Chapter 4 – Assessment and Identification of Flood Mitigation Needs

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4 Assessment and identification of Flood Mitigation Needs

This chapter identifies 1) the greatest flood risk knowledge gaps and known flood risks (Section 4.1), and 2) presents the technical memorandum submitted to the Texas Water Development Board (TWDB) in December 2021 (Section 4.2). The identification and evaluation of potential flood management evaluations (FMEs), potentially feasible flood management strategies (FMSs), and flood mitigation projects (FMPs) are described in Chapter 5. Collectively, FMEs, FMSs, and FMPs are referred to in the regional flood plan (RFP) as flood mitigation actions.

4.1 Flood Mitigation Needs Analysis

The flood mitigation needs analysis identifies where the greatest flood risk knowledge gaps exist and where known flood risk and flood mitigation needs are located within the Nueces Flood Planning Region (NFPR). This information guides the identification of flood mitigation actions.

4.1.1 Greatest Known Flood Risk and Flood Mitigation Needs

The areas of greatest known flood risk and flood mitigation needs in the NFPR are defined as areas with elevated levels of risk to property and life. The level of risk is defined by looking at the location and magnitude of flooding from the 1% and 0.2% annual chance flood event (flood hazard), who and what may be harmed (flood exposure), and what communities and critical facilities may be vulnerable (flood vulnerability). The details of the flood hazard, exposure, and vulnerability analyses are fully described in Chapter 2 – Flood Risk Analysis.

An analysis of known flood risk data was performed based on watershed boundaries. For the purposes of this analysis, a hydrologic unit code (HUC)-12 sized watershed was chosen. There are 627 HUC-12 watersheds in the NFPR, as shown in Figure 4-1.

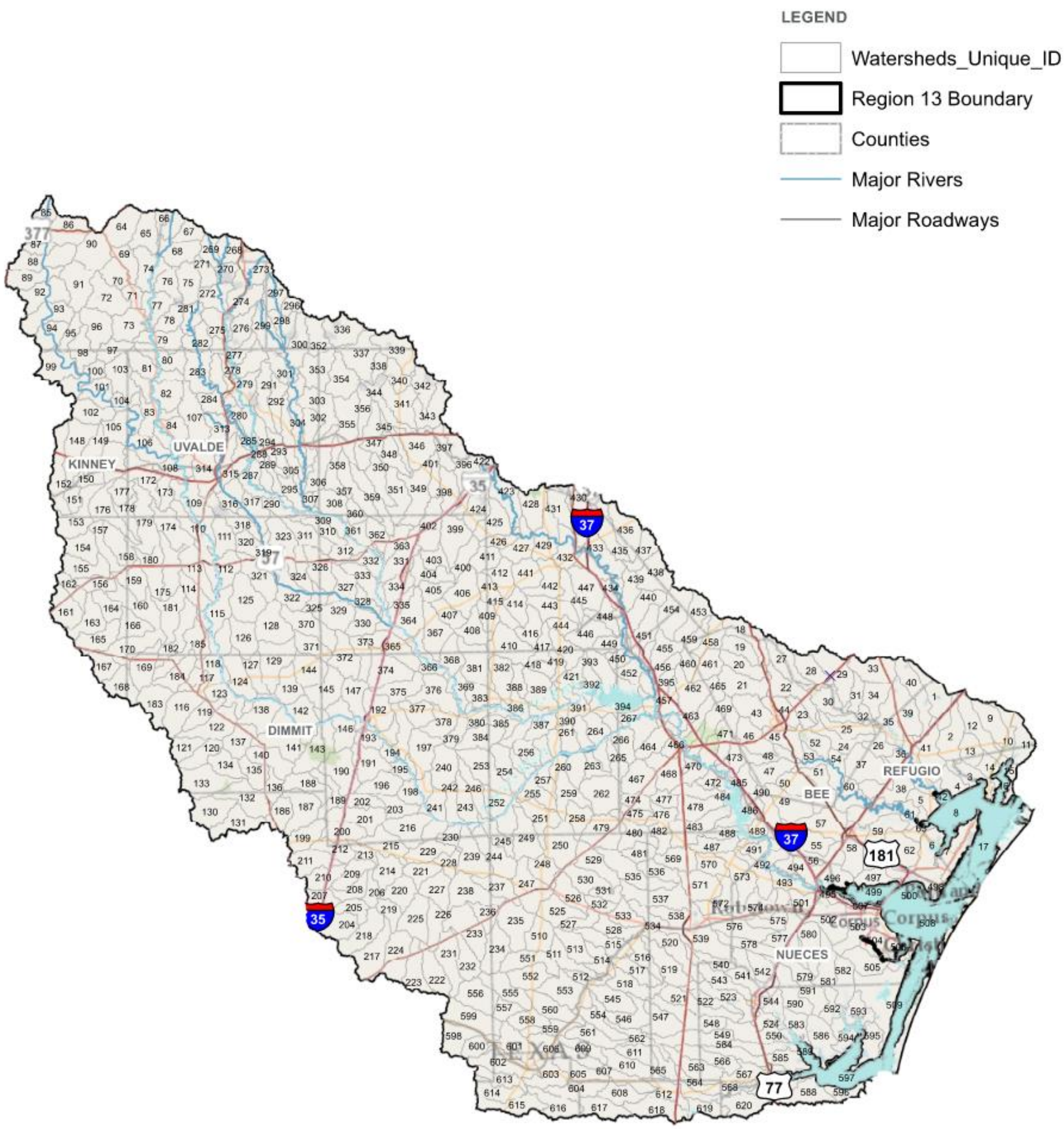

Figure 4-1. Nueces Flood Planning Area HUC 12 Watersheds

The flood risk data related to property damage and life loss risk was evaluated for each HUC-12 watershed in the basin. The various flood risk data categories are listed below with descriptions and assigned weighting percentage applied for each category provided.

- Historical Property Damage (15%) – Property damage data provided by the National Weather Service (NWS), the Federal Emergency Management Agency (FEMA), the U.S. Geological Survey (USGS), and local knowledge of flood-prone areas.

- Historical Life Loss (15%) – Flood fatality and injury data collected by the NWS since 1996.
- Property Damage – Exposure (15%) – Exposure data representing the number of residential and commercial building structures located within the best available 1% and 0.2% annual chance flood inundation boundaries.
- Property Damage – Vulnerability (15%) – Vulnerability data representing the number of residential and commercial building structures identified in the "exposure" layer above within a high vulnerability area (i.e., Social Vulnerability Index (SVI) > 0.75%)
- Property Damage – Critical Facilities (15%) - Vulnerability data representing critical facilities, which includes: shelters, airports, Department of Defense military facilities, hospitals, schools (K-12), fire stations, and police stations identified in the 'exposure' layer above.
- Life Loss – Low Water Crossings (15%) - Data as provided by Texas Natural Resources Information System (TNRIS).
- Life Loss – Dams (10%) - Data representing potential hazardous dams that have been identified as either hydraulically inadequate or deficient by the Texas Commission on Environmental Quality (TCEQ).

The data points for each category were counted for each HUC-12 watershed and a score of 1 to 5 assigned based on the statistical relationship to all other HUC-12 watersheds. Then, each category was weighted in terms of property damage and life loss risk to obtain an overall score. Total scores were then adjusted by a scale factor so that the highest score is 5 on the 1 to 5 scale. See an example of this calculation in Table 4-1.

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Table 4-1. Flood Risk Score Example Calculation (HUC12 121101060901, ID313)

Item	Historical Property Damage (Flood Prone Areas)	Historical Property Damage (Agency Data)	Historical Life Loss	Property Damage – Exposure (Buildings)	Property Damage – Vulnerability (Buildings)	Property Damage – Vulnerability (Critical Buildings)	Low Water Crossings	Life Loss (Dams)	Total Score	Scaled Score[1]
Count	0	0	0	174	84	4	6	0		
Percentile Rank	0	0	0	90%	93%	93%	96%	0%		
Unweighted Score (1-5)	0	0	0	5	5	5	5	0		
Weighted Percentage	7.5%	7.5%	15 %	15%	15%	15%	15%	10%	100%	
Weighted Score	0	0	0	0.75	0.75	0.75	0.75	0	3.00	4.29
1 – Scale score is equal to total score multiplied by the scale factor, which is the highest possible score (5) divided by the maximum score (3.5) (i.e. 3.00 x 5 / 3.5 = 4.29)										

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See Figure 4-2 for flood risk scores for each HUC-12 watershed in the Nueces Basin. No risk is represented by a score of zero and the highest risk is represented by a score of 5. The flood risk category data point scores and total score for each HUC-12 watershed are presented in Appendix C6 – HUC-12 Flood Risk Data Score Table and on a county basin in Appendix B23 – Flood Hazard Risk, Flood Risk Score, and Recommended Flood Mitigation Actions.

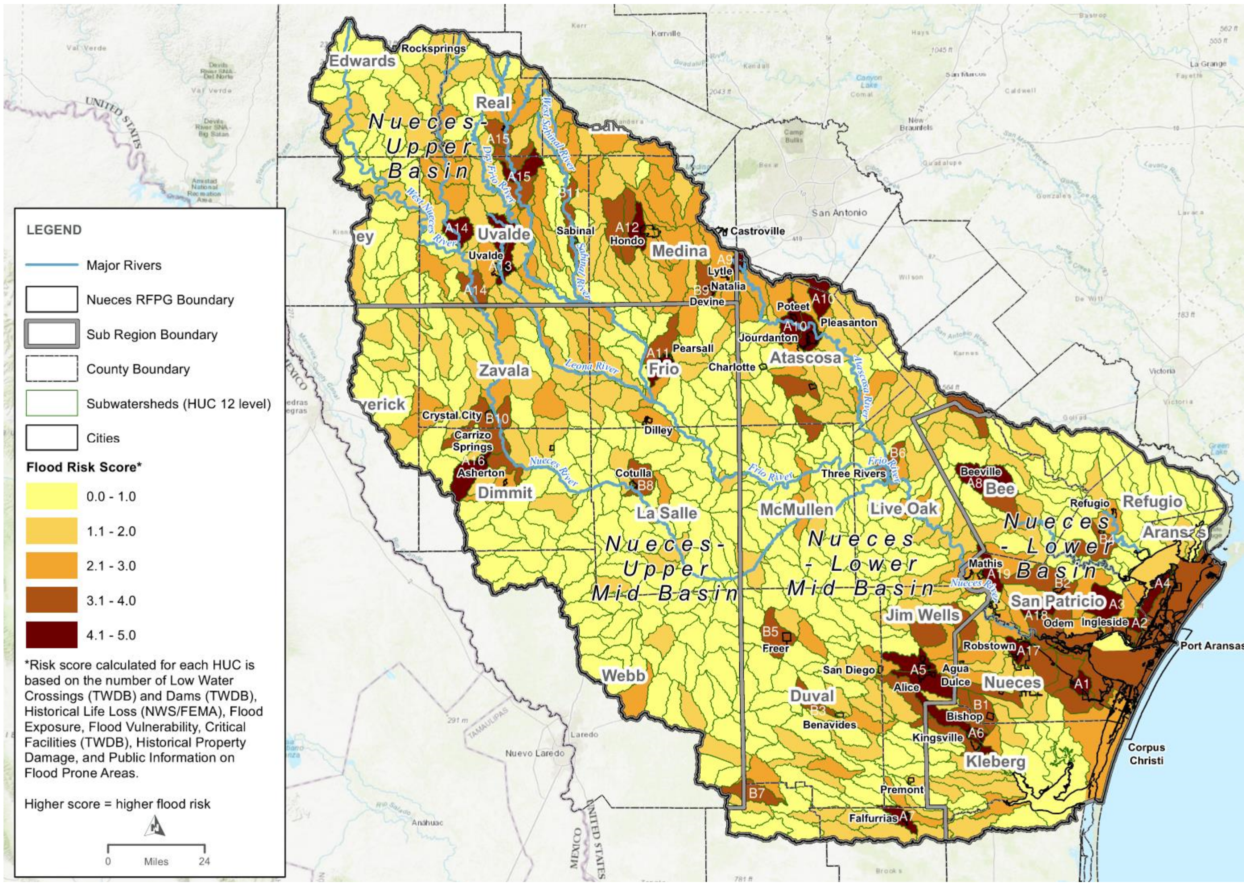

Figure 4-2. Overall Flood Risk per HUC-12 watersheds (Map 15)

Table 4-2 provides a listing of the greatest flood risk areas in relation to municipalities and counties and indicates if the greatest flood risk area is also located in exposure and vulnerability hot spots.

4.1.2 Greatest Flood Risk Knowledge Gaps

The greatest flood risk knowledge gaps for the NFPR are areas in the basin where the following conditions exist:

- Flood inundation boundaries are either not defined or considered inaccurate due to a lack of detailed modeling and mapping
- Flood studies and projects have not occurred in the recent past and are not on-going or proposed through funded projects

- Flood management practices do not exist or are not effectively enforced

4.1.2.1 Detailed Modeling and Mapping Gaps

Flood inundation boundaries are used to define the location and magnitude of flooding. Without accurate flood inundation boundaries, the existing flood risk is not well understood; therefore, controlling future risk through floodplain management regulations is difficult. Flood inundation boundaries based on recent detailed hydrologic and hydraulic models are considered accurate. These areas are shown in Figure 4-3.

Most of the basin does not have accurate flood mapping available and relies on approximate data. See Table 4-2 for a list of high-risk flood areas that are also located in the detailed flood modeling and mapping gap. Prioritizing investment in detailed hydrologic and hydraulic models in the gap areas with the highest overall flood risk is recommended.

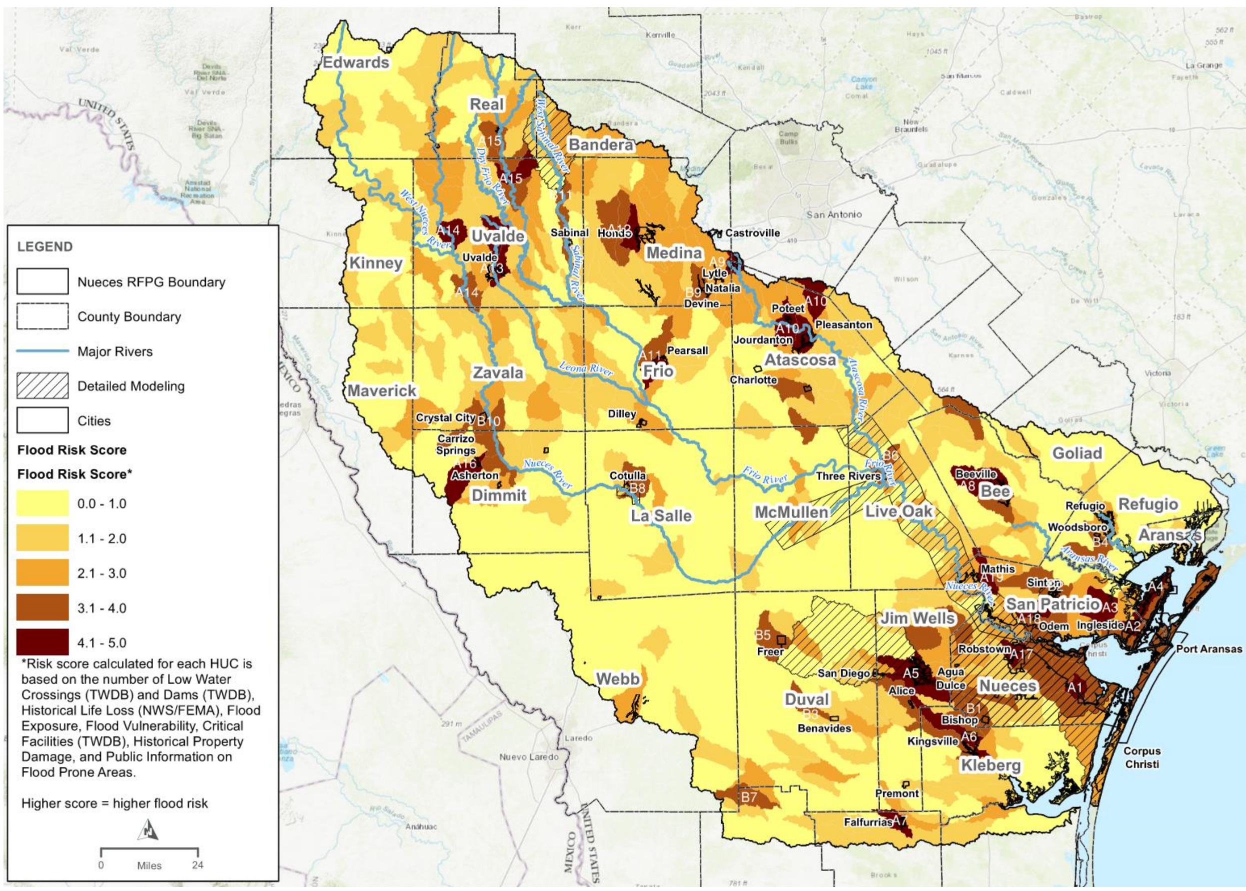

Figure 4-3. Accurate Modeling and Mapping Overlay w/ Overall Flood Risk (Map 14A)

4.1.2.2 Flood Studies and Projects Gaps

Flood studies are used to identify existing and future flood risks and often recommend mitigation or corrective solutions to reduce those risks. Without a flood study, it is difficult to implement actionable steps to reduce flood risk. For the NFPR, generally, flood studies have occurred or are occurring for counties near the coast. Figure 4-4 overlays the overall flood risk map with locations where on-going or proposed flood studies / projects have been identified. High flood risk areas located in flood study / project gap areas have been identified in Table 4-2.

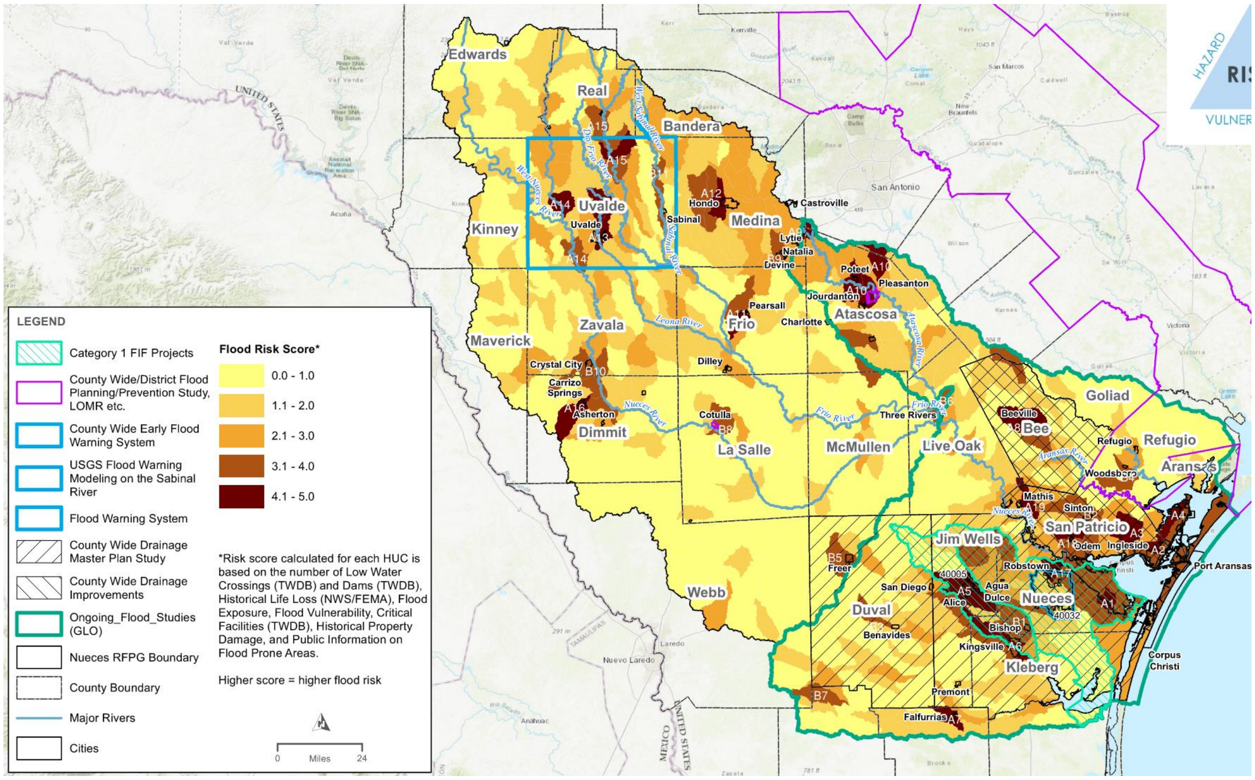

Figure 4-4. Flood Study / Project Overlay w/ Overall Flood Risk (Map 14B)

4.1.2.3 Floodplain Management Practice Gaps

Enacting floodplain management practices is effective in preventing activities that will result in increased flood risk in the future. Examples include requiring a floodplain permit for development activity in the floodplain and/or requiring building finished floor elevations to be one foot above the 1% annual chance flood elevation. Without floodplain management practices, it is difficult to control future flood risks. Figure 4-5 depicts the level of floodplain management practices and where higher floodplain standards are practiced in relation to the high flood risk areas. Areas of high flood risk in floodplain management gap areas are identified in Table 4-2 and generally include areas located away from the major population growth centers of Corpus Christi, San Antonio, and Laredo. Enhancement of flood management practices in areas with a high flood risk and a floodplain management gap (enforcement is low or none) is recommended.

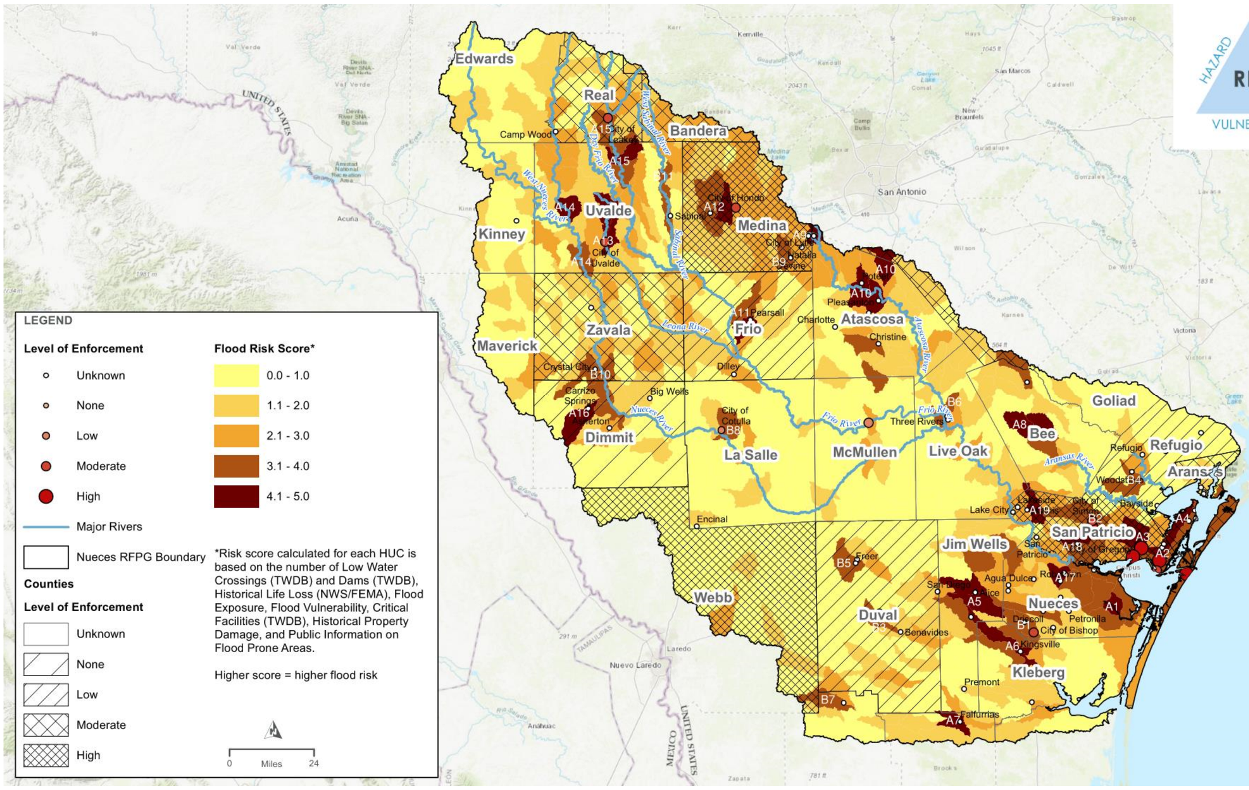

Figure 4-5. Floodplain Management Overlay w/ Overall Flood Risk (Map 14C)

4.1.2.4 Flood Mitigation Need Summary

The watershed areas with the highest flood risk scores are generally associated with populations located in or near cities or other unincorporated areas. Thus, areas with high flood risks were associated with these population centers in Table 4-2. Flood risk areas that have a flood score risk between 4 to 5 were grouped together to form a list of the highest risk areas. Similarly, flood risk areas that have a flood risk score between 3 to 4 were grouped together and considered high risk flood areas. Then, each flood risk area was evaluated to determine if the risk area is in a hot spot for exposure or vulnerability, as defined in Chapter 2. Further, each flood risk area was evaluated to determine if the risk area is in a knowledge gap area for detailed modeling and mapping, flood studies and projects, or floodplain management practices. The resulting table provides a list that represents the flood mitigation needs in the basin.

Table 4-2. Greatest Known Flood Risk Areas in Relation to Exposure/Vulnerability Hot Spots and Knowledge Gaps

Area ID	Area Description	Vulnerability Hot Spot	Exposure Hot Spot	Detailed Modeling Gap	Flood Study/Project Gap	Flood Management Gap
Highest Risk Areas (Score 4-5)						
A1	City of Corpus Christi	Y	Y	N	N	N
A2	Cities of Ingleside in San Patricio County	N	Y	N	N	N
A3	City of Gregory in San Patricio County	N	Y	N	N	N
A4	City of Rockport in Aransas County	N	Y	N	N	N
A5	City of Alice in Jim Wells County	Y	Y	N	N	N
A6	City of Kingsville in Kleberg County	Y	Y	N	N	N
A7	City of Falfurrias in Brooks County	Y	Y	Y	N[1]	Y
A8	City of Beeville in Bee County	N	Y	N	N	Y
A9	City of Lytle in Medina County	N	Y	Y	Y	N
A10	Pleasanton, Jourdanton, and Poteet area in Atascosa County	N	N	Y	Y[1]	N
A11	City of Pearsall in Frio County	Y	Y	Y	Y	Y
A12	Hondo area in Medina County	N	Y	N	Y	N
A13	City of Uvalde in Uvalde County	Y	Y	N	N[2]	N
A14	Area along Nueces River in western Uvalde County	N	N	Y	Y[2]	Y

Area ID	Area Description	Vulnerability Hot Spot	Exposure Hot Spot	Detailed Modeling Gap	Flood Study/Project Gap	Flood Management Gap
A15	Cities of Vanderpool and Utopia area along Frio River in Real and Uvalde Counties	N	N	Y	Y[2]	Y[3]
A16	City of Asherton in Dimmit County	N	N	Y	Y	Y
A17	City of Robstown in Nueces County	Y	Y	N	N	N
A18	City of Odem in San Patricio County	N	Y	N	N	N
A19	City of Mathis in San Patricio County	N	Y	N	N	N
High Risk Areas (Score 3-4)						
B1	City of Bishop in Nueces County	N	Y	N	N	N
B2	City of Sinton in San Patricio County	Y	Y	N	N	N
B3	City of Benavides in Duval County	N	N	Y	N	Y
B4	City of Woodsboro in Refugio County	N	N	N	N	N
B5	City of Freer	N	N	Y	N	Y
B6	City of Three Rivers in Live Oak County	N	Y	N	Y[1]	N
B7	City of Hebbronville in Jim Hogg County	N	N	Y	Y[1]	Y
B8	City of Cotulla	N	N	N	Y	Y

Area ID	Area Description	Vulnerability Hot Spot	Exposure Hot Spot	Detailed Modeling Gap	Flood Study/Project Gap	Flood Management Gap
B9	City of Devine in Medina County	Y	Y	Y	Y	N
B10	Crystal City in Zavala	Y	Y	Y	Y	N
B11	Sabinal River area in northeast Uvalde County and southwest Bandera County	N	N	N	Y	N

1. Located within GLO study area
2. Located within Uvalde Flood Warning System
3. Portion in Uvalde County potentially in a flood management gap area

4.2 Mid-Point Technical Memorandum

As an interim deliverable during development of the Nueces regional flood plan (NRFP), a technical memorandum was submitted to the TWDB on December 22, 2021, along with a geodatabase submittal. This technical memorandum provided a mid-point update on the following regional draft plan elements:

- Political Subdivisions with Flood-Related Authority
- Previous Relevant Flood Studies
- Inundation Boundaries for the existing and future flood hazard
- Additional flood-prone areas
- Availability of existing hydrologic and hydraulic models
- List of available flood-related models of most value
- Adopted flood mitigation and floodplain management goals
- Documented process to identify feasible projects and strategies
- Potential flood evaluations and potential feasible flood projects and strategies
- Identified flood projects and strategies determined infeasible

The NRFPG approved the technical memorandum for submittal to the TWDB on December 6, 2021. The technical memorandum is included in Appendix C5 – Mid-Point Technical Memorandum.

TWDB split out the geodatabase deliverable into two packages, due January 7, and March 7, 2022, respectively. The NRFPG submitted a single geodatabase along with the technical memorandum as part of the January 2022 deliverable and subsequent checklist acknowledging the March 2022 geodatabase deliverable for completion.