Task 4A: Flood Mitigation Needs

Source: Bastrop County Flood Photo

Utilizing the flood risk analysis and flood planning goals adopted by the Regional Flood Planning Group (RFPG), this chapter outlines the process used to identify areas within the Lower Colorado-Lavaca Region with the greatest risk of flooding and the need for flood management and mitigation activities. The assessment conducted in this task provides a high-level evaluation to help guide the identification of Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs) in future tasks. *Figure 4.1* provides a summary of the categories that were considered in the Flood Mitigation Needs Analysis.

Figure 4.1 Flood Mitigation Needs Analysis Categories

Threat to Life and Property

- Exposed Buildings
- Exposed Critical Facilities
- Exposed Low Water Crossings
- Inundated Roadways
- Inundated Agricultural Areas

Floodplain Management

- National Flood Insurance Program Participation

Data Gaps

- Inundation Boundary Mapping Gaps
- Hydrology and Hydraulic Model Gaps

Needs

- Emergency Needs
- Social Vulnerability Index

Flood Mitigation Needs Analysis

The flood mitigation needs analysis leveraged the Lower Colorado-Lavaca Region's existing condition 1 percent annual chance (100-year) flood exposure analysis to assess the threat to life and property as well as social vulnerability. This leveraged exposure analysis accounts for the use of the best available flood hazard data, including existing modeling analysis and documentation of historical flooding events. The *Lower Colorado-Lavaca Region Data Collection Survey Tool and Interactive Webmap* discussed in *Task 1: Planning Area and Description* included multiple opportunities for entities to submit conceptual, planning, or ongoing projects or studies/plans related to flooding. No entities in the Lower Colorado-Lavaca Region submitted revised floodplains that would result from flood mitigation projects with dedicated construction funding and completion date before the completion of this plan.

Analysis Process

The main objectives of Task 4A are to identify the areas of greatest known flood risk and areas where the greatest lack of flood risk knowledge exists. The Task 4A analysis is based on a geospatial process that combines information from multiple datasets representing the criterion listed in *Figure 4.1* and provides a basis for achieving the Task 4A objectives. The geospatial process was developed in a geographic information system (GIS) based on the data collected in Tasks 1 through 3. The geospatial assessment was conducted at a HUC-12 watershed level of detail, which is consistent with TWDB guidelines and rules. A Hydrologic Unit Code (HUC) is a unique code assigned to watersheds in the United States. As the watersheds get smaller, the number of units used to identify them gets longer. Therefore, the smallest unit of division used to identify a watershed is 12-digits or a HUC-12. The Lower Colorado-Lavaca Region has 560 HUC-12 watersheds, with an average area of 43 square miles.

A total of 10 data categories (summarized in *Figure 4.1*) were used in the geospatial analysis. A scoring range was determined for each data category based on the statistical distribution of the data. The scoring ranges vary for each category based on the HUC-12s with the smallest and largest quantity. A uniform scoring scale of one to five was adopted, and each HUC-12 was assigned an appropriate score for each category. The scores for each HUC-12 under each category were then added to obtain a total score that was used to reveal the areas of greatest known flood risk and need for mitigation activities. The areas with the greatest gaps of flood risk information were identified using the hydrologic and hydraulic modeling gaps.

The following sections briefly describe the data categories included in the assessment and how each HUC-12 watershed was scored. Note that the objective of the Task 4A process is to determine the factors present within a given HUC-12 and to what degree, not necessarily to determine the relative importance of each factor in determining flood risk. Therefore, no weight has been applied to emphasize one factor over another at this time.

Analysis Categories and Matrix

The 10 categories applied in this analysis were selected based on their inherent reflection of either risk or absence of information for each of the Lower Colorado-Lavaca Region's HUC-12 watersheds and are described in the sections below. Each category and its respective categories and score distributions are shown in *Table 4.1*. The geospatial assessment was conducted using the existing condition 1 percent annual chance (100-year) event as that is the most representative of current conditions.

Table 4.1 Flood Mitigation Needs Analysis Matrix

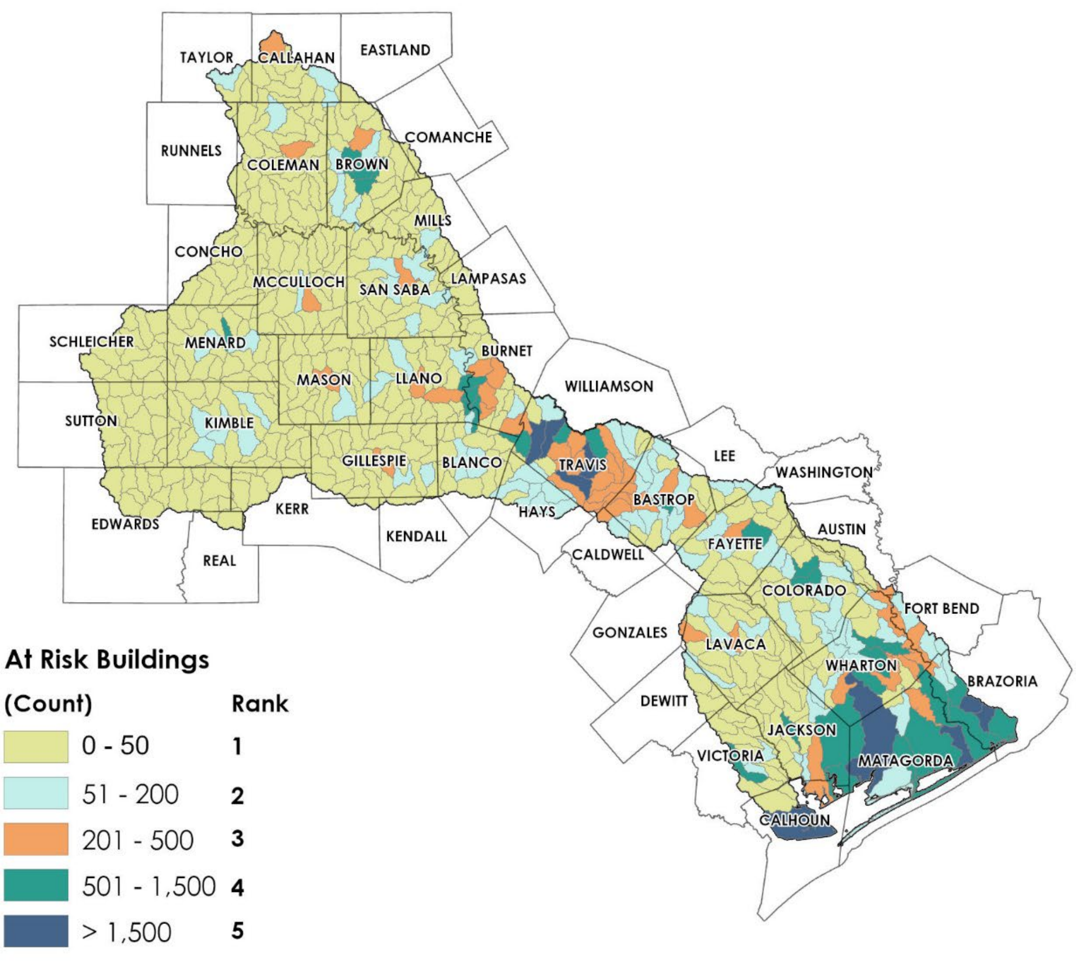
Category	Criteria	1 Point	2 Point	3 Point	4 Point	5 Point
Threat to Life and Property	Number of Exposed Buildings	0-50	51-200	201-500	501-1,500	1,500+
Threat to Life and Property	Number of Exposed Critical Facilities	0-1	2	3	4	5-8
Threat to Life and Property	Number of Exposed Low Water Crossings	0-5	6-10	11-15	16-20	21+
Threat to Life and Property	Miles of Inundated Roadway Segments	0-5	5.1-10	10.1-15	15.1-30	30+
Threat to Life and Property	Square Miles of Inundated Agricultural Area	0-5	5.1-10	10.1-15	15.1-30	30+
Floodplain Management	NFIP Participation	Yes				No
Data Gaps	Inundation Boundary Mapping Gaps	None-Partial 0.2% Flood Risk	Missing 0.2% Flood Risk	Outdated NFHL (10+ Years Old)	Not Model-Backed (Fathom)	Missing Atlas 14 Analysis
Data Gaps	H&H Model Gaps	No Gaps		Partial Gaps		Gaps
Need	Emergency Need	No				Yes
Need	Average Social Vulnerability Index of Exposed Buildings	0-0.25	0.251-0.45	0.451-0.55	0.551-0.65	0.65+

Threat to Life and Property

Exposed Buildings

The TWDB provided a building dataset utilized in Chapter 2: Flood Risk Analysis to conservatively identify buildings with a footprint within the existing condition 1 percent annual chance (100-year) event floodplain. Using this exposed building dataset, each HUC-12 was populated with the number of exposed buildings located within each HUC-12 boundary. The exposed building counts ranged widely across the region, with rural HUC-12s only having only a few buildings in the floodplain while urban HUC-12s may have over 1,000 exposed buildings. The scoring associated with the number of exposed buildings per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.2*. The navy watersheds represent the HUC-12s with the greatest number of exposed buildings. These watersheds are located in more urban areas near Lake Travis, the City of Austin, and along the coast.

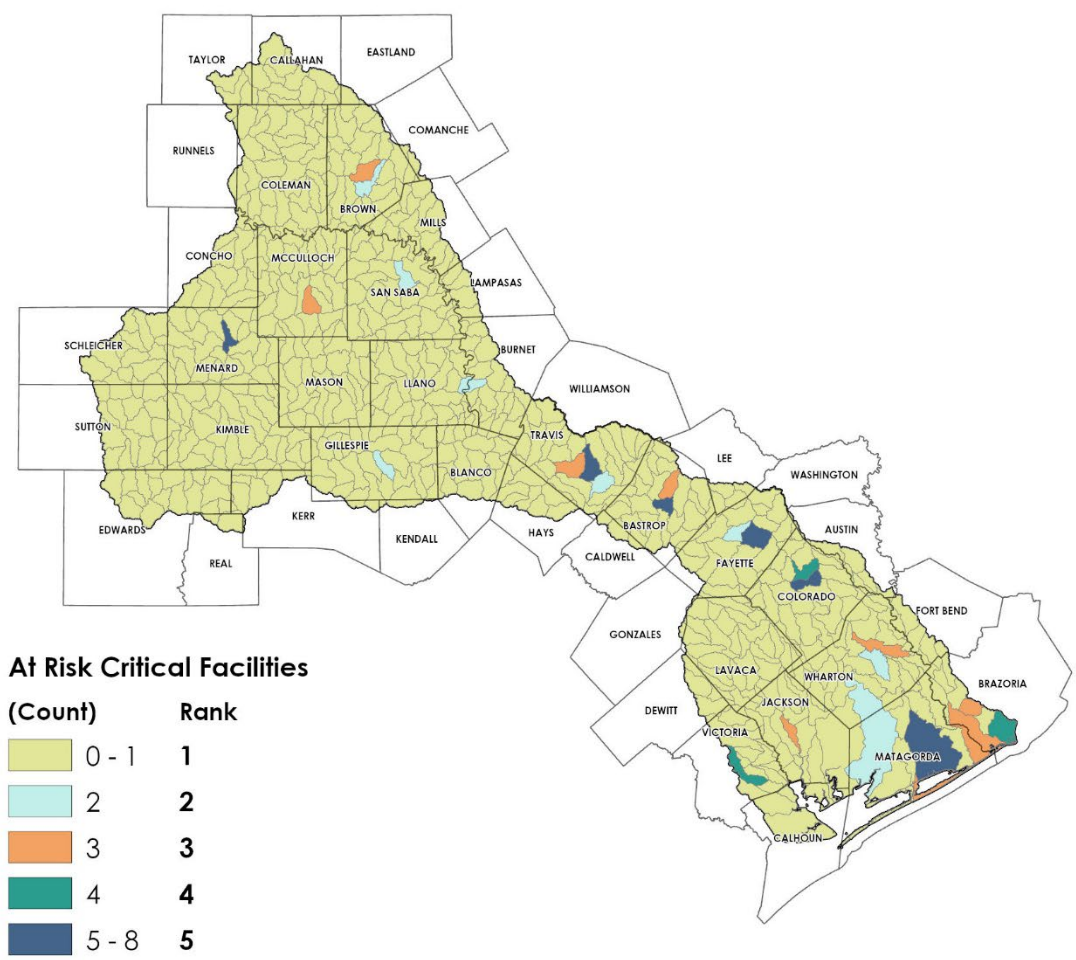
Figure 4.2 Scoring of Exposed Buildings



Exposed Critical Facilities

The exposure analysis in *Chapter 2: Flood Risk Analysis* conservatively identified critical facilities with a footprint within the existing condition 1 percent annual chance (100-year) event floodplain. Using this exposed critical facility dataset, each HUC-12 was populated with the number of exposed critical facilities located within each HUC-12 boundary. The exposed critical facility counts are relatively low across the region; however, there are six watersheds with five or more critical facilities potentially at risk of flooding. The scoring associated with the number of exposed critical facilities per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.3*. The navy watersheds represent the HUC-12s with the greatest number of exposed critical facilities.

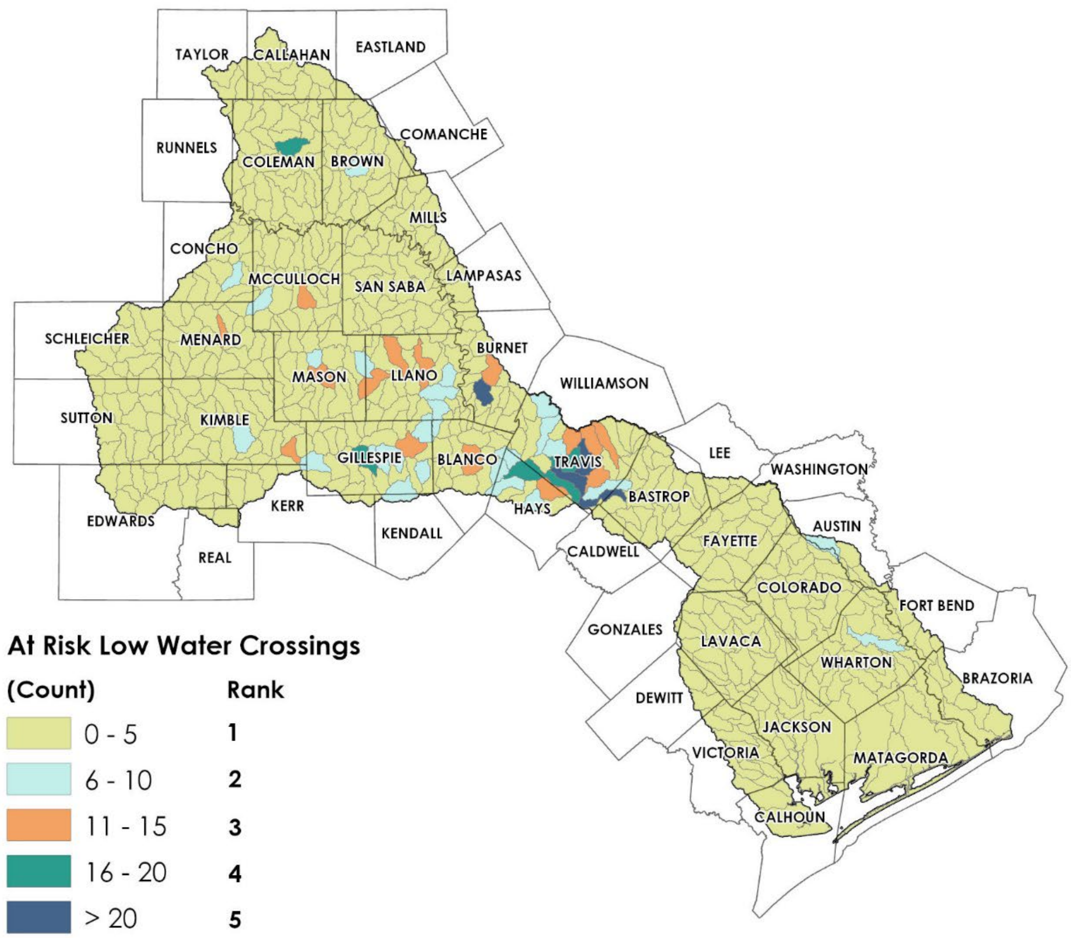
Figure 4.3 Scoring of Exposed Critical Facilities



Exposed Low Water Crossings

The exposure analysis in *Chapter 2: Flood Risk Analysis* identified low water crossings located within the existing condition 1 percent annual chance (100-year) event floodplain. Using this exposed low water crossing dataset, each HUC-12 was populated with the number of exposed low water crossings located within each HUC-12 boundary. The exposed low water crossing counts are relatively low across the region; however, there are 10 watersheds with 16 or more exposed low water crossings. The scoring associated with the number of exposed low water crossings per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.4.* The dark green and navy watersheds represent the HUC-12s with the greatest number of exposed low water crossings.

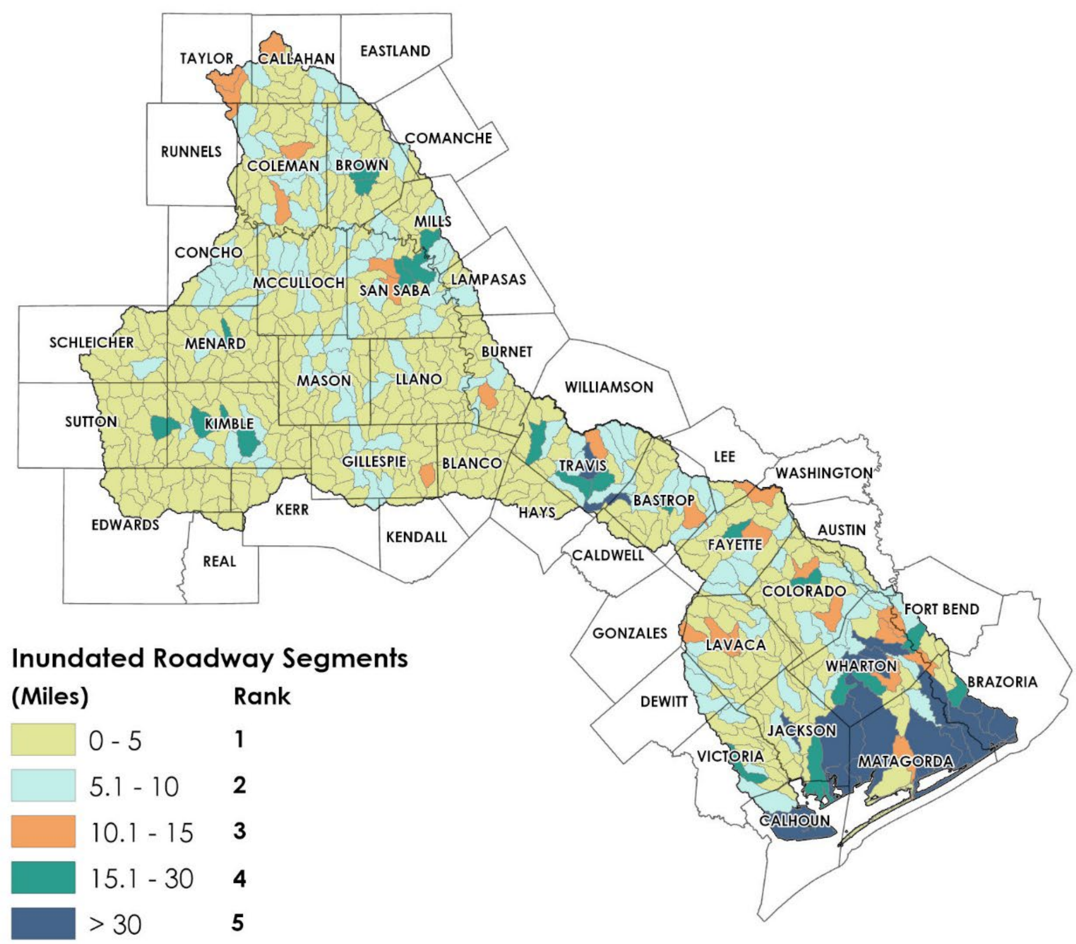
Figure 4.4 Scoring of Exposed Low Water Crossings



Inundated Roadway Segments

As described in *Chapter 2: Flood Risk Analysis,* inundated roadway segments were identified by clipping the Texas Department of Transportation (TxDOT) geospatial linework with the existing condition 1 percent annual chance (100-year) floodplain. Using this dataset, each HUC-12 was populated with the miles of inundated roadway segments located within each HUC-12 boundary. The inundated roadway mileage ranged widely across the region, with the majority of HUC-12s having less than five miles of roadway in the floodplain, while coastal HUC-12s may have over 30 miles of inundated roadway segments. The scoring associated with the miles of inundated roadway segments per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.5.* The navy watersheds represent the HUC-12s with the greatest number of inundated roadway segments.

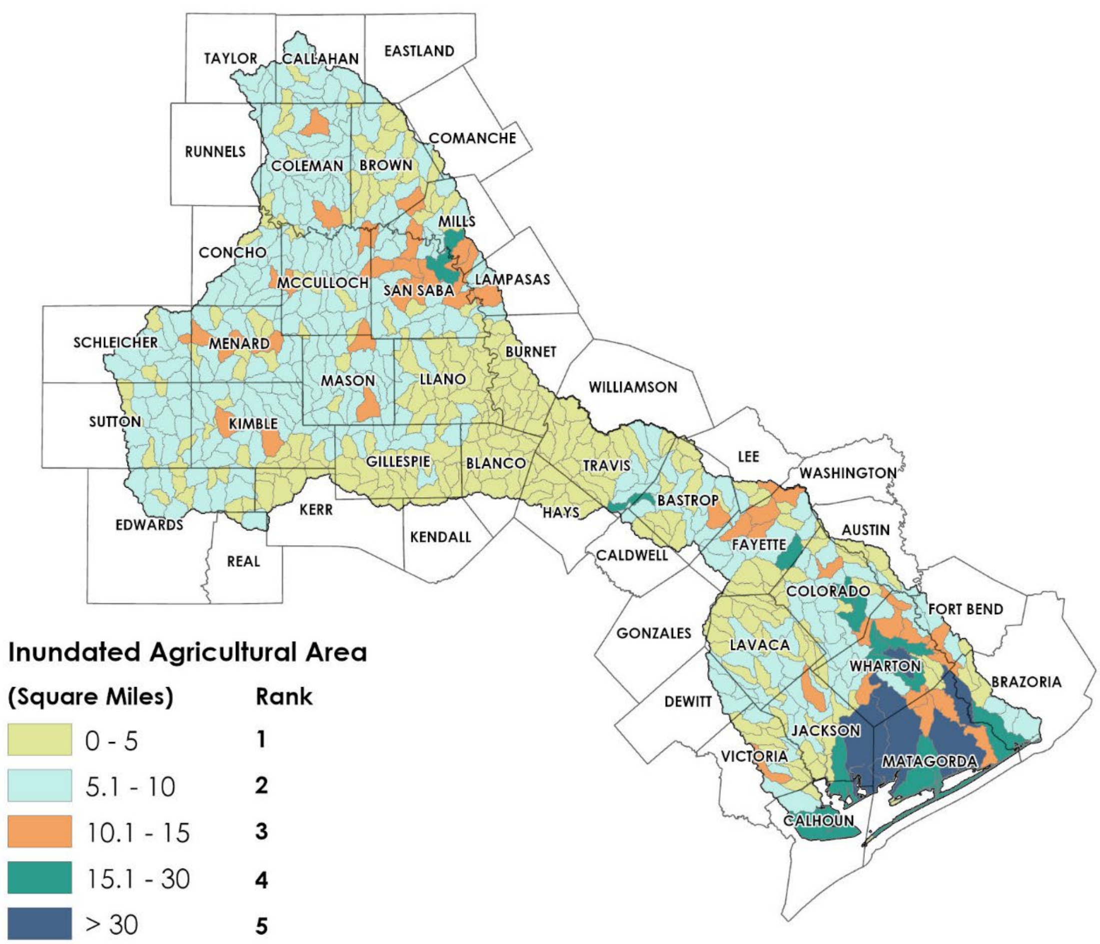
Figure 4.5 Scoring of Exposed Roadway Segments



Inundated Agricultural Areas

Agricultural land use data in the Lower Colorado-Lavaca Region was obtained from the 2020 Texas Cropland Data layer developed by the United States Department of Agriculture National Agricultural Statistics Service. The exposure analysis in *Chapter 2: Flood Risk Analysis* identified agricultural areas with a footprint within the existing condition 1 percent annual chance (100-year) event floodplain. Using this dataset, each HUC-12 was populated with the square miles of inundated agricultural areas within each HUC-12 boundary. As anticipated, the urban watersheds display less inundated agricultural areas than the rural watersheds. The scoring associated with the square miles of inundated agricultural areas per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.6.* The navy watersheds represent the HUC-12s with the greatest number of inundated agricultural areas.

Figure 4.6 Scoring of Inundated Agricultural Areas

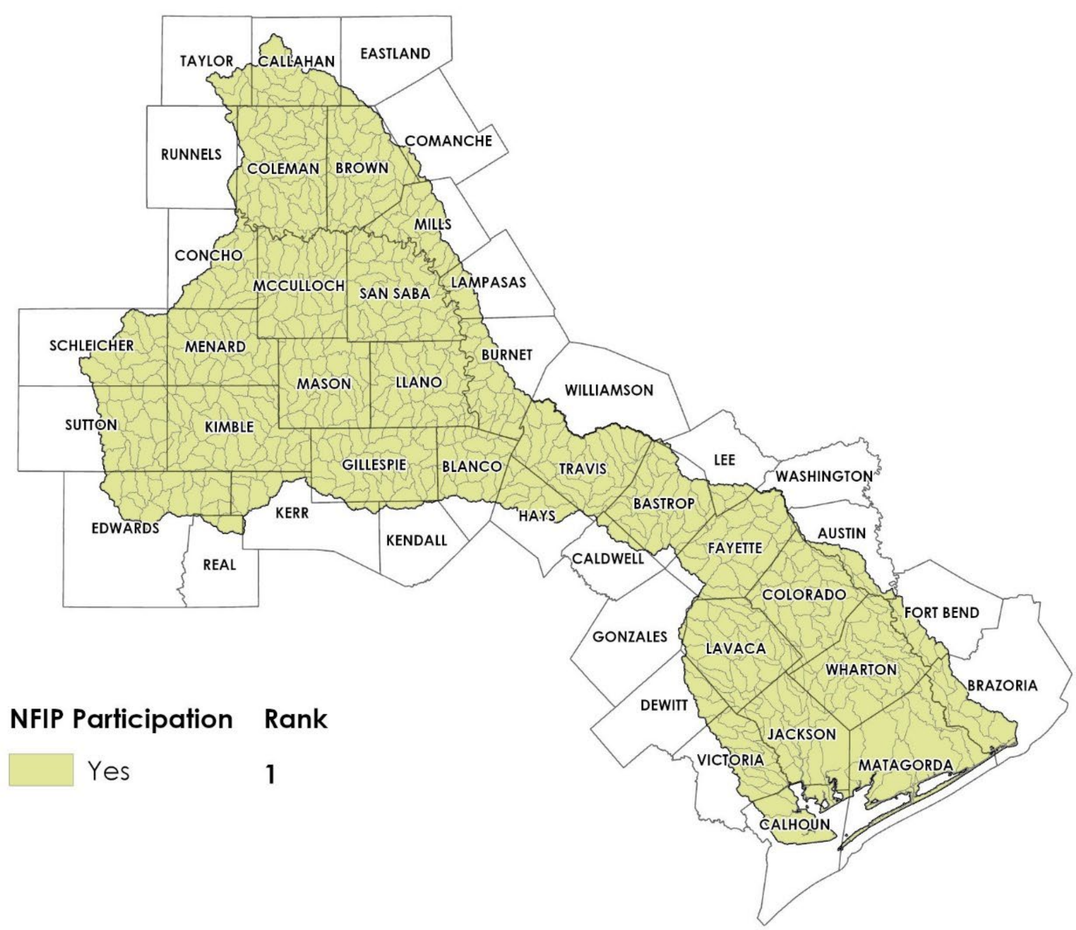


Floodplain Management

National Flood Insurance Program (NFIP) Participation

Participation in the NFIP was considered as a proxy for having adequate floodplain management regulations and land use policies for this assessment. The NFIP participation status for each county and community is presented in *Task 3: Floodplain Management Practices and Flood Protection Goals*. Non-participating entities likely have limited floodplain management regulations and are not eligible for flood insurance under the NFIP. Furthermore, if a presidentially declared disaster occurs as a result of flooding, no federal financial assistance can be provided to these entities for repairing or reconstructing damaged infrastructure. Unlike other planning regions, all counties within the Lower Colorado-Lavaca Region participate in the NFIP, with only eight municipalities currently not participating. Because the majority of the region participates in the NFIP, all watersheds were assigned a score of one, indicating a low risk for this category. The scoring results are displayed in *Figure 4.7*.

Figure 4.7 Scoring of National Flood Insurance Program Participation

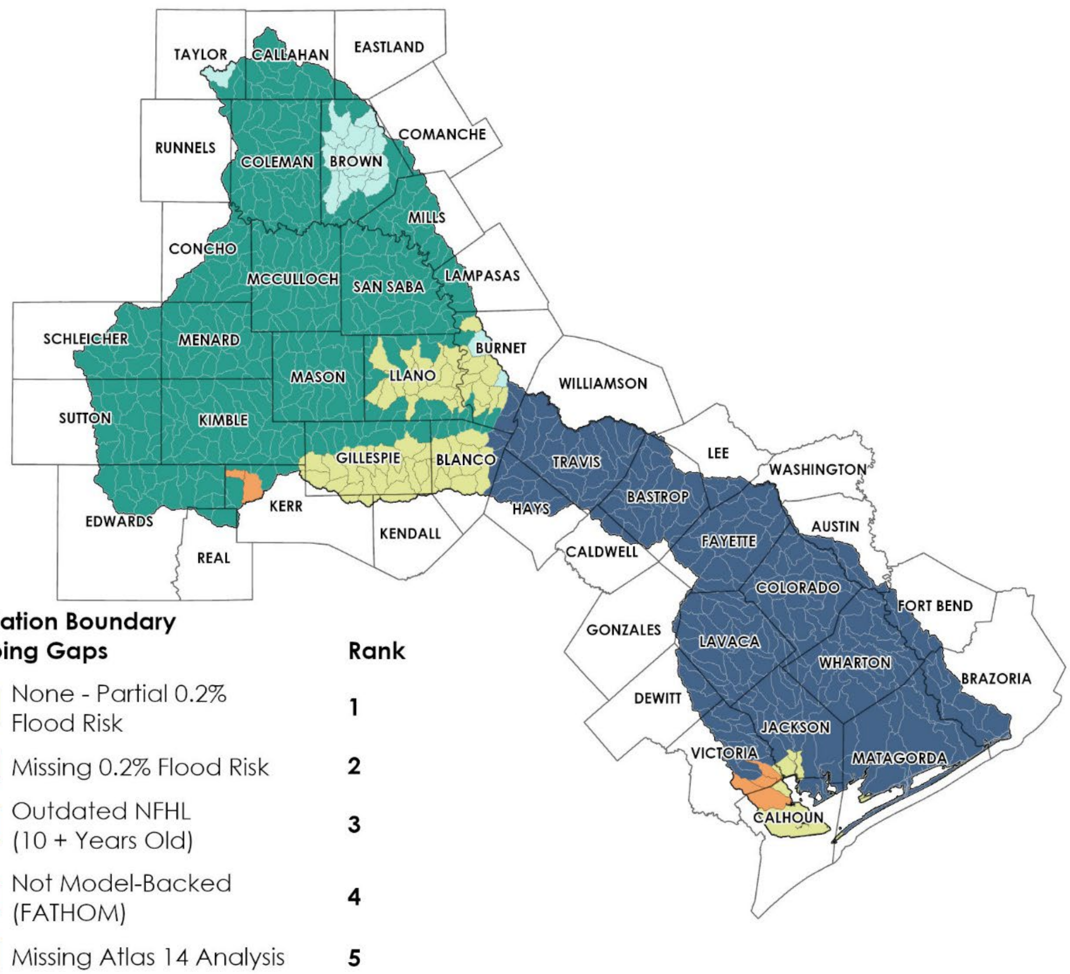


Data Gaps

Inundation Boundary Mapping Gaps

In *Chapter 2: Flood Risk Analysis,* inundation boundary mapping gaps were identified for areas where flood inundation boundary mapping for the 0.2 percent annual (500-year) event was missing, modeling and/or mapping was outdated, modeling and/or mapping was not reflective of the current scientific data, or mapping was not model-backed. The scoring associated with the inundation boundary mapping gaps per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.8.* The navy watersheds represent the HUC-12s with the greatest need for FMEs to assess the impacts of NOAA Atlas 14 rainfall data through the more populated portion of the region.

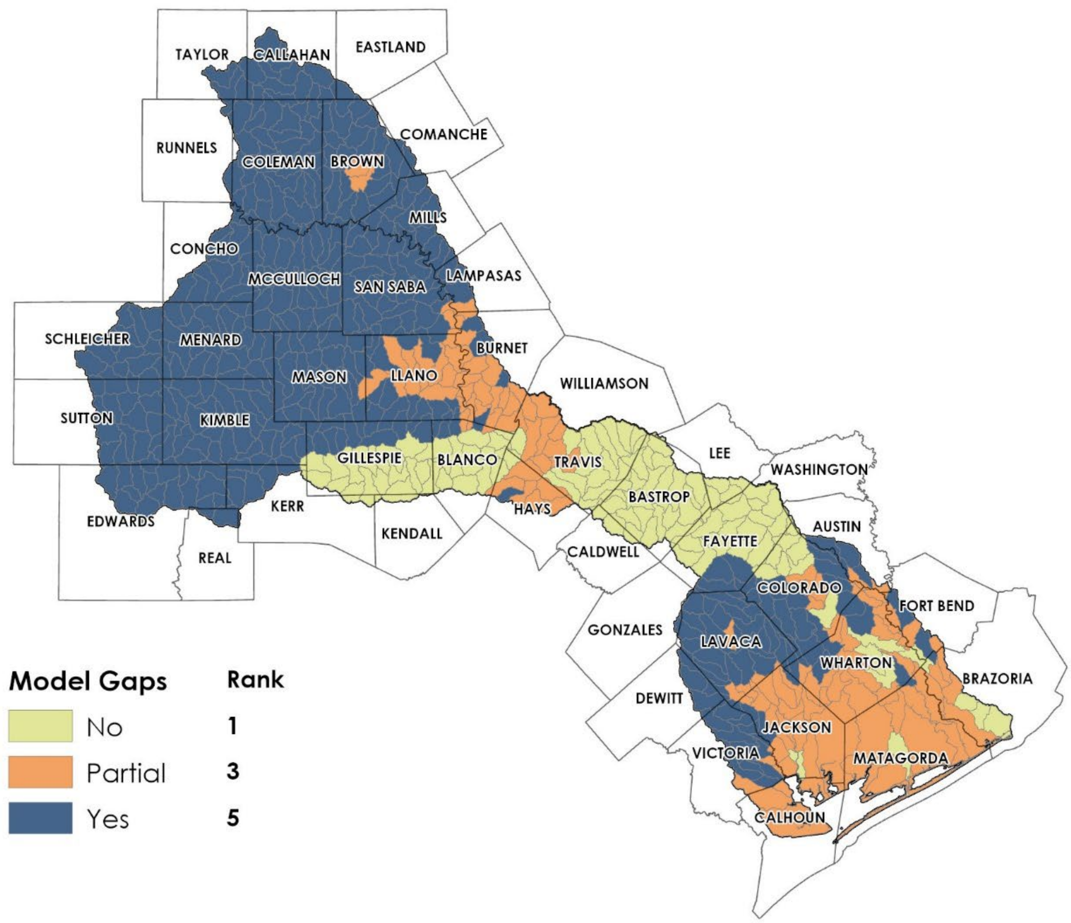
Figure 4.8 Scoring of Inundation Boundary Mapping Gaps



Hydrologic & Hydraulic (H&H) Model Gaps

In *Chapter 2: Flood Risk Analysis,* hydrologic and hydraulic model gaps were identified. The H&H gap areas exclude areas where local studies, base level engineering, and FEMA detailed or limited detailed studies are present because these areas are locations where H&H models are available. Scoring was determined based on whether a HUC-12 watershed had total, partial, or no coverage of model-backed floodplains. The scoring associated with the H&H model gaps per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.9*. The navy watersheds represent the HUC-12s with the greatest need for FMEs to generate hydrologic and hydraulic models where flood risk knowledge is limited.

Figure 4.9 Scoring of Hydrologic and Hydraulic Model Gaps

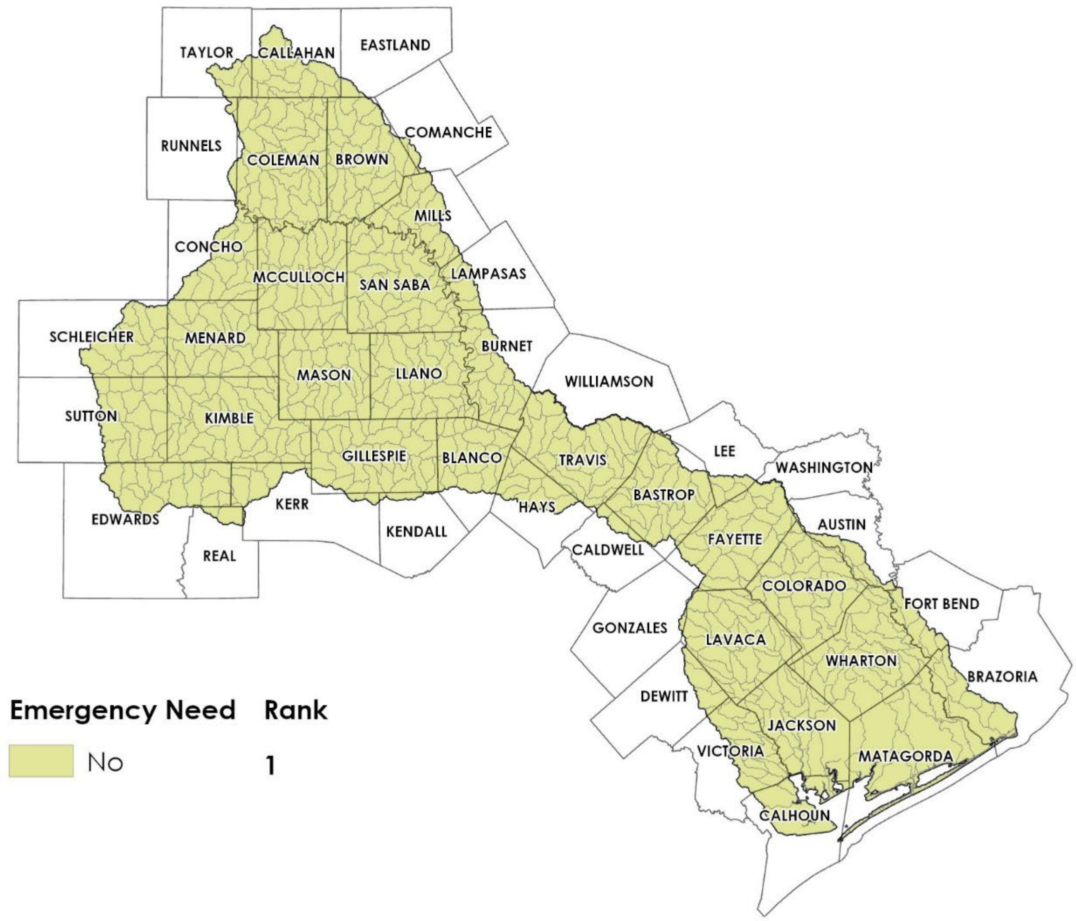


Areas of Need

Emergency Needs

The Lower Colorado-Lavaca RFPG has not developed a definition for Emergency Needs. This category is included as a placeholder for the next planning cycle. Since the category has not yet been defined, all watersheds were assigned a score of one, indicating a low risk for this category. The scoring results are displayed in *Figure 4.10*.

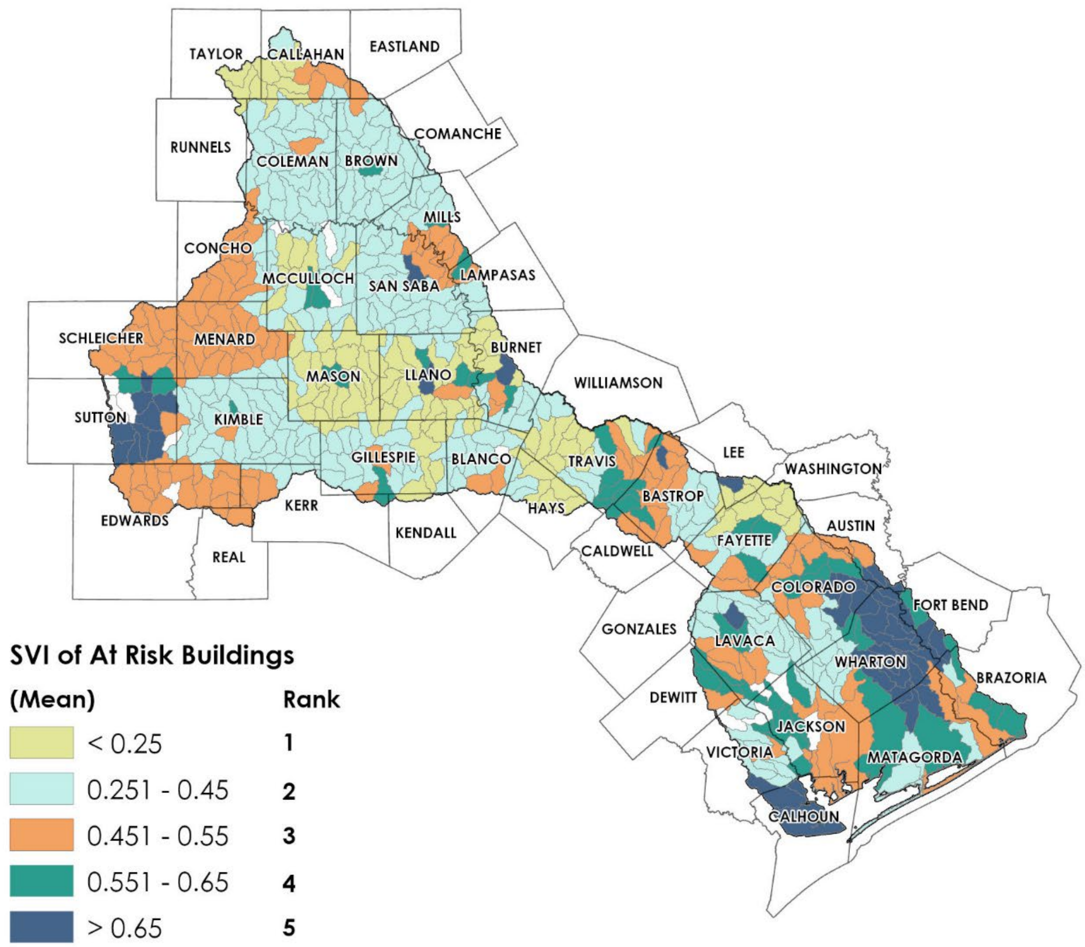
Figure 4.10 Scoring of Emergency Needs



Social Vulnerability Index (SVI)

Social vulnerability is the measure of the capacity to weather, resist, or recover from the impacts of a hazard in the long and short term. SVI values are present within the building footprints dataset provided by the TWDB and used in the existing condition vulnerability analysis discussed in *Chapter 2: Flood Risk Analysis*. Using the SVI values for the exposed building dataset, each HUC-12 was populated with the average SVI within each HUC-12 boundary. Higher SVI values represent watersheds with greater vulnerability, while lower SVI values represent watersheds with higher resilience. The scoring associated with the SVI of exposed buildings per watershed is displayed in *Table 4.1,* and the scoring results are displayed in *Figure 4.11.* The navy watersheds represent the HUC-12s with the greatest social vulnerability.

Figure 4.11 Scoring of Social Vulnerability



Mitigation Needs Analysis Results

The process and scoring methodology described above were implemented across the entire Lower Colorado-Lavaca Region. As previously discussed, this assessment was performed to address the two objectives of Task 4A. The first objective was to identify the areas where the greatest flood risk knowledge gaps exist. These areas were identified using the hydrologic and hydraulic modeling gaps. As observed in *Figure 4.9*, the majority of the region lacks hydrologic and hydraulic models, as indicated by the orange and navy watersheds.

The second objective was to determine the areas of greatest known flood risk and flood mitigation needs. For each HUC-12 in the Lower Colorado-Lavaca Region, the scores from the 10 categories in the assessment matrix were added to obtain a total score. Based on the distribution of the final scores in this preliminary assessment, the watersheds with the greatest risk of flooding and the need for flood management and mitigation activities are displayed in navy. It is important to note that low-scoring HUC-12 watersheds likely have flood risks, but the risk is relatively low compared to the others.

The maps resulting from the Task 4A assessment served as a guide to the RFPG's subsequent efforts in Tasks 4B and 5. The orange and navy HUC-12s in *Figure 4.12* highlight the areas in the Lower Colorado-Lavaca Region where potentially feasible FMEs should be considered as part of Task 4B. The dark green and navy HUC-12s in *Figure 4.12* emphasize watersheds where the RFPG should strive to identify and implement FMEs, FMPs, and FMSs to reduce the known flood risks within those areas.

Figure 4.12 Scoring of Flood Mitigation Needs Analysis