

Chapter 1

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INTRODUCTION

In 2019, the 86th Texas Legislature passed Senate Bill 8, which authorized the creation of the first-ever State Flood Plan for Texas. Sections §16.061 and §16.062 were added to the Texas Water Code. They established the regional and state flood planning process, which is to be led and administered by the Texas Water Development Board (TWDB). The legislation provided that the TWDB shall prepare and adopt a comprehensive state flood plan incorporating the regional flood plan approved under §16.062.

Per Texas Water Code Section §16.061, the State Flood Plan must (1) provide for orderly preparation for and response to flood conditions to protect against the loss of life and property, (2) be a guide to state and local flood control policy, and (3) contribute to water development where possible. Future regulatory and financing decisions by the TWDB for strategies and other efforts to mitigate flood risks need to be consistent with the approved State Flood Plan.

Per Texas Water Code Section §16.062, Regional Flood Plans must (1) use scientific data and updated mapping, (2) include a general description of the condition and functionality of flood control infrastructure in the flood planning region, (3) identify flood control projects under construction or in the planning stage, (4) provide information on land use changes and population growth in the flood planning region, (5) identify areas in the flood planning region that are prone to flood, and (6) identify flood control solutions for those areas. The regional flood plan should indicate whether the identified flood control solution meets an emergency need, uses federal money as a funding component, and may also serve as a water supply source.

The first Region 15 Flood Plan was approved and adopted by the Region 15 on December 7, 2022. The plan was amended twice; details of those revisions are included below:

- Amendment 1, adopted by the Regional Flood Planning Group (RFPG) on June 28, 2023. The amendment was issued to include additional FMX submissions from regional stakeholders and detail the alignment with the State Flood Plan Development Guidance Principles (31 TAC 362.3) and incorporate stakeholder input.
- Amendment 2, adopted by the RFPG on March 19, 2023. To ensure broad funding accessibility for communities throughout the Region, a call for additional FME and FMP items was issued in December 2024. The second amendment to the 2023 Regional Flood Plan incorporated 89 new FMEs, 35 new FMSs, and 12 new FMPs.

Each revision and amendment to the Region 15 RFP was conducted in accordance with Texas Administrative Code Chapters 361 and 362. All plan versions and supporting documentation remain publicly accessible via the Region 15 RFPG website.

This DRAFT Regional Flood Plan, to be formally issued in 2028, will be the first plan update for the Region 15 Lower Rio Grande Regional Flood Plan. This 2028 update builds on the foundation and lessons learned from the initial 2023 Regional Flood Plan and its amendments, continuing the commitment to scientific data, stakeholder engagement, and transparent process. The plan remains focused on

identifying flood risks, evaluating mitigation strategies, and supporting flood resilient communities throughout the Lower Rio Grande basin.

Overview of Flood Planning Region 15

The Lower Rio Grande River Basin, also known as Flood Planning Region 15, covers the southern half of the Rio Grande River Basin within Texas. The upstream portion of the region begins at International Amistad Reservoir in Val Verde County and extends along the Rio Grande to the Gulf of Mexico, encompassing all or portions of 14 counties. Because the river itself forms the international boundary between Mexico and the United States in the state of Texas, this regional flood planning group is only planning for roughly one-quarter of the contributing watershed area. **Figure 1.1** shows a map of the Lower Rio Grande Region 15- Regional Flood Planning Area.

Known as “Big River” in Spanish, the Rio Grande has its headwaters in Colorado, flows through New Mexico, and meets the Rio Concho at their confluence in Mexico. Flood Planning for the upper reach is being completed by a separate Regional Flood Planning Group, Region 14, also known as the Upper Rio Grande RFPG.

With an extremely arid climate, the Lower Rio Grande Basin has a substantially low watershed yield from year to year. Other streams of note within the basin are the Devils River, Pecos River, Arroyo Colorado, Mud, and Pinto Creeks. This region apportions surface water between New Mexico and Texas through the Pecos River Compact. Similarly, surface water from the Rio Grande is apportioned between Colorado, New Mexico, and Texas through the Rio Grande Compact and across international boundaries through the United States and Mexico Water Treaty of 1944. Falcon International Reservoir and Amistad International Reservoir are two reservoirs within this region that border the U.S. and Mexico.

The Lower Rio Grande Region is directly exposed to hurricane events in the south, and tropical storms, depressions, and related events (hail, high winds, etc.) in the upper reaches of the region. In recent years, the region has also experienced the effects of atmospheric rivers, narrow corridors of concentrated moisture in the atmosphere that can deliver intense rainfall over short periods. These atmospheric rivers, along with other large-scale weather patterns, have contributed to an increase in both the frequency and intensity of extreme precipitation events and flooding seen in the region. Most flooding in this region is caused by intense, localized thunderstorms and frontal-type storms during the spring and summer months, but the growing influence of atmospheric rivers and changing climate conditions are amplifying flood risks and variability.

Figure 1.1 Map of Region 15 Regional Flood Planning Basin, showing counties included



Source: TWDB Flood Planning website

Region 15 represents the drainage areas contributing to the Lower Rio Grande for the following 14 counties:

- Brooks*
- Cameron
- Dimmit*
- Edwards*
- Hidalgo
- Jim Hogg*
- Kenedy*
- Kinney*
- Maverick*
- Starr
- Val Verde
- Webb*
- Willacy
- Zapata

The “*” by the County name in the list above indicates that this county is partially within this RFPG and is represented by at least one other RFPG.

Regional Flood Planning Group

During the inaugural Flood Planning Cycle, the TWDB coordinated with entities throughout the Lower Rio Grande planning region to identify a sponsor for the Flood Planning Region. The Lower Rio Grande Regional Flood Planning Group (Region 15) selected the Hidalgo County Drainage District 1 (HCDD1) to serve as its sponsor for the initial plan and future updates.

The sponsor's role is to administer the regional planning process. For each planning cycle, funding from the TWDB enables the Regional Flood Planning Group to hire a technical consultant to support the plan development. The sponsor also provides support for meetings and communications and to manage the technical consultant contract. For the 2023 and 2028 flood planning cycles, the RFPG selected a consultant team led by the Halff Associates (Halff) to assist with the plan update. The consultant team works closely with HCDD1 to ensure the plan development is being completed in alignment with the State Flood Plan Guidance Principles (31 TAC §362.3), and in accordance with all applicable laws, regulations, and requirements of the TWDB, to include soliciting and considering public input, identifying specific flood risks, and recommending flood management evaluations (FME), strategies (FMS), and projects (FMP) to reduce risk in the region.

The RFPG membership includes a variety of stakeholders to ensure a multitude of perspectives to inform the plan development, including:

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

The Regional Flood Planning Group maintains a list of up-to-date members on its publicly facing website: www.region15LRG.org/page/members. Region 15’s Regional Flood Planning Group is led by the following executive committee members:

Table 1.1 Executive Committee Members for the Lower Rio Grande Regional Flood Planning Group

Name	Position	Entity
David A. Garza	Chair	Cameron County
David L. Fuentes	Vice-Chair	Hidalgo County Drainage District No. 1
Vacant	Secretary	

Region 15’s Regional Flood Planning Group is composed of the following voting members:

Table 1.2 Lower Rio Grande Regional Flood Planning Group Voting Members

Name	Interest Category	Entity
Troy Allen	Agricultural	Delta Lake Irrigation District
David A. Garza	Counties	Cameron County
Raul Pena Jr.	Counties	Starr County
Ernesto Garcia	Counties	Willacy County
Daniel Lucio	Electric Generating Utilities	AEP Texas
Hudson DeYoe	Environmental	University of Texas Rio Grande Valley
Anabel Salinas	Flood Districts	Cameron County Drainage District No. 1
David L. Fuentes	Flood Districts	Hidalgo County Drainage District No. 1
Joey Trevino	Industries	Rio Grande Valley Chapter of Associated General Contractors of America
Rene Estrada	Municipalities	City of Combes
Joe Califa	Public	Self
Jose Caso	Small Business	Caso Law Firm, PLLC
Ben Escobar	Water Districts	Cameron County Drainage District #3
Michael Kent	Water Districts	Donna Irrigation District

Region 15’s Regional Flood Planning Group is composed of the following non-voting members:

Table 1.3 Lower Rio Grande Regional Flood Planning Group Non-Voting Members

Name	Title	Entity
Nick Collins	Regional Flood Planner	Texas Water Development Board
Ramon Macias III	Principal Engineer	IBWC, US Section
Shonda Mace	Planner	General Land Office
Willy Cupit	Natural Resources Specialist	Texas Parks and Wildlife Department
Lupita Trinidad- Ramos	Homeland Security Planner III	South Texas Development Council
Tim Frere	Hazard Mitigation Planner	Texas Division of Emergency Management
Nelda Barrera	Field Representative	Texas Department of Agriculture
Adrian Perez	Field Representative	Texas State Soil and Water Conservation Board
Manny Cruz	Executive Director	Lower Rio Grande Valley Development Council
David Ramirez	Area Director – Border & Permian Basin	Texas Commission on Environmental Quality
Nick Gallegos	Executive Director	Middle Rio Grande Development Council

Chapter 1: Planning Area Description

The goal of this chapter is to describe the Region 15 Lower Rio Grande Planning Region's (1) social and economic character, (2) major flood risks to life and property, (3) historical flood events, (4) political subdivisions with flood-related authority, (5) general extent of flood risk-related regulations, (6) agricultural and natural resources impacted by flooding, and (7) any existing flood mitigation planning currently ongoing. This chapter also includes an (8) inventory and assessment of existing natural drainage features and major flood infrastructure information and a (9) summary of proposed and ongoing flood mitigation projects in the region. A more detailed discussion of each of these topics is included below.

1.1. Social and Economic Character

According to the U.S. Census Bureau, between April 2020 and July 2024, Texas experienced significant population growth, with an increase of approximately 2.14 million residents. This growth made Texas the fastest growing state in the nation, increasing by 7.3% in the most recent reporting period. Current projections estimate a continued increase in projected growth for the Lower Rio Grande Region, with an estimated population increase of approximately 180,000 residents between 2030 and 2060. Population density is more prominent in Webb, Hidalgo, and Cameron counties. The effects of urbanization are felt throughout the Region as these urban centers expand and the surrounding land is developed. As shopping centers replace former pastures and subdivisions take the place of row crops, the increase in paved surfaces reduces the land's ability to absorb rainwater. Aging stormwater systems, and roadside bar ditches convey the runoff and further tax the Lower Rio Grande's creeks and tributaries. The expansion of metropolitan areas into previously undeveloped land has intensified pressure on the region's flood control infrastructure, exposing a growing number of residents to flood risk.

1.1.a. Development and Population

Development

The Lower Rio Grande Region covers an area of approximately 12,430 square miles, encompassing all Texas drainage areas that contribute to the Lower Rio Grande, from the northern counties of Val Verde and Edwards to Cameron County at its southernmost extent. This region represents 14 counties (or parts thereof), 54 municipalities, and 45 other special districts. Although most of the region is composed of rural, undeveloped land, it contains eight core-based statistical areas, or geographic areas with populations over 10,000 that are tied to an urban center and share socioeconomic characteristics, as defined by the United States Office of Management and Budget (OMB).

- A metropolitan statistical area (MSA) is a geographical region with a population of at least 50,000 at its core that has close economic ties throughout the area.

- Micropolitan statistical areas (μSAs) are labor market and statistical areas with a population of at least 10,000 to 50,000 people.¹

Table 1.4 below shows these core-based statistical areas and their rank by population (*Estimated population, United States Census Bureau, 2023*). Similarly, micropolitan statistical areas (μSAs) are labor market and statistical areas).

Table 1.4 Core-based Statistical Areas within the Lower Rio Grande Planning Region

Core-based Statistical Area (CBSAs)	County	Rank in Texas	National Rank	2023 Population Estimate
McAllen–Edinburg–Mission, TX MSA	Hidalgo	5 of 26	95 of 424	880,921
Brownsville–Harlingen, TX MSA	Cameron	9 of 26	162 of 424	423,192
Laredo, TX MSA	Webb	16 of 26	222 of 424	267,731
Eagle Pass, TX MSA	Maverick	26 of 26	424 of 424	57,775
Rio Grande City-Roma, TX μSA	Starr	4 of 41	128 of 538	65,809
Del Rio, TX μSA*	Val Verde	13 of 41	238 of 538	47,647
Raymondville, TX μSA	Willacy	33 of 41	515 of 538	20,218
Zapata, TX μSA	Zapata	39 of 41	535 of 538	13,855

* Del Rio, TX USA is also partially located in Region 14- Upper Rio Grande Regional Flood Planning Area

Table 1.4 shows that the most populated areas are located in the lower half of the region. Subsequent sections will discuss the populations and economic sectors of the region in greater detail.

Population

About 6 percent of Texas residents currently reside in the Lower Rio Grande Region. Region 15 is the state’s sixth (6th) most populous flood planning area, with an estimated 2,000,000 residents living within the 12,000 square mile area. The vast majority of the region’s population live within one of the major cities close to the United States-Mexico border. The northern counties feature population centers within Del Rio and Eagle Pass. Laredo serves as the population center in the middle of the basin. In the southern part of the region, populations are generally concentrated within the lower three counties, which are Cameron, Hidalgo, and Starr Counties.

¹ <https://www.federalregister.gov/documents/2021/07/16/2021-15159/2020-standards-for-delineating-core-based-statistical-areas>

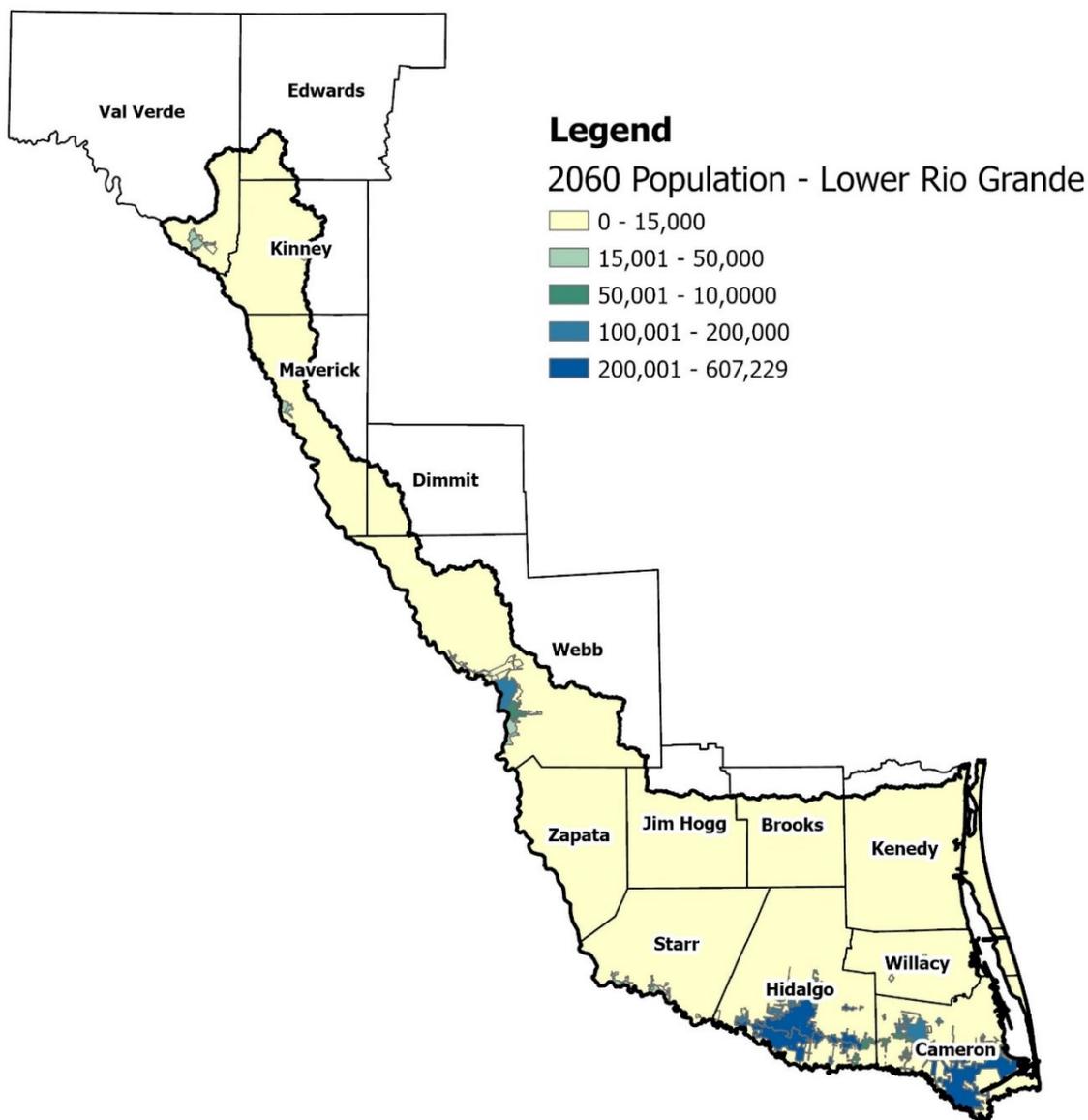
Table 1.5 below shows the estimated populations for the 14 counties, or portions thereof, located within the Lower Rio Grande Region for the year 2030 and projected populations for the year 2060. These populations are based on Water User Group and HUC (Hydrologic Unit Codes)-12 population projections adopted by the Texas Water Development Board (TWDB) from the 2027 State Water Plan. It is estimated that the population in this region will increase by 9.3 percent over the next three decades. Growth trends indicate continued urban concentration, particularly in metropolitan areas, while some rural counties are expected to experience population decline.

Table 1.5 Population Estimates of Region by County for 2020 and 2060

County	2023 Population, projected	% of Total Population of Region	2060 Population, projected
Brooks*	361	0.02%	371
Cameron	524,684	27.05%	555,798
Dimmit*	30	0%	19
Edwards*	10	0%	7
Hidalgo	754,154	38.88%	846,162
Jim Hogg*	428	0.02%	434
Kenedy*	1,027	0.05%	1,023
Kinney*	2,961	0.15%	2,644
Maverick*	62,424	3.22%	73,008
Starr	73,571	3.79%	82,244
Val Verde	54,066	2.79%	54,877
Webb*	285,928	14.74%	300,344
Willacy	165,592	8.54%	189,406
Zapata	14,270	0.74%	14,226
Total	1,939,505	100	2,120,563

Figure 1.2 shows the community population projections for 2060. The shading on the map indicates the population per community divided into five size categories: 0-15,000; 15,001-50,000; 50,001-100,000; 100,001-200,000; and more than 200,000. The communities with the largest populations are Laredo, Brownsville, and McAllen.

Figure 1.2 2060 Population Projection for Communities within the Lower Rio Grande Planning Region



The top 10 fastest-growing communities are displayed shown in **Table 1.6**. These communities are distributed throughout the southernmost counties of Texas, with Cameron, Maverick, Starr, and Hidalgo showing the most growth in the region. At the county level, Hidalgo and Cameron Counties lead in overall population expansion. Hidalgo County is experiencing rapid urbanization, fueled by accelerated population growth, and is projected to grow by more than 38 percent between 2030 and 2060. Cameron County’s growth is attributed to immigration, economic development, and the implementation of major infrastructure initiatives.

Table 1.6 Top 10 Fastest-Growing Communities in the Basin

Community (WUG)	Population 2030	Population 2060	Percent Change (%)
Primera	6,782	11,067	63.18%
La Villa	2,092	2,704	29.25%
McAllen	165,587	206,901	24.95%
Eagle Pass	58,692	68,762	17.16%
Edinburg	85,768	99,436	15.94%
La Grulla	8,309	9,569	15.16%
Rio Grande City	17,880	20,549	14.93%
Pharr	85,215	96,862	13.67%
Roma	21,305	24,213	13.65%
La Joya	4,764	5,399	13.33%

1.1.b. Economic Activity and High Flood Risk Sectors

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 factors:

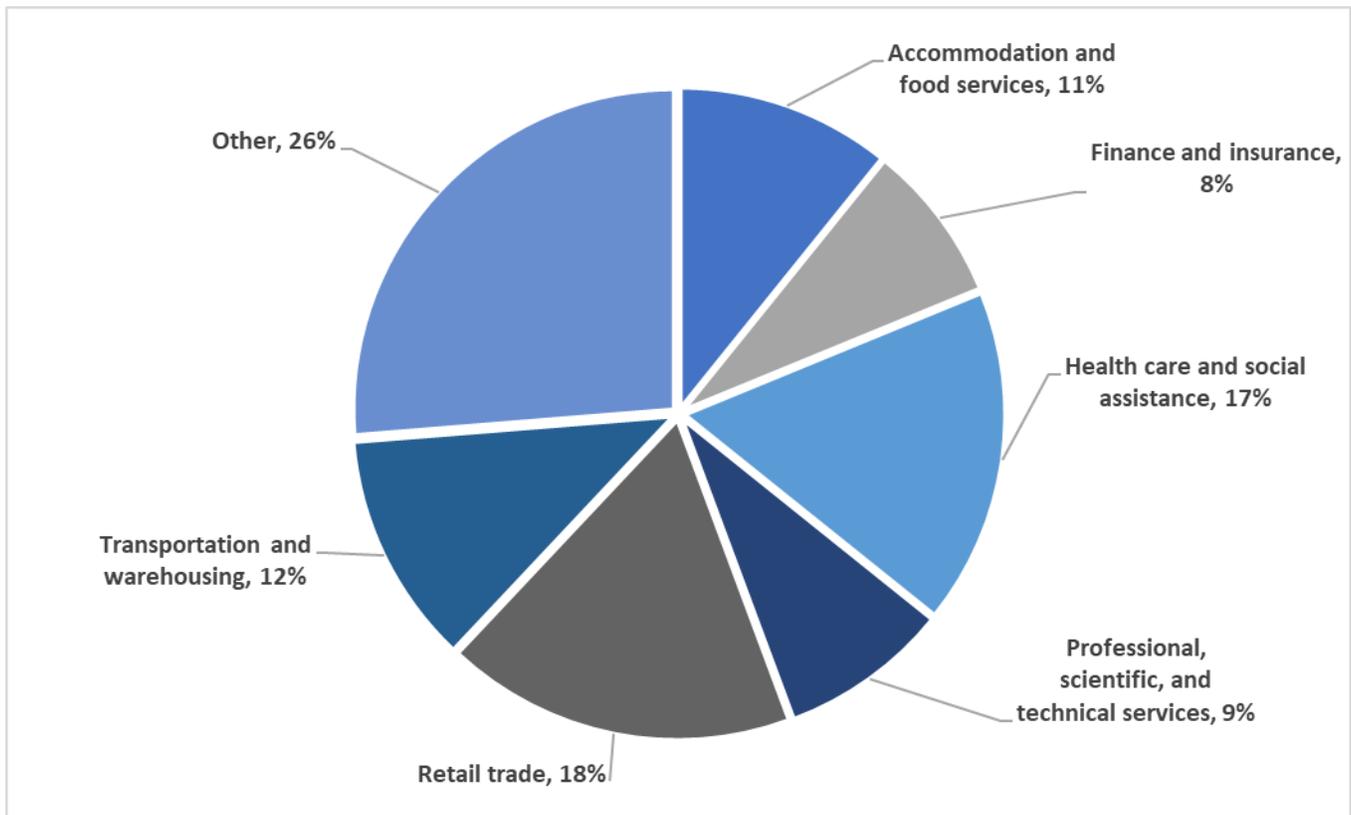
- Number of business establishments
- Annual payroll
- Total annual revenue

Data from the 2022 Economic Census was utilized to identify the predominant industries across the basin. Industries were divided in accordance with the North American Industry Classification System (NAICS), which standardizes business classifications to support the publication of economic statistics in the United States. For each county, the leading industry was identified using these three metrics. This approach highlights which sectors are potentially most vulnerable to economic disruption from flooding. The aggregated data provides a regional overview of potential flood-related economic impacts across key sectors.

Number of Business Establishments

The Lower Rio Grande Basin contains a total of 25,537 business establishments. Retail trade is the leading industry by number of establishments across the basin, followed by health care and social assistance. **Figure 1.3** illustrates the major industries in the region’s counties, ranked by the number of business establishments.

Figure 1.3 Major Industry, Lower Rio Grande Basin, Number of Business Establishments



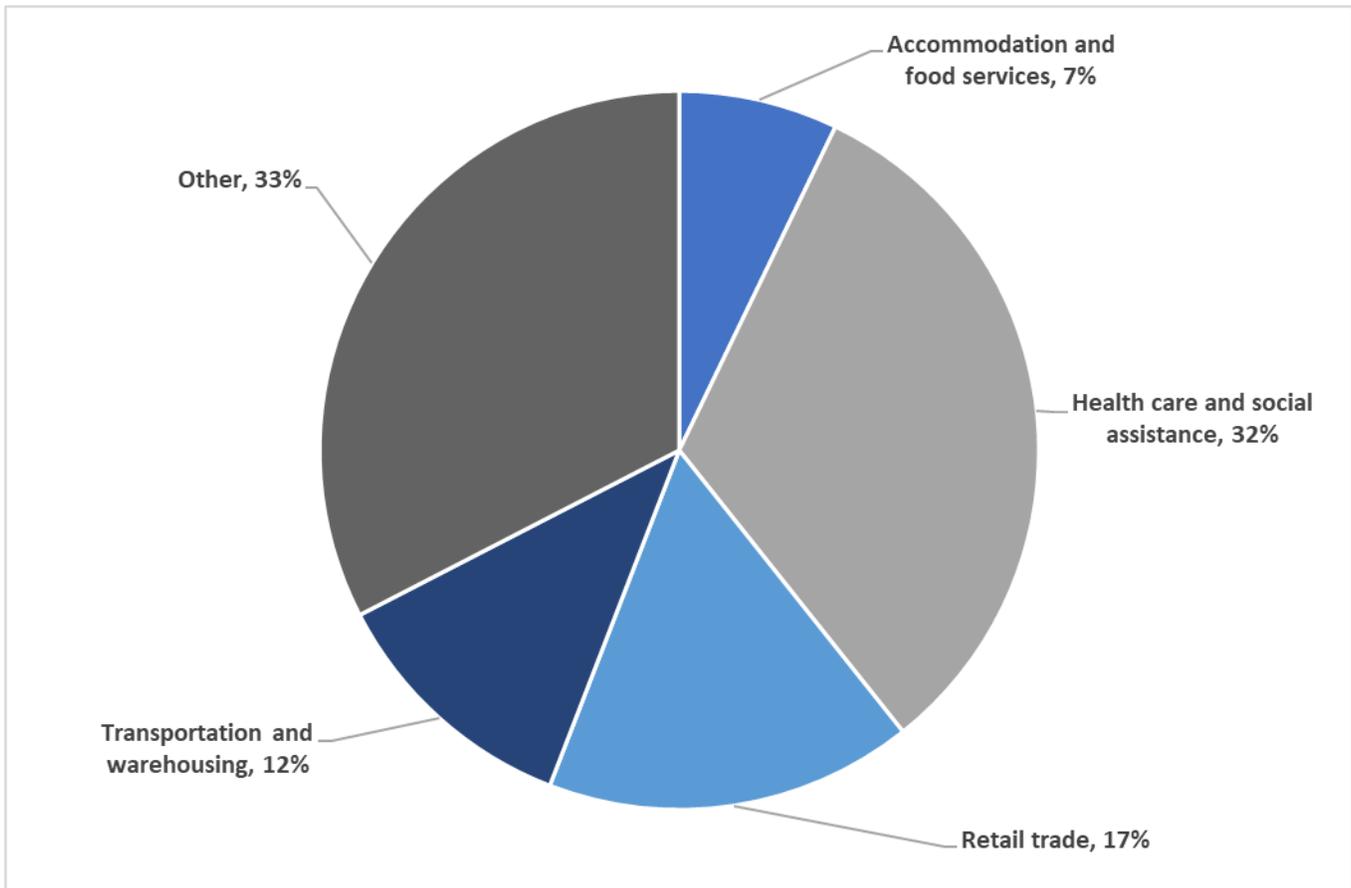
Source: United States Census Bureau Table: EC2200Basic (2022)

Each business contributes to the tax base of its 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 to 60 percent of small businesses never reopen their doors following a disaster. The impact of business interruption on each individual business is significant. However, it is important to note the possibility that many of these retail establishments are smaller businesses, and this measure may not fully capture the impact of a particular economic sector on the overall regional economy.

Annual Payroll

The total annual payroll in the Lower Rio Grande Basin is \$14,068,067. Health care and social assistance, retail trade, and transportation and warehousing represent the largest share among all industries in the Region based on payroll. Collectively, these sectors account for 32%, 17%, and 12% of total payroll, respectively. This trend aligns with national patterns, where trade, transportation, and health care rank among the highest paying sectors. **Figure 1.4** shows the major industries across all counties in the region, as determined by annual payroll amounts reported.

Figure 1.4 Major Industry by County, as determined by annual payroll amounts



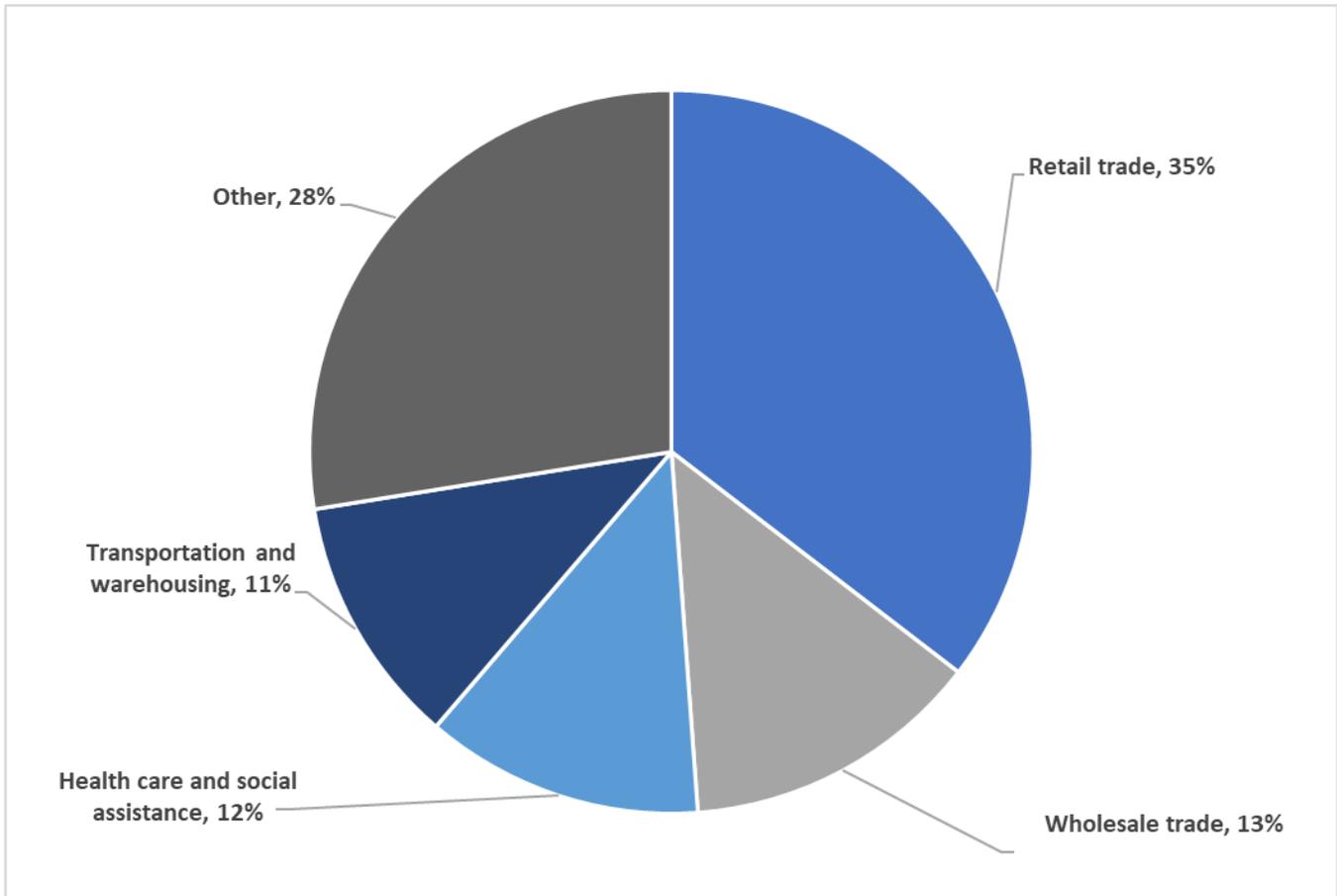
Source: United States Census Bureau Table: EC2200Basic (2022)

Health care and social assistance industries alone contribute \$4,523,268,000 to the Region’s annual payroll. One measure used to assess the impact of lost income is the Social Vulnerability Index (SVI), which identifies income loss as one of the strongest predictors of future vulnerability for individuals and communities. The SVI incorporates 15 census-based variables to help pinpoint populations that may require support before, during, and after a disaster. A severe flood event disrupting income streams in the health care, social assistance, or retail trade sectors is likely to disproportionately affect vulnerable populations across the region.

Total Annual Revenue

Of the three economic indicators analyzed, total annual revenue offers the clearest insight into which sectors are most economically vulnerable to flood-related disruptions. It serves as a strong indicator of which industries have the greatest economic footprint in each county and are therefore most susceptible to financial losses during flood events. **Figure 1.5** illustrates the major industries in the region, as determined by annual revenue reported.

Figure 1.5 Major Industry, Lower Rio Grande Region, Total Annual Revenue



Source: United States Census Bureau Table: EC2200Basic (2022)

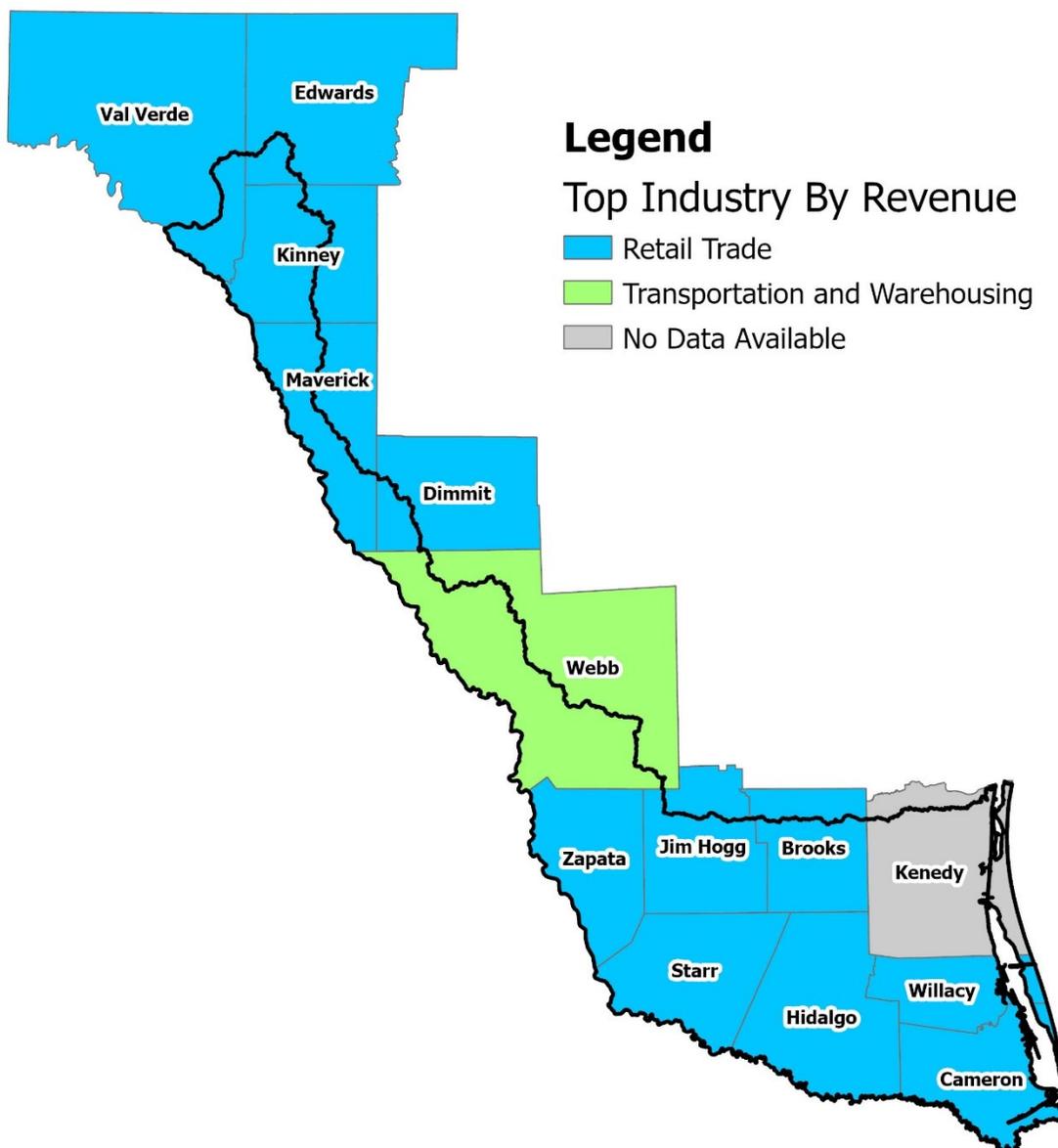
The total annual revenue for all industries in the Lower Rio Grande Region is \$85,158,184,000. The top three revenue-generating sectors, by dollar value are:

- Retail trade generating \$30,178,111,000
- Wholesale trade generating \$11,414,839,000
- Health care and social assistance generating \$10,592,448,000

These three industries alone account for approximately 61 percent of the Region’s total annual revenue. Retail trade generates more than twice the revenue of the next highest sector, underscoring its dominant role in the regional economy. Given that much of the commercial activity is concentrated in border cities, international commerce plays a significant role, particularly through cross-border retail spending by Mexican nationals. According to a 2012 study by the Federal Reserve Bank of Dallas, Mexican shoppers account for 20 to 30 percent of retail sales in the Brownsville, McAllen, and Laredo Metropolitan Statistical Areas. When international bridges reopened following COVID-19 closures, McAllen, Brownsville, and Laredo saw retail sales increase by more than 25% in 2022, driven largely by Mexican shoppers, according to Texas Comptroller data.

Figure 1.6 extends the industry assessment to the county level, identifying the leading revenue-generating sector in each county. This provides valuable context for developing flood mitigation strategies aimed at minimizing future economic disruption. As previously noted, retail trade is the largest revenue generator in all but one of the counties within the basin.

Figure 1.6 Industry Sector with Largest Share of Annual Revenue, per County



Agricultural and Ranching Activity

While urban development is generally concentrated along the U.S.-Mexico border, the waters of the Rio Grande also traverse an extremely productive agricultural region with a rich farming and ranching heritage. Although the census reporting did not record agriculture as one of the region's top economic drivers, it is still an integral component of the regional economy. Fewer people are exposed to flood hazards in these areas; however, the impact of flooding on agriculture, ranching, and forestry can be severe.

Floods can delay the planting season by saturating fields and rendering the areas inaccessible to heavy equipment. The delay in planting leads to reduced crop size, lower yields, and reduced profits. When floods occur as during crop maturation, 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 their feeding grounds. Forestry or orchard operations can lose trees to long periods of inundation, fast-moving waters, and erosion, wiping out years of growth in an instant.

To characterize the economic activity and character of Texas' rural spaces, this plan employs the term "working lands," as defined by the Texas A&M Natural Resources Institute (NRI) to describe the 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 1.7**, which uses data from the United States Geological Survey (USGS) to help visualize how land is used across the basin. Across Texas, the average acreage of farm and ranch operations is decreasing, and a smaller parcel size may reduce enterprise profitability. Combined with flooding losses, this could increase the likelihood of economic failure of farming, ranching, or forestry operations.

Ranching and rangeland dominate the northern parts of the Region, specifically in Zapata, Starr, Jim Hogg, Brooks, Kenedy, and the northern portion of Hidalgo counties. While these areas constitute relatively large landholdings, the economic benefit is not reflected in the socioeconomic data, as the census tracts in these areas experience some of the lower median incomes.

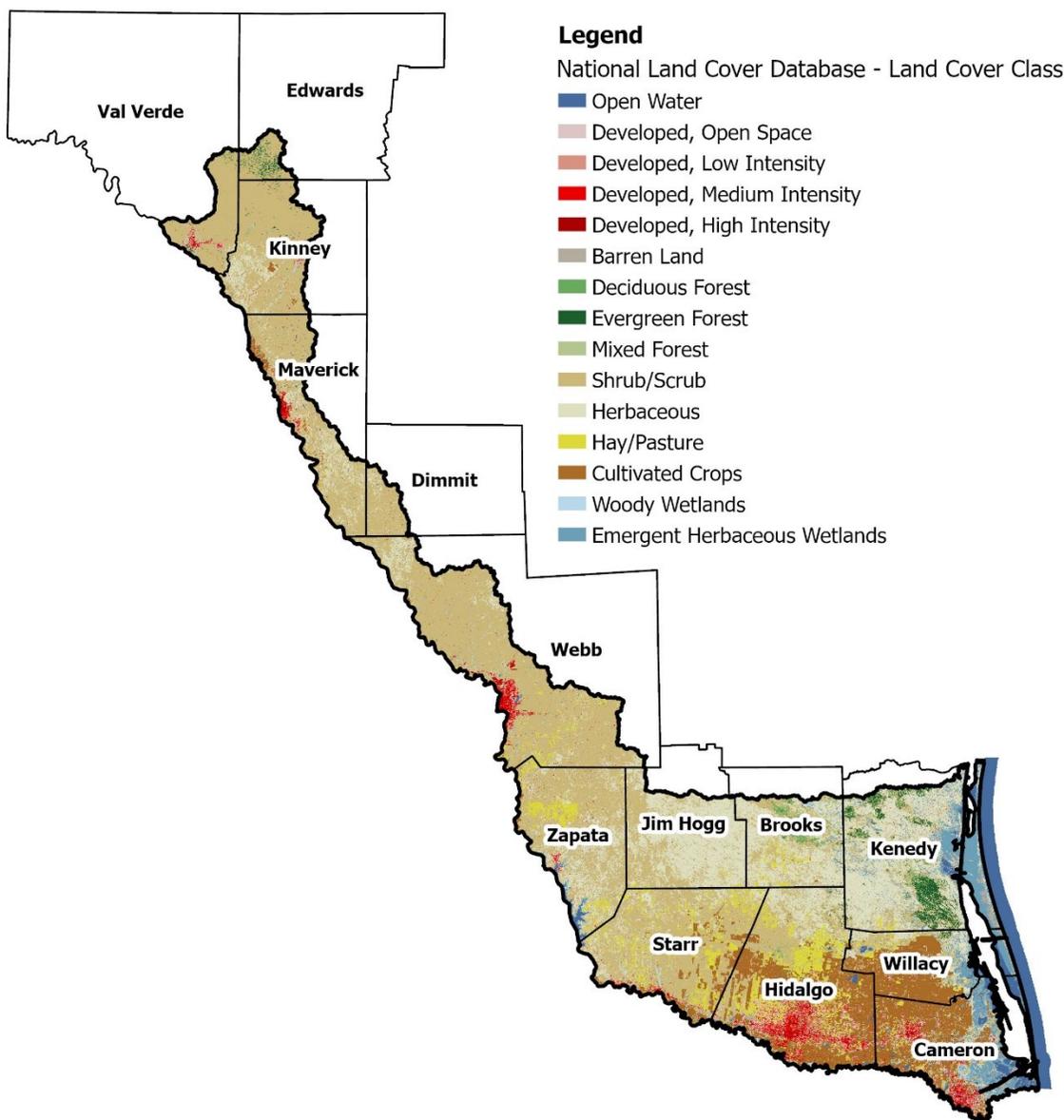
Additional areas where ranching is prominent include Kinney and Maverick counties, both situated within the Rio Grande drainage basin and characterized by expansive rangelands and livestock operations. In Kinney County, over 70 percent of the county's total land area is dedicated to farm and ranch operations. The terrain supports cattle, sheep, goats, and exotic game species, making livestock the dominant agricultural output.

These operations are increasingly vulnerable to flood-related impacts. Flooding in low-lying pastures can lead to direct livestock losses, when animals are unable to reach high ground. Prolonged exposure to floodwaters can result in bacterial infections such as cellulitis and dermatophilosis (rain rot), which

compromise animal health and productivity. Additionally, contaminated water sources, damaged fencing, and debris-laden fields pose ongoing risks to both animals and equipment.

When mandatory evacuations are imposed, livestock in these areas face risks of drowning, injury, and disease, particularly when floodwaters back up into creeks and irrigation canals. The economic toll includes not only the loss of animals but also the cost of repairing fences, barns, and feeding grounds, and the delays in grazing and hay production.

Figure 1.7 Texas Working Lands by Land Cover



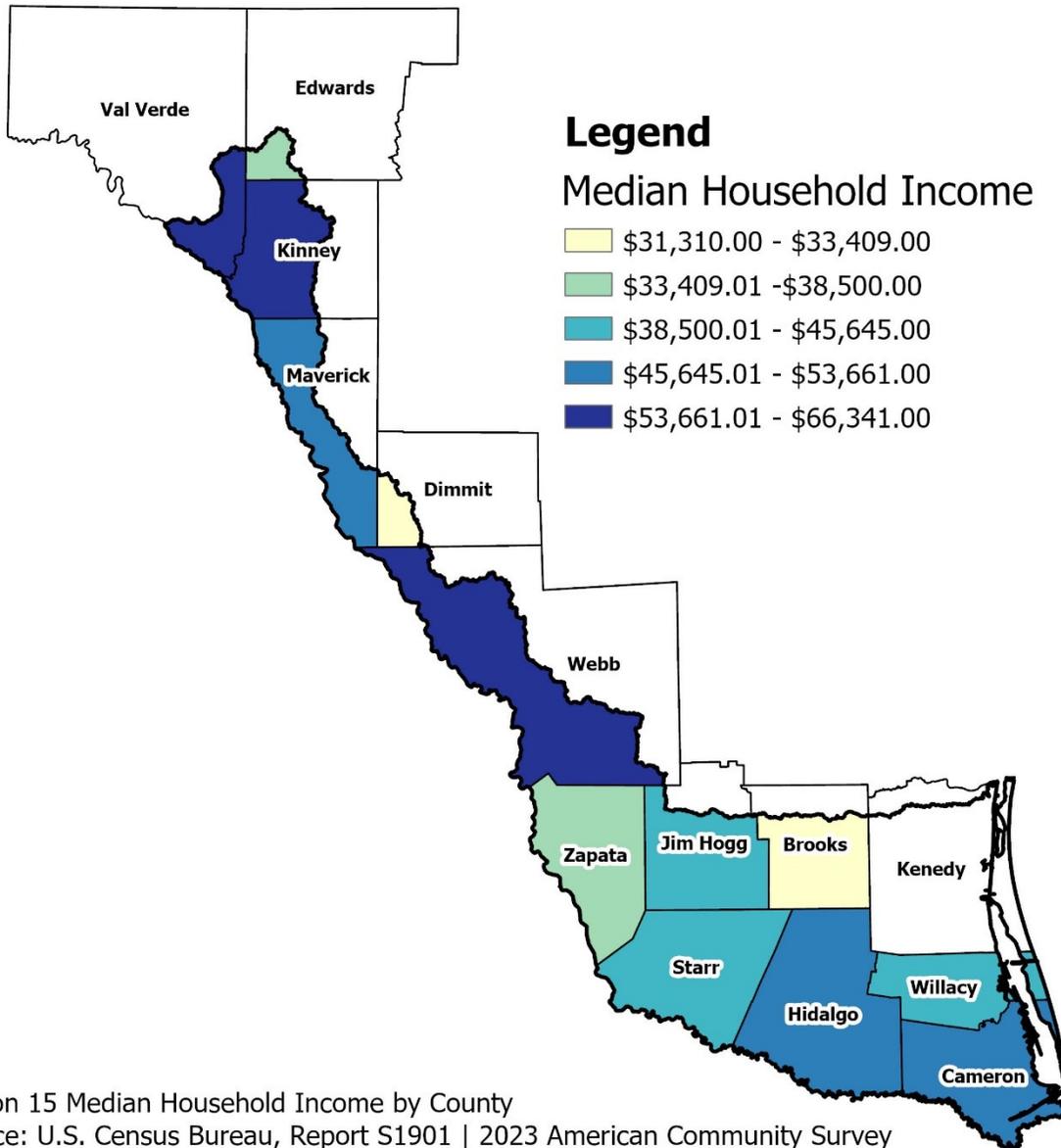
Source: Texas Geographic Information Office | National Land Cover Database | 2019

Cropland, symbolized in brown and yellow, is the predominant use of working lands in Hidalgo, Willacy, and Cameron counties. These counties are home to some of the most fertile farmlands in the region. According to the United States Department of Agriculture (USDA), major crops for 2024 included sorghum, cotton, corn, herbs, and onions.

Economic Status of Population Median Household Incomes (MHI) can affect many factors, including access to education, employment opportunities, and housing location. It is important to recognize that within any geographic area, residents may vary widely from the average, with outliers on both ends of the income spectrum.

The MHI was taken for each county using the 2023 American Community Survey (ACS) data and shown in **Figure 1.8**. However, data for Kinney County was excluded from the 2023 ACS release due to limitations in sample size or reporting thresholds, which are common challenges in counties with small or dispersed populations. This absence of data makes it difficult to fully assess the economic conditions of Kinney County residents, particularly in relation to flood vulnerability and recovery capacity. Given that over 70 percent of Kinney County's land is used for ranching and agricultural operations, the lack of income data presents a gap in understanding how economic resilience intersects with environmental risk in this rural area.

Figure 1.8 Median Household Income per County in Lower Rio Grande Planning Region



Region 15 Median Household Income by County

Source: U.S. Census Bureau, Report S1901 | 2023 American Community Survey

Note: No information available for Kennedy County

The Lower Rio Grande Basin reflects a broader trend observed across the state: urban areas near the Texas-Mexico border tend to have the higher median household incomes (MHI), while rural counties and areas with lower populations typically display tracts in more moderate and low-income categories.

The MHI across Region 15 counties ranges from \$31,310 in Brooks County to \$66,341 in Kinney County. The average MHI for the basin is \$47,119, which is significantly lower than the Texas state average of \$75,000. However, this disparity should be viewed in context—the cost of living in the Lower Rio Grande Basin is generally lower than in more urbanized regions of the state. As such, while incomes may appear modest in absolute terms, they may still support a relatively stable standard of living within the region.

Social Vulnerability Analysis

When anticipating the potential impact from a catastrophic flood event, the first consideration is **exposure**, based on the geographic location of people and property relative to the flood-prone areas. However, exposure alone does not determine the full impact of a disaster. Disasters affect different people or groups in different ways, ranging from their ability to evacuate an area in harm's way, the likelihood of damage to their homes and properties, capacity to find the financial resources needed to recover and rebuild after a storm. A critical second dimension is a review of the **vulnerability** of residents throughout the Region, which reflects how well individuals and communities can anticipate, cope with, resist, and recover from the effects of flooding.

To evaluate this dimension in the Lower Rio Grande Region, the assessment to quantify the vulnerability across the Region uses the Flood Social Vulnerability Index (FSVI), a modified version of the SVI from the United States Department of Health and Human Services (HHS) Centers for Disease Control and Prevention (CDC). The FSVI is designed specifically to assess a community's vulnerability to flooding and includes more assessment criteria directly applicable to Texas when compared to the SVI. The FSVI incorporates 18 demographic and environmental indicators that reflect conditions affecting flood resilience. These indicators include:

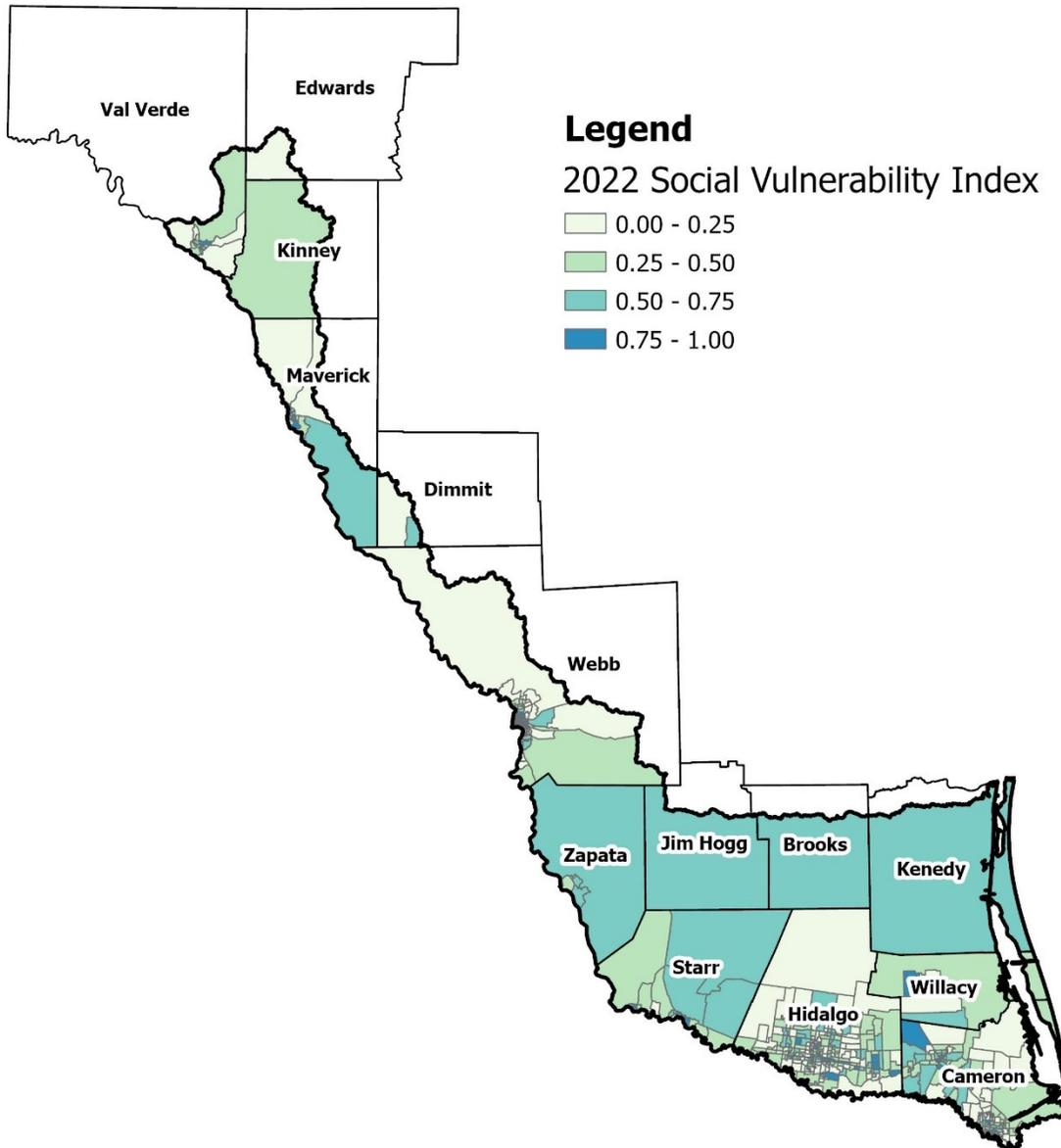
- Access to phone/internet
- Age
- Disability
- Environmental risk factors
- Housing age
- Housing value
- Income
- Language
- Migration
- Mobile homes
- No vehicle
- Minority

- Poverty
- Renters
- Rural-urban
- Employment type
- Single parent household
- Unemployment

The FSVI assigns a score between 0 and 1, with 1 indicating the highest level of vulnerability. This targeted approach helps identify communities that may face greater challenges before, during, and after flooding events, especially in areas where socioeconomic conditions, infrastructure limitations, and geographic isolation intersect.

Figure 1.9 illustrates the distribution of FSVI scores across the region, highlighting areas where flood resilience may be most compromised.

Figure 1.9 Flood Social Vulnerability by Census Tract



The presence of multiple vulnerability factors, whether across a population or within a single household, has consistently proven to be a reliable indicator of the long-term impacts of disasters. Individuals with limited mobility, financial resources, or access to communication and transportation are often more severely affected and slower to recover from flood events.

This plan incorporates the locations of highly socially vulnerable populations to inform decisions about protecting critical facilities and targeting flood mitigation investments. By aligning infrastructure planning with social vulnerability data, the region can better support communities that may face greater challenges in preparing for, responding to, and recovering from flooding.

Social vulnerability is not uniform and can vary significantly within counties. In the Lower Rio Grande Regional Flood Planning Area, approximately half of the census tracts fall within the 0.25 to 0.75 range on the FSVI, indicating a moderate level of vulnerability across much of the basin. This variability highlights the need for localized, data-driven strategies that address the specific needs of each community rather than relying solely on regional averages.

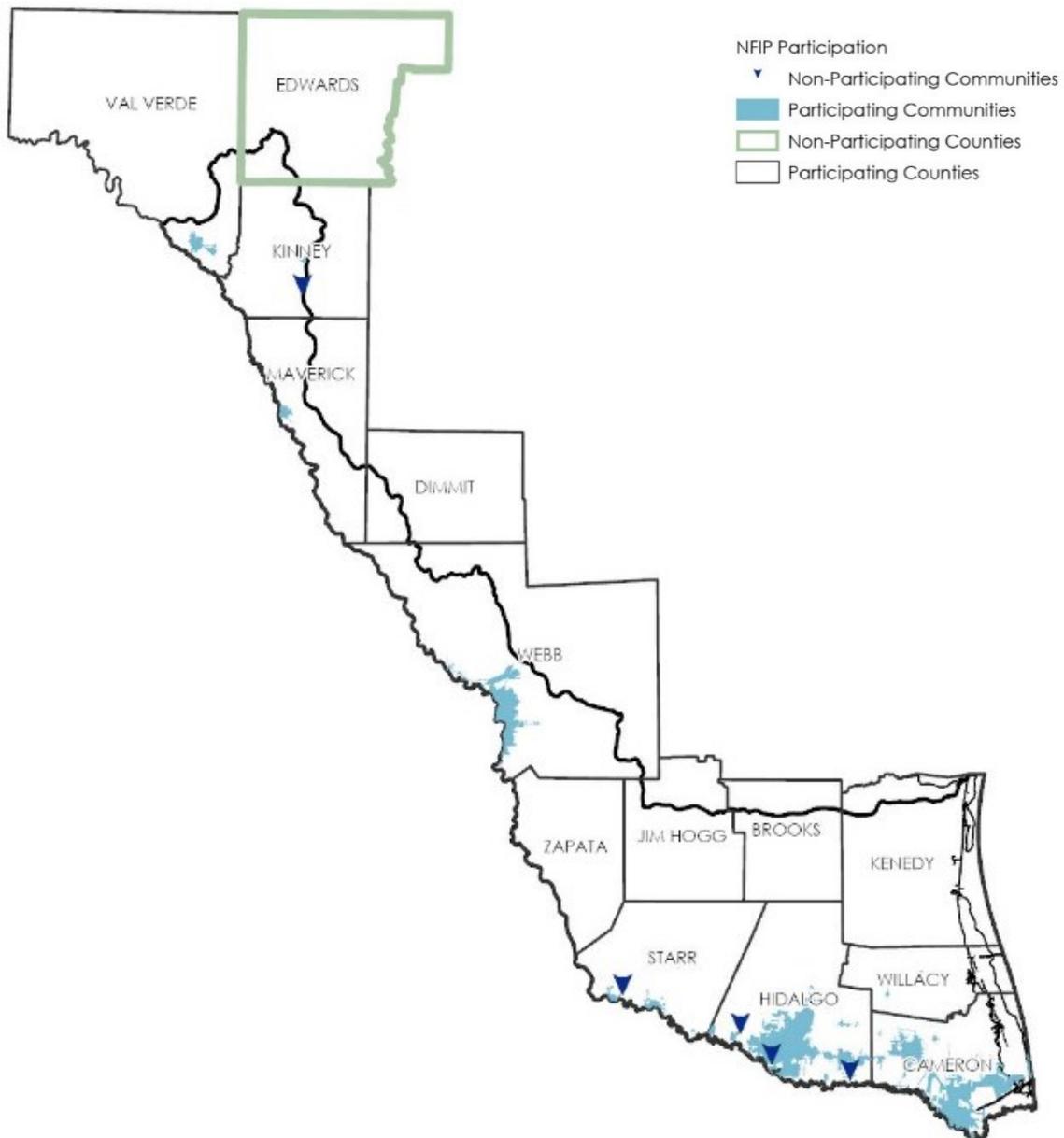
1.2. Major Flood Risks to Life and Property

A critical step in reducing the vulnerability of the Lower Rio Grande Region to future flooding is establishing flood risk. This section establishes what is currently known concerning the area's exposure to flood hazards and the vulnerability of the communities within the Lower Rio Grande Basin.

Today, a patchwork quilt of plans, regulations, and infrastructure provides Texans with limited protection from flooding. Flood planning largely takes place at a local level, with an inconsistent set of standards from community to community that makes it very difficult to quantify risk across the region. Fortunately, most of the communities in the Lower Rio Grande Region (91 percent) participate in the 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. **Figure 1.10** shows which communities participate in the NFIP and which have not yet joined at the time of this report.

Many communities use maps that are decades old and may only tell part of the story. These maps may not reflect changing development patterns and often fail to identify flood risks associated with changes in the topography and environment. Additionally, Flood Insurance Rate Maps are intended to identify and communicate risks in the watershed of less than 1 square mile. However, they do not always include all watersheds and may be greater than 1 square mile in many communities.

Figure 1.10 Participation in the National Flood Insurance Program (NFIP)

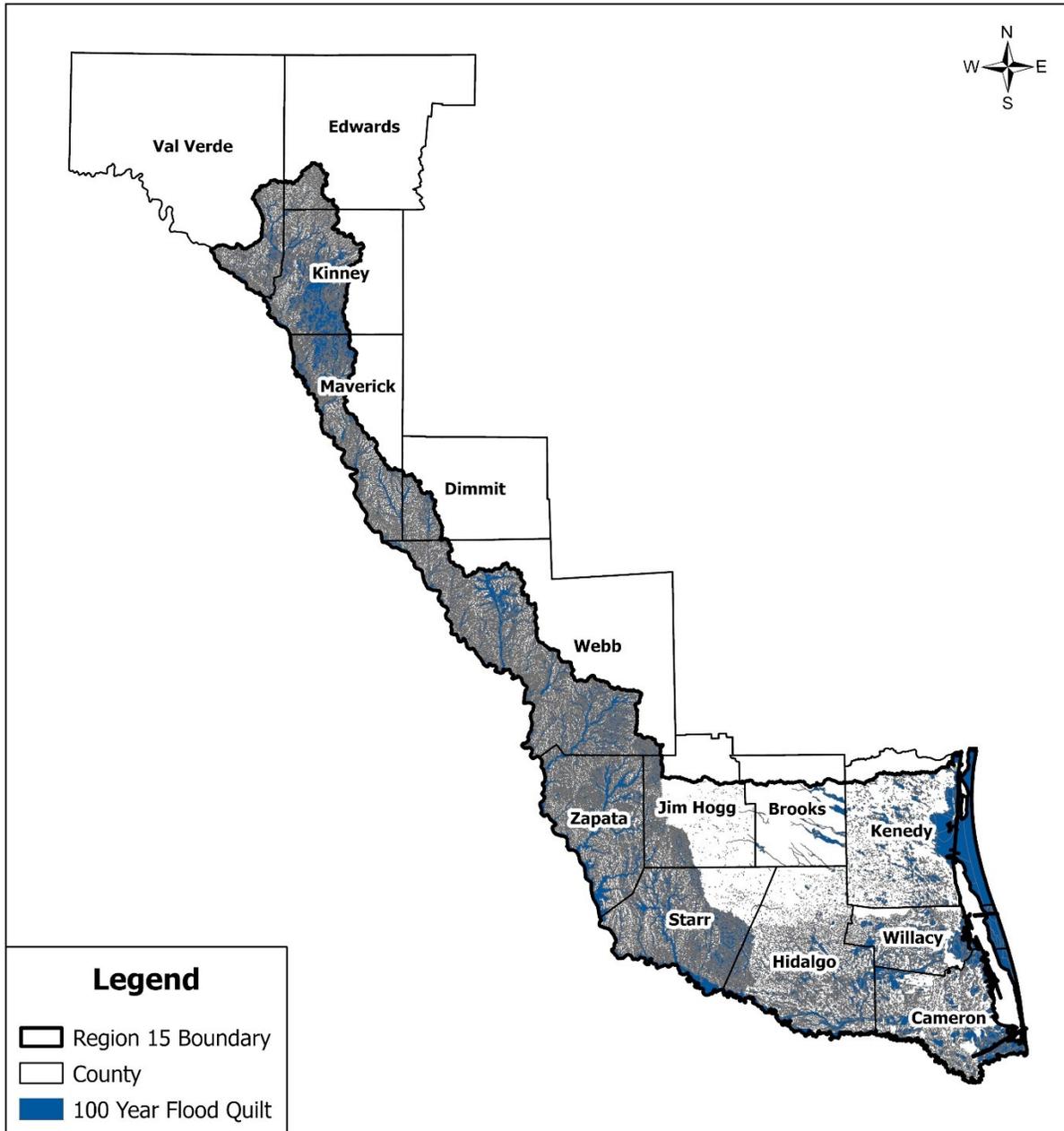


Identification of Flood-Prone Areas

According to current FEMA mapping, over 15 percent of the total area in the region is within the 1 percent annual chance event (ACE). In the Lower Rio Grande Region, more than 41 communities have over 20 percent of their land in the floodplain. This only tells part of the story because not all the floodplains within the Lower Rio Grande 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 an initial floodplain quilt that patched together the best available flood risk mapping for this region for use in this plan. The floodplain quilt combines various data sources, providing comprehensive coverage of all known existing statewide flood hazard information.

Figure 1.11 shows the initial floodplain quilt information provided by the TWDB, which serves as the Lower Rio Grande Region’s starting point, providing an approximation of region-wide flood risk using currently available data. In Chapter 2 – Flood Risk Analyses, this “quilt” will be confirmed, updated, and otherwise enhanced as appropriate to prepare a larger flood risk assessment (*TWDB, 2024*). When complete, this regional floodplain quilt will identify information gaps and more accurately approximate the distribution of flood risk across the region.

Figure 1.11 Initial Floodplain Quilt Map provided by TWDB for Regional Flood Planning



Types of major flood risks to life and property

The TWDB has defined the following flooding hazards in their Technical Guidelines for Regional Flood Planning, dated December 2024.

Riverine flooding: *Riverine flooding is caused by bank overtopping when the flow capacity of rivers is exceeded locally. The rising water levels generally originate from high-intensity rainfall creating soil saturation and large volumes of runoff either locally and/or in upstream watershed areas.*

Pluvial flooding including Urban flooding: *Urban flooding is caused when the inflow of stormwater in urban areas exceeds the capacity of drainage systems to infiltrate stormwater into the soil or to carry it away. The inflow of stormwater results from (a) heavy rainfall, which can collect on the landscape (pluvial flooding) or cause rivers and streams to overflow their banks and inundate surrounding areas; or (b) storm surges or high tides, which push water onto coastal cities. Floodwater inundation and movement are influenced by (a) land development, which disturbs natural drainage patterns and creates hardened, impervious surfaces that inhibit infiltration of stormwater; and (b) stormwater systems that are undersized for current needs and thus increase exposure to drainage hazards. (National Academies of Sciences, Engineering, and Medicine, 2019).*

Coastal flooding: *Coastal flooding occurs when normally dry, low-lying land is flooded by seawater.*

The Lower Rio Grande Region contains all three types of flooding hazards. The most prevalent type of flooding that poses a hazard to life and property is a combination of riverine and urban flooding.

1.3. Key Historical Flood Events

Although flood events have occurred from severe rainfall events, a good majority of the damaging floods that occur in the region are the result of tropical storms that move inland along the Rio Grande or through northern Mexico. In 1954, Hurricane Alice poured over 27 inches in 48 hours over the northern reaches of the region, causing flooding in the counties north of Webb County. In the southern extent of the region, Hurricane Beulah, which made landfall in September 1967, has caused the most damage of any recorded storms in the lower counties of Hidalgo and Cameron.

In the northern counties, flooding tends to occur along major streams. In the lower counties, the relatively flat terrain, low permeable soils, relatively high water table, and often inadequate channel capacities result in local flooding. Manmade structures, such as roadways, irrigation canals, and railroad embankments often contribute to local flooding as these cause barriers to drainage outfall channels. The three counties located along the coast also experience coastal flooding. Due to the coastline of Kenedy and Willacy counties not being as developed as Cameron County, the structural damage caused by coastal flooding in Cameron is much higher.

To protect the region from flooding from the Rio Grande, the federal government built the Amistad Dam and reservoir in Val Verde County, the Falcon Dam and reservoir in Starr County, and the Lower Rio Grande Flood Control Project (North Floodway, Arroyo Colorado Floodway, Anzalduas Dam, and Retamal Dam) in Hidalgo, Cameron, and Willacy counties. These facilities are owned and operated by the International Boundary and Water Commission, a bi-national organization. Although the Lower Rio Grande Flood Control Project mitigates flooding from the Rio Grande River, its levees and gate structures have caused stormwaters to pond outside the levee walls from severe events with large amounts of rainfall over areas in Hidalgo and Cameron counties that rely on the floodways as their outfall system.

Emergency Declarations and Major Declared Disasters

A Presidential Major Disaster Declaration (DR) puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities. An Emergency Declaration (EM) is more limited in scope and without the long-term federal recovery programs of a Major Disaster Declaration.

Generally, federal assistance and funding are provided to meet a specific emergency need or help prevent a major disaster. 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 for 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 the President has declared a major disaster. The approval of IA under a major disaster declaration may also activate assistance programs provided by other federal agencies based on specific disaster needs.

Since 2000, there have been 14 Emergency Declarations and 38 Major Declared Disasters across Texas. One or more of the 14 counties that make up the Lower Rio Grande Region were included in 7 of the 14 Emergency Declarations and 14 of the 38 Major Declared Disasters. **Table 1.7** shows that most of those Emergency Declarations and Major Declared Disasters impacted the lower counties of Cameron, Hidalgo, Starr, and Willacy.

A description of some of the larger or more catastrophic storms is included in this section. The information from these storms is summarized from information gathered from the FEMA Declared Disasters website ([Declared Disasters | FEMA.gov](https://www.fema.gov/declared-disasters)) as well as information from the National Oceanic and Atmospheric Administration's (NOAA)'s Storm Events Database on the National Centers for Environmental Information website ([Storm Events Database | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/storm-events))

P = Public Assistance (Including Categories A-G) X = Individual and Public Assistance (Category B)
B = Public Assistance (Category B) A = Individual and Public Assistance (Including Categories A-G)
I = Individual Assistance

March 2025: DR-4871-TX

This sudden rainfall event started on March 26, 2025, and continued into the early morning of March 28, 2025, producing 5 to 20 inches of rain in eastern Starr County through southern Hidalgo County, Willacy County and into Northern Cameron County. A federal disaster declaration was made on March 29. Between the four counties, approximately 1,900 residences were impacted, with 235 classified as destroyed or with major damage; 6 known fatalities were recorded as a result of this flash flood event. At least 1,000 structures were inundated with water, hundreds of roads and highways including IH-69E frontage roads and key segments of the I-2 corridor were flooded and impassable, and flights were suspended at Valley International Airport in Harlingen due to waterlogged runways. Property Damage is estimated to be over \$100 million.

July 2020: EM-3530-TX

Hurricane Hanna made landfall as a Category 1 Hurricane on July 25, 2020, in Kenedy County, tracking from Kenedy County into Northern Hidalgo and then into Starr County as a Tropical Storm. Reported rainfall ranged from 8 to 15 inches in various parts of the region, particularly in Western Cameron and Eastern Hidalgo County near I-2. In addition to property damage, the heavy rains and associated flooding caused the region to lose approximately 95 percent of the annual cotton crop, resulting in a combined crop damage and production loss of \$366 million.

June 2019: DR-4454-TX

This sudden rainfall event started on the evening of June 24, 2019, and continued into the morning, producing 8 to 15 inches of rain in Western Willacy, Northwestern Cameron, and Eastern Hidalgo counties. A federal disaster declaration was made on July 17. Between the three counties, approximately 1,300 residences were impacted, with 1,100 classified as destroyed or with major damage; no deaths or injuries were recorded as a result of this flash flood event. At least 45,000 private and public utility power customers were without power at the peak of the storm. The rainfall impacted 30 Texas-managed highways, including I-2 and 1-69E frontage roads. Property Damage for Cameron County alone was estimated to be \$30 million.

June 2018: DR-4377-TX

A tropical system from the Caribbean Sea arrived in South Texas on June 18, 2018, resulting in widespread heavy rains affecting much of the southeast portion of the region, including Hidalgo, Willacy, Cameron, Brooks, and Kenedy counties. A federal disaster declaration was made on July 6, 2018, for Hidalgo and Willacy counties. The resulting rainfall ranged from 12 to 18 inches in some parts of Hidalgo and Willacy counties and caused flood depths of up to 3 feet in some homes and businesses. Official statistics for this event state that approximately 20,000 residences and businesses were affected by the floods, and more than 7,400 were defined as minor to destructive by FEMA Standards. Public

infrastructure damage was estimated to be \$50 million in Hidalgo and Willacy counties, and property damage for Cameron County alone is estimated to be \$60 million.

October 2015: No Disaster Declaration

Thunderstorms produced heavy rain resulting in a flash flood that affected Maverick, Kinney, and Webb counties on the evening of October 8, 2015. The damage from the flooding resulted in \$1 million of property damage in Eagle Pass and the direct loss of two lives. The storm event did not receive a Disaster Declaration from FEMA. However, it is the only recorded event from 2000 to 2021 in the region that resulted in more than one life being lost.

June 2010: DR-1931-TX

Hurricane Alex (2010) made landfall as a Category 2 Hurricane in Northern Mexico; due to the favorable conditions in the Caribbean and Gulf of Mexico, Alex became a large storm that affected south and southwest Texas from late June until its remnants dissipated on July 6. Torrential rains over the storm period contributed to widespread drawn-out urban flooding in Val Verde, Maverick, Webb, Zapata, Jim Hogg, Starr, Hidalgo, and Cameron counties, resulting in an emergency declaration on August 3 for the period from June 30 to August 14. Of the 848 residences impacted by the flooding, 199 were destroyed, and 163 suffered from major damage caused by the flooding.

July 2008: DR-1780-TX

Hurricane Dolly (2008) caused significant rainfall in the region. The initial surge of rain became a more widespread area of moderate to heavy rainfall later in the evening and overnight within the Lower Rio Grande Valley. The heaviest rains were associated with the western and southern portions of Dolly's circulation, which edged into eastern Hidalgo County, then eased northwest overnight, reaching the four corners of Jim Hogg, Brooks, Hidalgo, and Starr County. The widespread flooding did not result in injury or loss of life. Still, it did result in approximately \$181 thousand in property damage and the loss of approximately \$335 million in damage to crops.

October 2003: No Disaster Declaration

Tropical moisture, in combination with a weather disturbance over south Texas, resulted in heavy rainfall across Brooks, Jim Hogg, Starr, Hidalgo, Willacy, and Cameron counties reaching up to 13 inches in La Joya in western Hidalgo County. Damage in Cameron County alone exceeded \$4.5 million, with approximately 550 residences across the affected counties suffering from minor to moderate damage. Flooding in Brooks County resulted in the closure of US-281 for several days.

Past Casualties and Property damage

The overarching goal of this Regional Flood Plan is “to protect against the loss of life and property,” as outlined in the Guidance Principles in 31 TAC §362.3. The worst loss associated with any hazard is the loss of life. According to the latest available data from the Storm Events Database provided by the National Oceanic and Atmospheric Administration (NOAA) at the time of writing, there have been four deaths as a direct result of storm events from January 1, 2000 to March 1, 2025. The deadliest storm event in this period happened in Eagle Pass (Maverick County) on October 8, 2015. Heavy

thunderstorms dropped more than 10 inches of rain in a matter of hours, causing a flash flood that resulted in several evacuations and 90 water rescues, leaving more than 60 people homeless. This single event resulted in the death of two men and a million dollars in damages ([Storm Events Database - Event Details | National Centers for Environmental Information \(noaa.gov\)](#)). Data from the March 2025 flash flood event, which resulted in 6 known fatalities, was not yet reflected in the NOAA database.

The Lower Rio Grande Region is fortunate to have no injuries directly from any historical flood events but unfortunate to have four deaths. Additionally, there were no indirect injuries or deaths associated with any flood or flash flood event in this region within the period of record. **Table 1.8** shows the total number of Casualties and Property Damages due to floods or flash floods reported to NOAA from January 1, 2000, to March 1, 2025, for the Lower Rio Grande Region. The totals included for the counties of Brooks, Dimmit, Edwards, Jim Hogg, Kenedy, Kinney, Maverick, and Webb in **Table 1.8** reflect only those events that impacted the portion of the counties that lie within the Lower Rio Grande Region, based on the event description provided on the NOAA Storm Events Database.

From 2000 to the present, property damage losses throughout the region due to flood and flash flood events amounted to \$437,875,000 in 2025 dollars, with the largest losses found in densely populated metropolitan areas prone to flash flooding and in areas subject to tropical storms and hurricanes.

Table 1.8 Total number of Casualties and Property Damages reported to the National Oceanic and Atmospheric Administration (NOAA) from January 1, 2000, to March 1, 2025, for the Lower Rio Grande Region

County	Total Recorded Events	Total Recorded Injuries	Total Recorded Deaths	Property Damage Value, \$
Brooks*	1	0	0	0
Cameron	69	0	0	117,375,000
Dimmit*	0	0	0	0
Edwards*	2	0	0	0
Hidalgo	62	0	1	225,412,500
Jim Hogg*	0	0	0	0
Kenedy*	0	0	0	0
Kinney*	21	0	0	100,000
Maverick*	20	0	2	2,005,000
Starr	38	0	0	56,413,000
Val Verde	28	0	0	1,110,000
Webb*	43	0	0	3,830,000

Willacy	31	0	0	30,244,500
Zapata	20	0	0	1,385,000
Region 15	335	0	3	437,875,000

Past losses for farming and ranching

According to the NOAA National Centers for Environmental Information, the cumulative reported losses to crops due to flooding in the Lower Rio Grande Region since 2000 amounted to \$457,945,000. Due to every county not reporting an amount of crop damage, it is likely that the amount of reported crop damage is greatly underestimated. Furthermore, we could not find a source that reports the amount of damage that historical storm events have had on livestock and other ranching activities. **Table 1.9** summarizes the crop damages by county within the Lower Rio Grande Region from 2000 through 2025.

Table 1.9 Total amount of Crop Damages reported to the National Oceanic and Atmospheric Administration (NOAA) from January 1, 2000, to March 1, 2025, for the Lower Rio Grande Region

County	Crop Damage Events	Crop Damage Value, \$
Brooks*	0	0
Cameron	6	107,210,000
Dimmit*	0	0
Edwards*	0	0
Hidalgo	8	163,000,000
Jim Hogg*	0	0
Kenedy*	0	0
Kinney*	0	0
Maverick*	0	0
Starr	2	50,500,000
Val Verde	0	0
Webb*	0	0
Willacy	6	137,210,000
Zapata	1	25,000
Region 15	13	457,945,000

Figure 1.12 Photo of the flooded neighborhood and adjacent agricultural field in Los Fresnos during the June 2018 rain event.



Source: NOAA Brownsville/Rio Grande Valley, TX Weather Forecast Office Storm Summary (The Great June Flood of 2018 in the RGV (weather.gov))

1.4. Political Subdivisions with Flood-related Authority

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 Texas Water Code. During the 2023 planning cycle, the TWDB provided an original list of political subdivisions within the Lower Rio Grande Region that were thought to potentially have some degree of flood-related authority. This list was refined through an initial data collection survey and outreach effort and was carried through for the 2028 planning cycle.

In addition to counties and municipalities, limited-purpose water supply and utility districts, such as Municipal Utility Districts (MUDs), Fresh Water Supply Districts (FWSDs), and Special Utility Districts (SUDs), per State law, may also hold flood-related authority. These districts, often located in or adjacent to cities and counties, can be involved in drainage and reclamation of overflowed lands, especially in areas where municipal infrastructure is limited.

Although flood-related activities on the Rio Grande are managed by the International Boundary and Water Commission (IBWC), the IBWC was not listed as a River Authority in the region because it is a federal agency, and not a state political subdivision. The IBWC operates as a binational entity, with U.S. and Mexican sections jointly administering treaty obligations related to boundary and water management.

The following political subdivisions were identified as having flood-related authority:

Political Subdivisions Identified as having Flood-Related Authority

Counties (14 total)

Brooks	Hidalgo	Maverick	Willacy
Cameron	Jim Hogg	Starr	Zapata
Dimmit	Kenedy	Val Verde	
Edwards	Kinney	Webb	

Municipalities by County (54 total)

Cameron County (18 total)

Bayview	La Feria	Port Isabel	San Benito
Brownsville	Laguna Vista	Primera	Santa Rosa
Combes	Los Fresnos	Rancho Viejo	South Padre Island
Harlingen	Los Indios	Rangerville	
Indian Lake	Palm Valley	Rio Hondo	

Hidalgo County (22 total)

Alamo	Granjeno	Mission	Progreso Lakes
Alton	Hidalgo	Palmhurst	San Juan
Donna	La Joya	Palmview	Sullivan City
Edcouch	La Villa	Penitas	Weslaco
Edinburg	McAllen	Pharr	
Elsa	Mercedes	Progreso	

Kinney County (2 total)

Bracketville	Spofford
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Maverick County (1 total)

Eagle Pass

Starr County (4 total)

Escobares	La Grulla	Rio Grande City	Roma
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Val Verde County (1 total)

Del Rio

Webb County (3 total)

El Cenizo	Laredo	Rio Bravo
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Willacy County (3 total)

Lyford	Raymondville	San Perlita
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River Authorities (0 total)

none

Flood Districts (10 total)

Cameron County Drainage District 1	Hidalgo County Drainage District 1
Cameron County Drainage District 3	Starr County Drainage District
Cameron County Drainage District 4	Webb County Drainage District 1
Cameron Count Drainage District 5	Willacy County Drainage District 1
Cameron County Drainage District 6	Willacy County Drainage District 2

Other Entities with flood authority (7 total)

Irrigation Districts with Flood Control Authority (5 total)

Bayview Irrigation District 11	Harlingen Irrigation District
Donna Irrigation District Hidalgo County 1	La Feria Irrigation District Cameron County 3
Hidalgo and Cameron Counties Irrigation District 9	

Municipal Utility Districts with Flood Control Authority (2 total)

Fort Clark MUD	Valley MUD 2
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Other Entities with no flood authority (28 total)

The following groups are included on the list of interest groups due to their close association with flood mitigation activities and, in some cases, their involvement in the conveyance of stormwater. For example, certain irrigation districts have entered interlocal agreements with local flood control districts, allowing for shared use of infrastructure. In areas where farmland is being converted into residential subdivisions, these districts have approved the use of field runoff swales and canals for drainage conveyance, helping to manage stormwater and reduce localized flooding risks.

This type of collaboration highlights the importance of multi-agency coordination in flood planning, especially in regions like the Lower Rio Grande Basin where agricultural, urban, and environmental interests intersect. Including these groups in the planning process ensures that existing infrastructure is leveraged effectively and that future development aligns with regional flood resilience goals.

Irrigation Districts, No Flood Control Authority (15 total)

Brownsville Irrigation District	Hidalgo County Irrigation District 5
Cameron County Irrigation District 2	Hidalgo County Irrigation District 6
Cameron County Irrigation District 6	Hidalgo County Irrigation District 13
Cameron County Irrigation District 16	Hidalgo County Irrigation District 16
Delta Lake Irrigation District	Santa Cruz Irrigation District 15
Engelman Irrigation District	United Irrigation District
Hidalgo County Irrigation District 1	Valley Acres Irrigation District
Hidalgo County Irrigation District 2	

Special conservation and reclamation district, No Flood Control Authority (1 total)

Rio Grande Regional Water Authority

Municipal Utility Districts, No Flood Control Authority (8 total)

Hidalgo County MUD 1	Paseo De La Resaca MUD 2
Los Fresnos MUD 1	Paseo De La Resaca MUD 3
Los Fresnos MUD 2	San Ygnacio MUD
Paseo De La Resaca MUD 1	Sebastian MUD

Council of Governments with flood control authority (4 total)

Coastal Bend Council of Governments	Middle Rio Grande Development Council
Lower Rio Grande Valley Development Council	South Texas Development Council

Entities removed from the original TWDB list

The following entities have been removed from the entities list as they have no flood control authority. Their primary purpose or mission relates to coastal areas or the conservation, delivery, and use of surface water for consumption and use.

Navigation Districts with no Flood Control Authority (3 total)

Brownsville Navigation District	Willacy County Navigation District
Port Isabel San Benito Navigation District	

Water Districts with no Flood Control Authority (11 total)

Cameron County Water Improvement District 10	Maverick County WCID 1
Cameron County Water Improvement District 16	Port Mansfield Public Utility District
Rio Grande Palms Water District	
Hidalgo County WCID 18	Siesta Shores WCID
Hidalgo County WCID 19	Southmost Regional Water Authority
Laguna Madre Water District	Zapata County WCID-Hwy 16 East

Flood Planning, Floodplain Management, and Flood Mitigation Activities

Flood Planning Activities

Flood planning activities are proactive measures undertaken before a flood event to better understand the dynamics of a watershed and to develop strategies that reduce or eliminate flood impacts. These types of activities can be undertaken by the local communities that manage the floodplains, but also states, flood districts, river authorities, and other special districts and entities that develop or partner with local entities for the common goal of developing resilient communities. Typical flood planning activities include:

- Hydrologic and hydraulic studies of watersheds or subbasins,
- Feasibility studies and design of flood mitigation projects,
- Coordination and development of regional flood projects,
- Policy and regulatory assessments for floodplain management,
- Community preparedness planning for flood events.

These efforts lay the groundwork for informed decision-making and effective flood response.

Floodplain Management Activities

According to FEMA, floodplain management is a community-based effort aimed at preventing, reducing, or mitigating the risk and impact of flooding, resulting in a more resilient community ([Floodplain Management | FEMA.gov](#)). Floodplain management activities are usually performed by local governments and include passing and enforcing land use and development regulations. Floodplain management activities include:

- Zoning regulations and land use planning,
- Building codes and construction standards,
- Adoption and enforcement of minimum development standards,
- Public education and outreach on flood risks,
- Participation in the National Flood Insurance Program (NFIP).

While FEMA has minimum floodplain management standards for NFIP communities, adopting higher standards can lead to safer, stronger, and more resilient communities.

Flood Mitigation Activities

Flood mitigation activities are implementation-focused measures designed to protect life and property. These activities often involve capital investment and are carried out by local communities, flood districts, and river authorities.

Flood mitigation measures fall into two categories:

- Structural Mitigation Projects:
 - Flood control structures (e.g., weirs, pump stations, gates),
 - Drainage infrastructure (e.g., channels, ditches, storm sewer systems),
 - Retention and detention ponds,
 - Green infrastructure (e.g., bioswales, infiltration gardens, green streets).
- Non-Structural Mitigation Projects:
 - Property buyouts in high-risk areas,
 - Restoration of natural systems (e.g., riparian corridors, wetlands, floodplains),
 - Flood warning systems, stream gauges, educational campaigns, and road crossing barriers.

These activities are essential for reducing flood damage and improving long-term community resilience.

A summary of the number of political subdivisions, or entities, identified for the Lower Rio Grande Region by entity type is included in **Table 1.10**. This table also lists the type of activities that entities typically undertake. Only those entities listed as having no flood authority are the ones that are not active with flood planning, floodplain management, or flood mitigation activities.

Table 1.10 Political Subdivisions with Flood-related Authority, by Entity Type, in the Lower Rio Grande Region

Entity Type	Number in Region	Type of Activities typically undertaken by Entity Type
Counties	14	Flood Planning, Floodplain Management, and Flood Mitigation activities
Municipalities	54	Flood Planning, Floodplain Management, and Flood Mitigation activities

Entity Type	Number in Region	Type of Activities typically undertaken by Entity Type
River Authorities	0	Flood Planning, Floodplain Management, and Flood Mitigation activities
Flood Districts	10	Flood Planning, Floodplain Management, and Flood Mitigation activities
Other with flood authority	7	Flood Planning activities
Other with no flood authority	28	Occasional coordination with flood authorities

1.5. Extent of Flood Risk-Related Regulations

In the Lower Rio Grande Region, 91 percent of eligible entities, including 49 of 54 municipalities and 13 of 14 counties, participate in the NFIP. The Texas Water Code §16.315 requires NFIP participants to adopt a floodplain management ordinance and designate a floodplain administrator. This individual is responsible for understanding and interpreting local floodplain management regulations and reviewing them for compliance with NFIP standards. Entities granted floodplain management authority under this statute have several key responsibilities, including:

- 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 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

To assess the regulatory landscape across the region, a data collection survey was administered during both the 2023 and 2028 planning cycles. The following tables summarize the entities’ responses to questions about their existing regulatory environment and any measures they may have in place to increase resilience. The information in these tables is strictly based on responses to the data collection survey.

A total of 42 unique entities participated in the data collection surveys, administered across two Regional Flood Planning cycles (2023 and 2028). To provide a comprehensive overview, responses from both cycles were combined. In cases where entities responded in both cycles, only the most recent response (2028) is reflected for entities that responded in both cycles.

Table 1.11 summarizes the type of regulations or development codes that the entities who responded to the survey indicated they had implemented to manage existing and future risk for developments. The responses are included as a percentage of survey participants. These plans and regulations were divided into four categories: Drainage Criteria Manual/Design Manual, Land Use Regulations, Ordinances (Floodplain, Drainage, Stormwater, etc.), and Unified Development Code (UDC) and/or Zoning Ordinance with map.

Among these categories, the largest number of respondents indicated that they had adopted active floodplain, drainage, and/or stormwater ordinances, reflecting a strong regional commitment to managing flood risk through regulatory frameworks.

Table 1.11 Types of Regulatory Measures to Promote Resilience in Flood-Prone Areas

Type of Regulation	Percent of Data Collection Respondents, %
Drainage Criteria Manual/Design Manual	40
Land use regulations	60
Ordinances (Floodplain, Drainage, Stormwater, etc.)	69
Unified Development Code (UDC) and/or Zoning Ordinance with map	38

Source: Lower Rio Grande Region Data Collection Tool and Interactive Webmap

In general, these regulations and ordinances cumulatively:

- restrict and prohibit land uses that are dangerous
- control alteration of floodplains, channels, and natural protective barriers
- describe permitting and variance procedures for land use regulation in relation to flood prevention
- define the duties of the floodplain administrator
- specify subdivision and construction standards
- prescribe penalties for non-compliance with standards
- define overall rules and regulations for flood control and flood hazard reduction

Beyond regulations, **Table 1.12** identifies additional measures entities undertake to comprehensively promote resilience in flood-prone areas to mitigate the effects of flooding. As defined by FEMA, resilience aims to build a culture of preparedness through insurance, mitigation, continuity, preparedness programs, and grants. According to the 42 respondents to the data collection survey, the most popular measures entities currently employed in the Lower Rio Grande Region include participation in the NFIP Program, implementation of land use regulations that limit future flood risk, and flood response planning. Roughly half of the respondents indicated that these three measures were currently being used. Flood readiness education and training and the use of a flood warning system was used by 32 percent and 21 percent of respondents, respectively. A respondent from one of the municipal utility districts indicated they take the same measures that the other local entities with

overlapping jurisdictions take. See **Table 1.12** for a detailed breakdown of the measures currently employed to promote resilience in the region’s flood-prone areas.

Table 1.12 Types of Measures to Promote Resilience in Flood-Prone Areas

Measures to Promote Flood Resilience	Percent of Data Collection Respondents, %
Acquisition of flood-prone properties	14
Flood readiness education and training	36
Flood response planning	55
Flood warning system	24
Higher Standards for floodplain management	10
Land use regulations that limit future flood risk	48
Participation in the Community Rating System (CRS)	12
Participation in the National Flood Insurance Program (NFIP)	60
Coordination with adjacent entities who share watershed	0

Source: Lower Rio Grande Region Data Collection Tool and Interactive Webmap

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 development from being in harm’s way by encouraging or requiring communities to avoid developing in flood-prone areas or to take precautions, such as: increasing building elevation, preserving overflow areas through buffering, and avoiding sensitive natural areas such as wetlands.

Floodplain Ordinances and Local and Regional Flood Plans

Floodplain ordinances dictate how development interacts with or avoids a city’s floodplain. FEMA and TWDB provide communities with flood hazard information (Flood Insurance Rate Maps & Base Level Engineering) to support the development of floodplain management regulations. Floodplain ordinances are subject to the NFIP and ensure that communities and entities consider flood hazards when making land use and land management decisions. Ordinances may include maps with base flood elevations (BFE), freeboard requirements, and criteria for land management and use. This information will be discussed in greater detail in Chapter 3.

Comprehensive Plans and Future Land Use Plans

The comprehensive plan establishes policies and a program of action for a community's long-term growth and development. The future land use (FLU) plan, or map, provides a guide for future areas of growth and development, as well as areas that are to be conserved in their natural state. Together, these plans provide the foundation for informed decision-making regarding future development. While many cities have FLUs, the content of these plans varies widely in specificity. Irrespective, the existence

of a FLU plan may mean that the entity is likely taking a more detailed approach to the type and location of future development.

Comprehensive plans and their associated FLU plans also provide legal authority for zoning regulations in the State of Texas. They 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 development location with respect to floodplains, the need for future drainage improvements, etc. As many development decisions are made during the first step in the development process, particularly during negotiated development proposals like planned unit developments (PUDs), it is critical for floodplains to be accounted for in these conversations.

Land Use Regulations and Policies: Zoning, Subdivision

Zoning ordinances regulate how property owners can use their property and what types of uses are allowed within a certain area. 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:

- stream buffers
- setbacks from wetlands and other natural areas
- conservation easements

Subdivision regulations get into a more focused direction on the design and form of the building blocks of a city. They regulate platting processes, standards for the design and layout of streets and other types of infrastructure, the design and configuration of parcel boundaries, and standards for protecting natural resources and open space. While both cities and counties have subdivision ordinances, counties do not have zoning authority in Texas. As identified by the survey results, 18 jurisdictions indicated that they have land use regulations to manage existing flood risk as part of development, while 15 indicated they had a future conditions land use plan or future zoning plan. Eleven jurisdictions indicated that they currently have unified development codes and/or zoning for construction.

Drainage Criteria

Drainage criteria are created to set the minimum standards for design engineers to follow when preparing plans for construction within the jurisdictions in which they serve. These could be for municipalities, counties, or districts with flood-related authority within the basin. The document covers standards pertaining to submissions, right of way/easements, hydrology, and hydraulics.

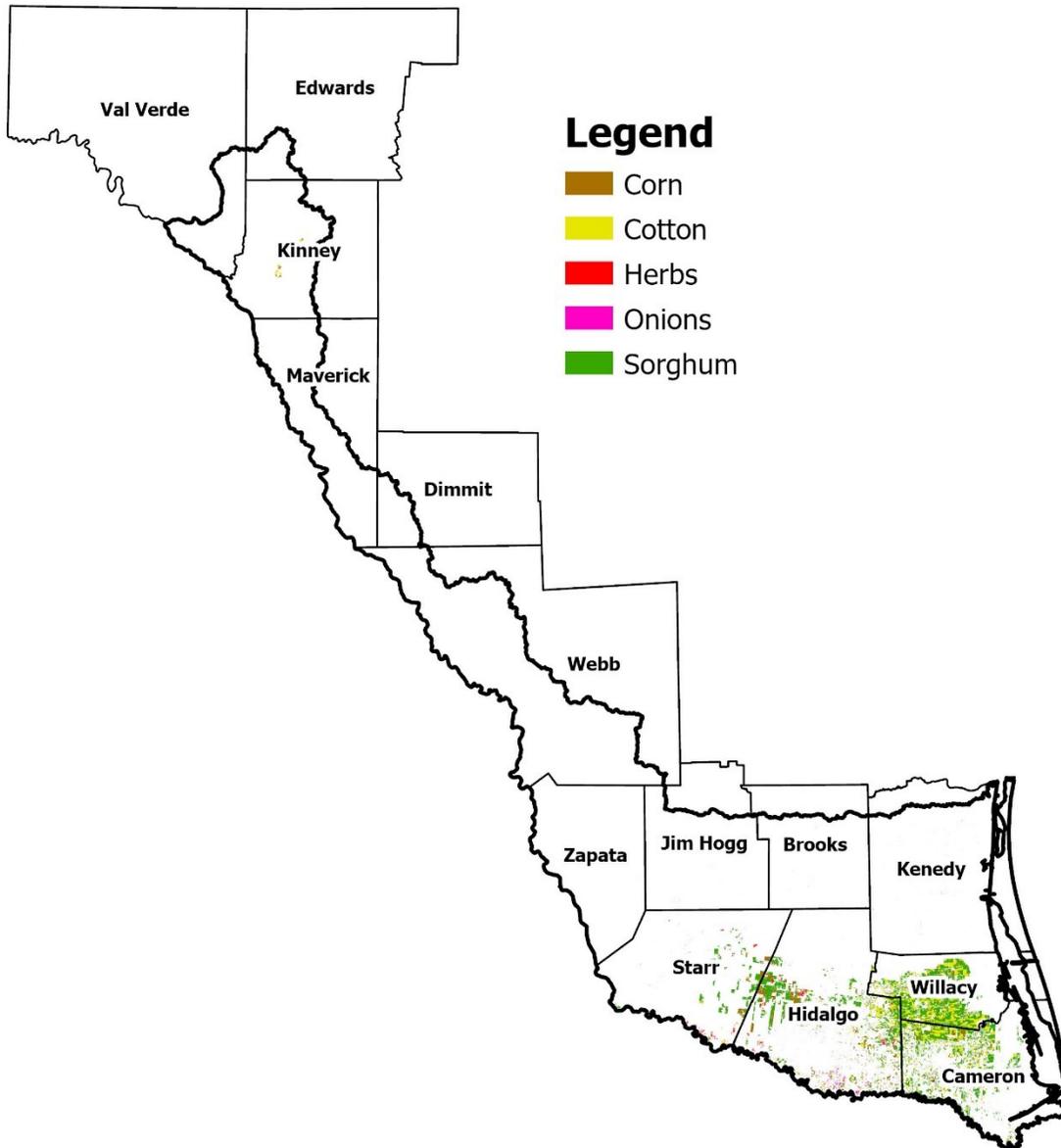
A storm drain system is a network of open channels and underground pipes designed to capture and convey concentrated stormwater flows to a point beyond the developed property limits. Developers may sometimes oversee creating drainage infrastructure that will be continuous and synergistic with the existing storm drain system and will not prevent surrounding property owners from extracting economic

benefits from their properties. As identified by the survey results, 17 jurisdictions have indicated that they currently have drainage criteria manuals/design manuals.

1.6. Agricultural and Natural Resources impacted by flooding

Figure 1.13 displays the locations where the top five crops in the region intersect with the floodplain. A large portion of these five major crops are located in the southern half of the Lower Rio Grande Basin. This concentration places floodplain-exposed crops primarily between the northwest portions of Zapata County and the southeast portions of Cameron County. There are some areas of the northern Region that hold significant amounts of grasslands, with a mix of crops in Maverick and Kinney Counties. These will typically be the crops and regions that feel the effects of flooding the most. As discussed in section 1.3, NOAA estimates the amount lost in this region due to flooding to be \$457,945,000 since 2000. However, not all counties consistently report property or crop damage following disaster events, so this figure may be significantly underestimated.

Figure 1.13 Top 5 crops in the Floodplain



1.7. Existing Flood Mitigation Planning Efforts

Most of the planning efforts within the Lower Rio Grande Region are primarily conducted at the local government level. Of the 14 counties located within the Lower Rio Grande Region, only 43 percent (6 counties) have current Hazard Mitigation Plans (HMPs) that are approved by FEMA according to TDEM County Hazard Mitigation Plans Status web map as of 6/30/2025 (County Hazard Mitigation Plans Status (arcgis.com)). Two of the counties are currently expired.

In addition to the counties, 45 of the 54 municipalities and 5 of the 17 special districts have undertaken additional Hazard Mitigation Planning to address needs specific to their unique circumstances. Several of the Flood Management Strategies (FMSs), Flood Management Evaluations (FMEs), and Flood Mitigation Projects (FMPs) identified in this Regional Flood Plan (see Chapter 5) were also listed in these HMPs, reflecting the interconnected planning efforts conducted across the region.

Most of the active Flood Mitigation Planning efforts currently ongoing are funded by the Flood Infrastructure Fund that was also approved by the 86th Texas Legislature and entrusted to the TWDB to administer. Within this region, six (6) FIF – Category 1 projects are currently underway. Category 1 projects are studies that provide Flood Protection Planning for Watersheds. These projects are listed in **Table 1.13** below.

Table 1.13 Flood Infrastructure Fund- Category 1 Projects currently underway in Region 15.

Responsible Authority	County	Project Name	Amount
Cameron County Drainage District No. 3	Cameron	Flood Protection Study	\$ 1,485,000
Harlingen	Cameron	Flood Protection Study	\$ 5,613,300
Lower Rio Grande Valley Development Council	Hidalgo, Cameron, Willacy	Lower Rio Grande Valley Regional Flood Protection Planning	\$ 7,983,000
Laredo	Webb	Chacon Creek – Rio Grande Basin Flood Protection Study	\$ 585,000
Raymondville	Willacy	Watershed Study	\$ 400,000
Willacy County	Willacy	Willacy County watershed Study	\$ 1,440,000

(Source: TWDB Flood Infrastructure Fund (FIF) Project Reporting Dashboard, August 2025) <https://www.twdb.texas.gov/financial/programs/fif/dashboard.asp>

Currently, the Texas GLO is conducting a hydrologic and hydraulic study which will result in detailed flood information for a critical watershed area that covers the lower four counties of Cameron, Hidalgo, Starr, and Willacy. This is the largest regional study being performed in the region at this time. This project and several other ongoing within the region are included in **Table 2** of **Appendix B**.

1.8 Inventory and Assessment of Existing Flood Infrastructure

This section provides an overview of natural and structural flood infrastructure in the Lower Rio Grande Flood Planning Region that contributes to lowering flood risk. The Lower Rio Grande Region's flood infrastructure serves not only the communities from Del Rio to South Padre Island, but in contrast to other flood planning regions in Texas, flood control infrastructure in this region depends on binational coordination through the International Boundary and Water Commission (IBWC). A map of the known existing flood infrastructure, natural and constructed, is included in **Appendix A** as **Map 1- Existing Flood Infrastructure**.

When assessing flood risk management infrastructure, this plan considers both the natural and manmade features that contribute to risk reduction, which may include, but are not limited to:

Natural Features:

- rivers, tributaries, and functioning floodplains
- wetlands
- parks, preserves, natural areas
- playa lakes
- sinkholes
- alluvial fans
- vegetated dunes

Structural Features:

- levees
- sea barriers, walls, and revetments
- tidal barriers and gates
- stormwater tunnels
- stormwater canals
- dams that provide flood protection
- detention and retention ponds
- weirs
- storm drain systems
- flood early warning systems

Both natural areas and built features make up the flood infrastructure in the region, including dams, levees, regional detention ponds, etc. The Texas Water Development Board provided several data sources to assist with the identification of flood management infrastructure in the Flood Data Hub. These features may be owned and managed by stakeholders ranging from the US Army Corps of Engineers to the National Parks Service to individual landowners. There were several questions posed in the data collection survey that was used to complement the information provided by existing data

sources to create a more complete picture of how communities in the region protect themselves from flood risk.

Information related to the Inventory of Existing Flood Infrastructure summarized in this section is included in TWDB **Table 1**: Existing Flood Infrastructure Summary Table, included in **Appendix B** of this plan and serves as the basis for several tables and charts in this section.

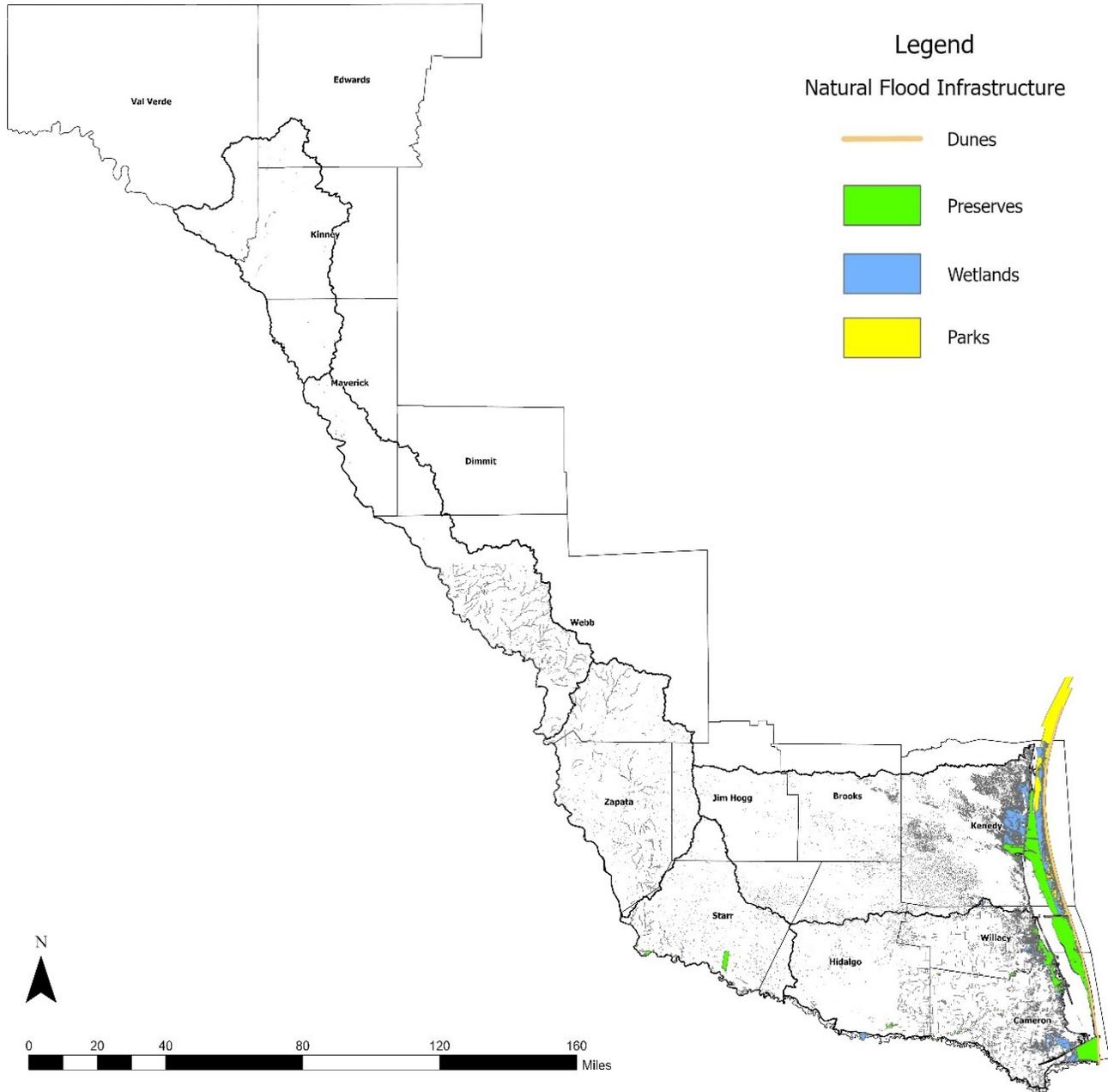
1.8.a Natural Features

As the population growth and infrastructure trends along the U.S./ Mexico border continue, the basin will need to take a more deliberate approach to managing its natural infrastructure to continue to receive the benefits of open spaces, something which the U.S. Army Corps of Engineers addresses in its Engineering with Nature Initiatives. The State and Federal government are already actively managing 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 1.14**. Recent changes to border security infrastructures and the built environment have begun to disrupt preserves and natural areas, as well as the natural hydrology.

When left in their natural state, many soils can be efficient at handling rainfall. As drops fall from the sky, they are intercepted by trees, shrubs, or grasses, which allow rain time to soak into the soil and slow the passage of runoff to the region's waterways. Wetlands and woodlands are most efficient at recycling rainfall. The branches and undergrowth intercept water before reaching the ground, thus minimizing overland flow to tributaries and the river. Pastureland performs this function effectively as well, whereas croplands may shed a greater degree of water so as not to inundate the fields.

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 (Low Impact Development Center). Even small changes in developed areas can have a significant impact on downstream flooding.

Figure 1.14 Natural Flood Infrastructure



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

- **Watershed or Landscape Scale:** Where natural areas are interconnected to provide opportunities for water to slow down and soak in and overtop the banks of creeks and channels when needed. These solutions often include multiple jurisdictions and the restoration of natural habitats to achieve maximum effectiveness.
- **Neighborhood Scale:** Solutions built 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 surges and tidally influenced flooding, nature-based solutions can be used to stabilize shorelines and restore wetlands. (FEMA, 2021)

As forests and fields give way to urban development, soil permeability decreases. 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 twenty years between 1997 and 2017, the Texas Land Trends project found that the Lower Rio Grande River Basin lost about 200,000 acres of working land (crops, grazing lands, timber, and wildlife management) to urban and suburban development. While the population increased by more than 15% during that time, only about 1 percent of the total acreage of natural areas was replaced with structures, roads, and parking lots. These types of hard surfaces can increase the potential for increased runoff unless flood mitigation is incorporated into the development. The acreage that remained as open space grew increasingly fragmented.

As the trend toward urbanization and fragmentation continues, the region should consider taking a more deliberate approach to managing its natural infrastructure to continue to receive the benefits of open spaces, something which the U.S. Army Corps of Engineers addresses in its Engineering with Nature initiatives, which align natural and engineering processes to deliver economic, environmental, and social benefits efficiently and sustainably through collaborative projects. The TWDB also 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 1.14** above.

Rivers, Tributaries & 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. The first part of the floodplain is the main channel of the river itself, called the floodway, which may be dry for part of the year. 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 floodwaters to reduce flood peaks and velocities. Even in urban areas, the preservation of this

integrated system of waterways and floodplains serves a valuable function, as even small floods resulting from a 5- or 10-year storm can cause severe flood damage. Depending on soil type and permeability, a single acre of floodplain land can significantly reduce the risk to properties downstream. With over 33 percent of its land area located in the floodplain and the Rio Grande River and its tributaries crossing through both rural and highly urbanized areas of Texas, the river and its many tributaries and floodplains contribute to flood risk reduction as they meander southeast on their way east to the Gulf of Mexico. (FEMA, 2021)

Similar to the floodplain quilt, the region’s streams were populated with available information from FEMA, USGS, TWDB, and local entities. It should be noted that the streams are compiled from the best available datasets; however, they generally do not align with the current topography. Along with statewide mapping, the TWDB is developing updated stream layers that can be integrated into the next planning cycle. As displayed in **Table 1.14** Streams by HUC-8 Watershed, there are over 29,878,173.74 stream miles in the Lower Rio Grande Region.

Table 1.14 Streams in Lower Rio Grande Region by HUC-8

Stream Name	HUC-8	COUNTY	Area (Acres)	Stream Miles
Elm-Sycamore	13080001	Val Verde	2,626,958	4,791,121
Central Laguna Madre	12110207	Kenedy	2,392,011	3,086,686
South Laguna Madre	12110208	Willacy	1,910,401	8,809,707
San Ambrosia-Santa Isabel	13080002	Webb	3,691,642	7,324,160
International Falcon Reservoir	13080003	Webb	1,802,008	4,729,751
Los Olmos	13090001	Starr	2,012,880	1,136,748

Wetlands

Wetlands are some of the most effective natural features for recycling water by minimizing the overland flow and reducing the need for other types of flooding 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 land's surface and is covered by shallow water. They can include mangroves, marshes, swamps, forested wetlands, and coastal prairies, among other habitats, and their soil or substrate is at least periodically saturated by fresh or salt water. There is

a robust concentration of wetlands directly surrounding the Rio Grande River, and as the river heads eastward towards the coast, the concentration of wetlands increases. When left undisturbed by development, wetlands can not only mitigate flooding from upstream but also blunt the force of storm surges from the coast in the form of hurricanes and other tropical storms. According to the USGS National Wetlands Inventory, wetlands comprise 414,900 acres within the basin. This accounts for one of the largest types of natural infrastructure for the basin.

Parks, Preserves & 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 necessary for the region's continued ecological health. Parks include any municipal, county, state, and national parks within the region, while preserves include the Texas Parks & Wildlife Department's State Wildlife Management Areas. These areas provide a sanctuary for all these aspects impacted by human activity. Additionally, these are essential components for water retention in the event of flooding and severe rainfall.

- Parks account for 165,200 acres
- Preserves make up 191,400 acres within the basin.

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.

Coastal areas

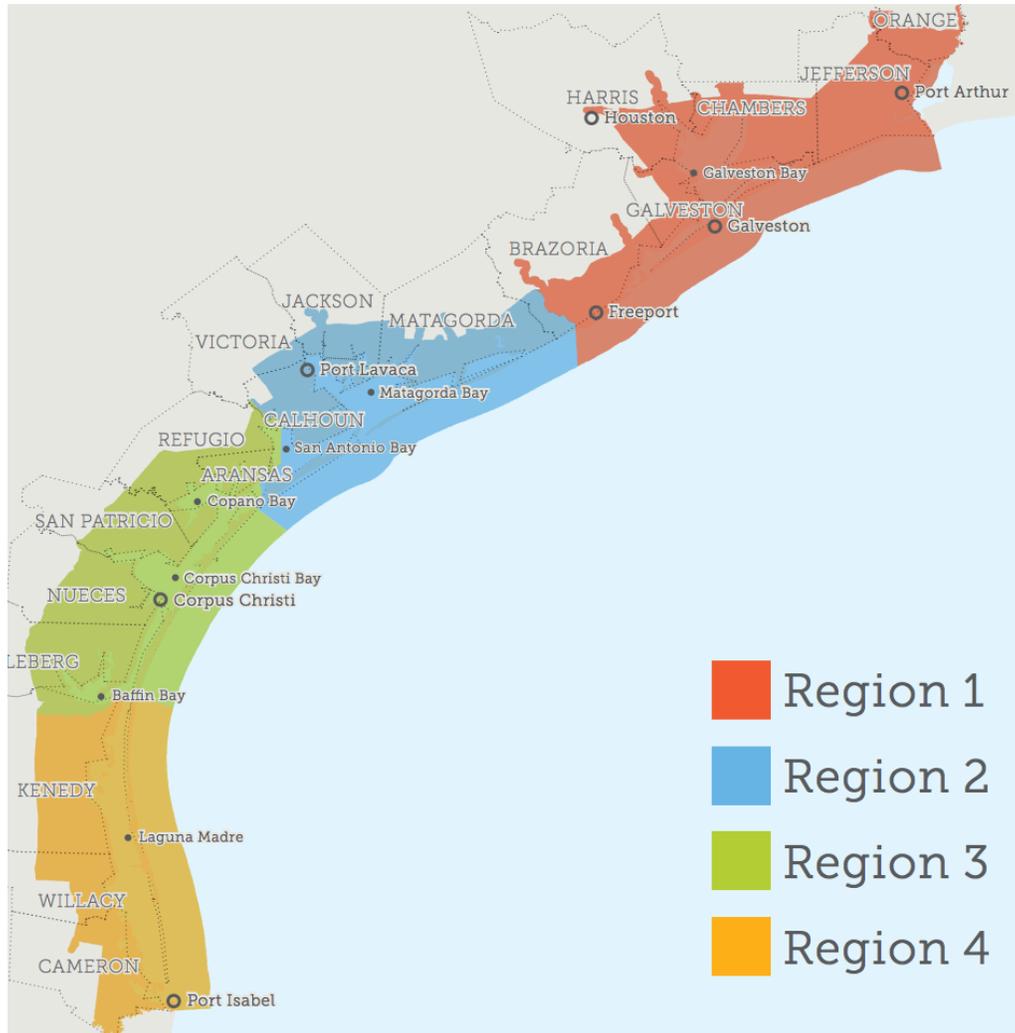
The National Coastal Zone Management Program is a voluntary partnership between NOAA and coastal states that was formed between states and the federal government following the passage of the Coastal Zone Management Act of 1972. This program supports efforts to:

- Protect coastal ecosystems
- Manage shoreline development
- Mitigate erosion and storm surge impacts

These coastal strategies are especially relevant in the southeastern portion of the basin, where tidally influenced flooding and hurricane-related storm surges pose significant risks.

In Texas, this program is managed by the Texas General Land Office (GLO) and implemented through the 2023 Coastal Resiliency Master Plan (CRMP). The geographic extent of the State's Coastal Zone is illustrated in **Figure 1.15**. For planning purposes, the state divides the Texas coast into four regions based on factors such as size, population centers, habitats, and environmental conditions.

Figure 1.15 The 4 Regions of Texas' Coastal Zone, as defined by the Texas General Land Office (GLO) in their Coastal Resiliency Master Plan (CMRP)



Source: 2023 Texas Coastal Resiliency Master Plan

In the Lower Rio Grande Flood Planning Region, only the eastern areas of Cameron, Willacy, and Kenedy Counties intersect Texas Coastal Zone, Planning Region 4 – a unique and ecologically significant coastal lagoon. The Laguna Madre is one of only five hypersaline coastal ecosystems in the world, characterized by shallow waters, limited freshwater inflow, and extensive seagrass beds that cover over 65 percent of its bottom surface. It is physically divided into Upper and Lower Laguna Madre by a land bridge near South Padre Island, and its waters are critical for supporting biodiversity, stabilizing shorelines, and buffering inland areas from storm surge and tidal flooding.

As the lagoon lies adjacent to rapidly developing areas, its natural features—such as seagrass meadows, mudflats, and barrier islands—play a vital role in coastal flood mitigation. These features help absorb wave energy, reduce erosion, and slow the movement of floodwaters during tropical storms and

hurricanes. Mitigating coastal flooding is a primary objective of the CRMP, and proposed solutions include:

- elevating structures
- incorporating green infrastructure into the development
- creating flood-resilient parks and recreational spaces
- retaining and restoring open space
- maintaining/creating freshwater wetlands and coastal prairies

The 2023 CRMP recommended 14 Tier 1 projects within Region 4, with a total estimated cost of \$472 million, many of which are designed to enhance resilience in and around the Laguna Madre ecosystem.

1.8.b Constructed/ Structural Flood Infrastructure

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.

Dams, Levees & Reservoirs

below identifies the location of all known dams and levees in the Lower Rio Grande Region. Dams in Texas serve many purposes, including recreation, flood risk mitigation, irrigation, water supply, and fire protection, among others. About one in three of the state’s dams provides flood risk mitigation, and one in seven is for irrigation or water supply.

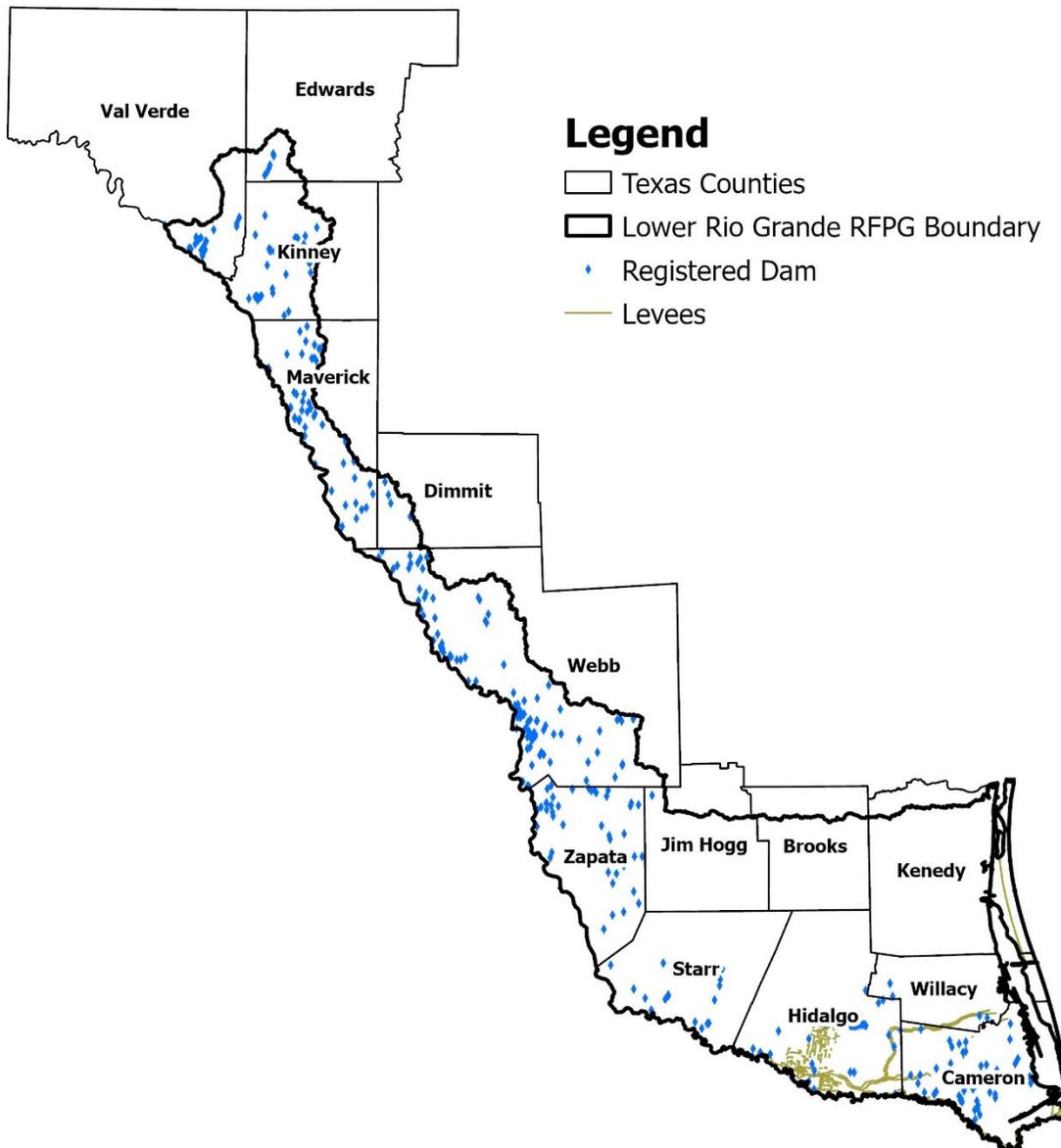
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Levees are man-made structures that provide hurricane, storm, and flood risk reduction measures. Levees protect more than one million Texans and \$248 billion worth of property. The 2025 ASCE State of Texas Infrastructure Report Card lists 234 levee systems within the state.

The *Lower Rio Grande Flood Control System* contains 270 miles of U.S. flood control levee along the Rio Grande, interior floodways, and the Arroyo Colorado in Texas. Flood control works along the Rio Grande include 102 miles of levees and floodplain from Peñitas, Texas to beyond Brownsville, Texas. The interior floodway, which starts 13 levee miles downstream from Peñitas at Anzalduas Dam, is about 70 miles long and is bounded by 143 miles of levees: 68 miles on the right side and 75 miles on the left side.

The Arroyo Colorado, a 53-mile natural channel that breaks off the interior floodway, is confined by high ground and 25 miles of the levee; 10.5 miles on the left side and 14.6 miles on the right side. The Lower Rio Grande Flood Control System provides protection to the following metropolitan statistical areas: Brownsville-Harlingen, Texas, and McAllen-Edinburg-Mission, Texas. Approximately one million U.S. residents live in the Lower Rio Grande Valley. Due to its proximity to the Gulf of Mexico and related tropical weather systems, the Lower Rio Grande Valley is prone to hurricanes and annual flood events.

Figure 1.16 Known Dams and Levees



Storm Sewer Systems

Many of the developed areas of the region rely on a network of storm sewer pipelines and reinforced concrete boxes to convey storm water from the urban areas to a drainage outfall channel, or ditch, system that ultimately outfall to the Rio Grande River or the Laguna Madre and Gulf of Mexico. Very few entities within the region provided location and size information regarding the storm sewer systems they manage and maintain. Unfortunately, no information was given to the condition or adequacy of the improvements. The existing information provided is included in **Map 1** in the **Appendix A**.

Flood Early Warning System (FEWS)

A Flood Early Warning System (FEWS) relies on data collection, data analysis and visualization, and information dissemination to alert communities about current or impending flood conditions. It uses advanced sensor technology to monitor, and in some cases predict, real-time local flood conditions through a network of connected gauges, National Weather Service data, and any other regional or national data sources. There are two levels to the FEWS system:

- Flood Monitoring, which requires input data from variety sources, such as real-time flow gauges, water elevation sensors, and rainfall measurements. These are compared against a predefined threshold of concern. Once flood waters reach critical levels, the system analyzes the data and sends notifications to relevant stakeholders, alerting them to current flood conditions.
- Flood Forecasting, builds upon monitoring data and uses predictive models (such as a hydrologic and hydraulic analysis or an empirical rainfall runoff algorithm) to future flood conditions and provide early warnings to flood authorities and the public. To improve awareness of current water conditions and possible flooding, stream data are combined with rain data collected at nearby USGS rain gauges. Several of the USGS stream gauge locations in Texas are integrated into the National Weather Service Advanced Hydrologic Prediction Service (AHPS) data that is disseminated through the NOAA/NWS application programming interface (API) allowing a forecast of water elevation for up to 72-hours in the future.

Flood monitoring systems are generally less expensive, and easier to operate than forecasting systems. Both systems enhance coverage for areas of concern, reduce risk and loss of life by minimizing exposure to flood conditions, and may help reduce property damage by providing advance notice. Additionally, FEWS systems are often more cost-effective than traditional structural flood control strategies.

Regional FEWS Implementation

Region 15 is working towards a long-term goal of developing a regionally coordinated warning and emergency response program capable of detecting flood threats and providing timely warning to more than 70 percent of the Region's most populated areas by 2053.

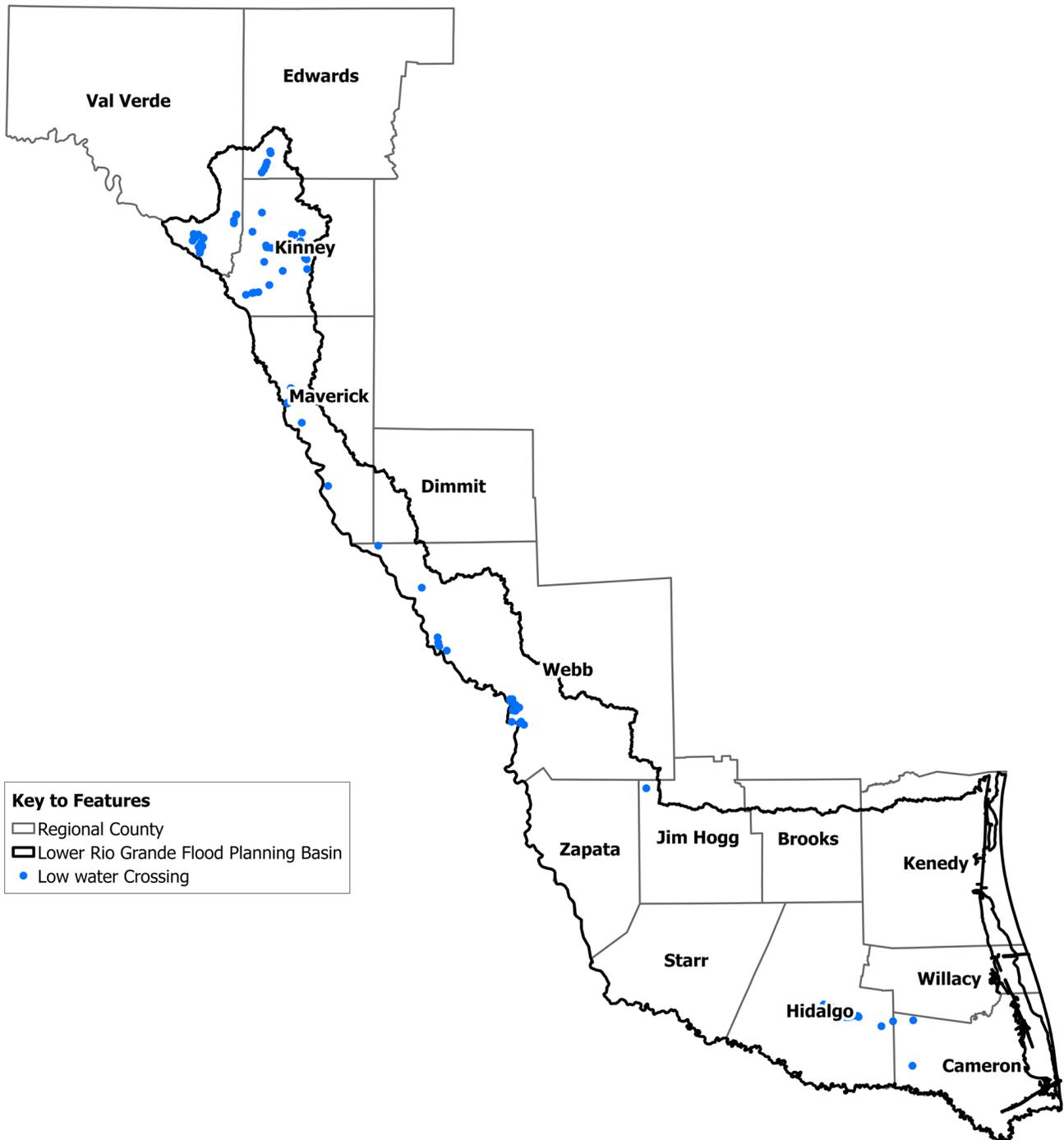
To support this goal, the Lower Rio Grande Valley Stormwater Task Force, in partnership with the Water Resources Advisory Committee (serving Willacy, Hidalgo, and Cameron Counties), is developing the Regional Texas Hydrologic Sensor (RTHS) Network. This initiative is part of a broader effort to create an “Intelligent Watershed,” including a comprehensive regional Early Warning System (EWS). The system currently consists of 60 continuous water level sensors which have been in operation since 2024. TWDB has committed \$8.8 million to support this project, with an additional \$20 million pending for further development; TWDB funded 73 percent of the sensors in place, with local cities providing the final 27 percent. Additionally, TWDB has awarded a grant in 2020 to Val Verde County for \$500,000 to install flood monitoring equipment at eight sites and a communication tower for FEWS.

Roadways

Although not classically considered flood infrastructure, roadways can act as conduits for conveying stormwater away from structures. Where roadways intersect with drainage conveyance channels, sometimes the roadway structure, such as a bridge, often serves a dual purpose as stormwater infrastructure. Even when not designed as bridges, roadways crossing drainage features are critical for public mobility, particularly during adverse weather and storm events.

The Lower Rio Grande Region’s low water crossing database was initially populated with the TWDB-provided low water crossings and then refined using input from entities. **Figure 1.17** below shows the Low Water Crossings identified for the Lower Rio Grande Flood Planning Region. The TWDB defines a low water crossing as a roadway crossing that is overtopped by the 1 percent ACE (100-year) or more frequent events. At-risk roadway segments for our region were identified as the portions of the roadway that were located within the 1 percent and 0.2% floodplains.

Figure 1.17 Known Low Water Crossings



1.8.c Condition and Functionality of Infrastructure and Other Flood Mitigation Features (Table 1)

TWDB requires **Table 1: Existing Flood Infrastructure Summary Table** to be included in **Appendix B** and includes the location and summary of existing flood infrastructure and natural features within the Lower Rio Grande Flood Planning Region, whose information was readily available. Although there have been efforts to collect flood control and conveyance information from the entities with the Lower Rio Grande, no digital information has been able to be collected thus far. This database is expected to be enhanced with more local information as future data collection efforts are undertaken. Thus, no information has been acquired or received regarding the functionality of constructed flood infrastructure.

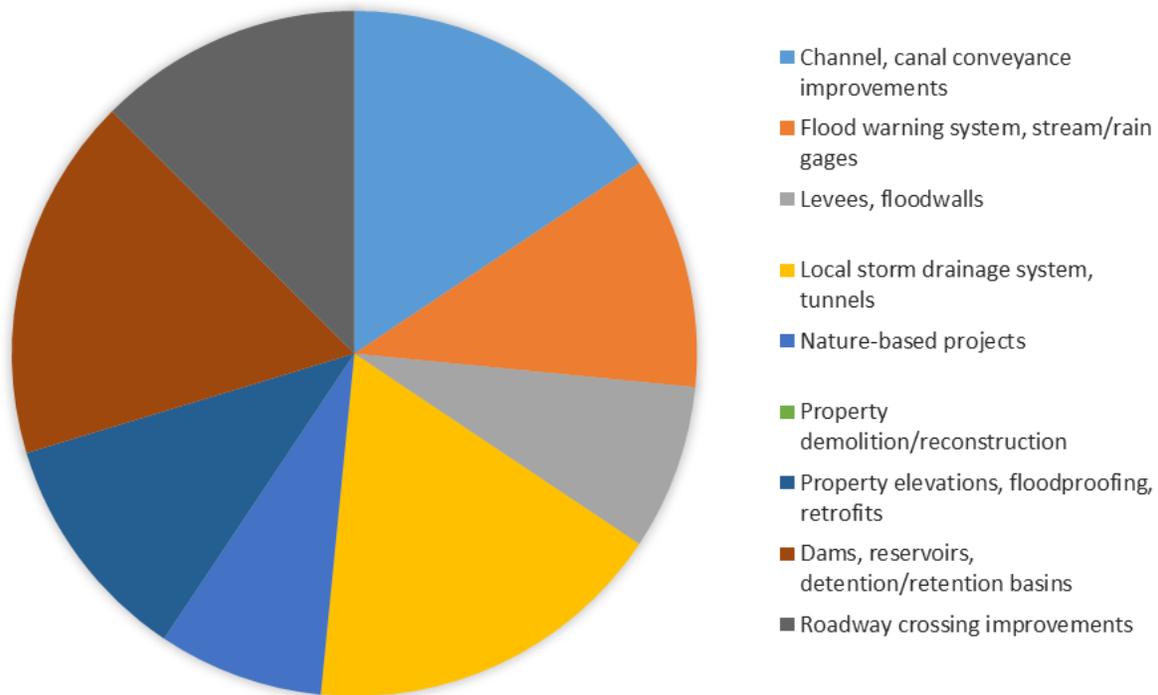
1.9 Proposed or Ongoing Flood Mitigation Projects (Planned Flood Infrastructure Improvements (Table 2)

The data for this section is derived from two primary sources. The first source of this data is the region's data collection survey, which was supplemented by direct outreach and interviews with stakeholders. More detailed results are available in TWDB required **Table 2: Summary of Proposed or Ongoing Flood Mitigation Projects** is included in **Appendix B**. The second source was a summary of TWDB-sponsored flood mitigation projects provided during the planning process.

About 17 communities indicated in the survey that they planned to undertake flood mitigation projects in the coming years. However, there are several gaps in this data set, as little data was provided on individual projects. Respondents were allowed to select multiple alternatives.

Most respondents to this question indicated they intended to pursue more than one type of flood mitigation project. **Figure 1.18** represents all potential types of projects identified in the survey. Local storm drainage systems, tunnels, roadway and crossing improvements, bridges, and culverts are among the most frequently cited FMPs for all responding jurisdictions. Flood Mitigation Projects (FMPs) will be covered in greater detail in Chapter 4 of this plan.

Figure 1.18 Flood Mitigation Project Types Survey Result



To accompany this chart, **Table 1.15** details the frequency with which communities plan on implementing a particular type of flood mitigation project. 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 regional dams and retention and even highway improvements that may involve State agencies.

Table 1.15 Flood Mitigation Projects (Survey)

Types of Flood Mitigation Projects	Count
Channel, canal conveyance improvements	10
Flood warning system, stream/rain gages	7
Levees, floodwalls	5
Local storm drainage system, tunnels	11
Nature-based projects	5
Property demolition/reconstruction	0
Property elevations, floodproofing, retrofits	7
Dams, reservoirs, detention/retention basins	11
Roadway crossing improvements	8

Structural Projects under Construction

Of the 116 total ongoing Flood Mitigation Projects throughout the Lower Rio Grande Region, 109 are structural projects. The concentration of these is within Hidalgo, Cameron, & Willacy Counties while Webb and Val Verde Counties have their own projects currently ongoing. The structural projects are spread over these five counties and represent four of the seven hydrologic subbasins (HUC 8) present within the Region 15 planning study area.

These projects include detention ponds (regional/local), ditch improvements, drainage improvements, and channel/canal improvements, among other improvements. These projects range in estimated project cost from \$10 thousand to over \$10 million, with the largest estimated to be \$32 million for a series of channel and regional detention improvements between Mile 9 North, Mile 15, North, FM 493, and the IBWC Floodway.

Of the structural projects, 31 include components for detention facilities, 3 include retention facilities, 38 include new or expanded channels or ditches, 20 include culvert improvements, and 22 include improvements or extension of the storm sewer system.

Nonstructural Flood Mitigation Projects being implemented

Of the 116 total ongoing Flood Mitigation Projects throughout the Lower Rio Grande Region, 7 of them are nonstructural projects. These are also within the Counties of Hidalgo, Willacy, Webb, Val Verde, & Cameron and represent five of the seven hydrologic subbasins (HUC 8) present within the Region 15 Planning Area.

These projects include flood studies, gauging/monitoring mechanisms, and other expansion of a drainage district's machinery for constructing and maintaining flood mitigation infrastructure. These projects range in estimated project cost from \$75 thousand to \$8 million. These nonstructural projects include watershed or specific planning studies for the affected regions for future planning periods, an early flood warning system, and a digitization project for existing Storm Sewer and Drainage Systems. It is noted that none of the nonstructural projects look at opportunities for buyouts or flood proofing.

Structural & Non-Structural Flood Mitigation Projects with Dedicated Funding & Year Complete Funding sources

Of the 116 total ongoing Flood Mitigation Projects, there are currently 114 ongoing projects with a dedicated funding source for construction and only 2 without dedicated funding. Of these projects, a large majority of them are funded through the Texas Water Development Board's Flood Infrastructure Fund (FIF) or a Drainage Bond Program. Of the funded projects, 86 are in Hidalgo County, 15 are in Cameron County, 12 are in Willacy County, 5 are in Webb County, and 1 is in Val Verde County.

The projects that have funding are distributed between all four hydrologic subbasins (HUC 8) identified as part of the structural and nonstructural flood mitigation projects present within the Region 15 planning study area.