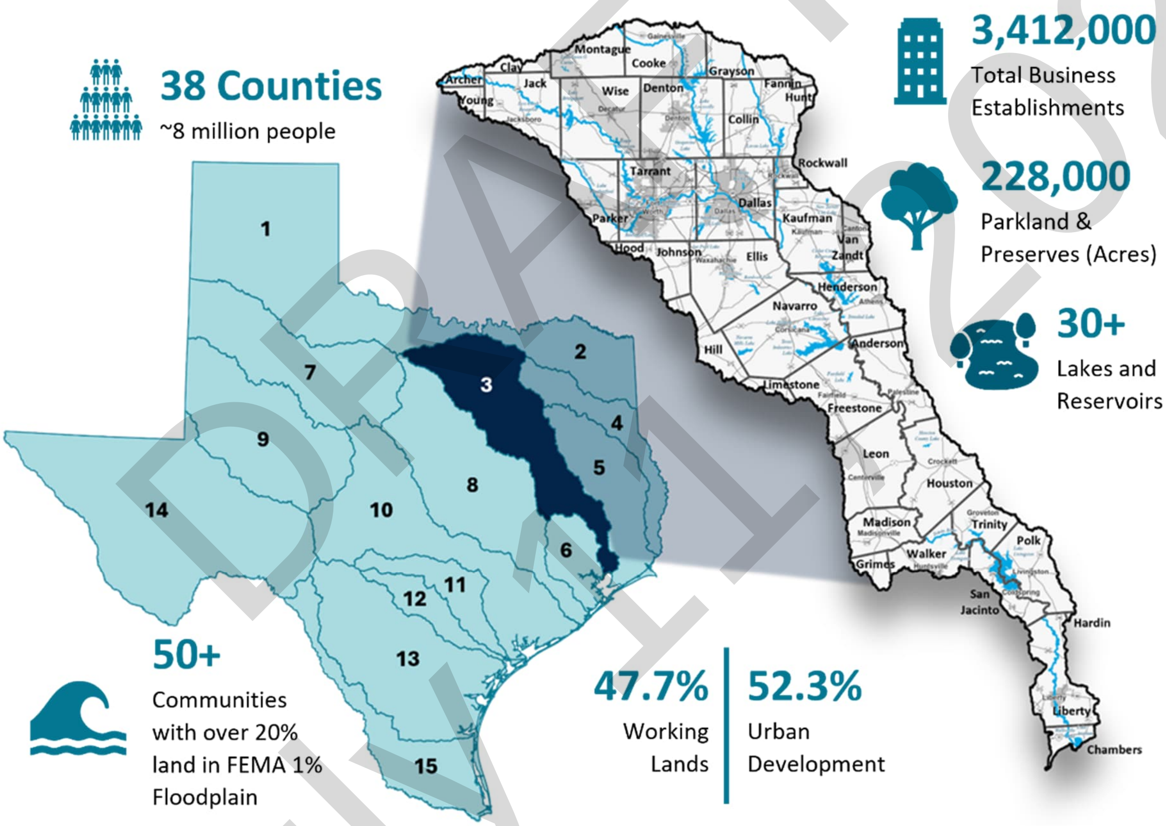
COMMUNITY PROFILE OVERVIEW

The Trinity Region, stretching from Gainesville in Cooke County to Anahuac in Chambers County, covers a diverse range of landscapes and communities. It includes approximately 47,000 stream miles, draining a total land area of nearly 18,000 square miles. One of the state's most populated flood planning areas, the Trinity region is expected to have 96 communities with populations over 25,000 by 2060. The area experiences a variety of flood risks due to its mix of arid, subtropical, agricultural, and urban climates.

REGION 3



PRIMARY INDUSTRIES

Retail Trade
By Revenue

Professional, Scientific & Technical Services
By # of Establishments & Payroll

Agriculture

FLOOD RISK IN THE TRINITY REGION

This region is bordered by the Red River Basin to the north, the Sabine and Neches River Basins to the east, and the Brazos and San Jacinto River Basins to the west and south.

In a major flood event, there are often losses incurred. In the Trinity Region, these reported losses include property damage, agricultural damage, physical injuries, and loss of life. Since 2000, the region has experienced an estimated $6.8 billion in property damage and $2 million in crop damage. These figures, sourced from the NOAA storm events database, represent only the documented losses; actual totals for agriculture, property, and life losses are likely higher. The most substantial losses are observed in densely populated metropolitan areas prone to flash flooding and coastal regions susceptible to tropical storms and hurricanes.

200+
Major Disaster and Emergency Declarations (2000-2021)

288
NFIP Participants

457 (25.5%)
High Hazard Dams

1,008
Flood Control Dams

FLOOD MITIGATION PROJECTS

There are 110 structural and non-structural flood mitigation projects in progress in the Trinity Region, with 69 planned for the future.

93
Structural Flood Mitigation Projects (Currently under construction)

17
Non-Structural Flood Mitigation Projects (Currently being implemented)

FLOOD INFRASTRUCTURE

	FUNCTIONAL	NON-DEFICIENT*
Dams	62%	15%
Levees	45%	49%
Reservoirs	8%	32%
Ponds	0%	92%
Wetlands	100%	89%

*See chapter details for definition

FLOOD MITIGATION PROJECTS

Structural	• Conveyance Improvements • Levees/Flood Walls • Local Storm Drainage Improvements	• Dams/Reservoirs/Detention/Retention Basins • Roadway Crossing Improvements • Property Floodproofing
Non-Structural (Nature)	• Nature based projects • Urban Planning and Maintenance	• Nature Planning Improvements • Erosion Control Measures
Administrative/ Societal/Other	• Flood Warning Systems • Floodplain Management Ordinances • Property Elevations • Flood Insurance (NFIP Participation) • Outreach/Community Engagement	• Property Buyouts/Acquisition • Equipment Procurement • Flood Study/Assessment • Technology Improvements

Chapter 1: Planning Area Description

Figure 1-1: Image of Swollen Waxahachie Creek, Waxahachie, TX in January 2018

Source: Robert Best (NCTCOG, 2018)

Origins of the State Flood Planning Process

In Texas, the billion-dollar flood disaster is becoming a regular occurrence (see *Figure 1-1*). Between 2015 and 2017, flooding alone caused nearly $5 billion in damage to Texas communities. When considered in conjunction with the impact of Hurricane Harvey, the total cost in 2017 approached $200 billion in financial losses and nearly 100 deaths (NOAA (NCEI), 2025). As the state grappled with how to better manage flood risk and reduce loss of life and property from future disasters, the Texas Water Development Board (TWDB) prepared the first ever statewide flood assessment which described Texas' flood risks, provided an overview of roles and responsibilities, included an estimate of potential flood mitigation costs, and summarized entities' views on the future of flood planning.

The TWDB presented its findings to the 86^{th} Texas legislative session in 2019 (Lake, Jackson, Paup, & Walker, 2019). Later that year, the Legislature adopted changes to Texas Water Code §16.061 which established a regional and state flood planning process led by the TWDB. The legislation provided funding to improve the state's floodplain mapping efforts and to develop regional plans to mitigate the impact of future flooding. Regional flood plans for each of the state's 15 flood planning regions were submitted to the TWDB by January 10, 2023. In response to concerns regarding the expedited schedule to prepare the flood plans, the TWDB secured additional funding and provided the planning groups with an additional six months to prepare and adopt amended plans to incorporate additional flood mitigation actions. The amended plans were submitted to the TWDB by July 14, 2023. An updated version of the regional flood plans will be due every five years thereafter (TWDB, 2021). Texas adopted its first statewide flood plan on August 15, 2024.

This second cycle of regional flood plan developed aims to:

- Document flood risks that continue to pose a serious threat to lives and livelihoods
- Update flood risk mitigation measures that are in progress or have been completed since the 2023 Plan
- Identify new flood risk areas
- Incorporate additional studies, projects and strategies
- Provide updated maps that better reflect known flood risks
- Meet legislative and TWDB requirements.

Overview of the Planning Process

Given the diverse geography, culture, and population of the state, the planning effort is being carried out at a regional level in each of the state's major river basins. Region 3 (Trinity) is one of 15 flood planning regions where regional flood plans continue to be developed. When the second cycle of regional flood planning is completed, the TWDB will compile these regional plans into a single statewide flood plan and will present it to the Legislature in 2029. Regional flood plans are required to be based on the best available science, data, models, and flood risk mapping. The Legislature allocated funding to be distributed by the TWDB for the procurement of technical assistance to develop the flood plans.

Who's Preparing the Plan?

The TWDB has appointed Regional Flood Planning Groups (RFPGs) for each region and has provided them with funding to hire technical consultants to help prepare their plans. Because it is not a political subdivision, the RFPG cannot enter into a contract with the TWDB to receive the funding to develop the plan. Therefore, each RFPG selects a political subdivision to handle contract administration. The Trinity RFPG chose the Trinity River Authority (TRA) to serve as its sponsor. The sponsor's role is to provide support for meetings and communications and to manage the technical consultant contract.

The RFPG's responsibilities include directing the work of their technical consultant; soliciting and considering public input; identifying specific flood risks; and identifying and recommending Flood Management Evaluations (FMEs), Flood Management Strategies (FMSs), and Flood Mitigation Projects (FMPs) to reduce risk in their regions.

To provide a diversity of perspectives, members represent a wide variety of interest categories potentially affected by flooding, including:

- Agriculture
- Counties
- Electric Generation Utilities
- Environmental Interests
- Flood Districts
- Industry
- Municipalities
- Public
- River Authorities
- Small Businesses
- Water Districts
- Water Utilities

The TWDB provided detailed specifications to guide the preparation of the flood plans for each region. When complete, the 15 regional flood plans will be rolled up into the second cycle State Flood Plan that will provide a path forward to reducing existing flood risk to life and property and improve floodplain management data and practices. The plan will also identify potential FMEs, FMSs, and FMPs which may be appropriate for future implementation and potential funding opportunities.

Data Sources

To confirm that flood plans are based upon consistent and reliable information in every region, the TWDB compiled the following Geographic Information Systems (GIS) data resources in the Texas Flood Planning Data Hub:

- Critical infrastructure
- Flood infrastructure
- Flood risk
- Hydrology
- Jurisdiction boundaries
- Parks
- Population
- Property
- Terrain
- Transportation

The RFPG's dedicated GIS experts organized, revised, and analyzed this data for the Trinity Region, identified additional data sources needed to meet the TWDB's objectives, and used the data to prepare the illustrative maps included in this report.

To supplement the data provided by the TWDB, the RFPG also developed a data collection tool (survey) for entities with flood-related responsibilities. In most instances, two recipients in flood-related roles from each entity received this detailed survey to increase response rates. Respondents provided contact information and their flood-related responsibilities, verified flood information that had already been collected, responded to questions to support the development of the regional flood plan, and verified and provided geospatial data through data uploads. An interactive web map allowed survey respondents to draw in problem areas and proposed projects that were not included in other information about the region.

Public Outreach

Almost 900 individuals representing the regional entities received the survey via email in December 2024. *Figure 1-2* illustrates the types of entities that were included in the data collection effort. *Figure 1-3* illustrates the various methods used to contact entities and the number of entities reached by each effort.

Figure 1-2: Outreach Efforts and Contacts Made

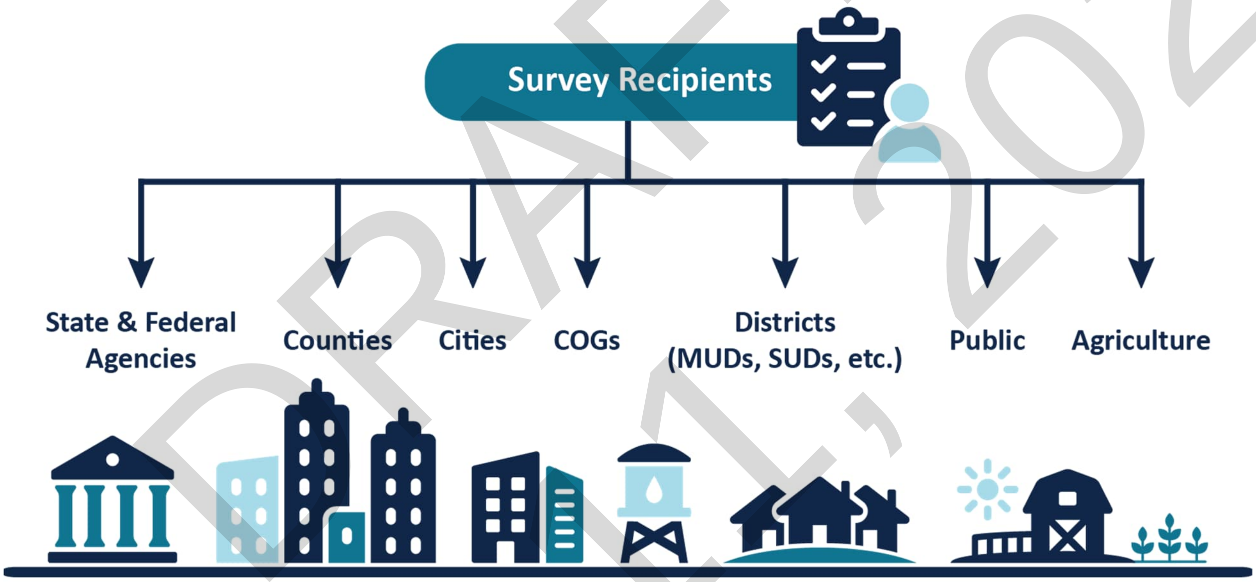
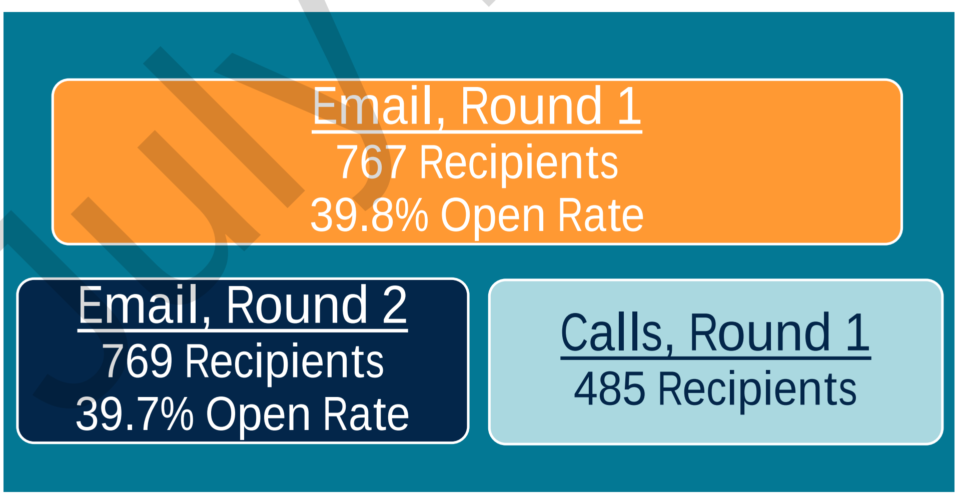


Figure 1-3: Outreach Efforts to Trinity Regional Entities



To encourage participation, the RFPG followed up via email a month later, in January 2025. Additionally, follow-up calls were made to entities to bring awareness to the data collection process and to provide the survey link. Calls went out to 485 recipients who had not yet responded to the survey in January and February 2025. The Trinity consultant team also employed a Trinity RFPG LinkedIn group, where the data collection tool was advertised as well. As of April 2025, the LinkedIn group had 46 members. The result of these outreach efforts was a response rate of approximately 14 percent. Survey results are included throughout *Chapter 1*, as well as the chapters to follow.

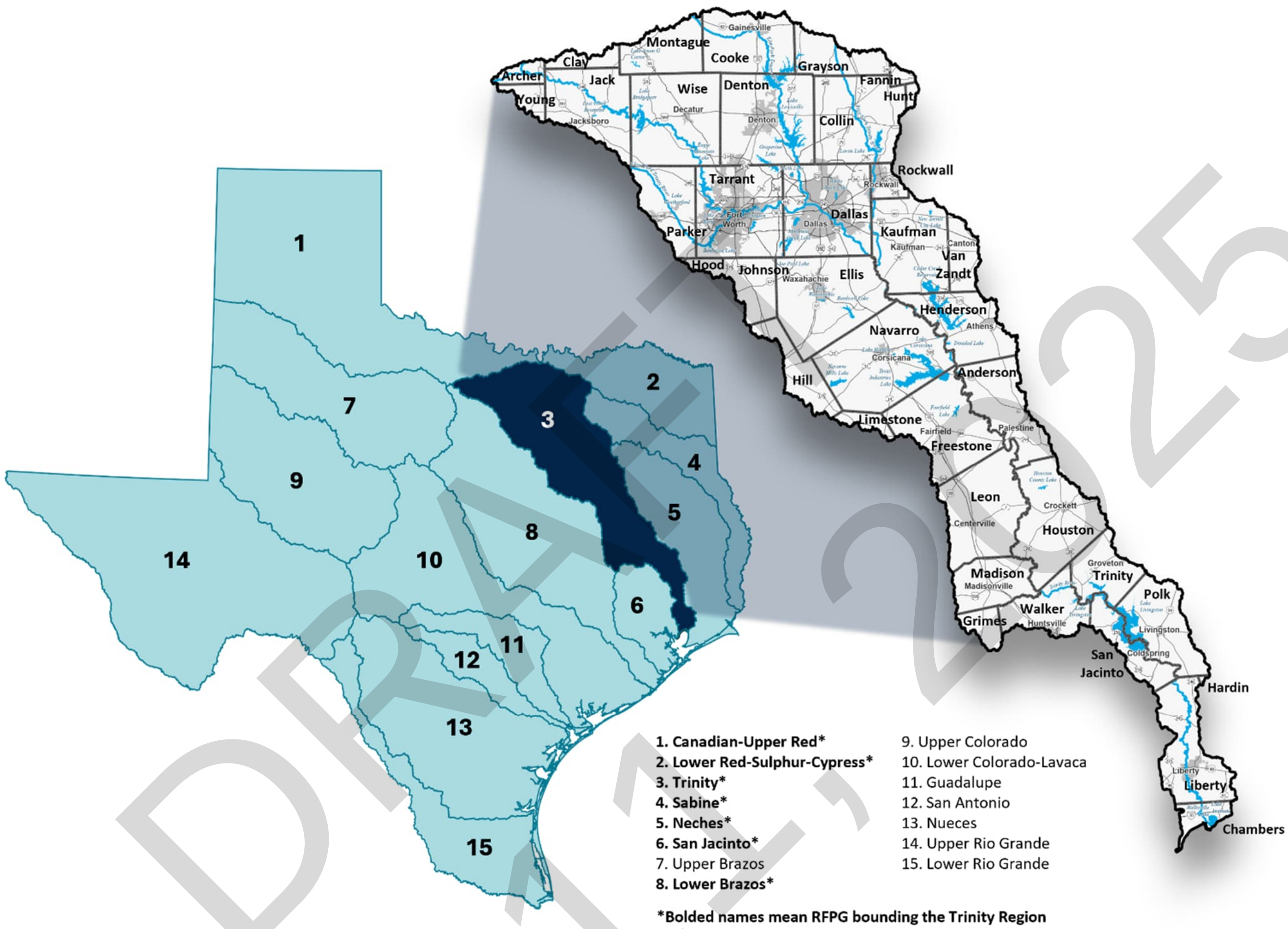
Funding Sources

To fund projects identified by these plans, the legislature established new flood financial assistance funds in response to flooding events over the last decade and charged the TWDB with administering the funds. Consequently, the Texas Infrastructure Resiliency Fund (TIRF), the Flood Information Clearinghouse (FLICC), and the Flood Infrastructure Fund (FIF) were created. These funds, approved by Texas voters in November 2019, are currently financing the preparation and development of these regional flood plans. The FIF has provided funding for recommended flood-related studies and projects through loans and grants facilitated by this legislative initiative. Communities who identify future projects aimed at flood mitigation will be eligible for financial assistance in the form of grants and loans from the TWDB. Additional discussion of funding sources available for flood mitigation activities, including federal and state funding, will be discussed in *Chapter 9* of this plan.

Characterizing the Trinity Region

Stretching from Gainesville, near the Oklahoma border, to Anahuac which meets the Trinity Bay at the Gulf, the Trinity Region encompasses a wide variety of landscapes and communities and includes approximately 46,800 stream miles with a total drainage area of approximately 17,900 square miles. The total context of the Trinity Region with respect to the State of Texas is illustrated in *Figure 1-4*. It is bounded to the north by the Red River Basin; to the east by the Sabine and Neches River Basins; and to the west and south by the Brazos and San Jacinto River Basins. From arid to subtropical, agricultural to urban, the flood risks faced by communities and landowners vary widely as well.

Figure 1-4: Trinity Region Flood Planning Area



To better understand the nature of that flood risk, this section will discuss people, types and locations of development; economic activity; and sectors at greatest risk of flood impacts. *Table 1.1* summarizes key elements of the primary streams and tributaries of the Trinity River system. *Figure 1-5* provides a map of those streams and tributaries described in *Table 1.1*.

Social and Economic Character

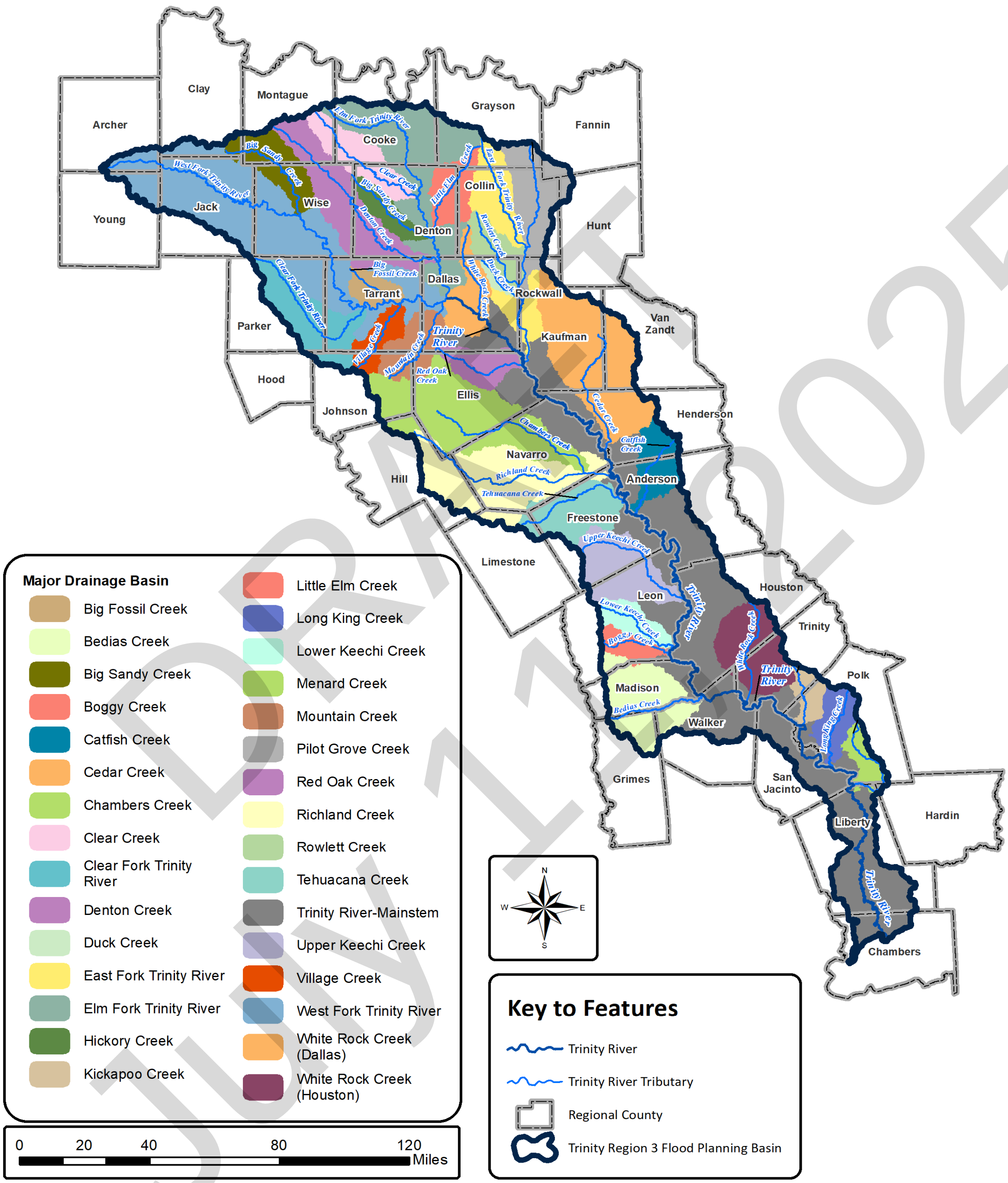
As the Trinity Region grows in population, many communities are expanding outwardly to accommodate this growth. Texas as a whole grew approximately 15 percent in the last decade, and research by the Texas Land Trends by Texas A&M Natural Resources Institute project found that in the Trinity Region alone, population grew by almost three million residents between 1997 and 2023.

Table 1.1: Primary Streams and Tributaries of the Trinity River System

Stream Name	Length (River Miles)	Drainage Area (Square Miles)
Trinity River (Main Stem)	473	17,853*
East Fork Trinity River	110	1,299*
Duck Creek	23	43
Pilot Grove Creek	49	508
Rowlett Creek	39	234
Elm Fork Trinity River	125	2,570*
Clear Creek	69	350
Denton Creek	106	717
Hickory Creek	46	178
Little Elm Creek	46	260
Richland Creek	92	1,984*
Chambers Creek	69	1,071
West Fork Trinity River	245	3,460*
Big Fossil Creek	21	146
Big Sandy Creek	53	352
Clear Fork Trinity River	68	522
Mountain Creek	41	294
Village Creek	36	191
White Rock Creek (Collin and Dallas counties)	40	288
Bedias Creek	55	601
Boggy Creek	40	149
Catfish Creek	47	292
Cedar Creek	62	1,062
Kickapoo Creek	30	146
Long King Creek	39	224
Lower Keechi Creek	44	186
Menard Creek	58	165
Red Oak Creek	40	231
Tehuacana Creek	61	431
Upper Keechi Creek	66	508
White Rock Creek (Houston and Trinity counties)	51	506

**Drainage area (Sq Mile) includes the drainage basins for this stream and its contributing subbasins.*

Figure 1-5: Primary Streams and Tributaries of the Trinity River System



Although growth has largely occurred in the Dallas-Fort Worth (DFW) metroplex, its effects can be felt downstream, as land that was once reserved for cropland or grazing declined during this period, with over 460,000 acres (about twice the area of Austin, Texas) of cropland and 250,000 acres of rangeland being converted to other uses (Texas A&M NRI, 2025). Without adequate measures, the conversion of pastures to shopping centers and subdivisions reduces rainwater absorption due to increased paved surfaces. Urban drainage networks may also strain the capacity of the Trinity River's creeks and tributaries. Population growth and the outward expansion of metropolitan areas into what was formerly open space without the corresponding mitigation infrastructure has increased the pressure on the region's flood control network and is exposing a growing number of residents to flood risk.

Population and Future Growth

Current Conditions

The Trinity Region is one of the state's most populated flood planning areas, with an estimated 9,453,000 residents living within a 17,900 square-mile area (ESRI, 2024). The vast majority live in the counties that make up the DFW metroplex in the northern area of the region, with multiple smaller population centers interspersed with farms, ranches, forests, and other "working lands" as the river moves southward. In the central region of the basin, the communities of Athens, Corsicana, and Trinidad are located along an east-west axis that borders both Cedar Creek and Richland-Chambers Reservoirs, with Crockett and Palestine to the south and southeast, respectively. As the river continues toward Lake Livingston, it approaches the communities of Liberty and Livingston. The southern tip of the region borders Trinity Bay and the Anahuac National Wildlife Refuge. Although not densely populated, the southernmost portion of the region attracts tourists to the sandy beaches of the Gulf, where they can engage in birdwatching and fishing activities year-round.

Urbanized Areas

The 2024 United States Census estimates 30 percent of Texas residents currently reside in the Trinity Region (US Census Bureau, 2024). Within the region, there are 38 counties and 290 local municipalities, 53 of which have an estimated population of 25,000 or greater. Most of these communities are located within Collin, Dallas, Denton, and Tarrant counties.

Municipalities in the Trinity Region with an estimated population of 25,000 or greater include:

- Allen
- Anna
- Arlington
- Balch Springs
- Baytown
- Bedford
- Benbrook
- Burleson
- Carrollton
- Cedar Hill
- Celina
- Colleyville
- Coppell
- Corsicana
- Dallas
- Denton
- DeSoto
- Duncanville

- Euless
- Farmers Branch
- Flower Mound
- Forney
- Fort Worth
- Frisco
- Garland
- Grand Prairie
- Grapevine
- Haltom City
- Huntsville
- Hurst
- Irving
- Keller
- Lancaster
- Lewisville
- Little Elm
- Mansfield
- McKinney
- Mesquite
- Midlothian
- North Richland Hills
- Plano
- Princeton
- Prosper
- Richardson
- Rockwall
- Rowlett
- Sachse
- Saginaw
- Southlake
- The Colony
- University Park
- Waxahachie
- Weatherford
- Wylie

Only three larger municipalities are located outside the DFW metroplex. The population of Huntsville in Walker County (which is only partially located within the planning area) was estimated at approximately 48,000 in 2024 (ESRI, 2024). The two other larger communities in the region include Baytown (Chambers County) and Corsicana (Navarro County).

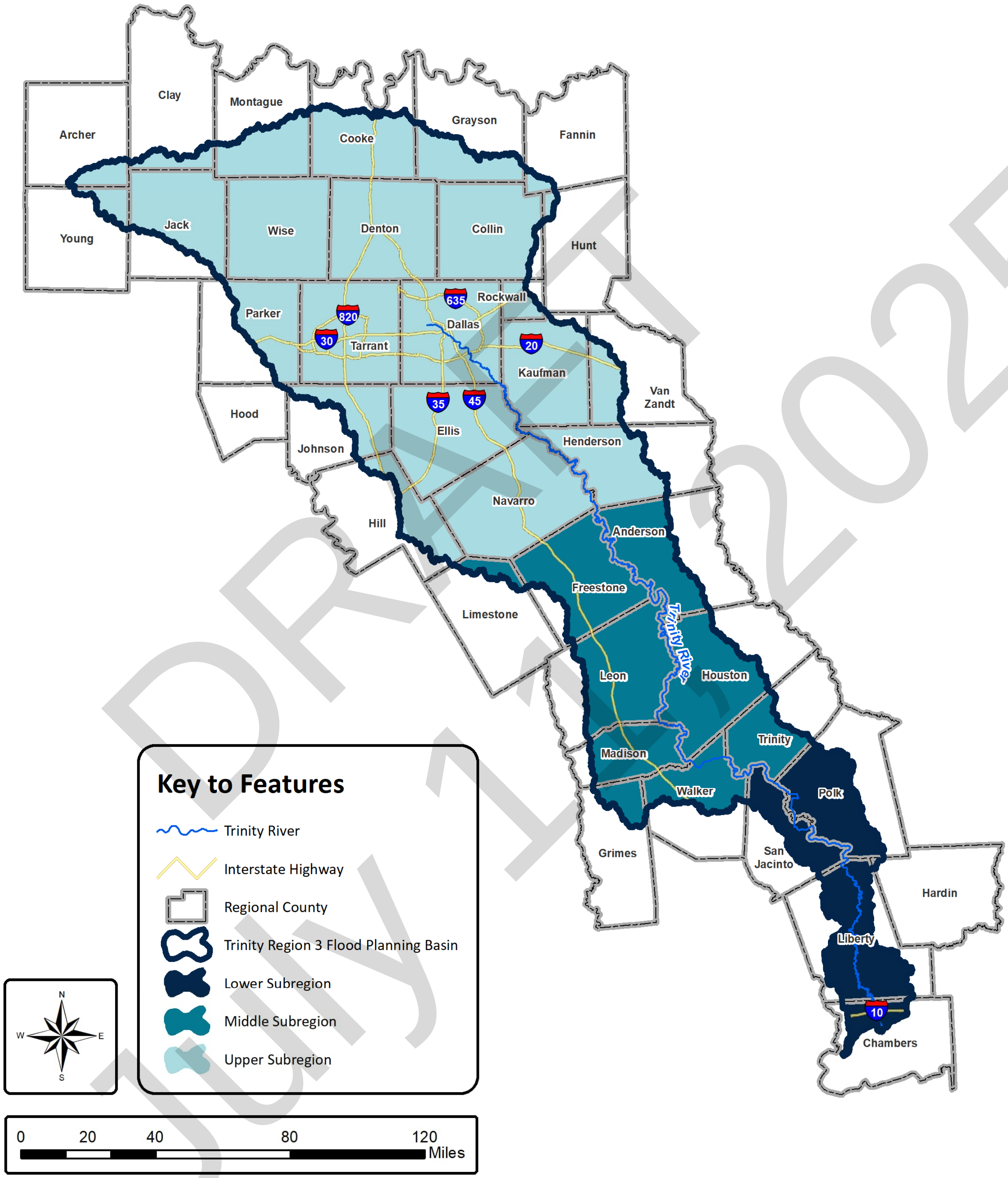
The Trinity Region also encompasses approximately eight River Authorities, nine Regional Council of Governments, and 292 other flood planning entities and political subdivisions with flood-related authority such as Municipal Utility Districts (MUDs), Special Utility Districts (SUDs), Water Control and Improvement Districts (WCIDs), Levee Improvement Districts (LIDs), etc.

Projected Growth within the Region

The current growth patterns in the Trinity Region are generally projected to continue over the next 30 years, with greater concentration in urban areas and even declining population in some rural counites. The analysis for this section was completed using the 2060 Water User Group and Hydrologic Unit Code (HUC)-8 population projections provided by the TWDB from the 2024 State Water Plan. Between 2024 and 2060, the number of municipalities with populations exceeding 25,000 is projected to rise from 53 to 70. Most of these communities will be located in the upper subregion, with a smaller number in the middle and lower subregions (ESRI, 2024).

Due to the large area covered by the Trinity Region, the basin will be divided into three subregions (upper, middle, lower) that are generally divided by growth patterns, as illustrated in *Figure 1-6*. These thresholds separate the communities into categories of similar sizes. The upper subregion contains those counties north of Henderson and Navarro, the middle subregion contains those counties north of Trinity and Walker and south of the upper subregion, and the lower subregion contains the rest of the counties south of the middle subregion. *Figure 1-6* illustrates the dividing line between these subregions.

Figure 1-6: Trinity River Basin Subregions



To determine growth patterns and future project population throughout the region, the team prepared *Figure 1-7* in which shading on the map indicates the population per community divided into five categories: 0-15,000; 15,001-50,000; 50,001-150,000; 150,001-350,000; and 350,001+.

Upper Trinity

The upper subregion of the Trinity Region encompasses the DFW metroplex and surrounding counties. A distinctive pattern within this subregion is an intense urban aggregation driven by the rapid acceleration of population growth. In fact, according to the TWDB's Water User Group projections, the top 10 fastest growing communities from 2024 to 2060 in the Trinity Region are within the upper subregion, all of which display over 250 percent increases in their population as shown in *Table 1.2*. While Arlington, Dallas, and Fort Worth experience large growth nominally, the higher percentages happen in suburban communities that are currently within agricultural or ranching areas, as displayed in *Table 1.2*. Generally, the fastest growth is in the northern portions of the DFW metroplex, specifically north of the cities of Dallas and Fort Worth. Other growth areas include Henderson, Ellis, Kaufman, and Navarro counties to the south.

Table 1.2: Top 10 Fastest Growing Communities in the Upper Subregion

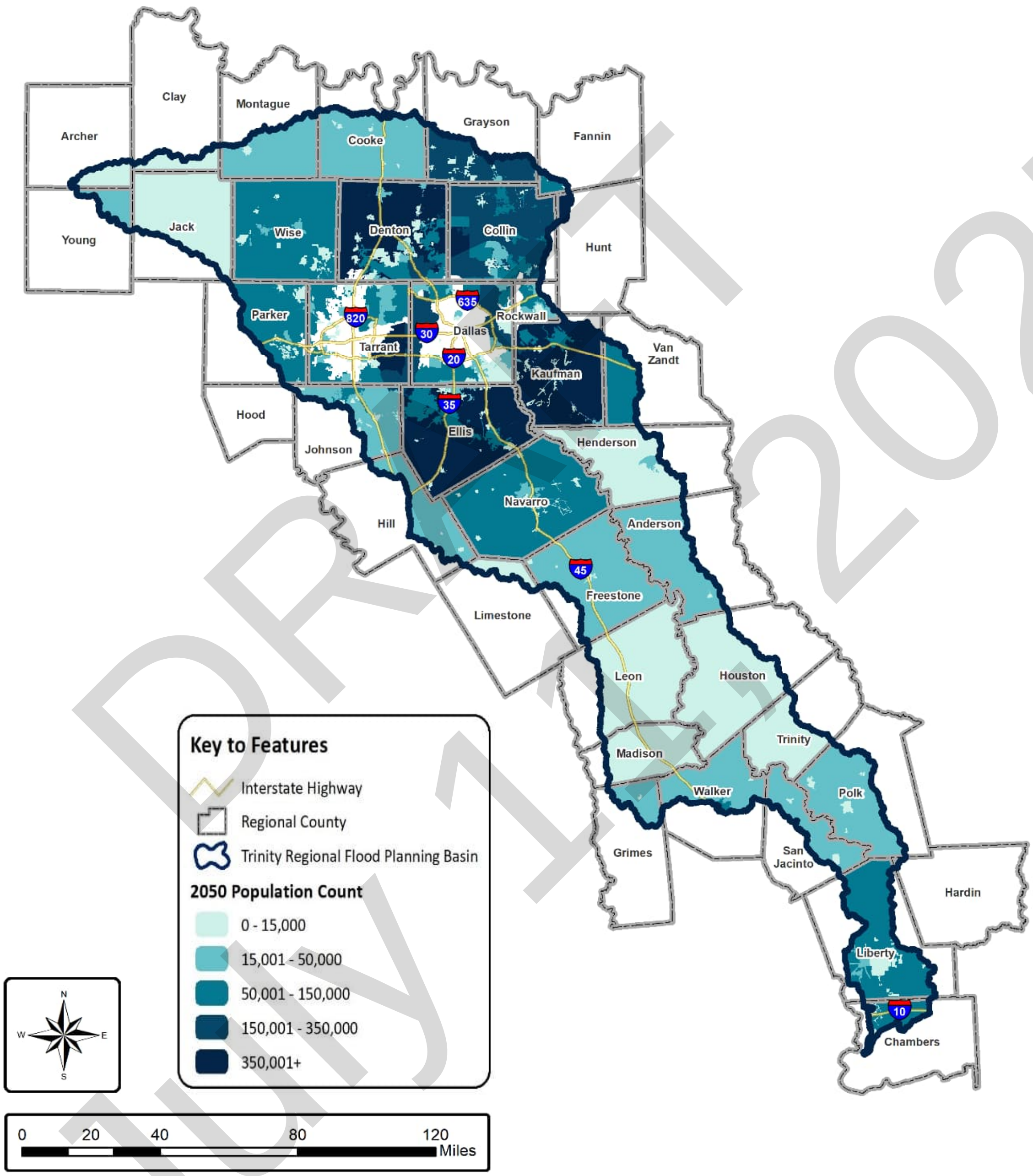
Community	Population 2024	Population 2060	Percent Change
Blue Ridge	1,288	116,583	8,951%
Celina	35,763	171,713	380%
Dorchester	76	2,183	2,772%
Farmersville	4,133	107,169	2,493%
Mabank	4,375	22,597	417%
Melissa	24,476	115,072	370%
Newark	1,229	6,216	406%
Northlake	10,234	55,000	437%
Rhome	1,863	9,085	388%
Trenton	877	7,248	726%

Source: TWDB Water User Group Projections 2024-2060 (TWDB, 2025)

Middle Trinity

In the middle subregion, Anderson, Freestone, Grimes, and Walker counties feature communities with populations in the 15,000-50,000 range. The City of Huntsville in Walker County is projected to grow to greater than 50,000 people by 2060. Growth will continue to occur in and around larger urban areas. Of the other larger communities in the middle subregion, the City of Crockett is projected to grow by 13 percent, the City of Fairfield by 261 percent, and the City of Madisonville is anticipated to see a 41 percent increase in population.

Figure 1-7: Community Population Projections (2060)



Source: TWDB Water User Group Projections 2024-2060 (TWDB, 2024)

Lower Trinity

The lower subregion of the Trinity Region's counties is within the Houston-Galveston Area Council and the Deep East Texas Council of Governments Regions. Additionally, the northwest corner of Hardin County, which constitutes less than 1 percent of the total area, is part of the South East Texas Regional Planning Commission region. Growth from the Houston area is expected to expand into the lower region and increase populations. The City of Baytown is expected to grow to a population of approximately 150,000 by 2060.

According to the Water User Group projections, the City of Dayton is expected to lead among the larger communities with a projected growth rate of 134 percent, reaching nearly 23,000 residents by 2060. Meanwhile, the Cities of Mont Belvieu and Liberty are expected to experience growth rates of 54 percent and 36 percent respectively but are expected to remain within the 0-15,000 population category.

Economic Activity

Commercial Activity

To understand the economic risk that the region faces from flood events, this study identified the most significant industries within the region by three measures:

- Number of establishments
- Annual payroll
- Total annual revenue

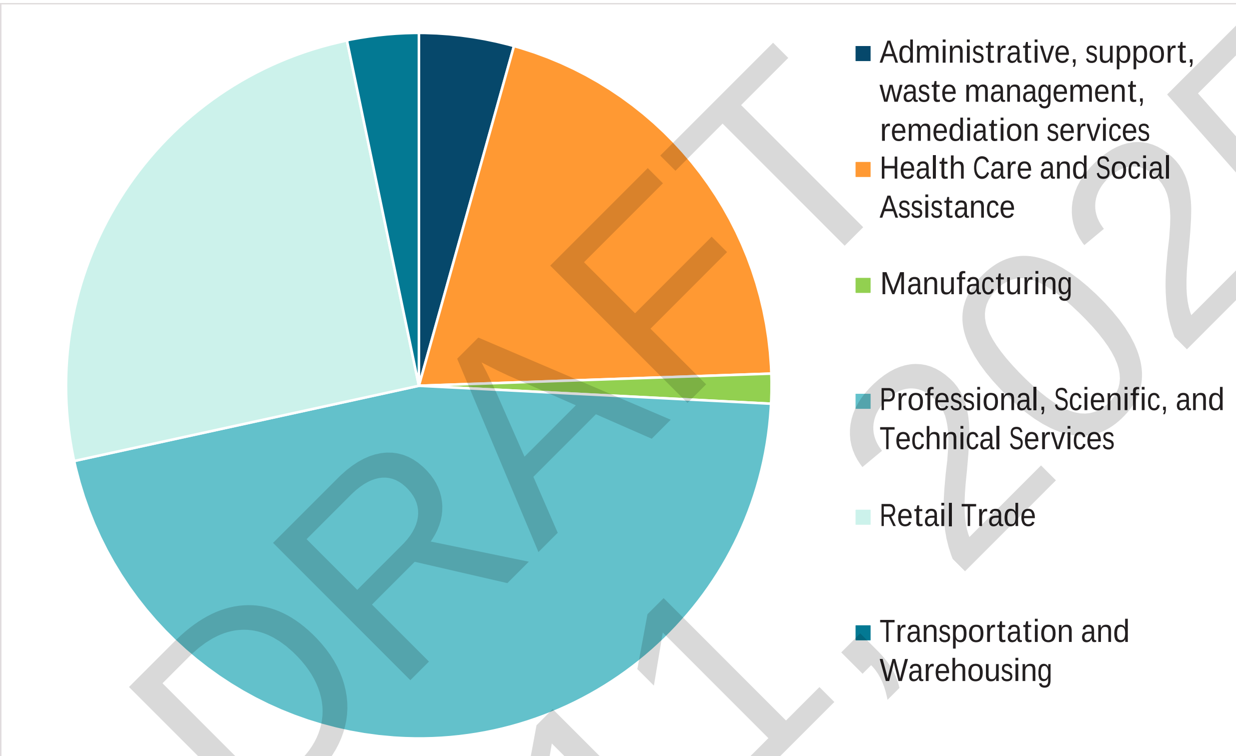
Data from the United States Census Bureau's Economic Census was used to identify the most predominant industries within the region. Industries were divided in accordance with the North American Industry Classification System (NAICS), which classifies all types of business sectors to facilitate the publication of statistical data related to the United States economy.

Number of Business Establishments

The total number of business establishments as of 2022 for every industry within the Trinity Region is approximately 3,412,000. As shown in *Figure 1-8*, professional, scientific, and technical services proved to be the predominant industry throughout the region. Professional, scientific, and technical services were followed by retail trade as the second most predominant industry within the region.

Each business contributes to the tax base of their community, and most employ workers who depend on them as a sole source of income. If damaged or forced to close for an extended period, these businesses may each need financial and technical support to recover. The Federal Emergency Management Agency (FEMA) reports that roughly 40 percent to 60 percent of small businesses never reopen their doors following a disaster (Insurance Information Institute, 2024). The impact of interruption on each individual business is significant. However, it is important to note the possibility that many of the retail establishments are smaller businesses and this measure may not fully capture the impact of a particular economic sector on the overall regional economy.

Figure 1-8: Major Industry by Number of Business Establishments



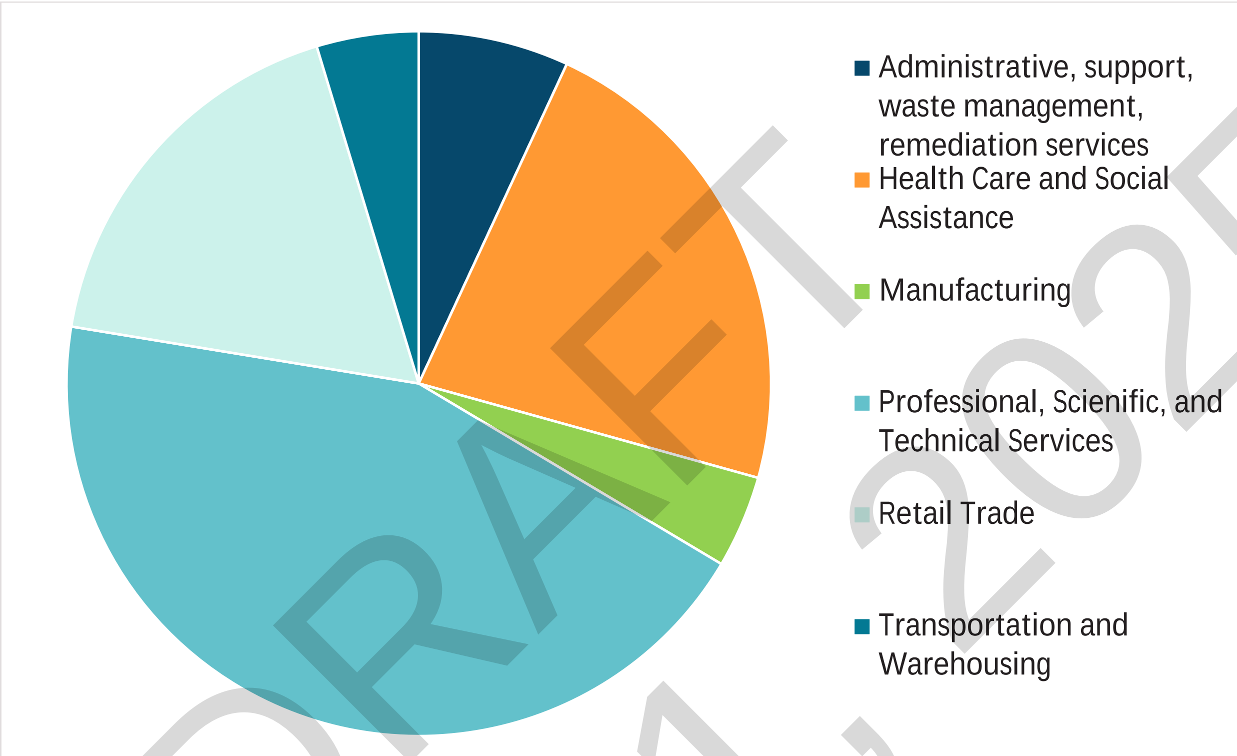
Source: United States Economic Census Table (US Census Bureau, 2022)

Annual Payroll

The total annual payroll in the region as of 2022 is $3,099,337,015. The share of payroll by industry sector is showcased in *Figure 1-9*. Professional, scientific, and technical services and health care represent the largest share of all industries by payroll. This is not surprising as both professional, scientific, and technical services and health care are among the highest-paying industries nationwide.

By mitigating the impact of flooding on businesses, communities can become more economically resilient. One factor that is considered in this plan is social vulnerability, as measured by the Social Vulnerability Index (SVI), which accounts for loss of income as one of the greatest predictors of future vulnerability for individuals and communities. The index (SVI) uses several different census variables to help identify communities that may need support before, during, and after a disaster. A severe flood event, which could affect income in these sectors, would heavily impact those vulnerable populations.

Figure 1-9: Major Industry by Payroll

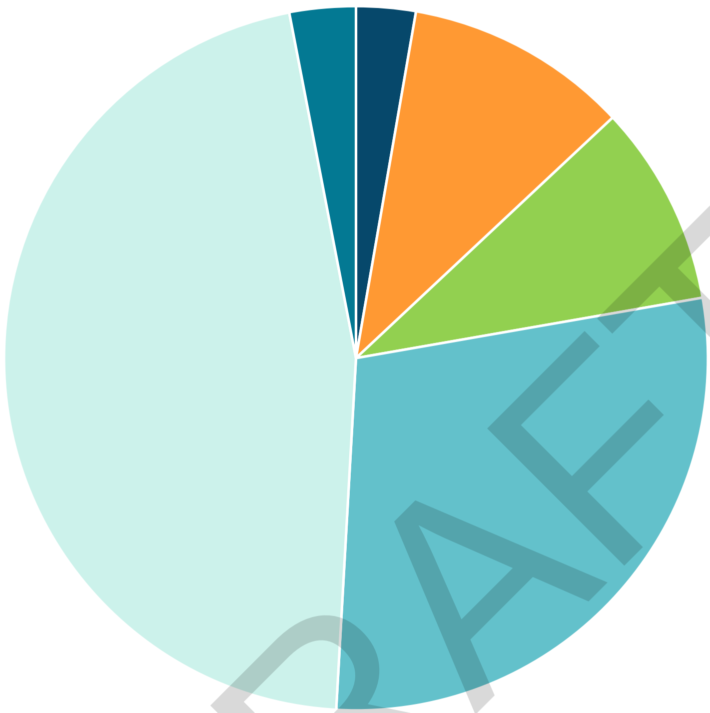


Source: United States Economic Census Table (US Census Bureau, 2022)

Total Annual Revenue

The analysis for total revenue by industry may provide the most useful insight into potential economic disruption of a major flood event by indicating the sectors most likely to be exposed to this risk. Total revenue indicates which industries have the greatest economic impact. While agriculture is an essential industry throughout the region, it provides a smaller amount of revenue in the region than some of the other categories. *Figure 1-10* demonstrates that retail trade remains the dominant industry in this area, followed by professional, scientific, and technical services. To extend this assessment to the county level, *Figure 1-11* identifies which industry sector makes up the largest share of annual revenue in each Trinity Region county, in order to provide some perspective on the benefit of developing mitigation strategies that reduce future economic impact.

Figure 1-10: Major Industry by Revenue

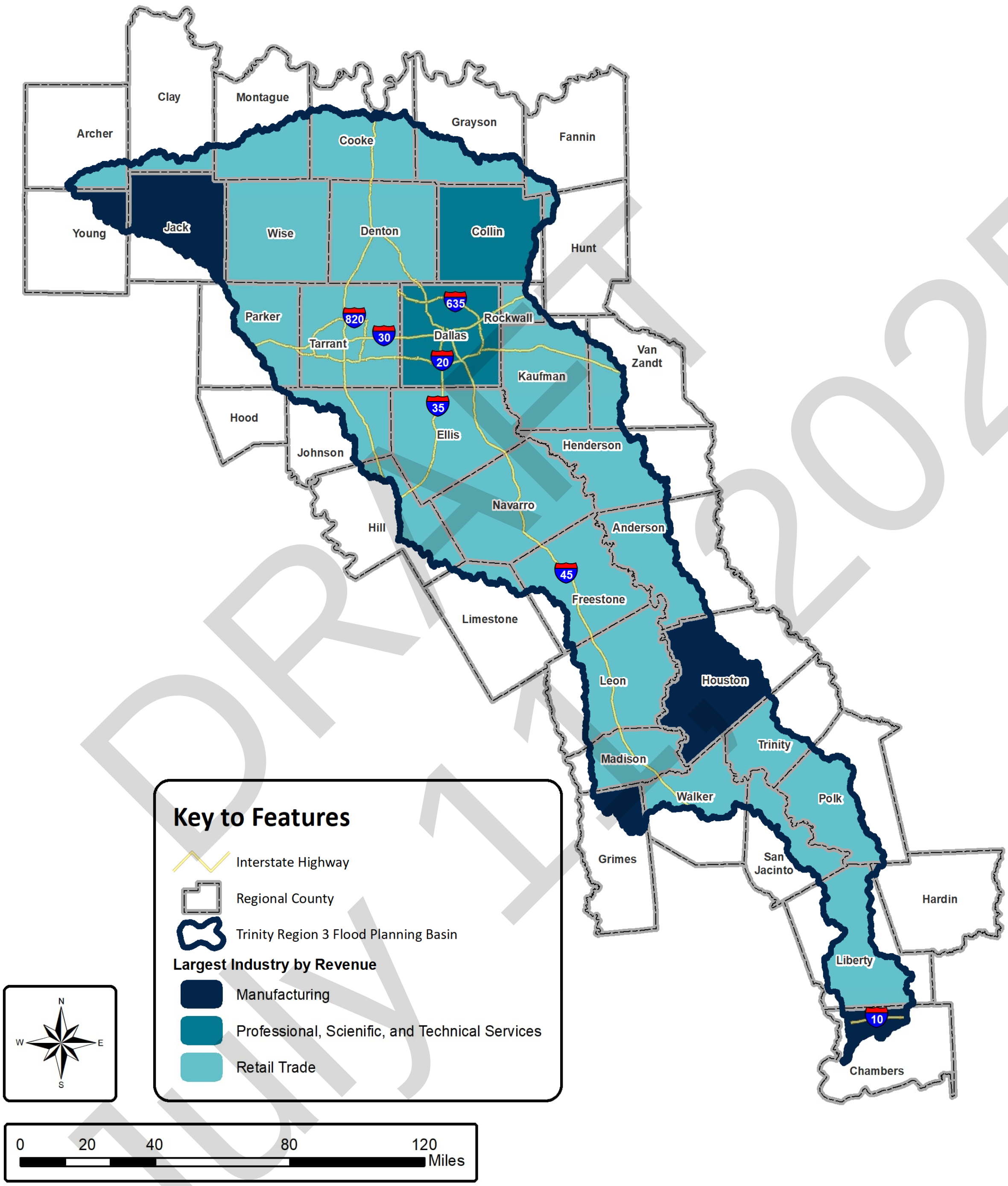


Source: United States Economic Census Table (US Census Bureau, 2022)

Agricultural and Ranching Activity

While the upper subregion of the Trinity Region may draw attention due to the DFW metroplex, the waters of the Trinity River also traverse an extremely productive agricultural region with a rich farming and ranching heritage. Although the economic census did not record agriculture as being one of the top drivers in the region, it is still an integral component of the regional economy. Even though fewer people are exposed to flood hazards in these areas, the impact of flooding on agriculture, ranching, and forestry can be severe. Floods can delay the planting season, as they soak the fields and make them impassable for heavy equipment. This can lead to reduced crop size, lower yields, and reduced profits. When floods occur as crops mature in the fields, they may destroy a whole season's work and investment. Floods at harvest time can make it impossible for farmers to harvest mature crops and get them to market. Livestock may drown in floodwaters if there is no high ground for them to escape. Even if the animals are safe, damage may occur to barns and other structures, and cleanup of muck and debris can affect feeding grounds. Forestry or orchard operations can lose trees to prolonged periods of inundation, fast moving waters, and erosion, wiping out years of growth.

Figure 1-11: Major Industry by County



Source: United States Economic Census Table (US Census Bureau, 2022)

To characterize the economic activity and character of Texas' rural spaces, this plan employs the term "working lands", used by the Texas A&M Natural Resources Institute to describe rural economic activity. Working lands are privately owned farms or cropland, ranches, and forests and associated uses that make up most of the economic activity in Texas' rural areas.

The distribution of these land uses across Texas is illustrated in *Figure 1-12,* which uses data from the United States Geological Survey (USGS) to help visualize how land is used across the region. The area dedicated to each use identified in *Figure 1-12* is as follows:

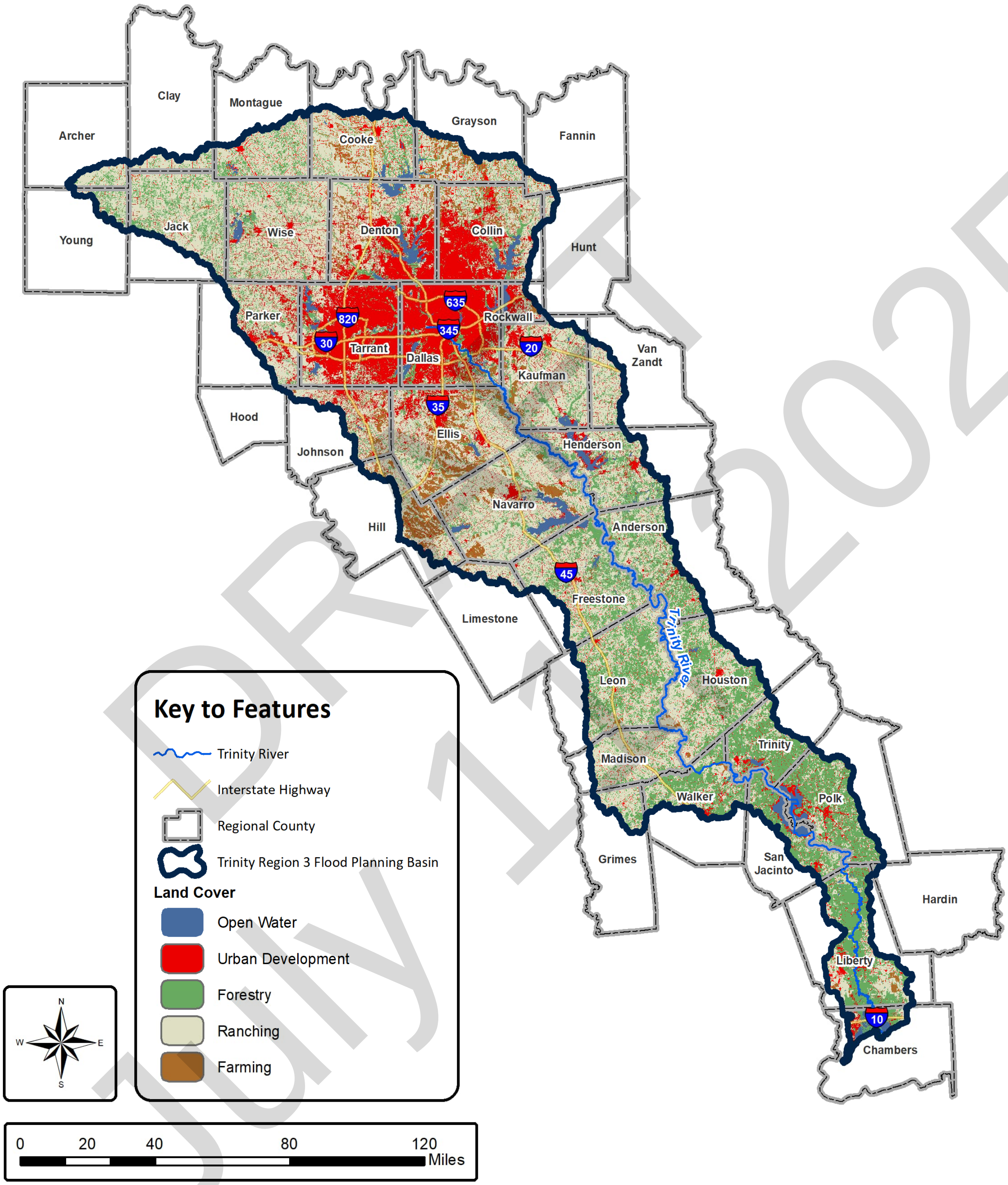
- Ranching: 5,488,000 acres
- Forestry: 2,886,000 acres
- Farming: 546,000 acres
- Urban development: 2,109,000 acres

Across Texas, the average acreage of farm and ranch operations is decreasing, and smaller parcel size may reduce the profitability of these enterprises. When combined with losses due to flooding, this could increase the likelihood of economic failure of farming, ranching, or forestry operations.

Ranching and rangeland land uses are predominately located in the northwest area of the Trinity Region in Parker and Wise counties, and the eastern half of Ellis County. Large landholdings in these counties may also be reflected in socioeconomic data, where census tracts far outside of urbanized areas have a remarkably high median income. In the central portion of the flood planning area, Henderson, Kaufman, Madison, Navarro, and Van Zandt counties are home to some of the largest concentrations of rangeland.

Farmland, symbolized in brown, is the leading use of working lands in the upper region. The Blackland Prairie Ecoregion in Collin and Grayson counties north of the metroplex, and Ellis, Hill, Johnson, and Navarro counties to the south are home to some of the state's most fertile croplands (TPWD, 2025). Cooke and Denton counties also retain significant farmland in the Cross Timbers Ecoregion, although Denton County cropland continues to experience encroachment from urban areas. As the Trinity Region descends south toward the Gulf, farming activity resumes. According to the United States Department of Agriculture (USDA), major crops between 2015 and 2023 included sorghum, corn, winter wheat, soybeans, hay, and rice in Liberty County as well as a small share of the State's cotton production (USDA, 2023).

Figure 1-12: Working Lands in the Trinity Region by Land Cover



Source: USGS Annual National Land Cover Database (USGS, 2024)

Economic Status of Population

Median Household Income (MHI), as illustrated on *Figure 1-13*, divides the data from the 2024 Environmental Systems Research Institute (ESRI) census tract levels across the region using natural breaks classification to provide a good comparison for income levels across the region. The MHI can be affected by many factors, including education levels, opportunity of employment, and location. It is important to note that within any given area, there are residents that are outliers in both directions. The Texas MHI in 2024 according to this measure is $76,300.

Many communities near the downtown areas of Dallas and Fort Worth, as well as the inner ring suburbs of DFW are living on incomes below the state MHI. Suburban communities outside of these central areas in the northern suburbs have the region's highest median incomes. Another location with higher-than-average income is the southernmost portion of the region near Trinity Bay. As the region moves south, many census tracts have MHIs that are comparable with the state, however in many rural areas' household incomes are significantly lower than the state median.

Income Levels by Subregion

Figure 1-13 shows distribution of income across the Trinity Region.

The upper subregion of the Trinity Region features the highest levels of household income, but still shows a wide diversity of incomes, with census tracts in every household income category. All the region's highest annual income census tracts greater than $150,000 lie within this subregion. The highest median income areas are within northern Dallas, Southlake-Flower Mound area, near the Collin-Denton County border, and to a lesser extent within Ellis, Parker, Rockwall and Tarrant counties.

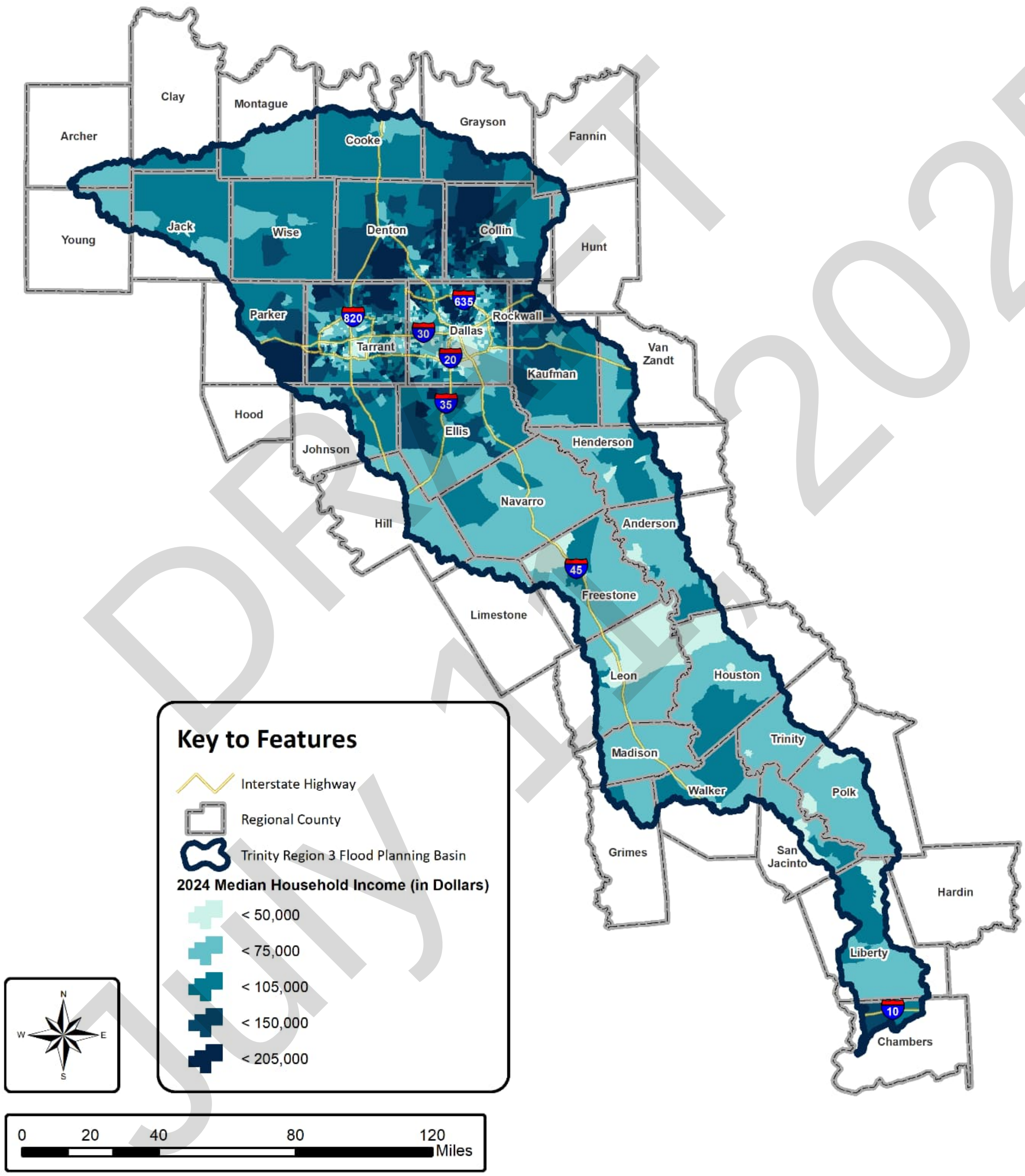
As stated previously, many of these tracts with higher incomes lie on the outskirts and suburbs of DFW, predominantly in the northern suburbs of Dallas. The $105,000 - $150,000 MHI range comprises most of Dallas, Ellis, Grayson, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise counties and half of Collin and Denton counties. The final two household income categories are mostly concentrated in the DFW metroplex, with some tracts being in the more rural areas of the upper subregion.

Most of the census tracts within the middle subregion have household incomes roughly equivalent to the 2024 Texas median income of $76,300. There is one census tract in each of Freestone, Grimes, Houston, and Leon counties that is within the $75,000 - $105,000 category. Anderson and Walker counties have at least 2 census tracts in this category.

The lower subregion increases in household income as it nears Trinity Bay and the influence of Houston. While there are many tracts in the lower two categories, there are a few tracts within

Chambers, Liberty, and San Jacinto counties that are in the $75,000 - $105,000 category. The three tracts in the northwestern section of Chambers County, bordering Trinity Bay, are within the $150,000 - $205,000 category.

Figure 1-13: Median Income by County



Source: ESRI Business Analyst Data (ESRI, 2024)

Social Vulnerability Analysis

When anticipating the likely extent of damages to a community from catastrophic floods, this assessment first considers "exposure" based on geographic location of people and property. Another important dimension to increasing the resilience of the communities in the Trinity Region is their relative "vulnerability" to floods when they do occur. Disasters impact individuals and communities in various ways, including their ability to evacuate from danger zones, the extent of damage to their homes and properties, and their capacity to gather the financial resources necessary for recovery and rebuilding after a storm. These factors are known as Social Vulnerability, or a person's or group's "capacity to anticipate, cope with, resist, and recover from the impacts of a natural hazard" based on their relative vulnerability (Donner & Rodriguez, 2011). *Figure 1-14* for the Trinity Region displays the Texas Flood Social Vulnerability Index (TX F-SVI) data developed by TWDB. The index is measured on a scale of 0-1, with one being the highest level of vulnerability and is used to map social vulnerability in the region.

The index focuses on a series of several demographic indicators (Hicks Masterson, et al., 2024):

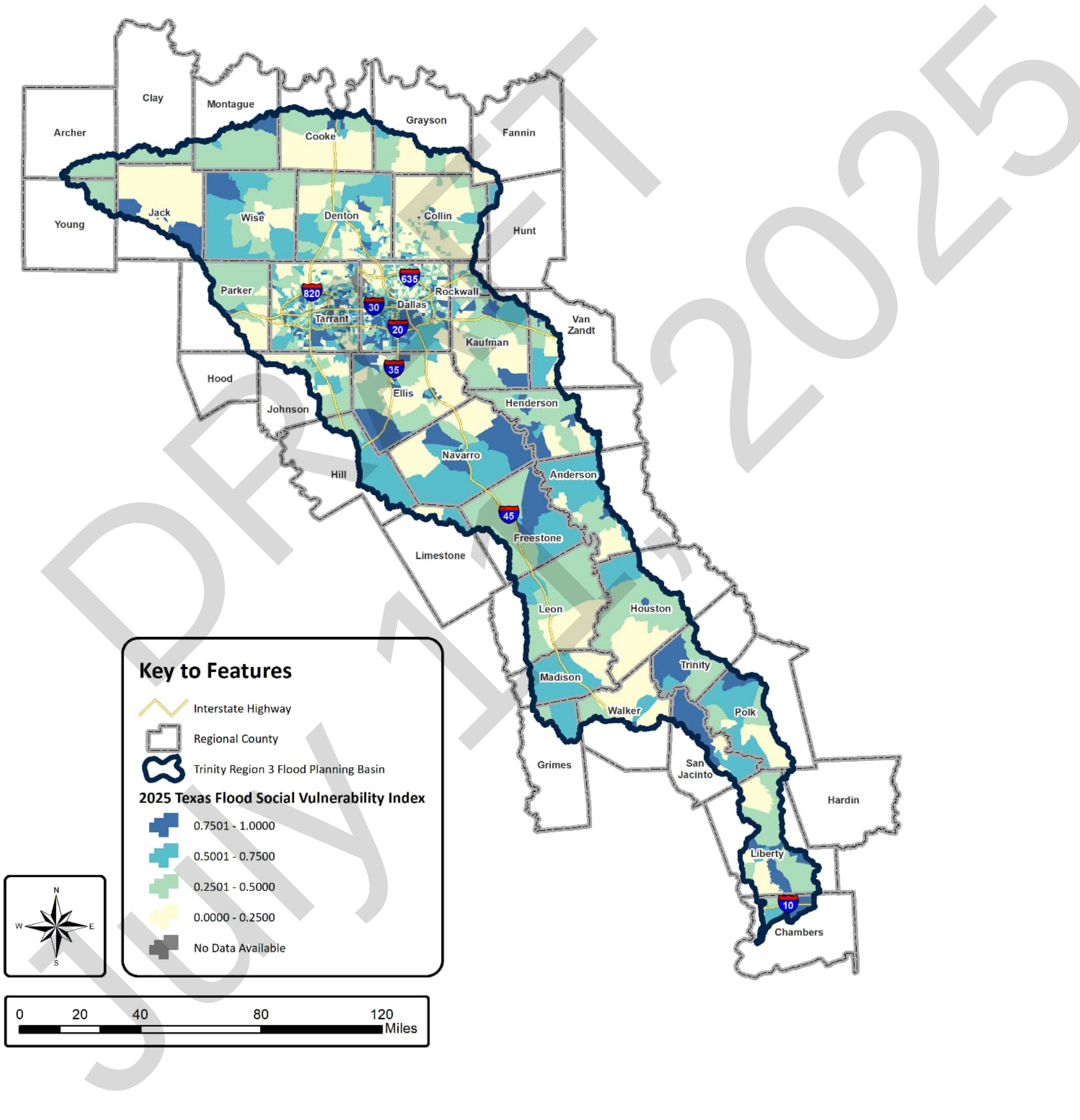
- Access to Phone/Internet
- Age
- Disability
- Environmental Risk Factors
- Housing Age
- Housing Value
- Income
- Language
- Migration
- Mobile Homes
- No Vehicle
- Minority
- Poverty
- Renters
- Rural-Urban
- Employment Type
- Single Parent Household
- Unemployment

The presence of multiple factors above in a population, or even an individual household, has proven to be a reliable indicator of the long-term impact of a disaster. In *Chapter 2*, this regional plan engages in a more detailed discussion about the location of high social vulnerability populations, the location of flood protection infrastructure and how future FMPs might reduce their vulnerability to injury and economic losses.

The level of social vulnerability varies widely even within a single county, which may contain both the most and least vulnerable populations. In the Trinity Region, the highest concentrations of social vulnerability, as shown in dark blue, are in the census tracts to the southeast of Dallas County, Tarrant County south of Fort Worth, and small but densely populated census tracts in Collin, Ellis, Henderson, Jack, Kaufman, Navarro, and Wise counties.

The middle region has a tract each in Anderson, Freestone, Houston, Trinity and Walker counties with remarkably high SVI.

Figure 1-14: Texas Flood Social Vulnerability Index (TX F-SVI) by Census Tract



Source: Texas Flood Social Vulnerability Index (TWDB, 2025)

The lower region shows high SVI tracts in Chambers, Liberty, Polk, and San Jacinto counties. Throughout the Trinity Region, each subregion encompasses a full spectrum of SVI values, ranging from low to moderate to high social vulnerability for various census tracts.

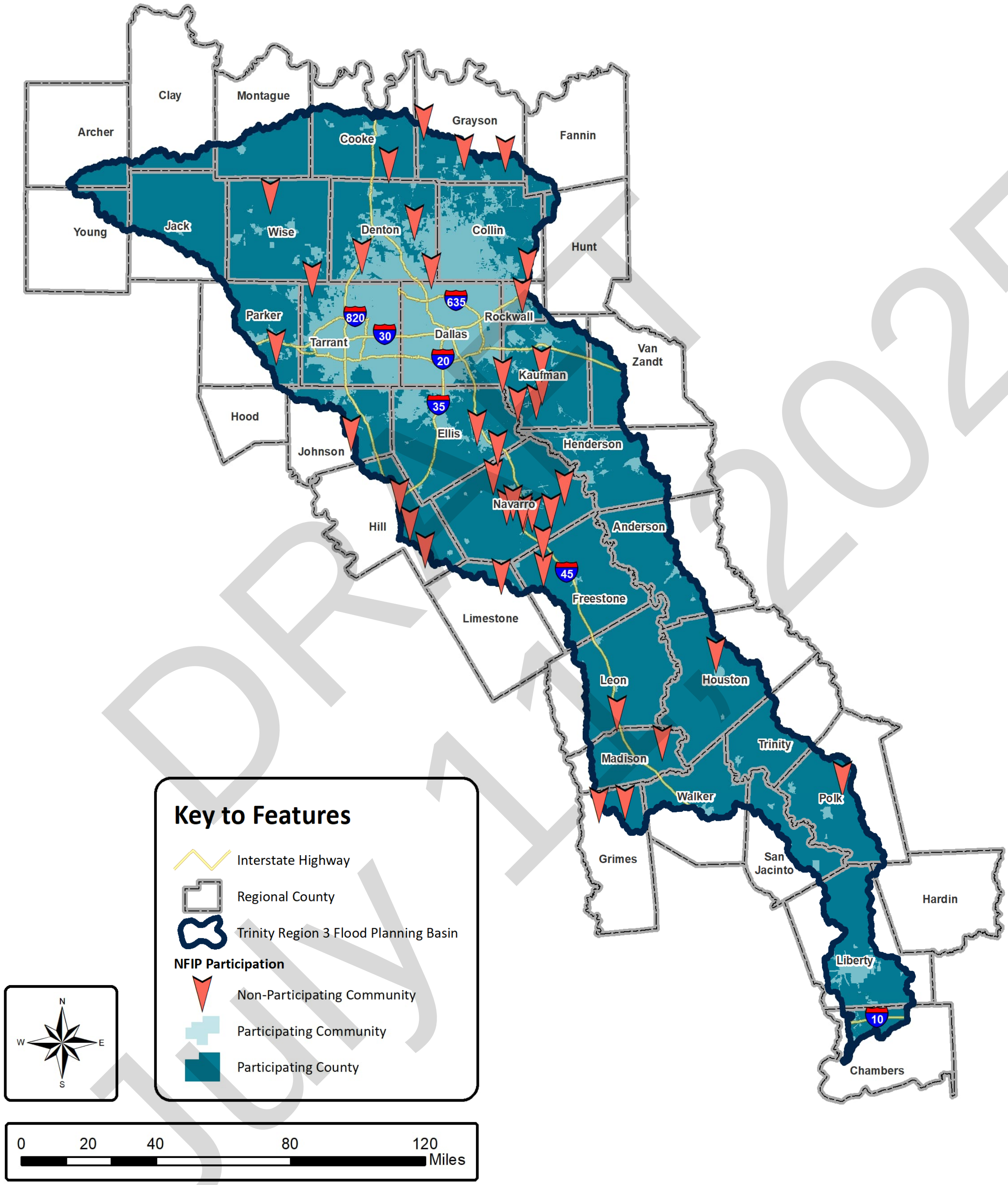
Flood-Prone Areas and Flood Risks to Life and Property

As Texas seeks to better manage flood risk to mitigate loss of life and property from flooding, this section establishes a baseline of what is known with respect to the area's exposure to flood hazards, as well as the vulnerability of the communities within the Trinity Region. This is a critical step in reducing the vulnerability of the Trinity Region's people and places to future flooding.

Today, a patchwork quilt of plans, regulations, and infrastructure provides Texans with limited protection from flooding. This planning largely takes place at a local level, with an inconsistent set of standards from community to community that makes it difficult to quantify risk across the region. Fortunately, many of the communities in the Trinity Region (88 percent) participate in the National Flood Insurance Program (NFIP). This is good news, as it improves their prospects for economic recovery in the event of a major flood and provides a system to reduce flood risk to new development. However, many communities rely on outdated FEMA regulatory maps, which may offer only a limited view of the current circumstances. Flood Insurance Rate Maps (FIRMs) may not reflect changing patterns of development and often fail to identify flood risks associated with changes in the topography and environment. Typically, FIRMs do not include the floodplains of streams with a drainage area of less than one square mile in urban areas and even larger drainage areas in rural areas. Therefore, if there is a localized flood problem that should be mapped to guide development regulations, the area will most likely have to be studied by the community. *Figure 1-15* shows the participating communities within the Trinity Region. While all the counties within the region participate in the NFIP, the same is not true of all the municipalities.

In the absence of a cohesive flood map that applies across the region, the following chapters of this assessment will piece together an intricate flood quilt, combining several data layers from FEMA, including effective detailed maps, effective approximate maps, Base Level Engineering (BLE) with data from other federal agencies, local and regional studies, and the commercially available data prepared by Fathom that was provided by the TWDB. (Additional information on the floodplain quilt is included in *Chapter 2*).

Figure 1-15: Participation in National Flood Insurance Protection Program



Source: FEMA Community Status Book (FEMA, 2025)

Identification of Flood Prone Areas

According to current FEMA mapping, approximately 20 percent of the total area in the region is within the one-percent annual chance flood hazard. In the Trinity Region, more than 50 communities have over 20 percent of their land located in the floodplain. Not all floodplains within the Trinity Region have been mapped and modeled. While developing a comprehensive flood risk model of the region is beyond the scope of this planning effort, the TWDB provided a floodplain quilt for use in this plan. The quilt is a combination of various sources of data, providing comprehensive coverage of all known existing statewide flood hazard information.

Figure 1-16 shows the May 2025 TWDB compiled flood quilt information that served as the Trinity Region's starting point, providing an approximation of region-wide flood risk using currently available data. In subsequent chapters, this "quilt" is confirmed, updated, and otherwise enhanced as appropriate to prepare a larger flood risk assessment (TWDB, 2025). When complete, this regional flood quilt identifies gaps in information and more accurately estimates the distribution of flood risk across the region. A more comprehensive description of the identification of flood-prone areas is provided in *Chapter 2*.

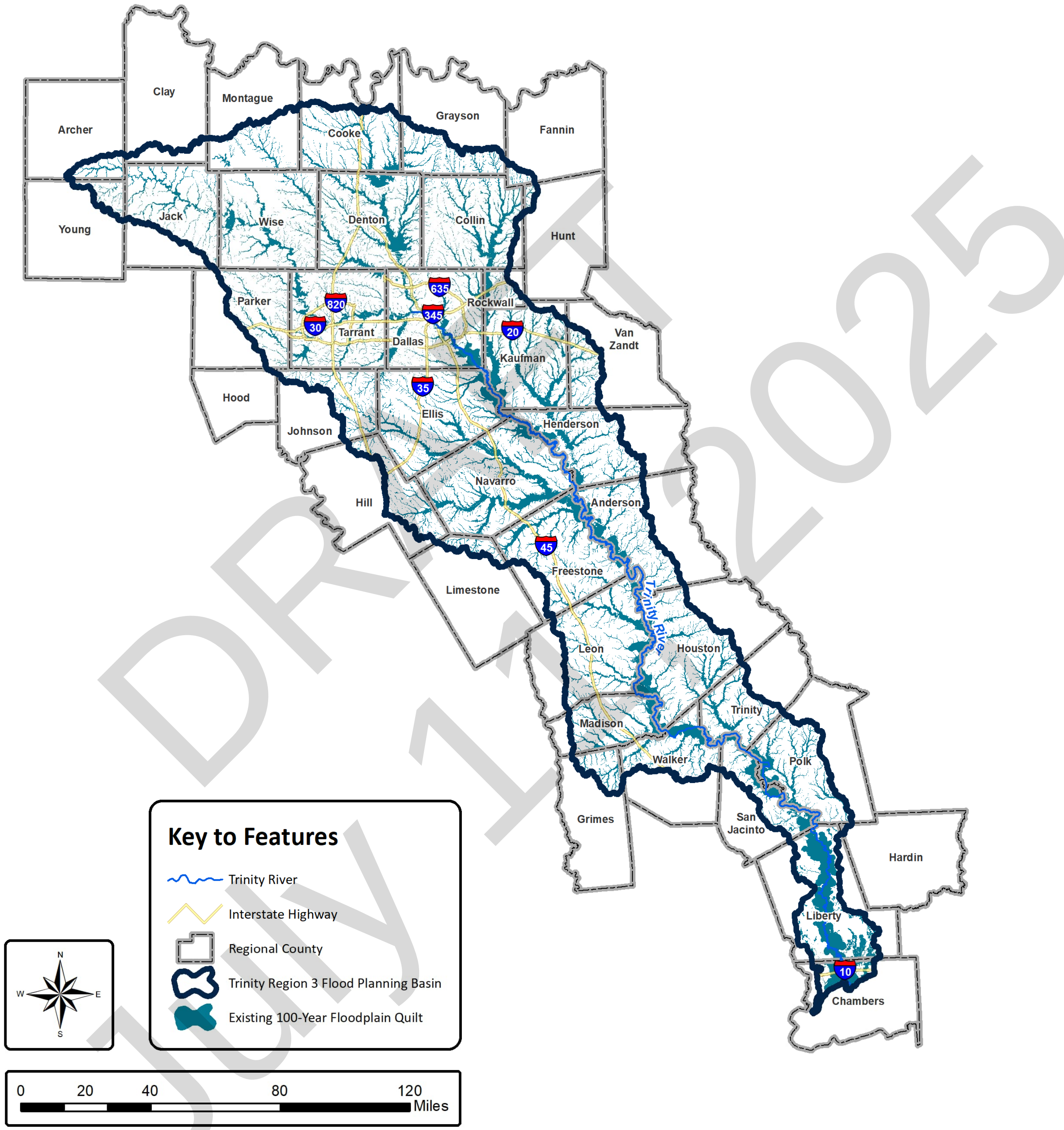
Key Historical Flood Events

The cycle of catastrophic disasters in the Trinity Region ebbs and flows year by year, but a long history of flooding has irrevocably shaped its communities, with flood control measures like dams and levees expanding the lands available for new development. Historical floods of the Trinity River affected population centers located along the river and its major tributaries. The 1908 and 1942 floods in DFW resulted in the creation of the United States Army Corps of Engineers (USACE) Fort Worth District in 1950 (USACE, 2021) and spurred the construction of multiple dams for flood control purposes within the Trinity Region (Cotter & Rael, 2015). In the years since, these flooding concerns have been addressed by state and local efforts in addition to the USACE. *Chapter 4* includes more detailed information on historical flood events.

One of the most significant storms was the May 1949 flood in the DFW metroplex. The levee for the Clear Fork Trinity River in Fort Worth failed, inundating hundreds of homes and businesses. *Figure 1-17* illustrates the impacts of this flooding on what are now some of the busiest commercial and residential areas of the City of Fort Worth.

Even though there are many years with no recorded disaster that reaches either the level of a Major Disaster Declaration (DR) or an Emergency Declaration (EM) the cumulative impact is great. Frequently, however, when one disaster occurs, it is followed by one or more catastrophic events during the same year, and perhaps even the same month.

Figure 1-16: Existing Flood Prone Areas



Source: TWDB Flood Planning Data Hub Flood Quilt: 2024 (TWDB, 2025)

Figure 1-17: Image of Flooded Wards Building and Rooftops, Fort Worth

Source: USACE (USACE, 1949)

Since 1996, there have been six EMs and 40 DRs within the Trinity Region (FEMA, 2025). A Presidential DR puts into motion long-term federal recovery programs, some of which are matched by state programs, that are designed to help disaster victims, businesses, and public entities. An EM is more limited in scope and without the long-term federal recovery programs of a DR. To search for more information on EMs or DRs, FEMA provides a search tool found here: https://www.fema.gov/disaster/declarations.

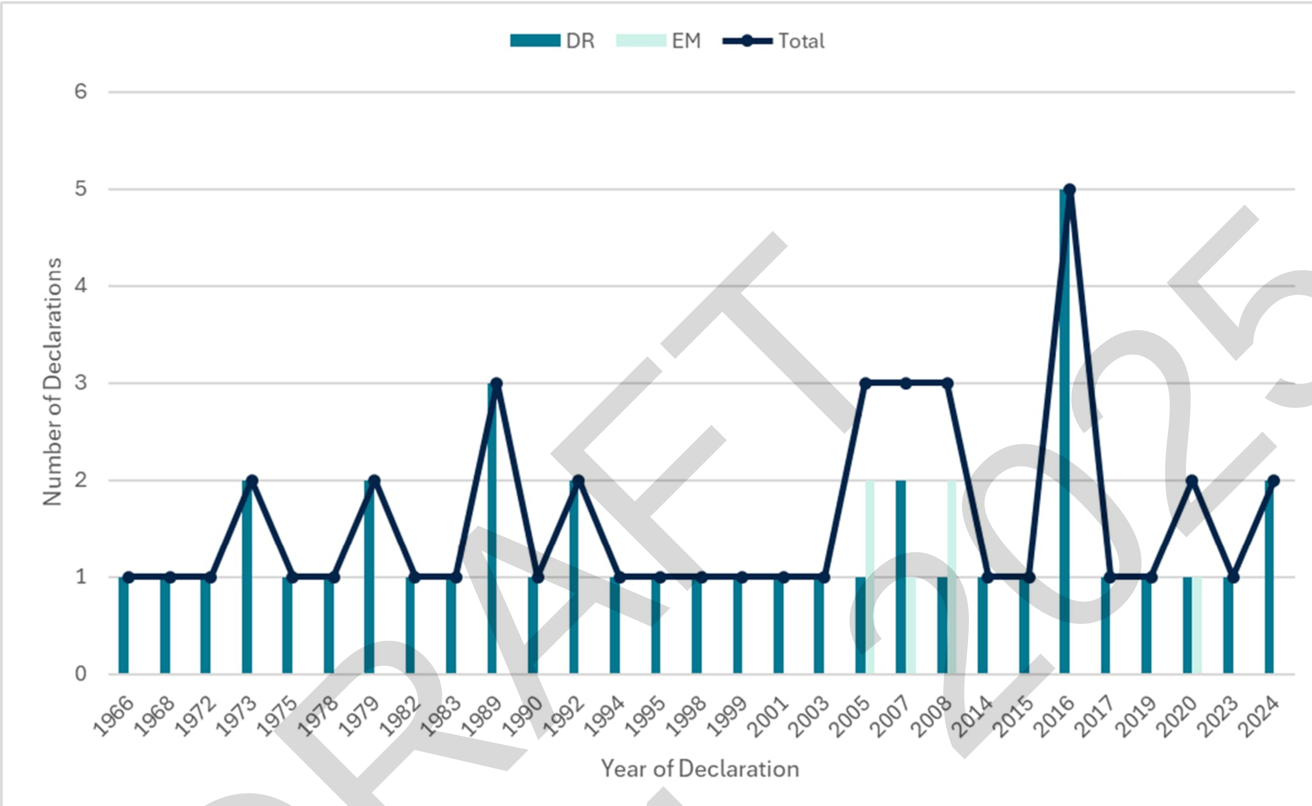
Generally, federal assistance and funding are provided to meet a specific emergency need or to help prevent a major disaster from occurring. Public Assistance (PA) is FEMA's largest grant program, providing funds to assist communities responding to and recovering from major disasters or emergencies declared by the president. The program provides funding for emergency assistance to save lives and protect property and assists with funding for permanently restoring community infrastructure affected by a federally declared incident. Supplementally, PAs can be categorized for emergency work such as PA-A for debris removal and PA-B which provides emergency protective measures. Individual Assistance (IA) programs are made available under EMs and are limited to supplemental emergency assistance to the affected state, territory, or tribal government to provide immediate and short-term assistance essential to save lives, protect public property, health, and safety, or to lessen or avert the threat of a catastrophe. All IA programs may be authorized once a major disaster has been declared by the president. The approval of IA under a DR may also activate assistance programs provided by other federal agencies based on specific disaster needs.

Figure 1-18 charts the frequency of these declarations across the Trinity Region between 1996-2024. Some of the most remarkable events in that period are as follows:

EM-3216-TX, August 2005 (Hurricane Katrina)

Hurricane Katrina was a category five Atlantic hurricane that caused over 1,800 deaths and $125 billion in damage in late August 2005, particularly in the City of New Orleans and the surrounding areas (NWS, 2005). For all United States hurricanes, Hurricane Katrina (2005, $201.3B) is the costliest storm on record. Hurricane Harvey (2017, $160.0B) ranks second (NOAA (NCEI), 2025). The storm was the twelfth tropical cyclone, the fifth hurricane, and the third major hurricane of the 2005 Atlantic hurricane season, as well as the fourth-most intense Atlantic hurricane on record to make landfall in the contiguous United States (NWS, 2005). The State of Texas had an EM declared on September 2, 2005, which included PA grants for 254 counties, including all the counties in the Trinity Region, for emergency protective measures. Texas provided shelter and resources for more than 250,000 evacuees from Louisiana and other affected states.

Figure 1-18: Federal Disaster Declarations within Trinity Region, 1966-2024



Source: Disaster Declarations (FEMA, 2025)

EM-3261-TX, September 2005 (Hurricane Rita)

Hurricane Rita was the most intense tropical cyclone on record in the Gulf. It moved westward through the Florida Straits, where it entered an environment of abnormally warm waters. Moving west-northwest, it rapidly intensified, achieving category five status on September 21, 2005. However, it weakened to a category three hurricane before making landfall in Johnson's Bayou, Louisiana, between Sabine Pass, Texas and Holly Beach, Louisiana. The timing of Hurricane Rita following on the heels of Hurricane Katrina compounded the disaster as Texas was still sheltering evacuees across the Trinity Region when Rita made landfall.

The impact of Rita on southeast and east Texas included both wind and storm-surge damage. Due to the extensive damage, FEMA declared an EM that provided PA for all 254 counties in the state, including all the Trinity Region counties.

DR-1791-TX, September 2008 (Hurricane Ike)

On September 12, 2008, a DR was declared due to Hurricane Ike. This event sustained winds of 110 mph upon landfall in Galveston Island, making it a category two hurricane. Ike was of a severity and magnitude that the need for supplemental federal assistance was determined to be necessary. For 34 counties, 11 of which are in the Trinity Region, this declaration made IA funding available to affected individuals and households. This declaration also made the PA program available to state and eligible local governments and certain private nonprofit organizations on a cost-sharing basis. A total of 50 counties qualified for PA with 13 of those counties being within the Trinity Region.

DR-4223-TX, May 2015

In the spring of 2015, the Trinity Region experienced several rounds of severe weather which culminated in supercell thunderstorms, dubbed the Memorial Day Floods of 2015. Heavy rainfall leading up to the Memorial Day event saturated the soil, intensifying flooding. The National Weather Service recorded over 16 inches of rainfall at DFW International Airport signaling the wettest single month in the DFW metroplex since 1982. The cumulative impacts of the event, coupled with Tropical Storm Bill, taxed the basin's rivers and lakes. Several reservoir levels came within inches of breaking all-time crest records for a period of record spanning over 110 years (NCTCOG, 2016).

On May 29, 2015, the State of Texas requested a DR due to severe storms, tornadoes, straight-line winds, and flooding which began on May 4, 2015, and continued through June 23, 2015, (GLO, 2025). The requested declaration included IA for 22 counties, including 17 Trinity Region counties, PA for 110 counties, including 31 Trinity Region counties, and hazard mitigation for the entire State of Texas. Preliminary damage assessments were conducted in the requested counties immediately after the event to determine the need for additional assistance. On May 29, 2015, the president declared a Presidential DR in the State of Texas.

DR-4245-TX, October 2015

October 22-31, 2025, brought more severe rainfall and subsequent flooding to the middle and lower subregions of the basin. Multiple counties within the region experienced severe storms, tornadoes, straight-line winds and flooding. Liberty and Navarro counties both received IA and PA funds. Hardin County received IA funding. Hill and Walker counties received PA funds. The disaster declaration date is November 25, 2015, (FEMA, 2015).

DR-4332-TX, August 2017 (Hurricane Harvey)

On August 23, 2017, Harvey was upgraded to a tropical depression. Over the next 48 hours Harvey would undergo a period of rapid intensification from a tropical depression to a category four hurricane. Harvey made landfall along the Texas coast near Port Aransas on August 25, 2017 as a category four hurricane and brought devastating impacts. As Harvey moved inland, its forward motion slowed and then meandered back offshore. Harvey continued to skirt the coastline as it made landfall a second time in the Harris County area on August 26, and then a third time just west of Cameron, Louisiana on August 30, 2017.

Rain bands on the eastern side of the circulation of Harvey produced rapid flash flooding and devastating, widespread flooding as the storm moved into southeast Texas. The unprecedented amount of rainfall caused catastrophic flooding and drainage issues. Approximately 46 percent of the Trinity River forecast points reached new record levels. Harvey maintained tropical storm intensity while moving inland over the Texas coastal bend and southeast Texas.

The southern region of the Trinity Region was severely impacted by flooding during Hurricane Harvey. From late August through early September, approximately 2.8-million acre-feet of water was released to Galveston Bay from Harvey rainfall in the proximity of Liberty County. The City of Liberty, located in Liberty County, recorded 55 inches of rain during Harvey with damages exceeding $11 million (TRA, 2021). Overall, Harvey caused $125 billion in damage.

On August 25, 2017, the State of Texas requested an expedited DR due to Hurricane Harvey. The DR request covered 60 counties, including ten Trinity Region counties. The requested declaration included IA and direct federal assistance under the PA program for 41 counties, including seven Trinity Region counties and hazard mitigation statewide. On August 25, 2017, the president declared a major disaster for the State of Texas.

Flash Floods in Dallas-Fort Worth, August 2022

In August 21-22, 2022, the DFW metroplex experienced intense rain and flash flooding which resulted in water damage to homes, businesses, cars and hundreds of high-water rescue calls. National Weather Service (NWS) Fort Worth said the 24-hour period of August 21-22 is the second wettest 24-hour period on record for Dallas/Fort Worth International Airport. As much as 9.19 inches fell during this time, which is just 0.38 inches short of the all-time record. Meanwhile the weather station at White Rock Creek in east Dallas recorded 15.16 inches in 24 hours to around midday on August 22, 2022, (FloodList, 2022).

By the afternoon of August 22, 2022, Dallas firefighters had responded to 195 high-water incidents across the city of Dallas and carried out 39 rescues. In neighboring Fort Worth, firefighters responded to 174 rescues and other high-water incidents and received a total of 500 calls. Local officials declared a state of disaster in Dallas County and requested state and federal assistance. Despite the damage incurred, this storm did not result in a FEMA disaster declaration.

DR-4798-TX, July 2024 (Hurricane Beryl)

Hurricane Beryl made landfall in southeast Texas on July 8, 2024. The storm weakened to a tropical storm as it continued to move northeast across Louisiana and Texas. Beryl dropped three to six inches of rainfall across southeast Texas and produced tides ranging from 2.5 to 3.25 feet (NWS, 2024). Storm surge was also documented in some areas of Louisiana and Texas that resulted in flooded roads. This storm spurred more than 50 documented tornadoes resulting in significant damage (NWS, 2024). Ultimately, Hurricane Beryl resulted in being more of a wind event than a flood event.

In all, 13 counties within the Trinity Region from Anderson and Freestone counties southward were designated in the July 9, 2024, presidential disaster declaration. These counties were eligible for PA and/or IA funding.

Past Casualties and Property Damage

In a major flood event, multiple types of losses are incurred, including property damage, agricultural damage, physical injuries, and loss of life. From 2000-2024, property damage losses throughout the region amounted to $6.8 billion (see *Table 1.3*) with the largest losses found in densely populated metropolitan areas that are prone to flash flooding, and in coastal areas that are subject to tropical storms and hurricanes. *Table 1.3* also provides a breakdown of the losses of life and injuries directly related to flooding during this same period.

Past Losses for Farming

The Trinity Region accounts for much of the agricultural production in Texas with much of the corn, cotton, hay, rice, sorghum, winter wheat, and soybeans being produced in this area. According to the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI), the cumulative reported losses to crops due to flooding in the Trinity Region since 2000 amounted to $2 million. As not every county fully reports the extent of agricultural damage, it is likely that even this multimillion-dollar tally of crop damage does not represent the full impact of flooding on agriculture in each county, nor does it include the losses of livestock. *Table 1.4* summarizes crop damages by county within the Trinity Region from 2000 through 2024.

Table 1.3: Total Casualties and Property Damages (2000-2024)

County	Total Events	Deaths (Direct)	Injuries (Direct)	2000-2024 Value Property Damage
Anderson	40	7	0	$18,422,000
Archer	20	0	0	$30,000
Chambers	38	0	0	$382,634,000
Clay	16	0	0	$10,000
Collin	68	1	0	$1,013,000
Cooke	58	4	4	$32,453,000
Dallas	131	13	1	$1,414,233,000
Denton	94	3	1	$13,782,000
Ellis	58	2	0	$6,817,000
Fannin	55	0	0	$2,532,500
Freestone	36	1	0	$2,108,500

County	Total Events	Deaths (Direct)	Injuries (Direct)	2000-2024 Value Property Damage
Grayson	77	3	1	$31,364,000
Grimes	42	0	0	$63,934,000
Hardin	51	0	0	$773,554,000
Henderson	38	0	0	$1,336,000
Hill	42	0	0	$2,024,000
Hood	47	0	0	$4,301,000
Houston	22	0	0	$101,215,000
Hunt	71	1	0	$1,950,000
Jack	38	0	0	$283,500
Johnson	69	4	0	$3,914,000
Kaufman	60	2	0	$4,681,000
Leon	32	0	0	$907,000
Liberty	40	1	0	$1,334,927,000
Limestone	67	0	0	$1,945,000
Madison	26	0	0	$90,838,000
Montague	37	0	0	$7,601,000
Navarro	58	4	0	$1,022,936,500
Parker	46	1	0	$9,628,500
Polk	30	0	0	$407,613,000
Rockwall	23	0	0	$215,000
San Jacinto	35	3	0	$384,356,000
Tarrant	152	20	3	$84,190,250
Trinity	26	1	1	$38,361,000
Van Zandt	38	1	0	$1,644,000
Walker	46	2	0	$622,673,000
Wise	63	0	0	$3,774,000
Young	46	0	0	$454,500
TOTAL	1936	74	11	$6,874,655,250

Source: Storm Events Database by County (NOAA, 2024)

Note: Some counties included in the table only have a small portion of the county within the Trinity Region.

Table 1.4: Total Crop Damage Value (2000-2024)

County	Total Events	2000-2024 Value Crop Damage
Anderson	40	$20,000
Archer	20	Not reported
Chambers	38	Not reported
Clay	16	Not reported

County	Total Events	2000-2024 Value Crop Damage
Collin	68	Not reported
Cooke	58	$500,000
Dallas	131	Not reported
Denton	94	$500,000
Ellis	58	Not reported
Fannin	55	Not reported
Freestone	36	$2,000
Grayson	77	$250,000
Grimes	42	$62,000
Hardin	51	Not reported
Henderson	38	Not reported
Hill	42	Not reported
Hood	47	Not reported
Houston	22	Not reported
Hunt	71	Not reported
Jack	38	Not reported
Johnson	69	Not reported
Kaufman	60	Not reported
Leon	32	Not reported
Liberty	40	$55,000
Limestone	67	Not reported
Madison	26	Not reported
Montague	37	$500,000
Navarro	58	Not reported
Parker	46	Not reported
Polk	30	$50,000
Rockwall	23	Not reported
San Jacinto	35	$60,000
Tarrant	152	$20,000
Trinity	26	Not reported
Van Zandt	38	Not reported
Walker	46	$20,000
Wise	63	Not reported
Young	46	Not reported
TOTAL	1936	$2,039,000

Source: Storm Events Database by County (NOAA, 2024)

Other Losses on Working Lands

When a major rain event causes flooding, it can also cause heavy losses for livestock. The USDA National Agricultural Statistics Service estimates that Texas has 12 million head of cattle and calves as of January 1, 2024, (USDA, 2024). Many of the State's cattle are raised in the Trinity Region, with the largest cattle production in Cooke, Grimes, Leon, Fannin, Houston, and Van Zandt counties (USDA, 2024). If these operations are disrupted due to flooding, particularly if cattle are lost in the flood, it can trigger an impact on milk and beef production statewide.

Political Subdivisions with Flood-Related Authority

The RFPGs are tasked with identifying political subdivisions with flood control authority within their region. Trinity Region maintains a list of 637 separate political subdivisions within the region who each have some degree of flood-related authority or responsibilities.

State guidelines for "Flood Protection Planning for Watersheds" define political subdivisions with flood-related authority as cities, counties, districts, or authorities created under Article III, Section 52, or Article XVI, Section 59, of the Texas Constitution, any other political subdivision of the state, any interstate compact commission to which the state is a party, and any nonprofit water supply corporation created and operating under Chapter 67. Of the political subdivisions referred to above, most are municipal or county governments, both of which enjoy broad authority to set policy to mitigate flood risk.

State law also provides for limited purpose utility districts. These are known as MUDs, Water Supply Utility Districts (WSUDs), Municipal Water Districts (MWDs), Fresh Water Supply Districts (FWSDs), Soil and Water Conservation Districts (SWCDs), or SUDs. These districts may be located in or adjacent to cities or in the county and in some cases may be involved in the reclamation and drainage of overflowed land and other land needing drainage (Texas Constitution and Statues, 2023). In the first cycle of regional flood planning, the Trinity Region removed from its utility district contact list those who reported not having flood responsibilities or authorities. The updates were provided to the TWDB. In this cycle of planning, two entities reported name changes that are reflected in this report.

Together, the entities outlined in *Table 1.5* constitute the primary entities with flood-related responsibilities in the Trinity Region by the numbers. Each of these entities received an invitation to participate in the data collection survey using the region's data collection tool and interactive web map located on the Trinity RFPG website.

Table 1.5: Political Subdivisions with Potential Flood-Related Authority

Entity	Number of Jurisdictions	NFIP Participants
Municipality	290	250
County	38	38
COGs	9	Not Applicable
River Authority	9	Not Applicable
Water Districts	3	Not Applicable
WSUDs (MUDs, FWSDs, MWDs, SUDs, SWCDs)	195	Not Applicable
Flood Control Entities (WCIDs, LIDs)	38	Not Applicable
Other	76	Not Applicable
TOTAL	658	288

Source: TWDB Data Hub (TWDB, 2025)

Two additional types of districts bear more discussion, as they have a more direct relationship with flood management, as outlined in the State Water Code. The differing roles of WCIDs and LIDs are described in *Table 1.6.*

Table 1.6: Role of WCIDs and LIDs

Entity	Statutory Authority	Flood Control Responsibilities
Water Control and Improvement Districts	State Water Code, Title 4, CHAPTER 51	(1) the improvement of rivers, creeks, and streams to prevent overflows and to permit navigation or irrigation
		(2) the construction and maintenance of pools, lakes, reservoirs, dams, canals, and waterways for irrigation, drainage, or navigation
		(3) the construction and maintenance control, storage, preservation, and distribution of water for flood control, irrigation, and power
Levee Improvement Districts	State Water Code, Title 4, CHAPTER 5	(1) to construct and maintain levees and other improvements on, along, and contiguous to rivers, creeks, and streams
		(2) to reclaim lands from overflow from these streams
		(3) to control and distribute the waters of rivers and streams by straightening and otherwise improving them
		(4) to provide for the proper drainage and other improvement of the reclaimed land

For political entities that participate in the NFIP program, Texas Water Code § 16.315 requires them to adopt a floodplain management ordinance and to designate a floodplain administrator who will be responsible for understanding and interpreting local floodplain management regulations and reviewing them for compliance with NFIP standards. Some of the rights and responsibilities granted under this authority of the Texas Water Code include:

- Applying for grants and financing to support mitigation activities,
- Guiding the development of future construction away from locations threatened by flood hazards,
- Setting land use standards to constrict the development of land which is exposed to flood damage and minimize damage caused by flood losses,
- Collecting reasonable fees from citizens to cover the cost of administering floodplain management activities,
- Using regional or watershed approaches to improve floodplain management,
- Cooperating with the state to assess the adequacy of local structural and non-structural mitigation activities.

Summary of Existing Flood Plans and Regulations

Approximately 11 percent of the entities who received an invitation to participate in the flood planning process via the Trinity RFPG data collection survey tool and interactive web map provided at least some measure of response at varying levels of detail. The tables that follow summarize the entities' responses to questions about their existing regulatory environment, as well as measures they may have in place to increase resilience. The information in these tables is based on responses to the data collection survey, as well as information found on each entity's website.

Table 1.7 summarizes the number of entities that have a particular regulatory or planning measure in place. These plans and regulations were divided into four categories: drainage criteria manual/design manual, land use regulations, ordinances (floodplain, drainage, stormwater, etc.), Unified Development Code (UDC), and/or zoning ordinance with maps. From the four types of regulations and plans, the largest number of entities had land use regulations and UDC and/or zoning ordinance with map.

Table 1.7: Summary of Flood Plan and Regulations

Type of Regulation	Count
Drainage Criteria Manual/Design Manual	114
Land Use Regulations	284
Ordinances (Floodplain, Drainage, Stormwater, etc.)	274
UDC and/or Zoning Ordinance with Map	284
TOTAL	956

Source: Trinity Region data collection tool and interactive web map as of March 31, 2025, with additional research online

Table 1.8 provides a perspective on the relative complexity of each community's floodplain management approach by tallying the number of regulatory and planning measures for each responding community along with available online documents from each entity website. Some communities responded that they do not have any documented regulation to aid with flood management, or that just one is in place. Comparing the survey results to online research, there is a higher level of preparedness than the survey results show for most entities. Most communities have 3 or more of the measures described in *Table 1.7.* A higher number of these measures indicates a greater degree of preparedness for flood management and appropriate regulation of development patterns.

Table 1.8: Number of Flood Plans and Land Use Regulations per Community

Regulations per Community	Count
0	37
1	4
2	15
3	162
4+	109
TOTAL	327

Source: Trinity Region data collection tool and interactive web map as of March 31,2025 with additional research online

Table 1.9 includes data that was extracted from the data collection tool survey. Communities identified the types of flood warning measures they were employing within their communities to mitigate the effects of flooding. These measures include regulations, information, education, and warning systems. The types of flood warning measures that are most widely used amongst survey respondents are participation in the NFIP and use of social media. It is important to note that these results derive from the respondents to the survey and are not an exhaustive count of all flood warning measures being undertaken throughout the region. Resilient communities adapt to changing conditions, allowing people and places to recover quickly from disasters and thrive in the face of adversity.

Using plans and policies to reduce the exposure of people and properties to flood risk is a form of non-structural flood control. Communities can prevent new developments from being in harm's way by avoiding development in flood-prone areas altogether. They can also restrict development by increasing building elevation, preserving overflow areas through buffering and avoiding sensitive natural areas such as wetlands.

Table 1.9: Types of Flood Warning Measures based on Survey

Flood Warning Measure	Count
Acquisition of flood-prone properties	13
Automatic low water crossing gates	0
Coordination with TxDOT message boards	0
Crew(s) set up barricades or close gates	0
Flood gauges	0
Flood readiness education and training	19
Flood response planning	17
Flood warning signs	0
Flood warning signs with flashing lights	0
Flood warning system	13
Higher Standards for floodplain management	32
Land use regulations that limit future flood risk	32
Outdoor siren/message speaker system	0
Participation in the Community Rating System	12
Participation in the NFIP	38
Portable/temporary traffic message boards	0
Public facing website	0
Reverse 911 system	0
Social media	0
TOTAL	176

Source: Trinity Region data collection tool and interactive web map as of March 31,2025

Floodplain Ordinances, Court Orders, and Local and Regional Flood Plans

Floodplain ordinances and court orders dictate how development is to interact with or avoid a city's or county's floodplain. FEMA provides communities with flood hazard information upon which floodplain management regulations can be based. Floodplain ordinances and court orders are subject to the NFIP and ensure communities are taking flood hazards into account when making land use and land management decisions. Ordinances may include references to maps with Base Flood Elevations (BFEs), freeboard requirements, and valley storage requirements, as well as criteria for land management and use. In addition, communities can regulate floodplains with higher or more restrictive standards.

Local and regional flood plans may go a step beyond the regulations laid out in an ordinance, enhancing a region's understanding of its flood risk, and establishing how that entity will manage or control floods in the future. They also outline the procedures for more sustainable flood risk management in the communities they serve (Pace, 2013).

Land Use Regulations and Policies: Zoning, Subdivision

Zoning ordinances regulate how property owners and developers are allowed to use their property. It is one of the most important tools that communities use to regulate the form and function of current and future development. Within the zoning ordinance, communities may incorporate a variety of tools, which may include, among others:

- Floodplain zones,
- Stream buffers,
- Setbacks from wetlands and other natural areas,
- Conservation easements.

Subdivision regulations provide a more focused regulation regarding the design and form of the building blocks of a city. They regulate the platting processes, standards for design and layouts of streets and other types of infrastructure, the design and configuration of parcel boundaries, as well as standards for protecting natural resources and open space. While both cities and counties have subdivision ordinances, counties do not have zoning authority.

Comprehensive Plans and Future Land Use Plans

Comprehensive plans and their associated future land use plans provide legal authority for zoning regulations in the State of Texas and consider capital improvements necessary to support current and future populations and often consider social and environmental concerns the community wishes to address. To produce a comprehensive plan, communities undertake an extensive planning process that encourages discussion about topics such as risk from natural hazards and may include recommendations regarding the location of development with respect to floodplains, future drainage improvements, open spaces, and more.

In the Trinity Region, the Trinity RFPG has identified 147 future land use plans for municipalities, which are the only entities with the authority to develop and use such plans. The content of these plans varies widely in specificity but are frequently prepared in concert with a comprehensive plan, which establishes policies and programs of action for long term growth and development of a community. These plans provide a guide for future areas of growth and development, as well as areas that are to be conserved in their natural state. According to the

Texas Local Government Code, the comprehensive plan sets the groundwork that is necessary for a municipality to regulate the location and character of development through local zoning and land use ordinances (Texas Legistative Council, 1997).

Drainage Design Criteria

Drainage design criteria are required and developed to establish the minimum standards for planners, architects, and engineers to follow when preparing plans for construction within the jurisdictions in which they serve. These could be for regional entities, such as the North Central Texas Council of Governments (NCTCOG), for municipalities, or counties within the region. These criteria mitigate flood risk by promulgating a consistent set of standards for location and design criteria that mitigate future flood risk. Criteria may pertain to development and permit applications, right of way/easements, and hydrologic, and hydraulic standards.

Assessment of Existing Flood Infrastructure

This section provides an overview of natural and structural flood infrastructure in the Trinity Region that contributes to lowering flood risk. The Trinity River watershed connects communities from Archer County to Chambers County along the Trinity Bay, which means that flood infrastructure must be viewed holistically as a regional system. Flood infrastructure benefits the community where it is located and may have benefits for people and property downstream.

When assessing flood risk management infrastructure, the TWDB guidance directs the RFPG to consider the following types of natural and constructed features that contribute to risk reduction, not all of which are present in the Trinity Region. (Features shown in italics have not been identified as major components within the Trinity Region.)

Natural Features

- Rivers, tributaries, functioning floodplains,
- Wetlands and marshes,
- Parks, preserves, natural areas,
- *Playa lakes,*
- *Sinkholes,*
- *Alluvial fans,*
- *Vegetated dunes.*

Structural Features

- Levees,
- Dams that provide flood protection,
- Local stormwater systems, including tunnels and canals,

- Detention and retention ponds,
- *Sea barriers, walls, and revetments,*
- *Tidal barriers and gates.*

Flood infrastructure in the region is formed by a complex web of natural areas and built features which are owned and managed by entities ranging from the National Parks Service to individual landowners. Flood infrastructure may include non-structural measures, such as natural area preservation, buyout of repetitive flood loss properties, and flood warning systems, but also includes all major public infrastructure, such as regional detention. The TWDB provided several data sources to assist with the identification of flood management infrastructure in the Flood Data Hub. The RFPG data collection survey also posed several questions such that that the responses complement the information provided by existing data sources and create a more complete picture of how communities in the region protect themselves from flood risk.

Information in the Inventory of Existing Flood Infrastructure summarized in this section refers to the *TWDB-Required Table 1*, included in *Appendix A* of this plan and serves as the basis for several tables and charts.

Natural Features

When left in their natural state, many different ecologies can be efficient at handling rainfall. As drops fall from the sky, they are intercepted by trees, shrubs or grasses which allows rain time to soak into the soil and slow the passage of runoff to the region's waterways. Wetlands and woodlands are the most efficient at recycling rainfall, as the branches and undergrowth intercept water before it even reaches the ground, thus minimizing overland flow to tributaries and the river, in a process called evapotranspiration. Pastureland performs this function effectively as well. Similarly, parklands in urban areas that are designed for dual functions can achieve nearly the same rate of capture of stormwater as lands in undeveloped areas (Marsh, 2010).

For natural features to achieve maximum effectiveness at flood mitigation, they should form part of an interconnected network of open space consisting of natural areas and other green features that also protect ecosystem functions and contribute to clean air. This is sometimes known as green infrastructure, the practice of replicating natural processes to capture stormwater runoff (NRPA, 2017). Even slight changes in developed areas can have a significant impact on downstream flooding.

Natural areas can be managed to be even more efficient at these functions in a variety of settings:

- Watershed or Landscape Scale: Where natural areas are interconnected, they provide opportunities for water to slow down and soak in, and to overtop the banks of creeks and channels when needed. These solutions often include multiple jurisdictions and restoration of natural habitat to achieve maximum effectiveness.
- Neighborhood Scale: Build solutions into corridors or neighborhoods that better manage rain where it falls. Communities establish regulatory standards for development that guide the use of neighborhood-scale strategies.
- Coastal Solutions: To protect against erosion and mitigate storm surge and tidally influenced flooding, use nature-based solutions to stabilize shorelines and restore wetlands (FEMA, 2021).

As forests and fields give way to urban development, the land cover becomes less pervious. This makes land less efficient at the tasks of maintaining natural runoff velocities and allowing rainfall to soak into the ground and recharge the groundwater. In the 20 years between 1997 and 2017, the Texas Land Trends project found that the Trinity Region lost over 360,000 acres (about twice the area of Austin, Texas) of working land to urban and suburban development. While the population increased by more than 50 percent during that time, four percent of the total acreage of natural areas were replaced with structures, roads, and parking lots. These types of hard surfaces can increase the potential for increased runoff unless flood mitigation is incorporated in the development. The acreage that remained as open space grew increasingly fragmented. In 1997, over one million landholdings consisted of parcels of more than 1,000 acres, whereas by 2017, the number of these larger parcels had declined dramatically. This trend was even more pronounced for landowners who held from 100-499 acres during the same period (Texas A&M NRI, 2025).

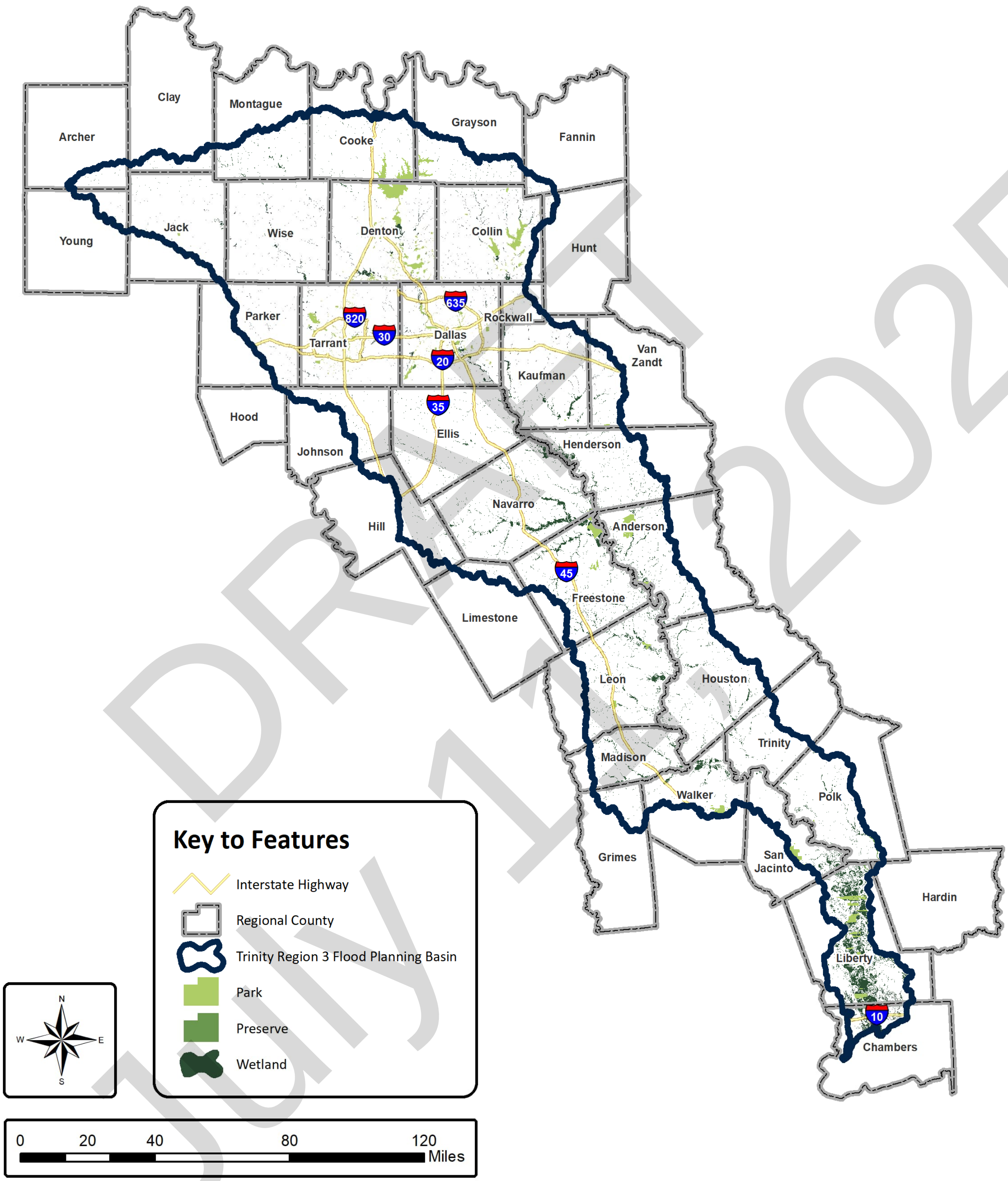
As the trend toward urbanization and fragmentation continues, the region should consider taking a more deliberate approach to managing its natural infrastructure to increase the benefits of open space. The USACE addresses this in its Engineering With Nature initiatives; alignment of natural and engineering processes delivers economic, environmental, and social benefits efficiently and sustainably through collaborative projects (USACE, 2025). The TWDB also has identified local, state, and national parks and wildlife management areas that form part of the region's natural infrastructure, all of which are illustrated in *Figure 1-19*.

Rivers, Tributaries, and Functioning Floodplains

The natural flood storage capacity of all streams and rivers and the adjacent floodplains contribute greatly to overall flood control and management. The floodplain is a generally flat area of land next to a river or stream that stretches from the banks of the river to the outer edges of the valley. Towards the primary flow path of the floodplain is an area of high hazard, called the floodway, where the flow tends to be more concentrated with a higher velocity. Surface water, floodplains, wetlands, and other features of the landscape function as a single integrated natural system. Disrupting one of these elements can lead to effects throughout the watershed, which increase the risk of flooding to adjacent communities and working lands.

Maintaining the floodplain in an undeveloped state provides rivers and streams with room to spread out and store floodwater to reduce flood peaks and velocities. Even in urban areas, preservation of this integrated system of waterways and floodplains serves a valuable function, as even small floods resulting from a 20 percent or 10 percent annual chance flood hazard can cause severe flood damage.

Figure 1-19: Natural Flood Infrastructure



Source: TWDB Flood Planning Data Hub, (TWDB, 2025), *State Wildlife Management Areas and Parks* (TPWD, 2022), *National Park Service Lands* (NPS, 2022), *and National Wetlands Inventory* (USGS, 2025)

Depending on soil type and permeability, a single acre of preserved floodplain can significantly reduce risk to properties downstream. With over 20 percent of its land area located in the floodplain, the Trinity River and its tributaries cross through both rural and highly urbanized areas of Texas. In rural areas where more of the floodplain is preserved in an undeveloped state, the more natural form of the river and its many tributaries and floodplains contribute to flood risk reduction downstream as they meander southeast on their way south to the Gulf (FEMA (EMI), 2021).

In the upper subregion of the Trinity Region, multiple entities participate in the Trinity Common Vision Corridor Development Certificate program for the purpose of stabilizing flood risk associated with floodplain development along the Trinity River within the DFW metroplex (NCTCOG, 2021). The program is a coordinated effort among NCTCOG, USACE, cities, counties, and others with flood control responsibilities along the corridor. USACE estimates that the Corridor Development Certificate program provides more than a third of the flood protection capacity along the Trinity River in the North Texas area, which is more than any one of its flood-control dams (NCTCOG, 2021). Additional information on this program is included in *Chapter 2*.

Wetlands and Marshes

Wetlands are some of the most effective natural features at recycling water as they minimize overland flow and reduce the need for other types of flood infrastructure. The USGS defines wetlands as transitional areas, sandwiched between permanently flooded deep water environments and well-drained uplands, where the water table is usually at or near the surface or the land is covered by shallow water (USGS, 2025). They can include mangroves, marshes, swamps, forested wetlands, coastal prairies, among other habitats and their soil or substrate is at least periodically saturated by fresh or salt water. A robust concentration of wetlands directly surrounds the southern end of the Trinity River. As the Trinity River approaches the coast, the concentration of wetlands increases. When left undisturbed by development, wetlands not only mitigate flooding from upstream, but also reduce the force of hurricane and other tropical storm induced coastal flooding resulting from storm surges. According to the USGS National Wetlands Inventory, wetlands comprise approximately 447,700 acres within the Trinity Region (USGS, 2025). This accounts for one of the largest types of natural infrastructure for the region.

Parks, Preserves, and Other Natural Areas

Parks and preserves serve as essential components of the ecosystem as they house a wide variety of local flora and fauna, as well as physical features that are necessary for the continued ecological health of the region. Parks include municipal, county, state, and national parks within the region, while preserves include the Texas Parks and Wildlife Department's (TPWD) state wildlife management areas. These areas provide a sanctuary for the natural aspects impacted by human activity. Additionally, these essential components offer water retention in the event of flooding and severe rainfall. Parks account for 211,600 acres while preserves account for 10,243 acres in the Trinity Region. This acreage includes state and local parks, wetlands identified on the national wetlands inventory, as well as USACE properties. These types of natural flood infrastructure are generally located in or close to floodplain areas throughout the basin with higher concentrations of them being located along or close to the major rivers. The largest concentration of these infrastructure types are located around Lake Ray Roberts between Cooke and Denton counties.

Coastal Areas

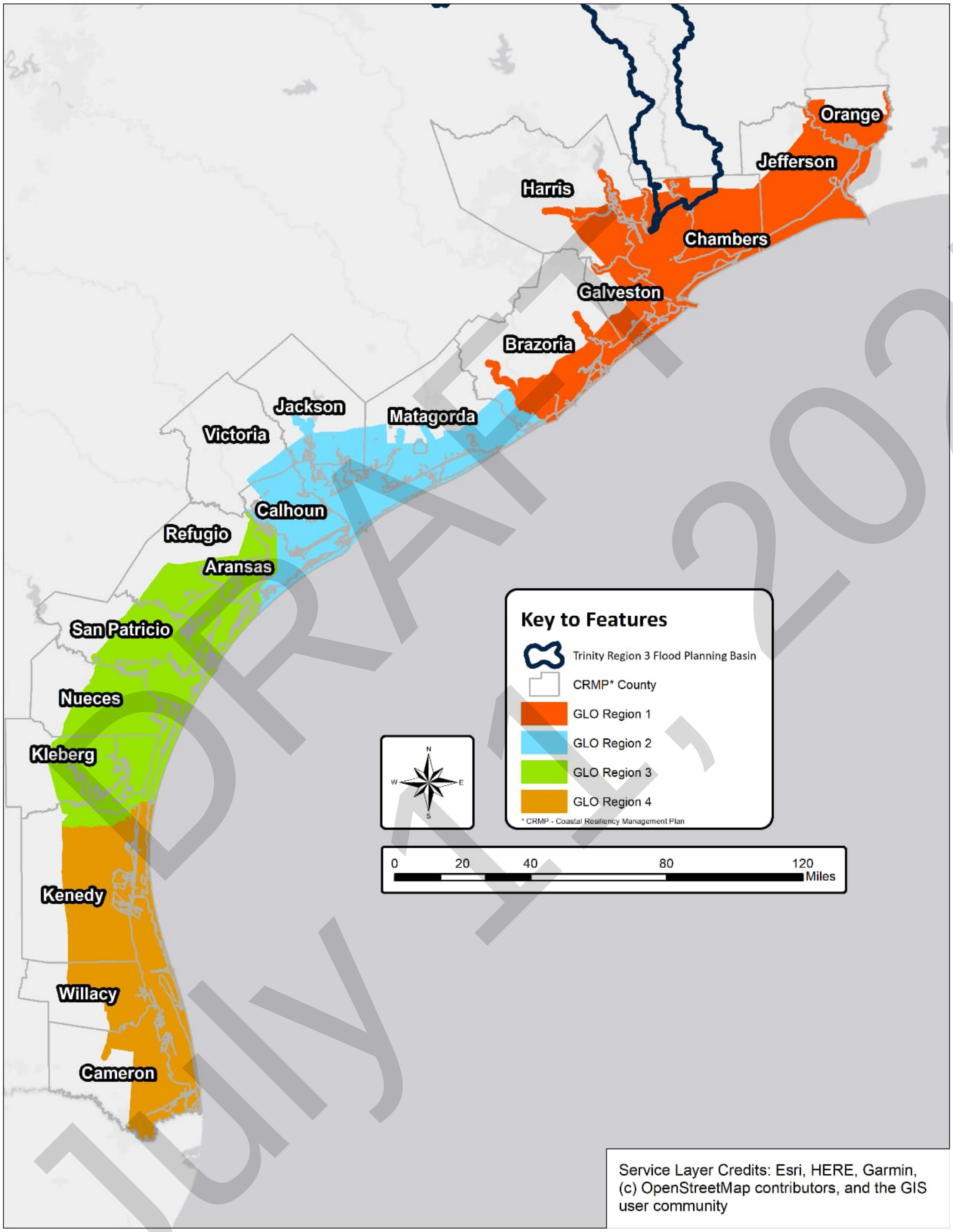
The National Coastal Zone Management Program is a voluntary partnership between NOAA and coastal states that was formed following the passage of the Coastal Zone Management Act of 1972.

In Texas, this program is managed by the Texas General Land Office (GLO) and implemented through the Coastal Resiliency Master Plan (CRMP). The geographic extent of the state's coastal zone is illustrated in *Figure 1-20*. The State divides the Texas coast into four regions for planning purposes based on approximate size, population centers, habitats, and environmental conditions. In the Trinity Region, only the southernmost area of Chambers County that touches Trinity Bay is in the Texas coastal zone, located in Region 1. The dynamics of flooding in coastal areas differ from riverine flooding. Coastal areas are significantly influenced by issues such as sea level rise, land subsidence, tidal flooding and storm surge, as well as rainfall events. Mitigating coastal flooding is one of the primary objectives of the CRMP, and proposed solutions include:

- Elevating structures
- Incorporating green infrastructure into development
- Creating flood resilient parks and recreational spaces
- Retaining and restoring open space
- Maintaining/creating freshwater wetlands and coastal prairies
- Infrastructure projects like levees, flood walls, and storm surge barriers

The Texas Coastal Resiliency Master Plan (TCRMP) was updated in 2023 to include Sea Level Rise (SLR) and storm surge modeling. This update provides quantitative information on the potential environmental impacts resulting from rising sea levels and enhanced storm surges, which are caused by higher water levels and changes in land cover along the Texas coast. The TCRMP employs an actions-based approach to mitigate coastal vulnerabilities and enhance coastal resiliency. This GLO report includes a list of Tier 1 projects in each region, which will be prioritized for funding in the coming years (GLO, 2023).

Figure 1-20: Texas Coastal Zone GLO Regions



Source: *2023 Texas Coastal Resiliency Management Plan* (GLO, 2023)

Constructed Flood Infrastructure/Structural Protections

A wide variety of structural measures are used by state and federal agencies, communities, and private landowners to protect development and agricultural areas from flooding. These may include flood control reservoirs, dams, levees, and local drainage infrastructure such as channels and detention areas. Dams and levees are some of the most frequently used defenses to achieve structural mitigation of future flood risk in this region and serve an established role of protecting people and property from flood impacts and will therefore be a primary focus of this section of this plan. *Figure 1-21* identifies the location of all known dams and levees in the Trinity Region. *Figure 1-22* is a photo of floodwaters contained with the Trinity Levee Systems.

Dams and Reservoirs

The Texas Commission on Environmental Quality (TCEQ) provided the 2021 list of State-Regulated Dams in Texas. When combined with the 2024 USACE National Inventory of Dams (NID), a total of 1,849 dams are identified within the Trinity Region.

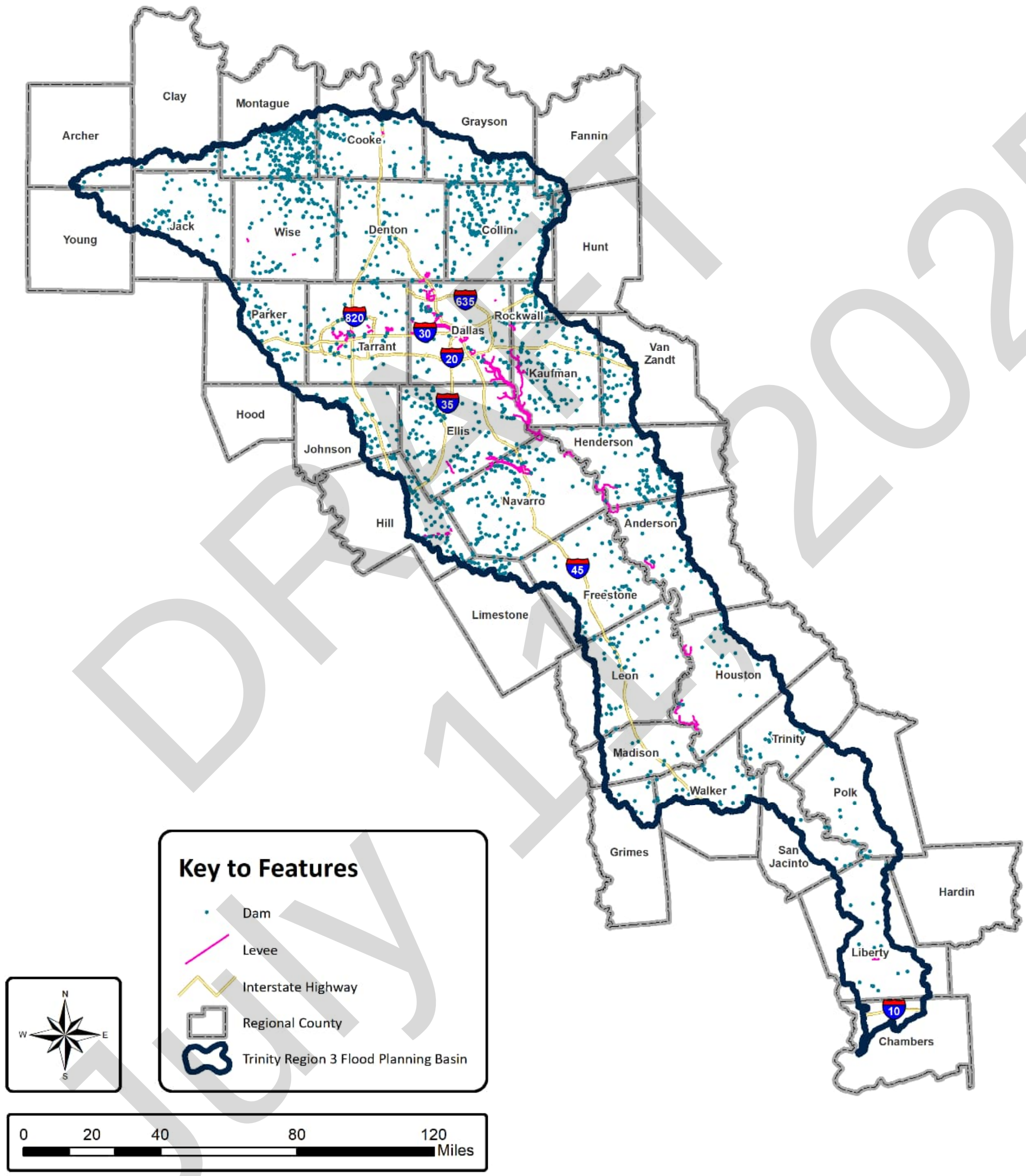
Dams in Texas serve a variety of purposes beyond flood control, including water storage for human consumption, agricultural use, power generation, industrial use, and recreation. More than 1,000 dams included in the TCEQ and NID inventories in the Trinity Region are identified as having flood control as one of its purposes. The focus of this plan is flood control dams, which are associated with reservoirs (lakes) permitted for flood control purposes.

The USACE is responsible for the management of the region's largest dams and flood control reservoirs. Although residents may know them for their recreational, water supply, and power generation functions, these facilities are particularly important in mitigating the effects of flooding because of their scale and ability to store vast amounts of water. Their size allows them to serve as a repository for flood waters and hold, store, and slowly release these waters over time to manage downstream flooding. (TCEQ, 2009).

Reservoirs in the Trinity Region owned and operated by USACE with flood control as a purpose include (USACE, 2024):

- Bardwell Lake
- Benbrook Lake
- Grapevine Lake
- Joe Pool Lake
- Lavon Lake
- Lewisville Lake
- Navarro Mills Lake
- Ray Roberts Lake

Figure 1-21: Constructed Flood Infrastructure/Structural Flood Protection



Sources: National Inventory of Dams (USACE, 2024) *and State Regulated Dams* (TCEQ, 2021)

Figure 1-22: Flooding, Trinity River Levees

Source: USACE (USACE, 2019)

For all dams that have a flood control purpose but are not maintained by the USACE, *Table 1.10* provides the total number of registered flood control dams in each county. Many of these dams were designed and constructed by the Natural Resources Conservation Service (USDA-NRCS), with the private property owner providing the land, the federal government providing the technical design expertise and the funding, and local owners and sponsors responsible for maintaining them into the future (TSSWCB, 2021).

These dams are owned and operated by a wide range of organizations and people, including state and local governments, public and private agencies, and private citizens. The TCEQ Dam Safety Program involves the permitting and inspections of these facilities, as well as maintaining hydrological data to establish standards for dam construction. However, the law provides for broad exemptions, which include private ownership, maximum capacity of less than 500 acre-feet, hazard classification, and location in a county with a population of less than 350,000 and/or outside city limits. Because of the diverse nature of ownership and capacity of dams, the frequency of inspection may vary widely as well. While high-hazard and large low-hazard dams are scheduled to be inspected every five years, small and intermediate size and low-hazard dams are primarily inspected at the request of an owner; as a result of a complaint; following an emergency such as a flooding event; or for determining the hazard classification (TCEQ, 2021). Even dams that are not permitted for flood control are subject to breaches and overtopping could have significant downstream impacts.

Table 1.10: Flood Control Dams by County

County	No. of Dams
Anderson	2
Clay	3
Collin	114
Cooke	57
Dallas	13
Denton	24
Ellis	88
Fannin	7
Freestone	1
Grayson	57
Henderson	5
Hill	58
Hunt	11
Jack	25
Johnson	22
Kaufman	77
Leon	1
Limestone	22
Madison	2
Montague	141
Navarro	97
Parker	34
Rockwall	27
Tarrant	5
Van Zandt	29
Wise	85
Young	1
TOTAL	1,008

Sources: National Inventory of Dams (USACE, 2024), *State Regulated Dams* (TCEQ, 2021), *and Flood Control Dams* (TSSWCB, 2021)

Within the Trinity Region, the TCEQ maintains hazard classifications of high, low, and significant for most dams based on function and purpose including the flood control dams identified in *Table 1.11*. High-hazard potential dams may be associated with the expected loss of seven or more lives or three or more habitable structures in the breach inundation area; excessive economic loss in or near urban areas where failure would be expected to cause extensive damage to:

- Public facilities,
- Agricultural, industrial, or commercial facilities,
- Public utilities,
- Major highways and/or railroads.

Table 1.11: Summary of Hazard Classification of Dams in the Trinity Region by County

County	High	Significant	Low	Unclassified	Total
Anderson	7	2	31		40
Archer			3		3
Chambers		1	2		3
Clay		1	6		7
Collin	85	9	65	4	163
Cooke	9	3	56		68
Dallas	29	2	30	2	63
Denton	27	5	38	4	74
Ellis	41	4	77		122
Fannin	6	2	2		10
Freestone	4	3	40		47
Grayson	14	2	48		64
Grimes		1	6		7
Henderson	25	7	52	1	85
Hill	3	7	62		72
Houston	1	1	23		25
Hunt	1	6	4		11
Jack	3	2	46		51
Johnson	22		16		38
Kaufman	34	16	58		108
Leon	1	2	41		44
Liberty	1	4	13		18
Limestone			24		24
Madison	3		17		20
Montague	5	3	173	6	187
Navarro	7	3	107		117
Parker	24	7	31	1	63
Polk	2		14	1	17
Rockwall	26		6		32

County	High	Significant	Low	Unclassified	Total
San Jacinto	1	1	4		6
Tarrant	42	4	21	3	70
Trinity	2	2	18		22
Van Zandt	5	5	23		33
Walker	2	4	28		34
Wise	25	3	71		99
Young			2		2
TOTAL	457	112	1,258	22	1,849

Source: TCEQ Total of dams in region by classification, provided December 2024

Dams categorized as having significant hazard potential may result in the loss of one to six human lives or one or two habitable structures in the breach inundation area downstream of the dam; appreciable economic loss, located primarily in rural areas where failure may cause:

- Damage to isolated homes,
- Damage to secondary highways or minor railroads,
- Interruption of service or use of public utilities, including the design purpose of the utility.

For low hazard dams, no loss of human life or damage to permanent habitable structures and minimal economic loss are anticipated in the breach inundation area (located primarily in rural areas where failure may damage occasional farm buildings, limited agricultural improvements, and minor highways. (TAC, 2009).

Levees

Levees are manufactured structures built alongside the banks of a river to provide flood protection of the area adjacent to the river. Levees are intended to keep floodwaters within the river banks. Approximately 1.5 million Texans and $248 billion worth of property and agricultural land are protected by levees. The Texas 2025 Levee Inventory Report lists 234 levee systems in the state (ASCE, 2025). Only a small percentage of levee systems in Texas are built and/or maintained by USACE. The remaining levees are locally owned and operated through Levee Improvement Districts and other private owners. The USACE-owned levees are maintained and inspected to federal standards and provide a high standard of flood protection. Although not all levees are used for flood control purposes, failure of a single levee could have multiple consequences for property and human safety downstream.

According to the National Levee Database, published in December 2024, the USACE manages 78 levee systems in the Trinity Region. Texas Water Code §16.236 requires that the design be based on the one-percent annual chance flood hazard plus an additional three to four feet of freeboard in urbanized areas (Luna, Lovell, Barrow, Ivey, & Furlong, 2013). The Texas Water Code also outlines a review and approval process for the construction and improvement of levees following the filing of an application to TCEQ and a set of preliminary plans for the levee that includes sufficient engineering detail for evaluation. Applications must include the location and extent of the structure, location of surrounding levees, reservoirs, dams, or other flood control structures which may be affected and the location and ownership of all properties lying within any proposed protected area or others which may be affected by the project's alteration of the flood flows. The preliminary plans must demonstrate the effects the proposed project will impose on existing flood conditions (TAC, 2005).

Table 1.12 provides the number of levees by county throughout the region. Dallas and Tarrant counties have the largest number of levees in the region. In 2004, FEMA initiated remapping for both Dallas and Tarrant counties that included the certification and accreditation of the DFW levee systems. Most USACE levees in Texas were designed to withstand a flood that exceeds the 0.2-percent annual chance storm event plus an additional three to four feet of freeboard (Luna, Lovell, Barrow, Ivey, & Furlong, 2013).

Smaller, concrete-lined channels can be found in many communities across the Trinity Region. Hardened, structural alternatives are being systematically reduced in application due to impacts on the environment and the potential for increasing flooding downstream and loss of open space. Recent channel improvements tend to incorporate more natural features.

Stormwater Management System

Stormwater management systems serve to manage both the quantity and quality of the water that drains into the Trinity River and its tributaries. Although survey respondents provided limited information as to their own stormwater management systems, participants in the Texas Pollutant Discharge Elimination System (TPDES) which is managed by TCEQ, are likely to have storm drainage infrastructure. Several large cities with populations exceeding 100,000 have implemented advanced drainage systems and are classified as Phase I Municipal Separate Storm Sewer Systems (MS4s). These cities are all located within the DFW metroplex in the Upper Basin. Small MS4s are communities located in urbanized areas as determined by the 2020 Census and are located throughout the Trinity Region.

Table 1.12: Number of Levees by County

County	Number of Levees
Anderson	1
Anderson, Henderson, Navarro	1
Cooke	1
Dallas	22
Dallas, Denton	1
Dallas, Ellis	1
Dallas, Kaufman	4
Denton	1
Ellis	4
Ellis, Navarro	3
Henderson	1
Henderson, Kaufman	1
Hill	4
Houston	4
Kaufman	4
Liberty	1
Navarro	6
Tarrant	16
Wise	2
TOTAL	78

Source: USACE National Levee Database (USACE, 2024)

Bridges and Culverts

Bridges and culverts are used to provide vehicular and pedestrian transportation across low points, including rivers, streams, creeks, and floodplains. Design criteria for these structures vary depending on the governing entity. These structures are usually designed to convey the flow of surface and stream water through the embankment for specific flood scenarios. Culverts and bridges can be overtopped by floodwater if the design capacity of the structure is exceeded. This type of flooding can occur during or following prolonged periods of rainfall or during or following an intense rainfall that overwhelms the culvert or bridge, such as a flash flood event or sunny day flood event. Additional information on bridges and culverts in relation to low water crossings is included in *Chapter 2* of this plan.

Coastal Areas

As previously noted, Chambers County is situated within the Region 1 GLO coastal zone. The 2023 TCRMP has identified Tier 1 nature-based and infrastructure projects aimed at enhancing ecological, societal, and administrative resiliency strategies and projects. The proposed nature-based projects include hydrologic connectivity, habitat creation and restoration, and shoreline stabilization. Additionally, infrastructure-based projects such as levees, flood walls, stream surge barriers, drainage systems, and roadway bridge repairs have been planned as proposed mitigation actions.

Non-Functional/Deficient Flood Mitigation Features/Condition and Functionality of Infrastructure and Other Flood Mitigation Features

The regional flood planning process requires each planning region to identify its existing natural and constructed flood infrastructure and perform an assessment of the condition and functionality of the major flood infrastructure. During the first flood planning cycle, RFPGs utilized limited GIS data provided by communities or publicly available sources to create a flood infrastructure inventory. Communities lacking a GIS-based asset inventory did not have a defined process for providing such information to the RFPGs for incorporation into the flood planning process.

Due to significant data limitations in the first planning cycle, the TWDB embarked on a research project for developing readily usable planning-level infrastructure condition assessment methods, including a toolkit to assess the condition of flood infrastructure at a regional planning level. The resulting Flood Infrastructure Assessment Toolkit (Toolkit) provides a standard methodology for classifying and prioritizing flood infrastructure and populating the condition and functionality fields within the TWDB flood planning database. Supporting guidance and documentation, including a Toolkit User Guide, can be found at Toolkit User Guide and the spreadsheet-based resource can be found here: https://www.twdb.texas.gov/flood/planning/planningdocu/2028/doc/FloodInfrastructure_ClassificationGuidance.pdf?d=53077.80000000028 Infrastructure Assessment Toolkit.

The methodology utilizes empirical and approximate data sources as the basis for the classification guidance. A three-tier data confidence rating system was developed as part of the methodology. This allows the confidence of each classification, based on the data utilized, to be documented with the assigned classification. Based on this methodology, classification guidance for functionality and condition has been developed for most of the flood infrastructure types.

Asset Classification Guidance and Prioritization

The following criteria have been incorporated into the Toolkit to classify each asset type according to functionality, condition, and the confidence rating related to each category. Functionality and condition classification guidance has been developed for most of the constructed flood infrastructure. Since natural flood infrastructure assets do not have a designed level of service, guidance for assessing functionality (capacity) has not been developed. However, guidance for determining deficiencies has been developed.

CONDITION

- Deficient: The infrastructure or natural feature is in poor structural or non-structural condition and needs replacement, restoration, or rehabilitation.
- Non-Deficient: The infrastructure or natural feature is in good structural or non-structural condition and does not require replacement, restoration, or rehabilitation.
- Unknown: Condition or deficiency for infrastructure or natural asset is unknown.

FUNCTIONALITY

- Functional: The infrastructure or natural feature is serving its intended design level of service.
- Non-Functional: Infrastructure or natural feature is not providing its intended design level of service.
- Unknown: Functionality or capacity for infrastructure or natural asset is unknown.

DATA CONFIDENCE LEVEL

- Low: No studies, reports, or analysis available to confirm or deny functionality or deficiency rating.
- High: Official studies have been performed by a reputable entity to confirm the functionality or deficiency rating.
- None: No known data available to confirm the functionality or deficiency of the asset.

TWDB has developed a flood infrastructure assessment prioritization ranking (*Error! Not a valid bookmark self-reference.*). Each type of flood infrastructure has been assigned to a priority group based on the potential risk to a community, with assets of similar consequence of failure grouped together. Assets within Priority Group A have the highest consequence of failure and should be prioritized for assessment, followed by Priority Group B and then Priority Group C. Assets within Priority Group C have little to no consequence of failure. TWDB advises that the flood asset inventory should be progressively developed based on the priority group and in the order listed in *Table 1.13*.

Table 1.13: TWDB Flood Inventory Prioritization

Priority Group A	Priority Group B	Priority Group C
• Dam • Levee • River • Sea Wall • Sea Barrier • Low Water Crossing • Roadway Stream Crossing	• Storm Drain System • Stormwater Channel • Weir • Reservoir • Revetment • Tributary • Pond	• Tidal Barrier • Tidal Gate • Wetland • Dune • Sinkhole • Other-Natural • Other-Constructed

Source: Toolkit User Guide (TWDB, 2025)

Condition and Functionality of Flood Infrastructure

The first step in developing a flood infrastructure inventory is to identify data sources that provide information such as installation date, constructed material, and dimensions of individual infrastructure assets. Potential data sources include hard-copy maps, engineering reports, design drawings, and staff institutional knowledge. The Trinity RFPG has utilized the following data sources for the infrastructure condition and functionality assessment.

Table 1.14: Flood Infrastructure Assessment Toolkit - References and Data Sources

Infrastructure Type	Reference and Data Sources
Dam	*National Inventory of Dams (NID)* (USACE, 2024) *Texas State Soil and Water Conservation Board (TSSWCB)* (TSSWCB, 2021) *Texas Commission on Environmental Quality (TCEQ)* (TCEQ, 2021)
Levee	*National Levee Database (NLD)* (USACE, 2024)
Low Water Crossing	*Low Water Crossings* (StratMap, 2013)
Culverts	*USGS WaterWatch – Streamflow Conditions* (USGS, 2025)
Bridges	*USGS WaterWatch – Streamflow Conditions* (USGS, 2025)
Storm Drain System	*TxDOT Hydraulic Design Manual* (TxDOT, 2019)
Stormwater Channels	*Culvert and Storm Drain System Inspection Manual* (Beaver, Richie, & Simpson, 2016)
Reservoir	*TxDOT Hydraulic Design Manual* (TxDOT, 2019)
Rivers	*Texas Parks and Wildlife: Texas River Guide; River Authority Webpages* (TPWD, 2025)
Tributaries	*Texas Parks and Wildlife: Texas River Guide; River Authority Webpages* (TPWD, 2025)
Wetlands	*National Wetland Condition Assessment* (EPA, 2023)

After the initial data collection step, the Trinity RFPG implemented TWDB's Infrastructure Toolkit methodology to classify constructed and natural flood infrastructure. The RFPG used the recommended flood inventory prioritization as a guiding tool in performing the assessment (*TWDB has* developed a flood infrastructure assessment prioritization ranking (*Error! Not a valid bookmark self-reference.*). Each type of flood infrastructure has been assigned to a priority group based on the potential risk to a community, with assets of similar consequence of failure grouped together. Assets within Priority Group A have the highest consequence of failure and should be prioritized for assessment, followed by Priority Group B and then Priority Group C. Assets within Priority Group C have little to no consequence of failure. TWDB advises that the flood asset inventory should be progressively developed based on the priority group and in the order listed in *Table 1.13.*

Table 1.13). *Table 1.15*, *Table 1.16*, and *Table 1.17* summarize the condition and functionality of the constructed and natural flood infrastructure features evaluated with the Infrastructure Toolkit. Due to data availability and budgetary constraints, the RFPG was not able to classify all infrastructure assets within the Trinity Region using the toolkit. As a result, the inventory reflects the best available information at this time, while highlighting the need for continued data development in future planning cycles.

The dam infrastructure category includes 1,848 features within the Trinity Region. These features were obtained from the National Inventory of Dams (NID), the TCEQ Dam Inventory, and the Texas State Soil and Water Conservation Board.

These features are classified into 10 subcategories:

- Flood risk reduction (1,008)
- Hydroelectric (1)
- Irrigation (98)
- Recreation (343)
- Debris control (2)
- Fire protection, stock (70)
- Fish and wildlife pond (2)
- Tailings (4)
- Water supply (96)
- Other (224)

The infrastructure assessment classified 72 percent of all dams as functional (i.e., infrastructure serves its intended design level of service) as shown in *Figure* . These dams were classified as functional since they can pass the required percent of the Probable Maximum Flood (PMF) based on hazard classification and size as indicated in the TCEQ Dam Inventory dataset, which is considered a high-confidence data source. An estimated 62 percent of those classified as flood risk reduction dams are considered functional. Dams classified as non-functional were based on proxy indicators such as age and ownership, which are considered low-confidence data sources. All dams classified as non-functional in the Trinity Region are older than 50 years and not owned by any Federal entity or any other entity that provides power or water supply.

An estimated 20 percent of all dams and 15 percent of flood risk reduction dams are considered non-deficient (i.e., they are in good structural condition and do not require replacement, restoration, or rehabilitation) as shown in *Figure 1-24.* A total of 265 dams were classified as deficient based on a condition rating of "Poor" or Unsatisfactory" in the National Inventory of Dams, which is considered a high-confidence data source. The deficient classification for most dams (1218 out of 1483) was based on proxy indicators such as age and ownership, which are considered low-confidence data sources. For the Trinity Region, many dams classified as deficient are primarily greater than 50 years of age and not owned by any Federal entity or any other entity that provides power or water supply.

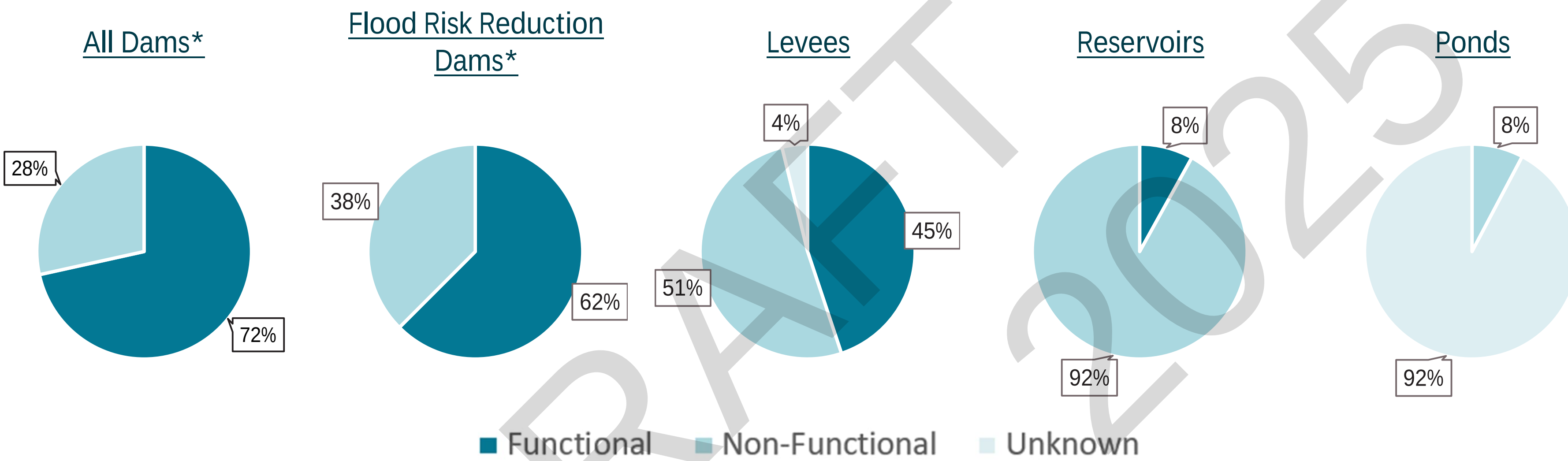
Functionality and condition are assessed in a similar way for reservoirs, using information from corresponding dams when possible.

For levees that have an accreditation status determined by FEMA, the functionality and condition ratings are determined with a high-confidence rating if the effective FIRM panel was published after 2018 and a low-confidence if the effective FIRM panel was published before 2018. For levees without accreditation status or those that are unknown, assumptions of their condition are made based on levee age. An estimated 45 percent of levees are considered functional and 49 percent are considered non-deficient.

Functionality and condition of ponds have been assessed based on their construction year. Pond age has been assumed based on proximity to either a corresponding dam or nearby structure using the National Structure Inventory (NSI). The primary reason for deficiency is that the estimated pond age was greater than 50 years. The primary reason for non-functionality is that the estimated pond construction date is before 2018, which is the Atlas 14 adoption date. If a date could not be assigned, the pond is still considered to be "Unknown" for functionality and condition ratings. These ratings are given with low confidence.

Wetlands are assessed for their condition using information from the National Wetlands Inventory (NWI). If a wetland has been modified by human activities—such as excavation, diking, or impoundment—it is considered deficient. Conversely, if a wetland has not been modified, it is considered non-deficient. These ratings are assigned with low confidence.

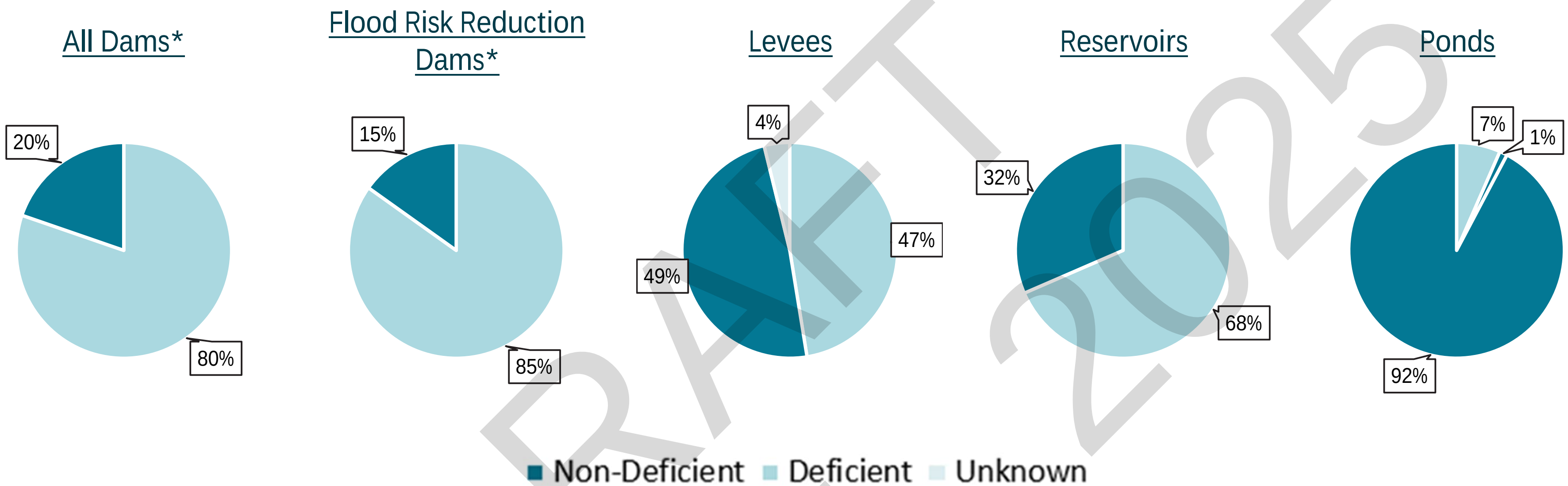
Figure 1-23: Functionality of Constructed Features



*The "Non-Functional" classification for dams was based on proxy indicators such as age and ownership, which are considered low-confidence data sources. All dams classified as "Non-Functional" in the Trinity Region are older than 50 years and not owned by any Federal entity or any other entity that provides power or water supply. For further details on infrastructure functionality classifications and data confidence levels, see the following Section: *Error! Reference source not found.*

Source: 2025 Flood Infrastructure Assessment for the Trinity Region

Figure 1-24: Condition of Constructed Features



*The “Deficient” classification for most dams (1218 out of 1483) was based on proxy indicators such as age and ownership, which are considered low-confidence data sources. All dams classified as “Deficient” in the Trinity Region are older than 50 years and not owned by any Federal entity or any other entity that provides power or water supply. For further details on infrastructure condition classifications and data confidence levels, see the following Section: *Error! Reference source not found.*

Source: 2025 Flood Infrastructure Assessment for the Trinity Region

Table 1.15: Constructed Flood Infrastructure Functionality

Infrastructure Type	Priority Group	Functional	Non-Functional	Unknown
Dam (all types)	A	1,322	526	0
Dam (flood risk reduction)	A	630	378	0
Levee	A	35	40	3
Reservoir	B	22	251	0
Ponds	B	0	1,416	16,845
TOTAL		2,009	2,611	16,848

Table 1.16: Constructed Flood Infrastructure Condition

Infrastructure Type	Priority Group	Deficient	Non-Deficient	Unknown
Dam (all types)	A	1,483	365	0
Dams (flood risk reduction)	A	855	153	0
Levee	A	37	38	3
Reservoirs	B	187	86	273
Ponds	B	1,204	212	16,845
TOTAL		3,766	854	17,121

Table 1.17: Natural Flood Infrastructure Condition

Infrastructure Type	Priority Group	Deficient	Non-Deficient	Unknown
Wetlands	C	3,054	25,976	0
TOTAL		3,054	25,976	0

Potential for Restoration

No database is currently available to assess the potential for flood infrastructure restoration. None of the survey participants provided any information regarding specific restoration needs for existing infrastructure. However, maintenance and restoration of existing infrastructure are important to maintain functionality. The Trinity RFPG researched locations of proposed or ongoing flood mitigation projects that support flood infrastructure restoration, flood risk mitigation, and overall flood resiliency in the region.

Proposed or Ongoing Flood Mitigation Projects

Data for this section was acquired through the Trinity Region data collection survey, publicly available planning documents from entities such as Hazard Mitigation Plans (HMPs), and other online databases hosted by local, regional, state, and federal sources. This information was further supplemented by direct outreach to entities when specific questions were identified. More detailed results are available in *TWDB-Required Table 3* in *Appendix A*.

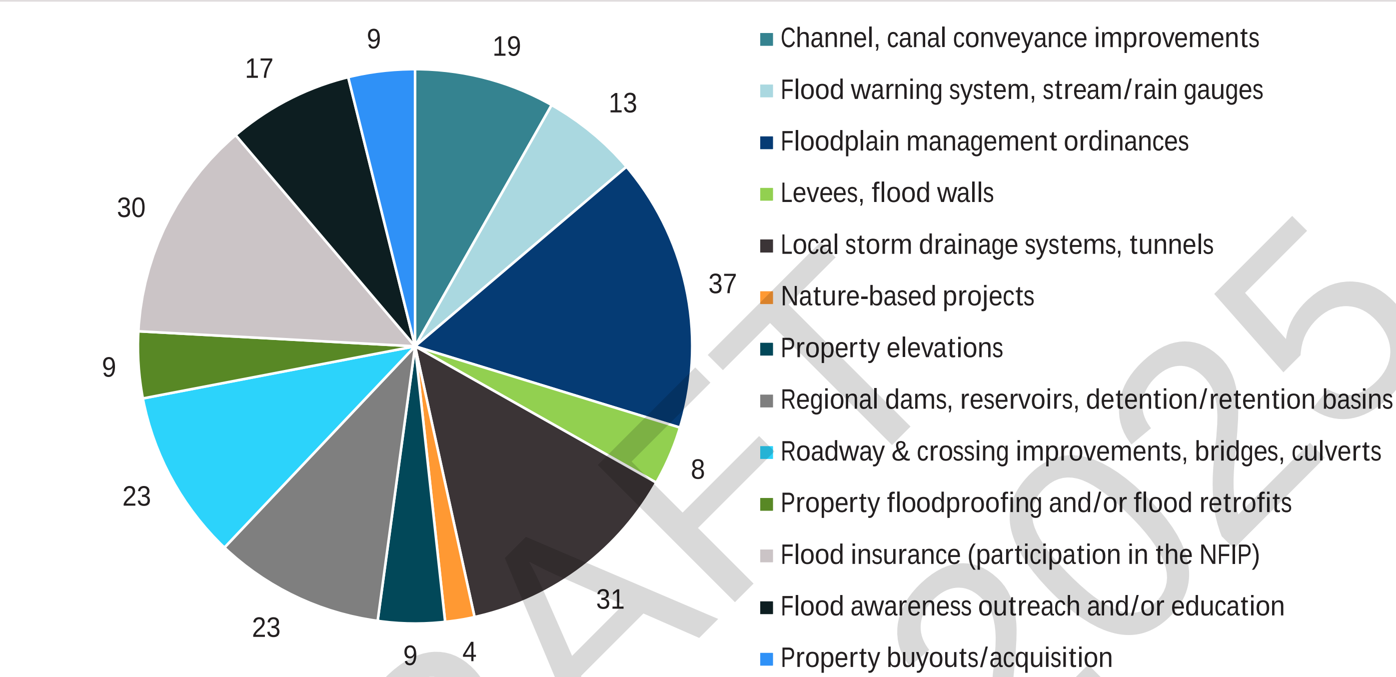
Ongoing or Proposed Projects Identified in Trinity Region Data Collection Tool and Web Map

A total of 232 projects were identified within the Trinity Region as being "currently in progress" via the Data Collection Tool. There are a number of gaps in this dataset as little information was provided on individual projects. Many entities indicated that they anticipated pursuing a variety of flood projects and activities in the coming years. Respondents were allowed to select multiple alternative actions and strategies from the survey.

Most respondents to the survey indicated they intended to pursue and implement more than one type of flood project to improve flood resiliency. *Figure 1-25*: represent all potential types of projects, activities, and strategies identified in the survey. The implementation of floodplain management ordinances emerged as the most favored solution among communities, followed by storm drainage systems and tunnels, participation in the National Flood Insurance Program (NFIP), roadway crossing improvements, and dams or reservoirs or detention/retention basins. Flood projects submitted from the survey will be submitted for potential recommendation as FMPs to be included in the 2028 Trinity Regional Flood Plan. This will be covered in *Chapter 4*.

To accompany this chart, *Table 1.18* details the frequency with which communities plan on implementing a particular type of flood project, activity, or strategy. While several project types, like local storm drainage systems and roadway improvements may be local in nature, many other solutions are more regional in nature, such as dams/reservoirs or highway improvements that may involve state agencies.

Figure 1-25: Proposed or Ongoing Flood Mitigation Project



Source: Trinity Region data collection tool and interactive web map as of March 31, 2025

Table 1.18: Proposed Mitigation Projects by Type

Type of Projects	Count
Channel, canal conveyance improvements	19
Flood warning system, stream/rain gauges	13
Floodplain management ordinances	37
Levees, flood walls	8
Local storm drainage systems, tunnels	31
Nature-based projects	4
Property elevations	9
Regional dams, reservoirs, detention, retention basins	23
Roadway and crossing improvements, bridges, culverts	23
Property floodproofing and/or flood retrofits	9
Flood insurance (participation in the NFIP)	30
Flood awareness outreach and/or education	17
Property buyouts/acquisition	9
TOTAL	232

Source: Trinity Region data collection tool and interactive web map as of March 31, 2025

These proposed or ongoing flood projects are derived from the community survey responses throughout the Trinity Region. According to the survey responses, only four communities are anticipating utilizing nature-based solutions. The predominant types of projects being pursued are:

- Floodplain management ordinances
- Local storm drainage systems, tunnels
- Flood insurance (participation in the NFIP)

Based on the survey data, it appears that there were limited plans for flood projects focusing on nature-based solutions, levees or flood walls. It is important to notice that there may be a larger number of projects than displayed, since entities submitted the categories of projects they were pursuing, but not the number of projects within each category. Potential funding sources for these projects that were identified by these entities include FEMA, GLO, Community Development Block Grant Mitigation, TWDB, Texas Division of Emergency Management, as well as local funding sources coming from their own general fund, taxes, stormwater utility fees and other fees. A breakdown of the ongoing specific flood mitigation projects is given in *Figure 1-26* and *Figure 1-27* showing the percentage of projects across certain regional characteristics.

Figure 1-26: Types of Ongoing Flood Mitigation Projects

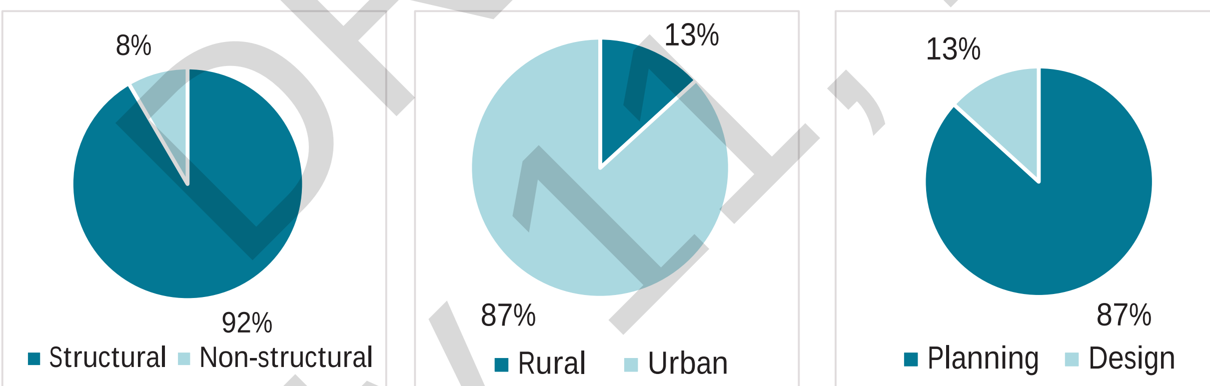
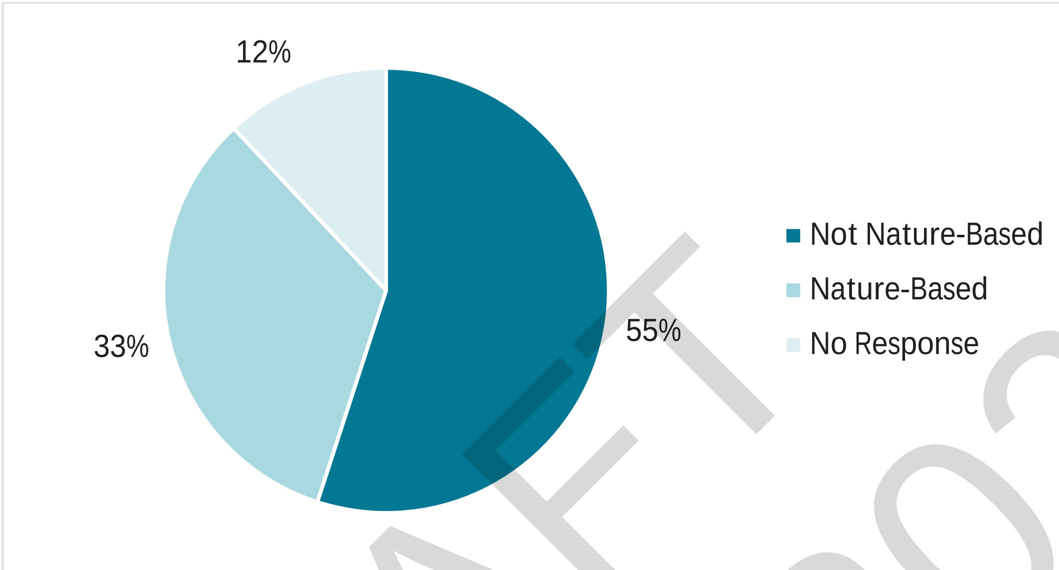


Figure 1-27: Nature-Based Ongoing Flood Mitigation Projects



Structural Projects Under Construction

Cross-referencing known projects with information from other sources like GLO, Tarrant Regional Water District (TRWD), and USACE, the structural projects currently under construction were determined to be 93. These projects are characterized by dedicated funding, are currently in a phase of construction, and have target completion dates.

Non-Structural Flood Mitigation Projects Being Implemented

Based on cross-referencing known projects with information from other sources like GLO, TRWD, and USACE, the number of non-structural projects currently under construction were determined to be 17. These projects are characterized by dedicated funding, are currently in a phase of implementation, and have target completion dates.

Structural and Non-Structural Flood Mitigation Projects with Dedicated Funding and Year Complete Funding Sources

Several respondents to the survey indicated that Stormwater Utility Fees, Bond Programs, Ad Valorem Tax, and the General Fund were anticipated to be their primary source of revenue to complete these improvements. Four respondents indicated that the entity would draw down funds from Special Tax Districts.

Non-local funding sources the entities are able to pursue to complete these projects include:

- Cooperating Technical Partners (CTP) funds (FEMA)
- Coastal Management Program (CMP) - Texas General Land Office

- Gulf of Mexico Energy Security Act (GOMESA) - Bureau of Ocean Energy Management
- Coastal Impact Assistance Program (CIAP)
- Oil Spill Prevention & Response Act (OSPRA) Research and Development
- National Oceanic and Atmospheric Administration (NOAA)
- Texas A&M University at Galveston
- Texas Agricultural Experiment Station
- Texas Cooperative Extension - Texas A&M AgriLife Extension
- Texas Parks and Wildlife Department
- Galveston Bay Foundation
- Trinity Bay Soil & Water Conservation District
- Hazard Mitigation Grant Program (HMGP- FEMA/TDEM)
- Pre-Disaster Mitigation (FEMA)
- USDA NRCS
- Flood Mitigation Assistance (FEMA)
- Flood Infrastructure Fund (FIF) (TWDB)

Plans Identified in Hazard Mitigation Projects

Table 1.19In addition to the projects identified via the survey conducted for this project, Hazard Mitigation Plans (HMPs) for the communities of the Trinity Region also served as an important source of information about future actions to promote flood mitigation. *Table 1.19* lists the types of flood projects, activities, and strategies and numbers of each subcategory type identified in the current HMPs in the Trinity Region. The available HMPs range in date from 2013-2025. Some HMPs are in the process of updating for the latest four-year cycle and are not available online. In these cases, the previous HMP was used. Projects listed in HMPs dated 2013-2021 are assumed to be completed or close to completion, while ongoing and proposed ones are from HMPs dated 2022-2025.

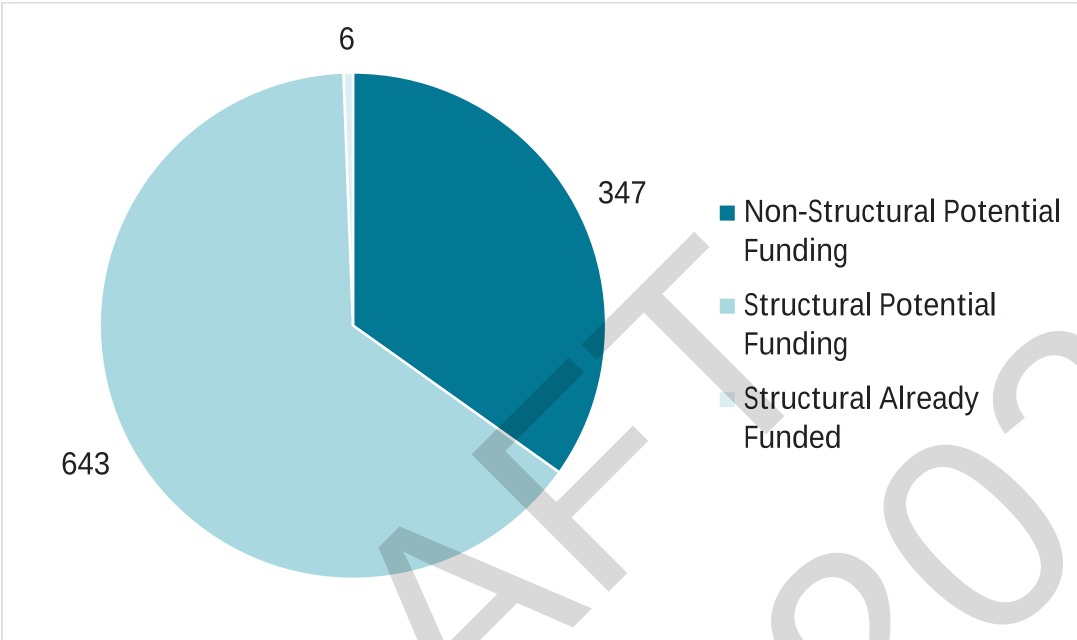
Table 1.19: Projects Identified in Hazard Mitigation Plans

Subcategory	Count
Infrastructure Improvement	276
Urban Planning and Maintenance	275
Education & Awareness for Citizens	276
Drainage Control & Maintenance	275
Equipment Procurement for Response	281
Flood Study/Assessment	274
Outreach and Community Engagement	275
Installation/Procurement of Generators	210
Buyout/Acquisition	141
Technology Improvement	281
Flood Insurance Education	243
Natural Planning Improvement	273
Erosion Control Measure	258
TOTAL	3,338

Accounting for projects that are assumed complete based on HMP publication date, there is a total of 996 ongoing or proposed projects identified in the HMPs. Specific locations and creeks were listed for some of the projects, activities, and strategies, but most projects encompass all creeks or roads within a given city or county limits. There may be a larger number of projects than displayed, since entities submitted the categories of projects they were pursuing, but not the number of projects within each category.

These projects are divided between structural and non-structural, and between potentially funded and funded, as shown in *Figure 1-28*.

Figure 1-28: Structural versus Non-Structural Projects



Due to the number of projects that are only "potentially funded", *Table 1.19* is best suited to provide evidence of the types of projects that will need funding in the future. Not every community provided a dollar value for future projects, so it is difficult to tally the total cost of needed mitigation from data collection alone. However, it is likely that there is a large need for funding structural and non-structural flood projects, given the information provided above.

Due to the extreme weather conditions experienced throughout the state, additional sources of funding may become available dependent upon disaster declarations given by the state or federal government. Disaster declaration funding can be used to support items included in the HMPs, such as equipment for emergency response or generators.

Many non-structural initiatives can be accomplished with lower investment, while an ongoing program of buyouts and acquisitions may be a longer-term initiative.

Many of the projects identified by communities may have already been completed in the time since the HMP was adopted. When possible, projects were cross referenced with the specific ongoing projects submitted to remove the risk of double-counting projects.

Flood Infrastructure Fund Projects

Of the applications to the Flood Infrastructure Fund (FIF) in 2021, twelve projects in the Trinity Region received funding. These projects, awarded to the Trinity River Authority, NCTCOG, Dallas County, and Kaufman County are primarily for flood and drainage studies. The City of

Palestine has two separate projects for dam improvement studies to ensure compliance with TCEQ regulations.

Within the 2024-2025 application cycle there were 56 FMPs that could potentially receive FIF funding within the Trinity Region. As of May 2025, awards for FMPs in the 2024 State Flood Plan (which pulled from the 2023 Regional Flood Plan) have just begun. Awards for the Trinity Region through the 2024 FIF distributions will need to be determined once funding award results are final.

The Trinity Regional Flood Planning Group recommended a total of 83 FMPs in the 2025 Amendment to the 2023 Regional Flood Plan. No FMPs had been removed from the list due to FIF distributions. These projects will be eligible for FIF distributions in 2026.

Potential Benefits of Planned Mitigation Projects

Although most communities did not provide detailed information about their intended projects, there appears to be substantial awareness of the value of preparing for future flood events. Both survey responses and a review of HMPs indicate that substantial investments are being made in local drainage, roadway, and flood control infrastructure. Structural measures for flood protection offer several benefits, primarily protecting people and property from flood damage, and can also enhance water quality and biodiversity. These measures include physical structures designed to alter the pathway of damage, reduce the probability of a flood, or to reduce the impact of a flood.

Non-structural mitigation is aimed at reducing the impact of an event on the community. It primarily involves land use planning, zoning regulations, and other strategies that adapt human activities to the natural characteristics of the floodplain. This is often more cost-effective than structural mitigation and prompts more community involvement. Review of the 2022-2025 HMPs shows approximately 35 percent of the entities in the HMPs intend to adopt and/or update non-structural measures, such as land use regulations that would help future development avoid areas of flood risk.

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